

WORLD TRADE REPORT 2008

Trade in a Globalizing World



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ABBREVIATIONS AND SYMBOLS

AMD	Advanced Micro Devices
BEA	Bureau of Economic Analysis
BIS	Bank for International Settlements
BOP	Balance of Payment
BPO	business process outsourcing
CAFTA	Central American Free Trade Agreement
CEO	Chief Executive Officer
CEP	Centre for Economic Performance
CEPAL	Comision Economica para America Latina y el Caribe
CEPII	Centre d'Etudes prospectives et d'Informations Internationales
CEPR	Center for Economic Policy Research
CES	constant elasticity of substitution
CGE	Computable General Equilibrium
CIA	Central Intelligence Agency
CIS	Commonwealth of Independent States
CMEA	Council of Mutual Economic Assistance
CORE	Centre for Operations Research and Econometrics
CRS	constant returns to scale
EC	European Community
EEC	European Economic Community
EFTA	European Free Trade Area
EU	European Union
FAME	forecasting analysis and modeling environment
FDI	Foreign Direct Investment
FTA	Free Trade Agreement
GATS	General Agreement on Trade in Services
GATT	General Agreement on Tariff and Trade
GDP	Gross Domestic Product
GNP	Gross National Product
GTAP	Global Trade Analysis Project
ICT	Information and Communication Technology
IF	Integrated Framework
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
IPRs	Intellectual Property Rights
IRS	increasing returns to scale
ISCED	International Standard Classification of Education
IT	Information Technology
ITC	International Trade Center
ITU	International Telecommunications Union
LDCs	Least-Developed Countries
MERCOSUR	Southern Common Market
NAFTA	North American Free Trade Agreement
NES	National Election Studies
NESPD	New Earnings Survey Panel Dataset
NIEs	Newly Industrialized Economies
NTBs	Non-tariff barriers
OECD	Organization for Economic Co-operation and Development
OEEC	Organization for European Economic Cooperation
OPEC	Organization of the Petroleum Exporting Countries
OSAs	Open Skies Agreements
PPP	purchasing power parity

R&D	Research and Development
RSIE	Research Seminar in International Economics
S&D	Special and differential treatment
SITC	Standard International Trade Classification
SOC	Standard Occupational Classification
SPS	Sanitary and Phytosanitary Measures
SSRN	Social Science Research Network
STDF	Standards and Trade Development Facility
STP	Software Technology Parks
TAA	Trade Adjustment Assistance
TFP	total factor productivity
UK	United Kingdom
UNCTAD	United Nations Conference on Trade and Development
US	United States of America
UNDP	United Nations Development Programme
USSR	Union of Socialist Soviet Republic
VAT	Value-Added Tax
WCO	World Customs Organization
WWI	First World War
WWII	Second World War

The following symbols are used in this publication:

...	not available
0	figure is zero or became zero due to rounding
-	not applicable
\$	United States dollars
€	euro
£	UK pound

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DISCLAIMER

The *World Trade Report* and any opinions reflected therein are the sole responsibility of the WTO Secretariat. They do not purport to reflect the opinions or views of members of the WTO. The main authors of the Report also wish to exonerate those who have commented upon it from responsibility for any outstanding errors or omissions.



FOREWORD BY THE DIRECTOR-GENERAL

This year's *World Trade Report* explores the role of trade in a world characterized over the last several decades by increasing dependence among nations. This inter-dependency – what we all call globalization today – is a multi-layered and complex phenomenon involving intensive political, social and economic interaction nationally and internationally. Few would contest the benefits that globalization has brought in terms of greater prosperity for hundreds of millions, as well as greater stability among nations. But many individuals in different societies across the world have shared little or not at all in the benefits of globalization. The challenges facing national governments in managing globalization are formidable, and success in spreading prosperity more widely requires a strong common purpose.

Misgivings about the consequences of globalization have grown over the years. Increased anxiety about disruption, displacement and exclusion has become more apparent, not least from public opinion surveys. These misgivings have dominated political debate, especially when elections are imminent. Wherever such concerns are encountered, it is obvious that a failure to address them in a constructive manner will reduce the opportunities for governments to pursue policies that permit societies to benefit from globalization. Such neglect will also provoke intensified claims of injustice and unfairness that challenge the fundamental legitimacy of openness in international economic policy. We must ask ourselves what may be done in the framework of international cooperation, including through the WTO, to mitigate the negative side-effects from positive change, and to what extent governments have a responsibility to manage change domestically.

This Report examines how trade fits into today's panorama of globalization. It revisits long-standing theories about the sources of gains from trade and examines new insights, but also highlights what we do not know enough about. It considers evidence of the gains that have been realized and by whom. We have known since the days of Ricardo that the gains from trade are not evenly distributed – some win and others lose. Interpreting and explaining sometimes complex and dense theories is not always easy. But I believe the effort is worthwhile, allowing analysis and evidence to take the upper hand over prejudice and populist opportunism. And this

applies to all sides of the debate on trade and its place in an increasingly globalized world.

A thorough review of the evidence could not be more timely. Some of the most renowned economists have recently engaged in a vigorous debate on whether off-shoring to developing countries diminishes the gains from trade in the industrialized world. Perhaps one of the factors that has increased reservations about the attractions of globalization is precisely that it increases uncertainty in the job market. Off-shoring will often occur with little warning in any sector and may affect professional groups that had previously believed their jobs were safe. The fragmentation of production processes implied by off-shoring offers opportunities for industrial development and diversification. At the same time, governments have a range of measures at their disposal to reduce the negative effects on disadvantaged groups and some are more adept at using them than others. More work is needed here. Countries missing out on international production opportunities risk being marginalized from globalization – indeed, this is a vivid example of how globalization can leave countries and societies behind. But the good news is that much of what can be done to avoid this outcome is in the hands of responsible government.

In terms of sharing the benefits of trade and globalization, the Report reviews what we know about how trade may have an impact on inequality and poverty. Trade can affect income distribution in a variety of ways. Much evidence suggests that technological change rather than trade is the main cause of any negative impact on the distribution of income. But this conclusion has been questioned on the grounds that trade and technology flows cannot easily be separated.

Trade affects the poor in different ways. It is extremely difficult to determine precisely how changes in trade policy have an effect on poverty, but the overall view is that opening to trade has a positive effect, even though some households are likely to be negatively affected. In the context of relatively open trade policies, the massive global challenge of pulling people out of poverty raises issues that go far beyond a country's trade regime. Mounting evidence suggests that factors such as the quality of infrastructure, education, the

effectiveness of technological development, the ability of domestic markets to function properly and the quality of the institutional framework are crucial for successful growth and development. These relationships were examined in detail in the *World Trade Report 2004*.

As noted above, we need to ask what scope exists in the WTO for addressing the policy implications of global economic integration. Clearly international initiatives play a role, but these are no substitute for action taken by individual governments. In many instances, domestic policies determine more than anything else a government's capacity to benefit from international cooperation. This does not suggest that we can be satisfied with current arrangements for international cooperation, and the Report highlights a few areas for possible improvement.

Much of what is immediately obvious in the WTO context concerns the on-going negotiations under the Doha Development Agenda. By bringing these negotiations to a close, we can contribute in several ways to lower trade costs and to improve the

rules governing multilateral trade, thus increasing opportunities to gain from global integration. The trade negotiations involving manufactured goods, agriculture and services could make a significant difference. The work on trade facilitation also has the potential to yield high returns. The Aid For Trade initiative offers an unprecedented opportunity for clarifying needs and coordinating action to ease trade-related supply constraints in developing countries. More generally, a balanced outcome and successful closure of the Doha Round will signal the commitment of governments to preserve harmonious trade relations and to strengthen the trading system for the benefit of a more certain trading environment and a healthier world economy.



Pascal Lamy
Director-General

EXECUTIVE SUMMARY

TRADE IN A GLOBALIZING WORLD

International trade is integral to the process of globalization. Over many years, governments in most countries have increasingly opened their economies to international trade, whether through the multilateral trading system, increased regional cooperation or as part of domestic reform programmes. Trade and globalization more generally have brought enormous benefits to many countries and citizens. Trade has allowed nations to benefit from specialization and economies to produce at a more efficient scale. It has raised productivity, supported the spread of knowledge and new technologies, and enriched the range of choices available to consumers. But deeper integration into the world economy has not always proved popular, nor have the benefits of trade and globalization necessarily reached all sections of society. Trade scepticism is on the rise in certain quarters, and the purpose of this year's core topic of the World Trade Report, entitled "Trade in a Globalizing World", is to remind ourselves of what we know about the gains from international trade and the challenges arising from higher levels of integration.

The Report explores a range of interlinking questions, starting with a consideration of what constitutes globalization, what drives it, the benefits it brings, the challenges it poses and what role trade plays in this world of ever-growing interdependency. We ask why some countries have managed to take advantage of falling trade costs and greater policy-driven trading opportunities while others have remained largely outside international commercial relations. We also consider who the winners and losers are from trade in society and what complementary action policy-makers need to take in order to secure the benefits of trade for society at large. In examining these complex and multi-faceted questions, the Report reviews both the theoretical trade literature and empirical evidence that can help to give answers to these questions.

GLOBALIZATION AND TRADE

The key economic features of globalization constitute deeper integration in product, capital and labour markets.

Globalization is not a new phenomenon. Since the mid-19th century, there have been at least two

episodes of globalization. The most recent period of globalization starting in the immediate post-World War II period, strongly bolstered by new communications and transport technologies, has been marked by a prolonged period of strong trade and economic growth.

TRENDS IN GLOBALIZATION

Globalization has caused significant structural changes in parts of the world economy.

Some countries and economic sectors have been able to take advantage of these structural changes better than others. In the first decades after World War II, Europe and Japan were important beneficiaries of globalization as they sought to restructure their economies. In more recent years, newly industrializing economies have been among the major winners from increasing economic integration.

A long-term shift in the composition of world merchandise trade has occurred, with the share of manufactured goods rising dramatically, against a decline in agricultural products and non-fuel minerals. The domination of developed countries in world exports of manufactures has been greatly diluted, first in labour-intensive goods (such as textiles and clothing) and subsequently in electronic products and capital-intensive goods (such as automotive products).

Global trade growth was less dynamic after the oil crisis of 1973, while migration and foreign direct investment (FDI) flows accelerated, especially from the mid-1980s onwards. Migration differed between the two globalization periods referred to above, as many earlier sources of emigration (especially Western Europe) became destination points. South to North migration flows increased in importance, while South-South flows continued.

Capital flows have always played a prominent role in the globalization process. In the last few decades liberalization and deregulation have contributed strongly to a surge in FDI flows. But regions have been affected differently, with important consequences for the development of technological know-how and the geographical pattern of industrialization.

MAIN DRIVERS OF GLOBALIZATION

The main forces driving global integration have been technological innovation, political change and economic policy choices.

Chief among the technological drivers of globalization are inventions that have improved the speed of transportation and communications and lowered their costs. These include the development of the jet engine, containerization in international shipping, and the revolution in information and communications technology. Equally notable are changes in production methods which have created new tradable products, expanded global production in food and made manufacturing more efficient.

Political developments in the last decades of the 20th century sowed the seeds of further economic integration. These include China's economic reforms, the fall of the Berlin Wall and the collapse of the Soviet Union.

Finally, globalization has benefited from economic policies favouring deregulation and the reduction or elimination of restrictions on international trade, foreign investment and financial transactions. Trade opening has been pursued multilaterally through successive multilateral negotiations, bilaterally and regionally through preferential trade agreements and unilaterally. In the case of many developing countries, early commercial policies had an inward-looking focus. But the success of a number of newly industrializing economies in East Asia with exported growth strategies contributed to a more general adoption of industrialization policies that recognized the importance of exports in the process.

GLOBALIZATION AND PUBLIC ATTITUDES

Globalization has benefited the world economy but concern has intensified about its potentially disruptive and disadvantageous consequences.

Global integration in product, capital and labour markets has resulted in a more efficient allocation of economic resources. Economic integration has resulted in higher levels of current output and prospects of higher future output. Consumers have a wider choice of products and services at lower prices. Capital can flow to countries which need it the most for economic growth and development.

Allowing workers to move across national borders can alleviate skill shortages in receiving countries or respond to the needs in rapidly ageing societies while alleviating unemployment or under-employment in countries providing these workers.

International surveys of public attitudes towards globalization suggest that a majority of people recognize these benefits. But this recognition is accompanied by anxieties about the challenges that come with globalization. While large majorities believe that international trade benefits their countries, they also fear the disruptions and downsides of participating in the global economy. Seemingly, stronger support exists for trade in some emerging economies than in industrial countries. Support for globalization appears to be waning in the industrialized countries even though it still enjoys the support of a majority of the public.

For policymakers who embrace more open markets, survey results indicating overall support for globalization may be encouraging, but disregard for rising public concern about some aspects of globalization threatens to undermine the legitimacy of governments and imperils social support. The answer to this tension lies in a balance between open markets and complementary domestic policies, along with international initiatives that manage the risks arising from globalization.

THE CAUSES OF TRADE

Economic theory has identified several sources of gains from trade and thus a number of different causes of trade.

Traditional trade theory emphasizes the gains from specialization made possible by differences among countries. The main contribution of this strand of thought is that opportunities for mutually beneficial trade exist by virtue of specialization on the basis of relative efficiency – a country does not have to be better at producing something than its trading partners to benefit from trade (absolute advantage). It is sufficient that it is relatively more efficient than its trading partners (comparative advantage). This insight explains why so many more opportunities to gain from trade exist than would be the case if only absolute advantage counted. More recent theories point to other sources of gains from trade not linked to differences among countries, such as economies of scale in production, enhanced competition, access to a broader variety of goods and improved productivity.

GAINS FROM SPECIALIZATION

Traditional trade theory comprises a number of distinct but related propositions that are more or less robust and more or less supported by empirical evidence.

The gains-from-trade theorem, which is the central proposition of trade theory, states that if a country can trade at any price ratio different from its relative domestic prices, it will be better off than if it refrains from trade. The law of comparative advantage predicts that if permitted to trade, a country will gain from specializing in the export of goods in which it has a comparative advantage – that is, goods that it can produce at low relative cost compared to other countries.

Traditional theory distinguishes two main factors that give rise to divergence between autarky – or self-sufficiency – and free trade prices. These are differences in technology and differences in factor endowments (labour and capital). Ricardian theory links technological differences between countries to gains from trade through comparative advantage. The Heckscher-Ohlin model does the same with factor endowment differences.

While the gains-from-trade theorem and the law of comparative advantage are fairly general and provide robust results, the Ricardian model and some of the main propositions of the Heckscher-Ohlin model are more difficult to generalize.

In a world of many products and many countries, the Ricardian model only predicts trade under strong simplifying assumptions. With more realistic assumptions, such as the existence of trade barriers, intermediate inputs, and numerous countries and products, it fails to do so. But the fundamental insight of comparative advantage continues to predict and explain gains from trade. In more realistic theoretical formulations, the presence of market imperfections such as monopolistic market power, increasing returns to scale in production and various other market failures will complicate but not invalidate the comparative advantage theorem.

Real-world complexities combined with the difficulties of isolating and observing relationships makes the validation of trade theories challenging. But improvements are being made in empirical testing methodologies and available evidence sheds some light on the factors that contribute most to our understanding of international trade.

Evidence generally confirms that alternative theoretical explanations of the causes of trade, as well as the sources of gains from trade, are not mutually exclusive. Patterns of international trade typically reflect the interaction of several different factors. However, we have a limited appreciation of the overall impact of realized comparative advantage on an economy's total income.

Recent work suggests that technological differences are crucial in explaining the commodity composition of trade. More precisely, relative factor abundance – that is, whether a country is endowed with relatively more capital or relatively more labour – can only be shown to explain the commodity composition of trade if technological differences among countries are properly accounted for and if certain other assumptions are relaxed.

The simplest formulations of comparative advantage and the gains from trade disregard the possibility that intermediate inputs can also be traded and production processes fragmented across countries. But the inclusion of this possibility does not undermine basic propositions concerning the gains from specialization. On the contrary, the possibility that production processes may be spread across countries (fragmentation) offers the possibility of additional trade gains. New literature on this issue has emerged in the light of the growing incidence of production sharing and offshoring (see below).

Exchange among nations involves both trade in products and the movement of factors of production across frontiers. In some theories trade in products is a substitute for factor movements (Heckscher-Ohlin). In other formulations, where trade is driven by technological or other influences, trade in products and factor movements may be treated as complements.

While the law of comparative advantage can be extended to cover the movement of factors of production as well as trade in products, the formulation tends to be so general that it cannot predict the direction of trade or factor movements. Where technology is also assumed to differ between countries, the analysis is even more complicated.

Moreover, when theories allow for the movement of factors of production it becomes necessary to distinguish between the domestic and national income (welfare) effects of international exchange. In the presence of foreign capital, a shift from

autarky to free trade may reduce national welfare while it increases domestic welfare.

GAINS FROM ECONOMIES OF SCALE, PRODUCT VARIETY AND INCREASED COMPETITION

While trade predicted by theories based on comparative advantage takes place among industries (inter-industry trade) and can involve countries with highly varied characteristics, in reality much international trade takes place among similar countries and comprises the exchange of products within the same industry (intra-industry trade).

For many industrialized countries and emerging economies intra-industry trade accounts for more than half of their total bilateral trade flows. It has proven difficult to explain such patterns in international trade on the basis of traditional comparative advantage theories.

By emphasizing the importance of economies of scale at the firm level and of product differentiation, a theoretical framework based on monopolistic competition has provided a simple explanation of the benefits from an exchange of similar goods among similar countries. As a complement to the traditional comparative advantage theorem, this framework is well suited to explain trade among industrialized nations, while differences in terms of resources or technology continue to play an important role in North-South trading relationships.

The appreciation by consumers of different product varieties, the existence of less than perfectly competitive markets and the possibility for firms to exploit economies of scale are important reasons why countries open up to trade.

When firms gain access to new markets, they can increase production and reduce their average costs. At the same time, consumers are able to choose from a wider range of product varieties at lower prices. Firms can also realize important gains from having access to more specialized intermediate inputs.

However, in an integrated market, some firms will go out of business as a result of trade. A number of factors may have an influence on where production ultimately takes place, such as a country's resource endowments and market size, as well as the trade costs involved in supplying other markets.

A number of country studies have confirmed the existence of substantial gains following trade opening, owing especially to increased competition and product variety.

Measuring the effect of increased product variety on economic welfare is complex and has only been undertaken recently, when more detailed statistics became accessible. Two studies on the United States found that the availability of a larger number of imported product varieties, especially from North American Free Trade Agreement (NAFTA) partners, but more recently also from China, increased real incomes in the United States by 3 per cent on average.

Many more studies have been undertaken on the pro-competitive effects of trade liberalization in both developing and developed countries. Significant decreases in price-over-cost margins have been achieved, particularly in highly concentrated industries – a common phenomenon in a number of developing countries. In certain countries, the impact of a reduction in non-tariff barriers plays an even more important role than falling tariffs in the realization of such benefits.

By contrast, in both developing and developed countries, increases in openness do not seem to be systematically associated with further increases in the scale of production of firms. Instead, observed productivity improvements in sectors open to trade appear to be a consequence of the reallocation of market shares towards more productive plants. This observation has triggered further research into the role of differences in firm characteristics as a rationale for trade.

PRODUCTIVITY GAINS

Until relatively recently, trade theorists typically assumed that all firms within a given industry were identical. In the 1980s, however, data sets with detailed information on production and trade at the firm level became available. This new information showed considerable differences among firms and suggested that such differences affected aggregate outcomes. These findings are reflected in the so-called “new new” trade theories.

The firm-level information shows that only a small number of firms export and that among these, only a few of them export a large fraction of their production. Moreover, at least some firms export

in every industry, with the share of exporting firms being determined by the industry's comparative advantage. The data also show that exporting firms are different from non-exporters in several respects, and that trade liberalization raises average productivity within industries. So far, most of the firm-level evidence is from developed countries. However, available information from developing countries suggests that many of the insights drawn from developed country data may also apply to a wider set of countries.

These findings pose further questions not addressed by traditional trade theories, nor by the advances made by the “new” trade theories, such as the basic monopolistic competition framework. The most recent theories (“new new” theories) focus on the role of firms and explain the above-mentioned empirical findings. These models identify new sources of gains from trade and new ways in which international trade may lead to resource reallocation.

In the “new new” theories, firms typically differ in terms of their productivity and they pay fixed entry costs to enter both the domestic and the foreign markets. Some firms find it profitable to sell only on the domestic market while the most productive export. A reduction in barriers to trade boosts existing exporters and encourages new firms to begin exporting. Through its impact on factor prices, this expansion of the most productive firms pushes some of the non-exporting, lower-productivity firms to exit the market. This selection mechanism leads to an increase in average industry productivity that represents an additional gain from trade. Trade opening may also encourage individual plants, both import-competing and exporting, to upgrade their technology, a key ingredient in stimulating long-term economic growth.

The new focus on firms has allowed researchers to explain other determining factors for international trade, such as firms' decisions to invest abroad or outsource certain activities at arm's length.

Besides various types of trade costs, it has been found that differences in the productivity of firms are an important factor determining whether foreign markets are accessed directly through an investment presence or through exports.

Productivity differences also play a role in firms' decisions to offshore parts of the production process

and whether to do so via foreign direct investment (FDI) or through arm's-length trade. These insights allow for certain predictions about how policy changes, such as tariff reductions or institutional improvements, may affect trade volumes.

When different sources of gains from trade are taken together, it has been shown that protectionist policies may carry significant economic costs. However, the benefits from opening up to trade may not be equally distributed across countries.

Looking at several of the expected positive effects resulting from trade opening, one study has estimated that if member states of the European Union were in a state of autarky, on average productivity would be lower by 13 per cent, mark-ups and prices higher by 16 per cent, and profits lower by 23 per cent. However, other studies indicate that given that countries are of different size and at different levels of development, some are likely to benefit more than others.

DYNAMIC GAINS

A distinction can be made between the comparative static analysis which seeks to compare the situation before and after a given change, and an analysis that tries to capture the dynamic gains from change. The general presumption of most theoretical literature is that trade yields dynamic as well as static gains, although several analyses point to the existence of offsetting effects.

International trade can affect the growth process through its effects on the accumulation of capital and on technological change. In a standard “neoclassical” growth framework, where technological change is determined externally (exogenously), international trade affects factor and product prices and, through this channel, incentives to accumulate capital. Within this framework, the effect of international trade on growth depends on the nature of trade taking place.

An analytical framework that explicitly considers the determinants of technological progress (endogenous growth models) yields conflicting predictions about the relationship between trade and growth. Some studies stress the risk that trade may have different effects because of the conditions prevailing before trade. Under particular conditions, the removal of trade barriers could encourage some countries to specialize in sectors of the economy with low growth potential. These studies, however, generally disregard

the possibility that international trade is accompanied by the flow of knowledge (knowledge spillovers).

Many studies that have focused on how trade might stimulate firms to innovate have uncovered several new mechanisms that could associate trade liberalization with higher growth rates. Examples of such mechanisms include increased market size, knowledge spillovers, greater competition, and the improved quality of the institutional framework. Several studies have pointed to possible offsetting effects resulting from differences in human capital across countries, imitation of foreign technologies, a worsening of policies affecting trade, and so on.

Nevertheless, many studies focusing on knowledge spillovers and firm productivity demonstrate a high correlation between growth rates and trade volumes. But this does not necessarily imply that trade leads to growth. Does trade cause faster growth or do economies that grow quickly also trade more? Several studies try to address this causality issue and find a positive effect of different indicators of international trade (measuring volumes of trade or commercial policy) on economic growth. However, these studies have come under recent criticism. Critics argue that this approach is unable to isolate from other effects the direct effect of trade on growth.

An alternative strategy is to estimate the importance of international knowledge spillovers, which are crucial for the realization of the dynamic gains from trade. Recent studies point to the presence of “direct” (i.e. bilateral) research and development (R&D) spillovers, which are related to the level of R&D produced by the trading partner, and “indirect” knowledge spillovers, which result from participating in international trade more generally.

Finally, recent studies that use firm-level data find that trade liberalization has a positive effect on firm productivity and that “learning by exporting” effects (externalities) exists in several emerging market economies.

TRADE, THE LOCATION OF PRODUCTION AND THE INDUSTRIAL ORGANIZATION OF FIRMS

New work on “economic geography” and offshoring explains the location decisions of firms and why some firms choose to spread their production processes across different countries.

The trade theories and the models we have examined so far have little to say about the location decisions of firms and their industrial organizational structure. In the work reviewed here, decisions on both of these matters are taken to be internal to the firm. By internalizing the location and organizational decisions of firms, the economic geography and offshoring literature provides explanations of why we observe the geographical concentration of production in some locations and the process of international fragmentation of production through the breaking-up of the supply chain.

INTERNATIONAL TRADE COSTS

Reductions in trade costs can be an important cause of both agglomeration of production in a location and the fragmentation of the production process. But the extent to which the trade costs story renders these two phenomena compatible has not yet been explored.

In the new economic geography literature, the size of trade costs is a major determinant in the decision of a firm on where to locate. In the literature on international fragmentation of production, trade costs have been seen as influencing the choice between outsourcing or in-sourcing, and sourcing inputs through intra-firm or arm’s-length trade.

The new economic geography literature predicts that a fall in trade costs leads to an initially greater geographical concentration of production and a subsequent reduction of concentration as trade costs fall to a sufficiently low level. Recent theories of fragmentation predict that a reduction in trade costs leads to greater fragmentation of production, with firms geographically spreading the different stages of their production process. When trade costs of intermediate inputs fall, different stages of the production process can take place in different places.

Empirical evidence shows a downward trend in overall trade costs in the last half century. Particularly significant is the reduction in air transport costs to far-away destinations and the reduction in the time cost of transport.

Trade costs have fallen for policy-related reasons (such as the reduction of tariffs and non-tariff barriers) as well as for technological reasons associated with transport and communications. The latter is especially true when quality improvements are taken into account. For example, although no

clear direct evidence exists of a downward trend in the cost of ocean transport, the reduction in shipping times – because of faster ships and reduced loading and unloading times – has cut trade costs. In the case of air transport costs, it is the price of long-haul flights that has fallen the most.

Advances in communication technologies have allowed the development of efficient logistics services, reducing both the time and uncertainty of delivery. This has led to a significant improvement in production processes relying on “just-in-time” delivery of inputs, which has prompted fragmentation.

GEOGRAPHICAL CONCENTRATION

The new economic geography provides additional insights into the location of production and the pattern of trade.

Much of the theory underlying the new economic geography is familiar from trade theory based on imperfect markets. Three important predictions about the pattern of production and trade are associated with this theory. First, a country will export products for which there is a large domestic demand (the home market effect). Second, a reduction in trade costs will amplify the home market effect (the magnification effect). Finally, falling trade costs will produce an initial period of divergence among countries, with manufacturing production becoming concentrated in a “core” while the “periphery” specializes in non-manufactures (core-periphery effect). However, a further reduction in trade costs will eventually reverse this process, with manufacturing production becoming increasingly dispersed among countries in the periphery.

A country will export those goods for which it has a large domestic market.

The home market effect predicts that a country will export those goods for which it has a large home market. In effect, the large domestic market serves as a base for developing a competitive export sector. A large market size provides more room for increasing returns to scale to operate, helping to drive down the production costs of domestic producers and giving them a price edge in world markets. Empirical evidence supports the hypothesis of a home market effect. The effect is strongest for manufactured goods which are differentiated and subject to scale economies.

Falling trade costs accentuate the home market effect.

If trade costs are very low, even small differences in the size of the two countries can lead to a large concentration of manufacturing in the larger country. A reduction in trade costs means that the large country’s advantage is increased as it can export manufactured goods to its partner at an even lower price than before. These are the magnification and core-periphery effects.

The geographic concentration of firms can create productivity spillovers (agglomeration).

Many industries tend to be concentrated in certain places, reflecting the economic benefits to firms of being located in close proximity to one another. These benefits can arise from knowledge spillovers between workers and firms or as a result of the development of specialized inputs tailored to the needs of a large number of similar firms who are present in one place.

The agglomeration effect, operating through the widespread use of intermediate inputs in manufacturing production, makes the total output of firms larger than if each one had been operating in a different region. The linkages relate both to output and inputs, allowing firms’ improved sales and savings in input costs to be transmitted through the whole manufacturing chain. Since firms are geographically close to their suppliers, this also saves on transport costs and further lowers the costs of production. At the same time, the large market makes it easier for the firm to sell more of its final products to other firms. Moving to a large market not only benefits the firms that do so but also firms that are already established in the region. In other words, a “virtuous circle” is created by the interaction of input-output linkages, increased variety, savings on transport costs and increasing returns to scale.

But there are also forces acting against concentration.

Forces that work against agglomeration effects include changes in factor prices (wage rate) and greater product competition. An expansion of the manufacturing sector requires it to employ more workers. If it is to continue to expand, it must pay a higher price to persuade workers to move. This tends to reduce the incentive for further expansion of the manufacturing sector.

A second factor working against agglomeration is the increase in product competition. Consumers demand variety. While manufactured goods are differentiated and therefore not substitutes, the appearance of a new product should nevertheless lead to a decline in the demand for all other varieties of manufactured goods. This makes further expansion of the manufacturing sector more difficult.

This interaction of forces explains the core-periphery outcome.

As trade costs fall, there is an initial phase where agglomeration effects dominate and produce a concentration of manufacturing in the core (“industrialized countries”). A nearly opposite process takes place in the periphery (“non-industrialized countries”). Its manufacturing sector shrinks as manufactured goods are supplied by the core. Exports from the core become increasingly dominated by manufactures while exports from the periphery are increasingly made up of agricultural products.

But beyond a certain point, a continued reduction in trade costs will allow other forces to emerge. In this second phase, changes in wage rates and greater product competition in the core become counteractive and ultimately reverse the agglomeration effects. The wage differential between the core and the periphery begins to attract more manufacturing production away from the core.

But the empirical evidence for this core-periphery process is rather sparse.

Little statistical testing exists of the core-periphery theory. Instead, numerical simulations are employed to see whether reasonable parameter values can replicate the results predicted by the new economic geography. Some simulations find a non-linear relationship between trade costs and concentration, while others find that a reduction in trade costs only leads to the dispersion of all industries. One explanation for the difference appears to be the nature of the industries involved. It is in industries with significant increasing returns to scale and strong intra-industry linkages where the non-linear relationship between trade costs and concentration is observed.

FRAGMENTATION OF PRODUCTION

Direct evidence on the worldwide incidence of offshoring is scarce due to a lack of data. But proxy measures indicate that the phenomenon is on the rise.

A major problem with measuring the magnitude and trend of offshoring of goods and services is that the economic definition of offshoring does not easily match officially collected data. Therefore, estimates of the pattern and the size of offshoring have to rely on substitute or proxy measures.

To the extent that trends in trade in intermediate goods and trade in “other commercial services” are a satisfactory proxy for offshoring, data suggest that in the last two decades offshoring in both intermediate goods and services has grown faster than trade in final goods, and that the growth in services offshoring has accelerated since 2000.

Research based on firm-level data for the United States has confirmed these patterns. Offshoring has expanded rapidly via arm’s-length trade and via trade within firms. Services offshoring has been increasing faster than goods offshoring in recent years. These trends have been widespread across sectors and type of inputs. Offshoring of service inputs is smaller than offshoring of goods inputs for all sectors and countries. Small countries tend to offshore more than large countries.

Economic theory suggests that the decline in the absolute costs of trading goods and services as well as recent advances in telecommunications technology are driving forces in the process of fragmentation.

Economic theory provides a very simple explanation for the increasing fragmentation of production. It might be the case that the various stages of production require different types of technology or skills, or they may require inputs in different proportions. Under these conditions, the benefit of fragmenting production across countries is that the firm can locate different stages of the production process in the country where there is a relative abundance of the type of skill or input used relatively more intensively in that stage of production. In so doing, the firm can lower costs of production. The standardization, geographical separability and tradability of tasks are key factors determining the prevalence of offshoring in particular areas of activity.

However, production fragmentation also carries costs. Separate production stages need to be coordinated and monitored. Furthermore, this implies incurring transportation and communication costs, insurance costs and other connecting services costs. All these costs have decreased, thus fostering fragmentation and offshoring.

Together with the traditional factors of comparative advantage (such as factor prices and the availability of skills), recent literature on offshoring has highlighted new sources of comparative advantage that can influence decisions about where to offshore. These include the quality of the institutional framework, the costs of setting up a business and the quality of infrastructure. Data show that low-income countries are at a strong disadvantage in participating in international production networks.

The quality of the institutional framework matters because institutions play a crucial role in determining the effectiveness of contract enforcement. If institutions are good, the contract between the final good producer and the supplier of the intermediate good is enforceable, and this reduces the risk associated with outsourcing.

The quality of infrastructure matters because it is an important determinant of transport and communications costs. These are both important factors in ensuring an efficient production structure.

A comparison across low-, middle- and high-income countries in terms of infrastructure, as well as the time required to start up a business and to exchange goods, reveals significant disadvantages for low-income countries. This is likely to limit the participation of low-income countries in production networks despite their advantage in terms of factor prices.

The organization of production processes influences how trade takes place. A growing body of literature looks at the factors that determine whether a firm acquires inputs through vertical integration (i.e. through its own company structure) or through arm's-length contracts. Choices here depend on the "thickness" of the market, the quality of the institutional framework, and sector-specific characteristics. Few rigorous empirical studies exist on these issues, but case studies in areas such as computer manufacture and financial services help to clarify the issues.

The thickness of the market (that is, the size of the market for a certain product) is an important factor in determining the costs of searching for an appropriate supplier of intermediate goods. The thicker the market, the easier business-to-business matching becomes and the more likely it is that firms opt for outsourcing rather than vertical integration.

As already noted, institutional quality helps to determine offshoring location decisions, and it is also a factor in the choice between outsourcing and vertical integration. In particular, where the fixed costs of vertical integration are higher than the fixed costs of outsourcing, arm's-length trade will increase relative to trade within a firm. The latter set of costs is influenced by the quality, reliability and enforceability of contracts.

Among the sector-specific factors influencing the choice between arm's-length trade and vertical integration include the degree of product standardization and the factor-intensity of an industry. Outsourcing tends to prevail in labour-intensive sectors, and component-intensive sectors, and in respect of products at later stages of the production process.

THE DISTRIBUTIONAL CONSEQUENCES OF TRADE

In the face of overwhelming evidence that countries gain from opening up to trade, why do countries often hesitate to liberalize trade or mitigate the liberalization?

The unequal distribution of the gains from trade may be one of the reasons. Understanding the potential distributional consequences of trade may help to anticipate and manage resistance to income-enhancing liberalization.

TRADE AND INEQUALITY

Where trade has contributed to increased inequality, its impact has generally been minor to other factors, most notably technological change.

Numerous studies on trade and inequality have focused on the question whether trade is one of the main drivers of changes in inequality or only one among many others. The literature appears to have converged to the view that international influences only contributed to about 20 per cent of rising wage inequality and that other forces – most prominently technological change – have been more important than trade in leading to changes in income distribution.

Trade has sometimes contributed to increasing inequality in developing countries.

A question that continues to intrigue researchers is the relationship between trade and inequality in

developing countries. It was originally expected that trade would contribute to a reduction of inequality in these countries. As such, trade would reduce poverty through two mechanisms – its positive effects on growth and on income distribution. Empirical research has shown, however, that the second mechanism has not always been triggered by trade reform.

The fact that trade liberalization may trigger technological change is one of several explanations for the association in developing countries of more open trade with greater inequality. Other factors include the timing of policy change and pre-existing protection levels.

The timing of trade liberalization, the degree of protection in place before liberalization and technological change are some of the elements that explain why certain developing countries have experienced increases in the skill premium – that is, the difference in wages between high- and low-skilled workers after trade liberalization.

Renewed interest has emerged recently in the evolution of inequality in industrialized countries and the role of trade in this evolution. Whereas “inequality” tended to be discussed in the 1980s and 1990s in terms of “high-skilled” versus “low-skilled” workers, more recent studies make a distinction between “high-”, “medium-” and “low-skilled” workers, reflecting some concern about the evolution of wages of medium-skilled workers. Other studies try to make even more nuanced distinctions between different types of skills. There has also been increased interest in the evolution of the relative income of the “super rich” and in the evolution of labour’s – as opposed to capital’s – share of income.

Trade theory predicts that increases in inequality in industrialized countries lead to increased calls for protectionism and that small and well-organized industries that stand to lose from trade tend to be successful in lobbying against trade liberalization. Both predictions have been confirmed by empirical analysis.

Trade theory has been used to predict the voting behaviour of individual households and the lobbying behaviour of private interest groups. One type of analysis shows that voters tend to prefer the *status quo* – that is, to vote against trade reform – as they may not know in advance whether they will be among the winners or losers from reform. Another type of analysis, the so-called median

voter model, predicts that increased inequality is associated with more restrictive trade policies in industrialized countries but with more open trade policies in developing countries. Empirical analysis has confirmed this expectation.

As the gains from trade liberalization tend to be distributed widely within a society, the individual gains from trade may be relatively small. The losses from trade reform, on the other hand, tend to hit relatively small groups, and losses may therefore be quite significant at the individual level. Even though overall gains from trade opening exceed overall losses, individual losers have a higher incentive to lobby against trade reform than the winners. There is evidence that relatively small industries have received a lot of protection in industrialized countries.

TRADE AND STRUCTURAL ADJUSTMENT

If trade reform is introduced, economic changes need to be made. Import-competing firms appear to adjust by reducing mark-ups, increasing efficiency and often by reducing firm size.

Trade literature has provided some evidence of the “import discipline hypothesis”. A number of studies have assessed firm-level reactions to trade liberalization in countries as diverse as Brazil, Canada, Chile, Côte d’Ivoire, India, Mexico and Turkey. They generally point to three consistent results. First, firm-level mark-ups of price over marginal cost tend to fall. Second, plants that survive competition from imports improve efficiency. Third, competing firms tend to shrink in size. It remains the case, however, that researchers have not yet addressed adequately the question of the short- and long-term costs associated with these efficiency gains.

Exporting firms often grow after trade reform, but there is no systematic tendency for productivity to increase. Some examples have been encountered of firms that learn from exporting.

A fundamental question is whether there is any evidence of “learning by exporting”. Until very recently, most evidence was in the negative. While more productive firms were the ones involved in exporting to begin with, there was little to suggest that they became more productive as a result of exporting.

Some new evidence to the contrary comes from a study on Canadian firms. The authors of the study suggest, however, that “learning by exporting” appears limited only to plants that were initially low-productivity producers, so not all plants learn from exporting. They nevertheless suggest potential mechanisms through which the learning may be taking place – for example, the “learning” plants engaged in more product innovation and displayed higher adoption rates of advanced manufacturing technologies after exporting than did other plants.

Trade reform does not appear to trigger significant levels of sectoral reallocation of workers, nor is there consistent evidence on the effect of trade reform on the size of the “informal economy” in developing countries.

Evidence about how labour markets adjust to trade reform is generally taken from studies of countries that have undergone a substantial import market liberalization “shock”. For example, in the case of Colombia, researchers have found surprisingly little labour reallocation across industries after liberalization, and this result is confirmed in cross-country studies as well.

Nevertheless, in the case of Colombia, evidence suggests larger reductions in the wage premium in sectors with larger tariff cuts. This suggests that some of the “rents” (additional income) associated with import protection that were going to workers have been dissipated by increased foreign competition. Surprisingly, this research fails to find much evidence of a link between trade liberalization and the shift of individual workers into the “informal economy”. This result is found in studies of Brazil and Colombia.

According to US data, individuals experiencing job loss for “trade-related” reasons do not appear to be systematically different from workers who experience job loss for “other” reasons.

While it is difficult to pinpoint exactly the reason for any individual’s job loss, some studies have adopted statistical techniques to allow them to address this issue. Using US data, it does not appear that these two types of workers are very different. On average, import-competing workers who lose their jobs are slightly older but they have similar levels of job experience as well as educational attainment as those put out of work for other reasons.

The primary difference between workers who lose their jobs for trade-related as opposed to other reasons is gender. Trade-displaced workers in manufacturing are much more likely to be women than are workers displaced for non-trade reasons. However, this should not be interpreted as an example of gender discrimination as it is mostly an industry composition effect. In the United States, import-competing industries use relatively more women, so as these industries shrink and displace workers, relatively more women will lose their jobs.

TRADE AND POVERTY

One of the biggest challenges facing the world community today is how to address poverty.

Trade reform could potentially help to alleviate poverty. The long-term benefits from improved resource allocation and efficiency resulting from trade liberalization are well documented. Openness to trade is believed to have been central to the remarkable growth of developed countries since the mid-20th century and an important factor in alleviating poverty, as shown by the experience of the East Asian countries.

Trade affects the poor in many ways. For example, it has an effect on growth, employment, revenue, consumer prices and government spending.

Although much attention has been paid in recent years to the relationship between trade liberalization and poverty, establishing the precise link between changes in trade policy and levels of poverty has proven to be a difficult task.

One of the difficulties lies in the fact that trade affects individuals in many ways. It may affect their income through effects on employment, distribution and/or growth, and it may affect their expenditure through prices of consumer goods. Trade reform may also affect the poor through its impact on government revenue and spending. The combined impact of these different effects tends to be difficult to assess and most economic studies have focused on one or two elements.

Overall the economic literature indicates that trade has helped to alleviate poverty but some poor households have been affected negatively.

Trade is expected to increase growth and several empirical studies have examined how growth affects

poverty. These studies tend to find a positive relationship between growth and poverty alleviation but the poverty-reducing effect tends to be more pronounced in some countries or regions than in others. Initial conditions appear to matter.

Poor households may also be affected differently depending on their source of income. As trade may trigger job losses or wage reductions for some, those affected may lose out from trade reform even if poverty levels are reduced on average.

The price effects of trade liberalization will have different impacts on individual households. Several studies have, for instance, found that rural households adjust better to agricultural price increases (triggered by trade reform or other events) than urban households. This is because rural households can fall back on subsistence farming for consumption or even turn into net suppliers of agricultural products.

The effect of trade liberalization on government revenue has been identified as one of the key concerns for many developing countries. Indeed, the share of trade taxes in total revenue is negatively associated with the level of economic development, with many low-income countries earning half or more of their revenue from trade taxes.

One response to declining government revenues resulting from trade reform is to seek alternative sources of revenue. Governments may want to take into account the effect on poor households when choosing other sources. Empirical evidence appears to indicate that developing countries have not managed always fully to recover lost tariff revenues. But empirical evidence so far does not provide reason to believe that these net revenue losses have resulted in reductions of social expenditure.

POLICY IMPLICATIONS OF GLOBAL INTEGRATION AND THE WTO

A number of factors have the potential to reduce the gains from trade.

Despite continuing gaps in our knowledge and understanding, the theoretical and empirical case for the gains from trade continues to be strong. But certain economic factors have the potential to reduce those gains or to skew their distribution. High trade costs can inhibit the participation of

more countries in international trade and reduce the potential volume of trade transactions. Many poor countries face supply constraints that make it difficult to increase trade even when market access is not an obstacle. Significant costs may be generated by adjusting to trade liberalization. Trade can create winners and losers in a country. Recent technological changes make it more difficult to predict winners and losers from liberalization, which is likely to add to anxieties about market opening.

TRADE COSTS AND SUPPLY CONSTRAINTS

High trade costs and supply-side constraints may prevent countries from taking advantage of trading opportunities.

The post-World War II era has been marked by falling trade costs and this has undoubtedly played a large role in global trade expansion. But trade costs continue to be at much higher levels in low-income countries. The absence of physical infrastructure or its poorly developed state in these countries is a major reason for high trade costs. Government policies and regulations that adversely affect the provision of infrastructure and the supply of its services exacerbate the situation.

National measures are needed to address these problems.

At the national level, two broad types of actions could be taken to reduce trade costs and to expand the export supply capacity of low-income countries. The first involves increased public investments in physical infrastructure essential to carrying out production and trade and to allowing traders cheaper access to international markets. Given that governments in low-income countries lack sufficient tax revenue for this purpose, they will need to tap official development assistance and private sector financing (both foreign and domestic).

A second and equally important action relates to regulatory reform. Poorly developed policies and unwarranted regulatory burdens can prevent the efficient use of already existing infrastructure, deter private sector infrastructural investments, or simply act as “red tape”. Appropriate reforms can improve the use of existing infrastructure and increase incentives for private investors, whether local or foreign, to contribute to the provision of vital infrastructure.

But there is a role too for international cooperation and institutions.

The international community can help draw attention to the problems faced by low-income countries, mobilize or direct resources, and provide expertise through technical cooperation. Some changes in policy and regulations may need to be negotiated with foreign partners. In this case, international institutions can serve as forums for negotiations and vehicles for implementing international accords.

In the WTO, the Doha negotiations, technical assistance and implementation of multilateral agreements provide a means of reducing trade costs.

The Doha negotiations provide members with the opportunity to bind current market access and to make new market-opening commitments in those areas that can contribute significantly to reducing trade costs and to increasing the productive capacity of low-income countries. Among the most relevant areas are services, especially maritime transport, telecommunications, distribution and trade facilitation.

Since the beginning of the Doha Round, the WTO's technical cooperation programme has focused on helping institutions and individuals to understand and implement WTO agreements and to participate in trade negotiations. The implementation of WTO agreements provides considerable opportunities for reducing trade costs and for enhancing market access opportunities.

The Aid for Trade initiative creates a targeted and internationally coordinated effort to address trade-related supply constraints faced by developing countries.

The Aid for Trade initiative is intended to help developing countries to build the supply capacity and trade-related infrastructure needed for trade expansion and to take advantage of opportunities offered by the multilateral trading system. The involvement of the WTO in these efforts arises from its role in creating opportunities for countries to benefit from participation in international trade.

Aid for Trade includes technical assistance, infrastructure development and the further improvement of productive capacity. The infrastructural component of Aid for Trade has a

direct impact on efforts to reduce trade costs and to expand productive capacity in low-income countries. Technical assistance to help members implement WTO agreements can also help developing countries to capitalize on market access opportunities.

A key aspect in the implementation of the Aid for Trade initiative is the role that monitoring the WTO can assume by undertaking a periodic global review of the initiative based on reports from a variety of stakeholders. The global review undertaken in November 2007 showed that Aid for Trade has assumed growing importance in most donor programmes. The resources for Aid for Trade averaged US\$21 billion over the 2002-05 period and now represent over 30 per cent of bilateral programmes. For the year 2008, the immediate goals are improving monitoring, advancing implementation and strengthening developing-country ownership of the initiative.

THE SOCIAL CONSEQUENCES OF TRADE OPENING

Some workers may lose their job as a result of trade reform.

Some of the gains from trade opening come about from the reallocation of resources to activities where they are more productive. While such reallocation is necessary to reap the benefits of trade reform, they may imply losses for some individuals. Jobs may, for instance, be curtailed in one branch of the economy and created in another and, as a consequence, some workers may lose their jobs.

In many countries, policies are in place to assist those temporarily out of work. Those policies are often general in nature, in the sense that they target anybody affected by job loss, independently of the cause of the loss. But examples exist of policies that explicitly target individuals, sectors or regions affected by trade.

A general problem with any trade-specific programme to assist workers is that it may be difficult to identify workers affected by trade. Moreover, no strong evidence exists that workers laid off as a consequence of trade differ significantly from workers laid off for other reasons, either in the length of their unemployment or their likely income in the future. However, under certain circumstances, arguments in favour of trade-specific

social protection programmes can be made on equity or even efficiency grounds. Some evidence suggests that trade-specific adjustment programmes can also play a role in garnering support for trade reform.

In many countries, general social protection systems exist to assist laid-off workers. In those countries, it is hard to justify trade-specific interventions, but in countries that lack general schemes trade-adjustment programmes for workers may be useful.

In developing countries, the case for trade-specific programmes may be stronger. Most industrialized countries have social protection systems in place, but such systems are lacking in many middle-income and most low-income countries. In the absence of any social protection, unemployment – even for a short period – may cause considerable hardship. Temporary assistance could be helpful in such cases and prevent the unemployed from falling into poverty. How to design such schemes for maximum effectiveness in low-income countries is a question that has not yet been fully answered.

To the extent that trade might contribute to increasing inequality, the question also arises whether it is desirable to introduce specific policies to redistribute the gains from trade. Many industrialized countries have general redistribution policies in place and such policies could, in principle, counterbalance any effect trade may have in increasing inequality. Developing countries tend to have limited experience with the design of redistribution schemes. Studies show, however, that trade is likely to be a minor contributor to changes in income distribution and this further weakens the argument in favour of trade-specific redistribution schemes.

A potentially more important question is how overarching redistribution systems should be designed to achieve their objectives without introducing new distortions – for instance, by changing the incentives facing employers, workers, consumers or others. Another difficulty may lie in the fact that some factors of production are more mobile than others at the global level, and the less mobile factors may end up carrying a heavier tax burden. This may be undesirable if those factors represent the lower income scale in the economy. Globalization may therefore pose new challenges to public finance.

TRADE AND TECHNOLOGY

Technical knowledge can be acquired through international trade.

Studies that focus on international knowledge spillovers find that knowledge developed in one country has positive effects on other countries through trade. Trade leads to the spread of international technology for three major reasons. First, technologically more sophisticated intermediate goods become available for production. Second, the technological specifications of intermediate and final goods developed abroad can be studied and the intrinsic knowledge can be acquired. Finally, trade favours person-to-person communication as an important vehicle of knowledge transfer.

However, countries have different abilities to absorb technology developed elsewhere.

Studies have emphasized several factors determining whether technology is successfully absorbed across countries. These factors are associated with the idea that a country needs to have certain types of skills (e.g. human capital) and institutions in order to be able to adopt foreign technological knowledge.

A wide range of policies can be used to foster technological progress at the national level. The multilateral trading system (and international organizations more generally) can play a role in facilitating international technology transfers.

Policies to improve a country's ability to adopt technological innovations must be targeted at its educational system as well as its business and regulatory environment. One particular problem related to the transfer of technology is that innovations produced in advanced economies may not respond to the needs of developing countries.

Such a mismatch may result from insufficient property rights protection. This suggests a role for international organizations in promoting international technology diffusion through adequate property rights enforcement. Other areas where international organizations can help include the coordination of development aid to build infrastructure and human capital.

I THE TRADE SITUATION IN 2007

A INTRODUCTION

Growth in world output and trade decelerated in 2007. Weaker demand in the developed economies reduced global economic growth to 3.4 per cent from 3.7 per cent, roughly the average rate recorded over the last decade. At some 7 per cent, growth in the developing regions was nearly three times the rate recorded in the developed regions and the contribution of the developing countries to global output growth in 2007 exceeded 40 per cent.¹ Economic expansion in the least-developed countries fully matched the growth rate recorded by developing countries as a group in 2007, sustaining a pattern that has been maintained since 2000.

Domestic demand weakened sharply in the United States, which reduced the external deficit and led to the weakest annual GDP growth rate (2.2 per cent) since 2002. A further widening of the external surplus contributed to more than one half of Japan's 2.1 per cent GDP growth rate in 2007. Europe recorded GDP growth of 2.8 per cent – a somewhat better performance than both Japan and the United States last year. Stimulated by sharply higher export earnings and rising investment, Russia's economic growth of 8 per cent was the strongest annual rate since 2000. In Central and South America, Africa, the Middle East and developing Asia, economic expansion rates showed no signs of deceleration in 2007. The most populous developing countries – China and India – continued to report outstandingly high economic growth.

The favourable investment climate maintained in developing regions and the Commonwealth of Independent States (CIS)² more than offset the adverse effects of financial market turbulence, especially that arising from the US sub-prime market crisis in the second half of 2007. Despite the adverse effects of scarce credit on the volume of mergers and acquisitions, global foreign direct investment (FDI) flows continued to rise. The UN Conference on Trade and Development (UNCTAD)³ provisionally estimated that global FDI inflows rose by 18 per cent to US\$1.54 trillion in 2007. Foreign direct investment flows to Latin America (eg, Brazil, Chile and Mexico) and Russia have been particularly strong (50 per cent and 70 per cent respectively). FDI flows to developing Asia and the new EU member

states are estimated to have seen less dynamic growth in FDI inflows in 2007 than in the past.⁴

Variations in the exchange rates of major traders in 2007 did not always result in effective exchange rate developments conducive to a reduction in global imbalances. While the US real effective exchange rate depreciated and contributed to a smaller current account deficit relative to its GDP, the real effective exchange rate of a number of current account surplus economies in East Asia (such as Japan, Chinese Taipei, Hong Kong, China) also decreased, contributing to new peak levels in the ratios of their respective current account surpluses to GDP in 2007.⁵ The real effective exchange rates of the Chinese and Singaporean currencies appreciated by 2 per cent and 7 per cent respectively in 2007, without arresting the rise in their respective current account surpluses.⁶ The real appreciation of the euro had differing consequences for the export performances of euro-zone economies. Thanks to a 20 per cent increase in its exports, Germany remained the world's leading exporter of merchandise.

The length of the global upswing and the strength of economic activity outside the industrial regions contributed to a further rise in the price of fuels and pushed up domestic inflation rates. At the end of 2007, consumer prices in developed and developing economies were increasing faster than at the beginning of the year, by about 1 and 2 percentage points respectively.

Weaker demand in the developed countries provided a less favourable framework for the expansion of international trade in 2007 than in preceding years (See Chart 1). Consequently, world merchandise exports grew in real terms (that is, at constant prices) by only 5.5 per cent, compared to 8.5 per cent in 2006. Lower import growth than in the preceding year was observed in North America, Europe, Japan and the net oil importing developing countries in Asia. This downward trend outweighed the higher import growth observed in Central and South America, the CIS, Africa and the Middle East. It is estimated that the developing countries as a group accounted for more than one half of the increase in world merchandise imports in 2007.

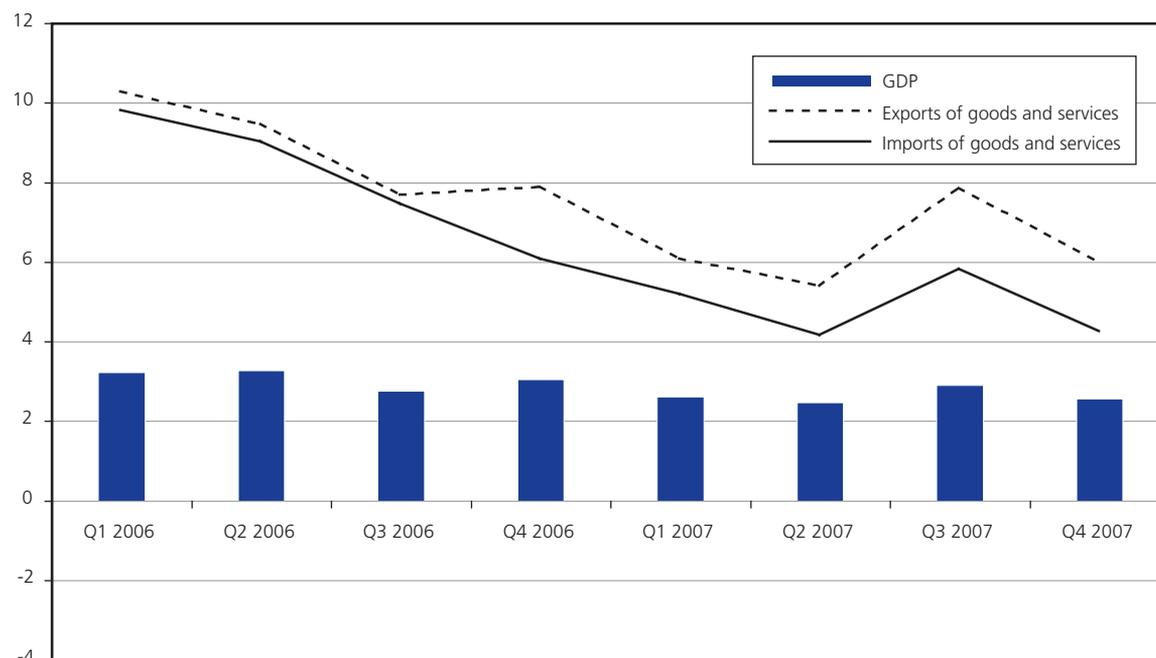
Among the leading traders, China's (real) merchandise trade expansion remained outstandingly strong in 2007 as lower export growth to the US and Japanese markets was largely offset by higher export growth to Europe and a boom in shipments to the net-oil-exporting regions. Despite a vigorous domestic economy, weaker demand in some of China's major export markets and a moderate real effective appreciation of the yuan, import growth continued to lag behind export growth.

The strength of overall economic growth in the developing world should not blind observers to the sometimes large differences in the situation faced by individual countries within this grouping. While higher prices for minerals and various food products have improved the prospects of some developing country exporters, a large number of developing

countries are net importers of fuels and food and have been adversely affected by the surge in the prices of these commodities. Surging food prices have become a cause of civil strife in some countries and the situation poses serious challenges for governments. The adverse consequences of turmoil on financial markets will not only affect US demand growth but also lead to further downward revisions in economic growth for Japan and Western Europe. As world trade responds strongly to variations in global economic activity a stronger than projected deceleration in world economic growth could cut trade growth much more sharply, to significantly less than the 4.5 per cent predicted above. (Income elasticity – how much trade responds to changes in income – has been between 1.5 and 2 over the last decade, indicating that trade reacts significantly.)

Chart 1
Real GDP and trade growth of OECD countries, 2006-07

(Percentage change on a year to year basis)



Source: OECD National Accounts.

B REAL MERCHANDISE TRADE AND OUTPUT DEVELOPMENTS

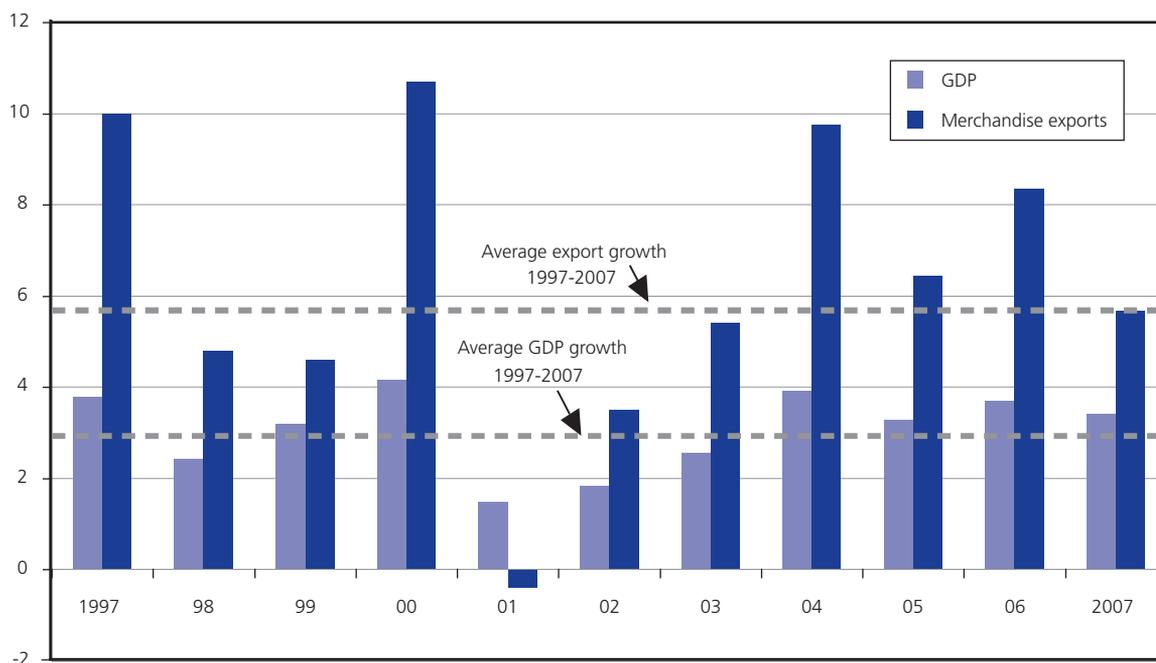
The slowdown in economic activity in developed countries was the major factor in the reduced expansion of global trade in 2007. Real merchandise export growth is provisionally estimated at 5.5 per cent in 2007, nearly 3 percentage points less than in 2006 but still close to the average rate of trade expansion over the last decade (1997-2007). The expansion of real trade exceeded global output growth by 2 percentage points (See Chart 2).

In 2007, the variation in real trade growth among regions remained large, reflecting marked differences in economic activity and relative price developments. Major terms-of-trade gains could be observed again in countries and regions exporting primarily fuels or minerals. More recently net-food exporters have also enjoyed gains from favourable terms-of-trade movements. Unsurprisingly, thanks to their faster income growth and increased international purchasing power, net exporters of mining products (fuels and minerals) recorded a double-digit rise in their imports, while exports tended to increase less than the global average.

South and Central America and the CIS increased their real merchandise imports by about 20 per cent, more than three times the global average in 2007. South and Central American exports were up by 5 per cent and those of the CIS by 6 per cent (See Table 1 and Chart 3). As mining products account for more than half of African and Middle East merchandise exports, these regions have been major beneficiaries of relative price changes over the last three years. Consequently, these regions increased their import volume by about 12 per cent while their exports almost stagnated in real terms.

Exports from Asia rose by 11.5 per cent in real terms, again exceeding significantly the region's import growth (8.5 per cent). Within the Asian region very large variations could be observed on the import side. While China and India recorded double-digit import growth, the comparable figure for Japan was practically stagnant (1 per cent). The trade performance of the four so-called newly industrialized economies – Hong Kong, China; Republic of Korea; Singapore and Chinese Taipei – continued to be less dynamic than that of the region as a whole, but still

Chart 2
Growth in the volume of world merchandise trade and GDP, 1997-2007
 (Annual percentage change)



Source: WTO Secretariat.

Table 1
GDP and merchandise trade by region, 2005-07
 (Annual percentage change at constant prices)

	GDP			Exports			Imports		
	2005	2006	2007	2005	2006	2007	2005	2006	2007
World	3.3	3.7	3.4	6.5	8.5	5.5	6.5	8.0	5.5
North America	3.1	3.0	2.3	6.0	8.5	5.5	6.5	6.0	2.5
United States	3.1	2.9	2.2	7.0	10.5	7.0	5.5	5.5	1.0
South and Central America ^a	5.6	6.0	6.3	8.0	4.0	5.0	14.0	15.0	20.0
Europe	1.9	2.9	2.8	4.0	7.5	3.5	4.5	7.5	3.5
European Union (27)	1.8	3.0	2.7	4.5	7.5	3.0	4.0	7.0	3.0
Commonwealth of Independent States (CIS)	6.7	7.5	8.4	3.5	6.0	6.0	18.0	21.5	18.0
Africa and Middle East	5.6	5.5	5.5	4.5	1.5	0.5	14.5	6.5	12.5
Asia	4.2	4.7	4.7	11.0	13.0	11.5	8.0	8.5	8.5
China	10.4	11.1	11.4	25.0	22.0	19.5	11.5	16.5	13.5
Japan ^b	1.9	2.4	2.1	5.0	10.0	9.0	2.5	2.5	1.0
India	9.0	9.7	9.1	21.5	11.0	10.5	28.5	9.5	13.0
Newly industrialized economies (4) ^c	4.9	5.5	5.6	8.0	12.5	8.5	5.0	8.5	7.0

a Includes the Caribbean.

b Trade volume data are derived from customs values deflated by standard unit values and an adjusted price index for electronic goods.

c Hong Kong, China; Republic of Korea; Singapore and Chinese Taipei.

Source: WTO Secretariat.

recorded an excess of export growth over import growth (8.5 per cent and 7 per cent respectively).

North America's real merchandise exports rose somewhat less than global trade but more than twice as fast as imports. The excess of regional export growth over import growth can be attributed largely to the United States, where import volumes increased only marginally (1 per cent), while exports expanded by 7 per cent in 2007. Canada and Mexico, two net exporters of mining products, with currencies strongly appreciating against the US dollar, increased their merchandise imports much faster than exports.

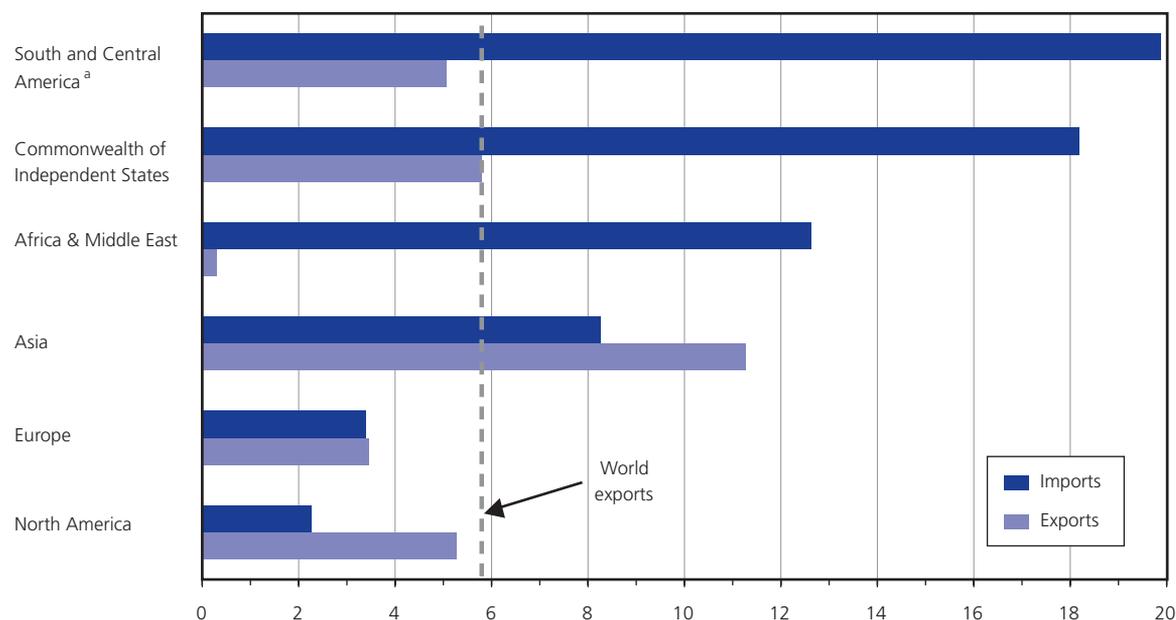
European trade performance was somewhat atypical in 2007. A slight deceleration in economic growth (by 0.1 percentage points) is reported, together

with a sharp reduction in the expansion rate of both exports and imports (3.5 percentage points). The slowdown in Europe's trade is particularly pronounced for intra-EU trade.⁷

Europe's real merchandise export and import growth of 3.5 per cent in 2007 continued to lag behind the global rate of trade expansion, as has been the case since 2002. Within Europe, individual countries' trade performances differed widely in 2007. Three groups can be distinguished. First, most of the new EU members and Turkey expanded exports and imports by more than 10 per cent. Second, Germany, the Netherlands, Austria, Belgium and Switzerland registered trade growth of about 5 per cent. The third group's trade was almost stagnant (eg, France, Spain, Ireland and Malta).

Chart 3
Real merchandise trade growth by region, 2007

(Annual percentage change)



^a Includes the Caribbean.

Source: WTO Secretariat.

C NOMINAL TRADE DEVELOPMENTS IN 2007⁸

1. MERCHANDISE TRADE

The structure of world merchandise exports in dollar value terms was strongly affected by developments in relative prices and exchange rates in 2007. Price developments differed widely by sector and region in the course of the year.

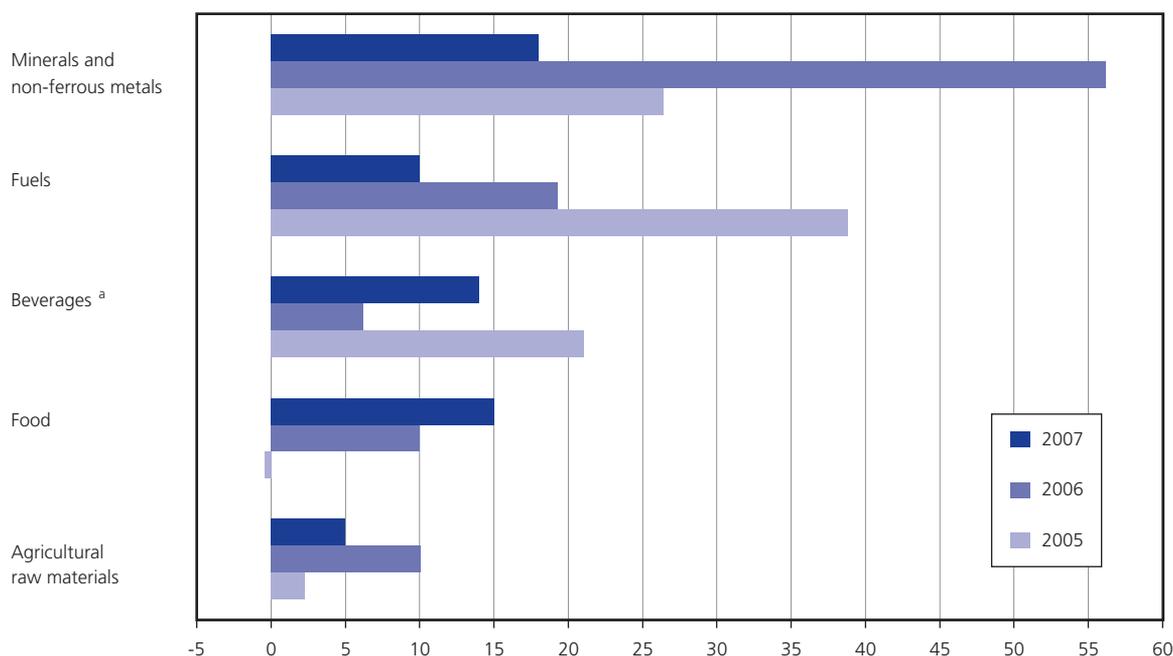
According to the International Monetary Fund (IMF) world export prices of fuels, food and beverages increased sharply in the course of the year while prices for agricultural raw materials ended the year at a lower level than at the start. Prices for metals, which had risen by more than one half in 2006, continued to rise to new record levels in the first half before falling back by December to the level reached in January 2007. Comparing the

annual averages, prices increased by 18 per cent for metals, 15 per cent for food and beverages, 10 per cent for fuels and only 5 per cent for agricultural raw materials (See Chart 4).

Export prices of manufactured goods are estimated to have increased by about 9 per cent in 2007.⁹ Different types of manufactured goods saw quite different price movements. Export prices for iron and steel products rose at double-digit rates, while those of office and telecom equipment were estimated to have decreased again. Available information on export prices for chemicals point to a faster increase in this product group than for the average of manufactured goods, while prices for automotive products increased somewhat below average.

Chart 4
Export prices of selected primary products, 2005-07

(Annual percentage change)



^a Comprising coffee, cocoa beans and tea.

Source: IMF, International Financial Statistics.

Prices of manufactured goods remained less strong than those of primary products for the fourth consecutive year. These shifts in relative prices had a significant impact on regional export unit values (prices) which ranged from increases of about 10 to 13 per cent for the CIS, Africa and the Middle East, to between 4 and 5 per cent in Asia and North America. Information on price developments in world commercial services trade is not available. However, the price deflators for US services exports and imports increased by 3 per cent in 2007, somewhat less strongly than in the preceding year.

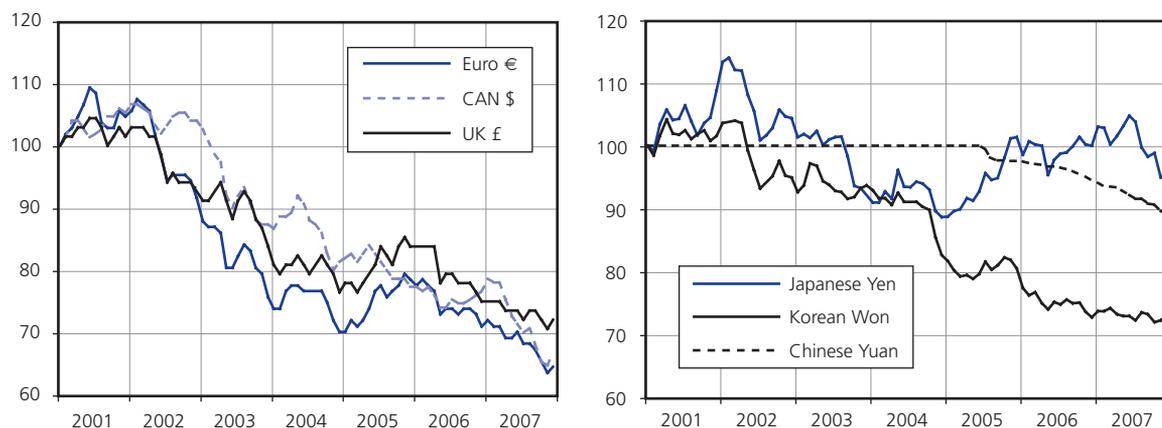
Exchange rate developments in 2007 had a major impact on the dollar price level of internationally traded goods. Contrary to developments in 2006, the US dollar depreciated strongly (in terms of annual averages) against the major European currencies and the currencies of major exporters of mining products (such as Canada, Australia and Russia).

In Asia the picture was mixed. The currencies of Japan, Hong Kong, China; and Chinese Taipei remained practically unchanged against the US dollar (annual averages) while those of India, Thailand and the Philippines increased by about 10 per cent. An intermediate development can be observed for the currencies of China, Singapore and Malaysia, which appreciated by about 5 per cent against the US dollar (See Chart 5).

The combination of an export structure concentrated largely on electronic goods and other manufactures and a moderate average appreciation of the Asian currencies against the US dollar kept Asian export prices at about half the world average in 2007. In marked contrast, European dollar export prices rose at double-digit rates, largely due to exchange rate changes.

Chart 5
Dollar exchange rates of selected major currencies, 2001-07

(Indices, January 2001=100)



Source: IMF, International Financial Statistics.

World merchandise exports in dollar terms rose by 15 per cent to US\$13.6 trillion in 2007. Almost two thirds of this change in the dollar value can be attributed to inflation. Commercial services exports rose by 18 per cent to US\$3.3 trillion. The increase in commercial services exports in 2007 was markedly faster than in the preceding year and somewhat faster than that of merchandise trade, which expanded slightly less than in 2006 (See Table 2).

Merchandise exports by region in dollar terms are the result of a combination of factors including demand, prices, exchange rates and capital flows. The region with the highest expansion of both exports and imports in 2007 was the CIS, which benefited from strong domestic demand, favourable relative price developments over the last three years and increases in FDI inflows. Imports into the region rose by one third in 2007, twice as fast as world trade, while exports rose by close to 20 per cent. Consequently in 2007 the share of the CIS in world merchandise exports and imports rose to its highest level since 1990 (See Appendix Table 1).

The very high levels of primary commodity prices, in particular those of oil and metals, underpinned the strong expansion of South and Central America's merchandise trade values. The region continued to record a merchandise trade surplus, although imports rose by nearly one quarter while exports registered an increase of around 15 per cent. Brazil, which alone accounts for one third of the region's exports, reported import growth of nearly one third as compared to about half that level in respect of export growth. Argentina, Colombia and Peru also recorded a strong trade performance in dollar terms, with imports and exports growing faster than the regional average.

Europe was the only region reporting a stronger increase in the dollar value of its exports in 2007 than in 2006 (16 per cent and 13 per cent respectively). Import growth was only slightly less than export growth, and also somewhat faster than in the preceding year. This acceleration in nominal trade growth is entirely due to the strong appreciation of the European currencies *vis-à-vis* the US dollar in 2007.¹⁰ There were major differences

Table 2
World exports of merchandise and commercial services, 2007

(Billion dollars and percentage)

	Value	Annual percentage change			
	2007	2000-07	2005	2006	2007
Merchandise	13570	12	14	16	15
Commercial services	3260	12	12	12	18

Source: WTO Secretariat.

among European traders. Some countries reported stagnation in their trade (e.g. the United Kingdom) while most of the new EU members recorded dollar value growth rates in excess of 20 per cent. These dynamic traders benefited not only from FDI inflows but also from their proximity to the booming CIS region.¹¹

Due to the sharp deceleration in US import growth, North American imports rose by only 6 per cent, the smallest increase of all regions in 2007. China replaced Canada for the first time as the United States' leading supplier, although US imports from its partners in the North American Free Trade Agreement (NAFTA, ie, Canada and Mexico) and Asia increased both roughly in line with total imports. United States imports from China rose by 12 per cent, more than twice as fast as total imports, despite very weak US import demand in electronic goods (-4 per cent) and clothing (3 per cent), two prominent sectors of US imports from China.

In contrast to the strong import growth from China, US imports from Japan and other Asian economies declined or stagnated. United States merchandise exports to the world rose twice as much as its imports, despite sluggish exports to NAFTA partners and Japan. The expansion of US exports to Europe (16 per cent) and China (18 per cent) exceeded the growth in bilateral imports (6 per cent and 12 per cent respectively). United States exports were even more dynamic to the mineral exporting regions, rising by one fifth to Central and South America and the Middle East, and by one quarter to Africa.

For the first time since 2002 Africa's merchandise exports rose less than its imports. The figures for 2007 were 15 per cent for exports and 22 per cent for imports. Exports to China alone increased by one quarter, and imports by 40 per cent. South Africa, the region's largest merchandise trader, reported a deceleration of its import growth and an acceleration of its export growth, in marked contrast to the other African countries. Somewhat unexpected is the preliminary finding that imports of the non-oil exporting African countries increased as rapidly as those of the oil-exporting countries.

The Middle East's merchandise exports are estimated to have grown by 10 per cent in 2007, roughly in line with the increase in crude oil prices. Yet oil prices do not explain all export developments in this region, and the leading exporters in the region, Saudi Arabia and the United Arab Emirates,

recorded below average growth while Israel and Jordan (both non-oil exporters) expanded their shipments more than the average growth rate for the region. Merchandise imports are estimated to have increased by 23 per cent. Imports of Saudi Arabia and Qatar increased by about one third, while those of Iran and Yemen rose at rates well below the average.

Asia's merchandise exports continued to expand slightly more than world exports and also slightly more than the region's imports, further widening the region's merchandise trade surplus despite a stronger increase in import prices than in export prices. In 2007, the trade performance of Asian economies again showed major differences. While China, India and Viet Nam recorded export and import growth rates above 20 per cent, Japan and the four Asian newly industrialized economies (NIEs – Hong Kong, China; Republic of Korea; Singapore and Chinese Taipei) expanded their trade by about 10 per cent (See Appendix Table 1). China further advanced its pre-eminence among Asian traders in 2007. For the first time its trade (exports plus imports) exceeded the combined trade of Japan and the Republic of Korea, the second and third largest merchandise traders in Asia.¹²

From the regional review above it is apparent that the developing countries fared well in the expansion of trade in 2007. Their combined merchandise exports rose by 16 per cent, to US\$5.0 trillion, and imports rose by 18 per cent, resulting in an aggregate surplus in excess of US\$450 billion. The share of developing countries in world merchandise trade reached 34 per cent, an all-time record level.

For the least-developed countries, thanks largely to higher commodity prices, the expansion of merchandise exports was even stronger than for the developing countries over the last seven years. Least-developed country exports are estimated to have increased by about 16 per cent, to US\$120 billion in 2007. At 0.9 per cent, their share in world merchandise exports remained at its highest level since 1980 (the first year for which records were kept).

Developing countries' merchandise imports rose by 17 per cent, somewhat faster than world trade. But these countries show differences in commodity composition, individual country performance, and relative country size. Therefore, grouping them as developing countries or least-developed countries

is becoming less meaningful for trade analysis (See Appendix Table 1).

2. COMMERCIAL SERVICES TRADE

World commercial services exports rose by 18 per cent to US\$3.3 trillion in 2007.¹³ The acceleration in services exports could be observed in all major regions and in all three services categories.¹⁴

Much of this acceleration is due to exchange rate movements and in some cases also to higher costs of transportation fuels. It can be assumed that exchange rate changes played a stronger role in the dollar value change of services trade than in merchandise trade, as Europe (with its appreciating currencies) accounts for a larger share of services than merchandise exports.

Among the three broad commercial services categories, transportation, travel and “other commercial services”, the last of these has been the fastest growing category over the last seven years and accounts for slightly more than one half of total services exports. In 2007, other commercial services expanded by 19 per cent, again more than transportation and travel. Higher fuels cost contributed to the relatively sharp rise in the dollar value of transportation services (See Table 3).

Commercial services trade by region is presented in Appendix Table 2. Europe’s commercial services exports and imports were up by 19 per cent and 17 per cent respectively, consolidating Europe’s leading position in world services trade by region.¹⁵ Europe’s other commercial services and transportation services expanded markedly more than travel services for both exports and imports. For the latter category, the preliminary data indicate that Europe’s travel receipts lagged somewhat behind the expansion rate of global travel receipts.

The United Kingdom and Germany, the two largest services traders in Europe, experienced an increase in their services exports in line with European exports. The increase in France, Italy and the Netherlands was weaker than the European average, but much stronger than the average in Spain, Ireland, Sweden, Switzerland and Poland. On the import side Spain, Denmark and Sweden recorded services import growth in excess of 20 per cent.

The CIS registered the highest export and import growth in commercial services trade of all regions in 2007, but still has the smallest share in world services trade.

Asia’s commercial services trade rose only slightly faster than the world total in 2007. Exports of all three services categories expanded at roughly the same rate, while on the import side travel expenditure is estimated to have been much weaker than the other two services categories. The development of commercial services trade differed widely among the Asian economies. Somewhat weak export and import growth in dollar terms was reported for Japan and Chinese Taipei, while growth remained moderate for Hong Kong, China; and Singapore. Services exports and imports rose by more than 20 per cent in China, Malaysia and Australia.¹⁶ India is estimated to have one of the strongest import expansion rates for commercial services in Asia, while its services exports rose less than the global average for the first time since 1996.

North America’s commercial services trade recorded the weakest export and import expansion of all regions in dollar value terms in 2007. Although exports rose more than in the preceding year, annual growth lagged behind that of global trade expansion, for the seventh year in a row. US services imports grew by 9 per cent, one of the smallest increases among the 30 leading traders reported

Table 3
World exports of commercial services trade by major category, 2007
(Billion dollars and percentage change)

	Value		Annual percentage change		
	2007	2000-07	2005	2006	2007
Commercial services	3260	12	12	12	18
Transport	742	11	13	9	18
Travel	862	9	7	9	14
Other commercial services	1653	14	14	15	19

Source: WTO Secretariat.

in Appendix Table 2. US services exports rose by 14 per cent, contributing to a rise in the US trade surplus in commercial services of US\$120 billion. Canada's services exports were among those most affected by the slowdown in the US economy, rising by a mere 6 per cent in 2007. The appreciation of the Canadian dollar stimulated Canadian travel expenditure in the United States and contributed to a rise in services imports of 11 per cent.

In South and Central America commercial services imports expanded more than exports in 2007. According to preliminary data this development was largely due to the travel account, as it is estimated that travel expenditure in the region rose by about one quarter, or twice as fast as receipts. Brazil, the leading services trader of the region, was also one of the most dynamic, as exports and imports rose by about one quarter in 2007.

Endnotes

- ¹ Measured with GDP at constant prices and market exchange rates. Measured with GDP at purchasing power parities (PPP) the contribution of the developing regions to global output exceeded one half.
- ² Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan.
- ³ UNCTAD, UNCTAD Investment Brief, No.1, 2008.
- ⁴ The Institute for International Finance observed a strong increase in net private capital flows to emerging markets, driven largely by portfolio flows. Official net flows to emerging markets were negligible in 2007 following a net outflow in 2006. (Institute for International Finance, Capital Flows to Emerging Market Economies, 6 March 2008).
- ⁵ The ratio of the US current account deficit to US GDP is estimated to have decreased from its peak of 6.2 per cent in 2006 to 5.5 per cent in 2007.
- ⁶ JP Morgan, Real broad effective exchange rate indices. Direct communication to the WTO Secretariat. Estimates for current account balances are taken from IMF, World Economic Outlook April 2008.
- ⁷ It seems that the accuracy of trade between countries within Europe, as reported by some countries, has been severely affected by irregular trade transactions related to value-added-tax (VAT) fraud. In 2007, UK merchandise exports and imports contracted sharply although the overall growth in the economy remained unchanged between 2006 and 2007. The recent trade decline is most likely due more to a cut in trade flows related to VAT fraud than to changes in demand or regular business transactions.
- ⁸ Merchandise trade values for 2007 were estimated on the basis of monthly customs data while commercial services data are derived from balance-of-payments statistics. The latter are typically available later than merchandise trade data, contributing to greater uncertainty in the estimates for services than for merchandise trade in 2007.
- ⁹ Among leading traders, dollar export prices of manufactured goods increased at highly different rates in 2007. German prices rose by 10.2 per cent. US prices rose by 3.2 per cent, while Japan's edged up marginally and the Republic of Korea's decreased slightly. China's export unit value index for manufactured goods rose by nearly 5 per cent in 2007.
- ¹⁰ In euro terms Europe's merchandise exports slowed from 13 per cent growth in 2006 to 6 per cent in 2007. The figures for imports were 15 per cent in 2006, down to 5.5 per cent in 2007.
- ¹¹ The overall increase in Europe's trade in 2007 might be understated due to difficulties in accurately recording trade flows within the EU.
- ¹² China's customs trade data include shipments which temporarily leave China and are re-imported afterwards. Recorded as China's "imports from China" they amounted to US\$86 billion or 9 per cent of total imports (corresponding to 7 per cent of exports).
- ¹³ Commercial services data are derived from balance-of-payments statistics which do not include sales of majority-owned foreign affiliates abroad (commercial presence). Balance-of-payments data are reported with a greater delay than customs merchandise trade data which implies that the preliminary information on commercial services given in this report is less certain than for merchandise trade.
- ¹⁴ According to preliminary estimates the Middle East is the only region in which services trade expanded less rapidly in 2007 than a year earlier.
- ¹⁵ Measured in euro terms Europe's commercial services exports and imports rose by 8 per cent and 7 per cent respectively in 2007.
- ¹⁶ In the first half of 2007 China's commercial services exports reportedly increased by 39 per cent while imports rose by one quarter.

Appendix Table 1
World merchandise trade by region and selected country, 2007
 (Billion dollars and percentage)

	Exports					Imports				
	Value	Annual percentage change				Value	Annual percentage change			
	2007	2000-07	2005	2006	2007	2007	2000-07	2005	2006	2007
World	13570	12	14	16	15	13940	11	14	15	14
North America	1854	6	12	13	11	2704	7	14	11	6
United States	1163	6	10	15	12	2017	7	14	11	5
Canada	418	6	14	8	8	390	7	15	11	9
Mexico	272	7	13	17	9	297	7	12	16	11
South and Central America ^a	496	14	25	21	15	455	12	23	22	26
Brazil	161	17	23	16	17	127	12	17	23	32
Other South and Central America ^a	335	13	26	24	14	328	12	25	21	23
Europe	5769	12	9	13	16	6055	12	10	15	16
European Union (27)	5314	12	8	13	16	5569	12	10	14	15
Germany	1327	13	7	14	20	1059	11	9	17	17
France	552	8	3	7	11	613	9	7	7	13
United Kingdom ^b	436	6	11	17	-3	617	9	9	17	3
Netherlands	551	13	14	14	19	491	12	14	15	18
Commonwealth of Independent States (CIS)	508	20	28	25	19	377	24	25	31	34
Russian Federation	355	19	33	25	17	223	26	29	31	35
Africa	422	16	30	19	15	355	15	21	14	22
South Africa	70	13	12	13	20	91	17	17	24	18
Africa less South Africa	352	17	34	20	14	264	15	23	11	24
Oil exporters ^c	247	19	44	21	14	97	18	28	9	25
Non oil exporters	105	13	15	17	16	167	13	21	11	24
Middle East	721	15	35	21	10	462	16	21	13	23
Asia	3798	13	16	18	16	3528	13	17	16	14
China	1218	25	28	27	26	956	23	18	20	21
Japan	713	6	5	9	10	621	7	13	13	7
India	145	19	30	21	20	217	23	43	23	24
Newly industrialized economies (4) ^d	936	10	12	15	11	935	9	13	16	12
Memorandum items:										
Developing economies	4967	15	22	20	16	4517	14	18	17	18
MERCOSUR	224	15	21	16	18	184	11	20	23	31
ASEAN	863	10	15	18	12	773	11	17	14	12
EU (27) extra-trade	1695	12	11	11	16	1949	11	15	16	15
Least Developed Countries (LDCs)	120	19	36	24	16	118	15	21	15	17

^a Includes the Caribbean. For composition of groups see the Technical Notes of WTO, International Trade Statistics, 2007.

^b The 2007 annual change is affected by a reduction in trade associated with fraudulent VAT declaration. For further information, refer to the special notes of the monthly UK Trade First Release (www.statistics.gov.uk/StatBase/Product.asp?vlnk=1119).

^c Algeria, Angola, Cameroon, Chad, Congo, Equatorial Guinea, Gabon, Libya, Nigeria, Sudan.

^d Hong Kong, China; Republic of Korea; Singapore and Chinese Taipei.

Source: WTO Secretariat.

Appendix Table 2

World exports of commercial services by region and selected country, 2007

(Billion dollars and percentage)

	Exports					Imports				
	Value	Annual percentage change				Value	Annual percentage change			
	2007	2000-07	2005	2006	2007	2007	2000-07	2005	2006	2007
World	3260	12	12	12	18	3060	11	11	11	16
North America	533	7	11	9	13	440	7	9	9	9
United States	454	7	11	10	14	336	7	9	9	9
Canada	61	7	11	7	6	80	9	11	11	11
Mexico	17	4	15	2	6	24	5	9	7	9
South and Central America ^a	91	10	20	13	16	97	8	22	15	18
Brazil	23	14	28	21	25	34	12	39	21	24
Europe	1662	13	10	10	19	1434	12	9	9	17
European Union (27)	1512	13	9	10	19	1337	12	9	9	17
United Kingdom	263	12	6	10	17	193	10	10	7	13
Germany	197	14	10	12	18	245	9	6	6	15
France	130	7	5	-0	11	120	11	8	2	12
Italy	109	10	6	10	12	117	11	8	11	19
Spain	127	14	10	12	21	97	17	13	17	24
Commonwealth of Independent States (CIS)	64	20	20	23	25	90	21	18	17	29
Russian Federation	38	22	21	24	25	57	20	18	15	30
Africa	84	15	13	19	21	97	15	21	14	19
Egypt	18	10	3	10	16	12	7	27	8	15
South Africa	13	15	15	7	8	16	16	18	18	14
Middle East	79	13	17	16	15	125	14	20	19	17
Israel	21	5	9	10	10	18	6	7	9	24
Asia	745	13	15	17	19	778	11	12	14	17
Japan	136	9	14	14	11	157	5	2	9	9
China	127	...	19	24	...	129	...	16	21	...
India	86	...	...	35	15	78	...	...	33	24
Newly industrialized economies (4) ^b	243	11	11	13	15	230	11	11	13	15

^a Includes the Caribbean. For composition of groups see Chapter IV Metadata of WTO International Trade Statistics, 2007.

^b Hong Kong, China; Republic of Korea; Singapore and Chinese Taipei.

Note: While provisional full year data were available in early March 2008 for 33 countries accounting for more than 60 per cent of world commercial services trade, estimates for most other countries are based on data for the first three quarters (the first six months in the case of China).

Source: WTO Secretariat.

II TRADE IN A GLOBALIZING WORLD

A INTRODUCTION

Economic integration is proceeding across the world at an unprecedented pace. Globalization has brought enormous benefits for many countries and citizens. But some have been on the losing end of the process, and opposition to further integration is mounting for a multitude of reasons. Trade is just one aspect of globalization, and links with broader economic, political and technological forces are manifold and complex. Certain arguments against open trade are fuelled by a variety of factors – including a general fear of change – that have little to do with further trade opening. Governments responding to anti-trade pressures stemming from anti-globalization arguments risk making poor policy choices. Trade scepticism is clearly a cause of concern, particularly at a time when WTO members are striving to complete the Doha Round. At this crucial juncture, it seems appropriate to revisit the case for trade and to ask ourselves whether the traditional arguments in favour of free trade are still valid.

It is time to remind ourselves what trade can contribute, which seems to have been forgotten in some quarters, but also to be candid about who has benefited and by how much. Among the questions explored in this Report are whether countries have exploited their comparative advantage, realized economies of scale from access to larger markets, organized their industries in a more efficient manner, and benefited from the spread of technologies. The Report will explain the rationale underlying pro-trade arguments against the background of both well-established and newer theories about sources of trade gains. It will also examine available evidence to test various theories about these gains.

The Report will argue that the benefits from trade have not been evenly distributed. Comparative advantage may be meaningless if the costs of shipping a product are higher than the costs of producing it. The overall gains for a country will matter little to those who lose their jobs as a result of specialization driven by trade. These people may have difficulties in taking up positions in expanding sectors because they are not adequately trained. The poor may be particularly vulnerable, since they do not have the means to ensure a smooth transition from one activity to the next.

Industries do not spread their operations evenly across countries, but tend to concentrate in particular locations. These dynamics can be self-reinforcing, leading to agglomeration in some places and de-industrialization in others. At the same time, with reductions in transport and other trade costs, production processes can be split up into more and more individual steps. This has allowed firms in remote locations to become leaders in specialized activities and to join international production networks. Others remain outside these networks, often due to institutional, administrative and other constraints.

Policy-makers must address these issues if they want to allay public fears about trade and to allow nations to benefit from the considerable gains that can result from trade. Action complementary to trade-opening is needed at the national level, but some policies require multilateral coordination. Moreover, policies designed to reduce trade barriers should not prevent governments from taking appropriate flanking measures. A final section of this Report will contemplate how well the WTO is equipped to defend the trade-related gains from the globalization that the WTO itself has partly helped to create, while at the same time addressing appropriately the anxieties created by trade expansion.

Structure of the Report

Section B of the Report describes and analyzes the key elements of today's global integration process, its principal driving forces and some of the worries about the costs and benefits of globalization. While globalization is more than just trade, it is shown that trade has been a major part of the process and that a complementary relationship exists between trade and other elements of economic integration.

Section C re-examines the gains from trade. It explains the rationale underlying pro-trade arguments and examines their theoretical underpinnings. It also examines available evidence in regard to the realization of such gains.

Against the background of an understanding of the benefits that trade has to offer, Section D focuses specifically on countries' participation in

international trade. It examines the evidence of falling trade costs and two apparently contrasting patterns in international trade, the geographical concentration of production in some parts of the world and the fragmentation of production across numerous regions. This section attempts to clarify how widespread these phenomena are and what the specific concerns may be, especially for developing countries not taking part in this process.

Section E examines the distributional consequences of liberalization and the resistance to further trade opening that this may trigger. It analyzes how trade is likely to affect the distribution of wealth within economies in the long-run as well as the short-term adjustment process following trade reform. Another

part of this section deals with the link between trade and poverty and analyzes how the most vulnerable groups in society are affected by trade liberalization.

Finally, Section F deals with the challenges arising from more open trade and the flanking policies required to cope with them. Challenges include the supply constraints faced by developing countries and the need to further reduce trade costs, the need to manage the social consequences of trade liberalization and the relationship between trade and technological progress. While most measures need to be taken at the national level, the section will discuss the role that international cooperation, and the WTO in particular, can play.

B GLOBALIZATION AND TRADE

While there is no universally agreed definition of globalization, economists typically use the term to refer to international integration in commodity, capital and labour markets (Bordo et al., 2003). Using integration in these markets as the benchmark, it is clear that globalization is not a new phenomenon. Since the mid-19th century, there have been at least two episodes of globalization (Baldwin and Martin, 1999).

The first episode began around the mid-19th century and ended with the commencement of World War I (WWI). The second episode began in the aftermath of World War II (WWII) and continues today. In both these episodes of globalization, rapid trade and output growth went together with major shifts in the relative size of the economies involved. One valuable lesson from history is that globalization has not been a smooth process. It has often been marked by periods of accelerated integration (as observed in the 19th century and in the second half of the 20th century) and by periods of dramatic reversals (as in the inter-war period) sometimes with costly consequences.

The two most recent episodes of globalization were characterized by increased integration in trade, capital flows and movement of labour, although there are differences in the importance that each of these elements played in the two episodes (see Table 1).

1. TRENDS IN GLOBALIZATION

International trade after WWII entered a long period of record expansion with world merchandise exports rising by more than 8 per cent per annum in real terms over the 1950-73 period. Trade growth slowed thereafter under the impact of two oil price shocks, a burst of inflation caused by monetary expansion and inadequate macroeconomic adjustment policies. In the 1990s, trade expanded again more rapidly, partly driven by innovations in the information technology (IT) sector. Despite the small contraction of trade caused by the dotcom crisis in 2001, the average expansion of world merchandise exports continued to be high – averaging 6 per cent for the 2000-07 period. For the entire 1950-2007 period, trade expanded on average by 6.2 per cent, which is much stronger than in the first wave of globalization from 1850 to 1913.¹ As dollar prices expanded much faster after WWII than before WWI the nominal trade expansion of the former period is more than twice as fast as in the earlier period (9.8 per cent versus 3.8 per cent per annum).

The most dynamic traders in the 1950-73 period were the west European countries and Japan (see Chart 1). Post WWII reconstruction and the Korean War provided a major stimulus to Japanese and European exports in the early 1950s. Thereafter, European integration sustained the expansion of intra-European trade. The share of intra-west European trade in world trade rose from 18.3 per cent in 1953 to 31.2 per cent in 1973 while extra-regional trade expanded somewhat less than global

Table 1
Globalization waves in the 19th and 20th century
(Percentage change unless indicated otherwise)

World	1850-1913	1950-2007	1950-73	1974-2007
Population growth	0.8 ^a	1.7	1.9	1.6
GDP growth (real)	2.1 ^a	3.8	5.1	2.9
Per capita	1.3 ^a	2.0	3.1	1.2
Trade growth (real)	3.8	6.2	8.2	5.0
Migration (net) Million				
US, Canada, Australia, NZ (cumulative)	17.9 ^a	50.1	12.7	37.4
US, Canada, Australia, NZ (annual)	0.42 ^a	0.90	0.55	1.17
Industrial countries (less Japan) (cumulative)	...	...	...	64.3
Global FDI outward stock, year			1982	2006
FDI as % of GDP (world)	...	...	5.2	25.3

^a Refers to period 1870-1913.

Source: Maddison (2001), Lewis (1981), UNCTAD (2007), WTO (2007a).

trade. While the United States remained Japan's largest export market throughout that period, Japanese export shipments grew more rapidly to western Europe and the Asian newly industrialized economies (NIEs).² From the early 1960s onwards, the six NIEs followed an outward oriented trade policy and succeeded in sharply increasing their merchandise exports. In the two decades following 1963 the share of the Asian NIEs rose from 2.4 per cent to 9.7 per cent of world merchandise exports. These economies initially excelled in exporting textiles but diversified later into exports of consumer electronics and IT products.

The dominant share of the United States in world trade in the early 1950s was eroded in subsequent decades. While the automotive agreement between the United States and Canada in 1965 strengthened intra-North American trade, the combined share of the two countries in world trade shrank by 10 percentage points between 1953 and 1973 (see Chart 1). During the following two decades, the share of regions in world merchandise exports varied, largely due to the fluctuations of commodity prices and exchange rates. The oil-exporting developing countries (especially those in the Middle East) increased their share between 1973 and 1983 but

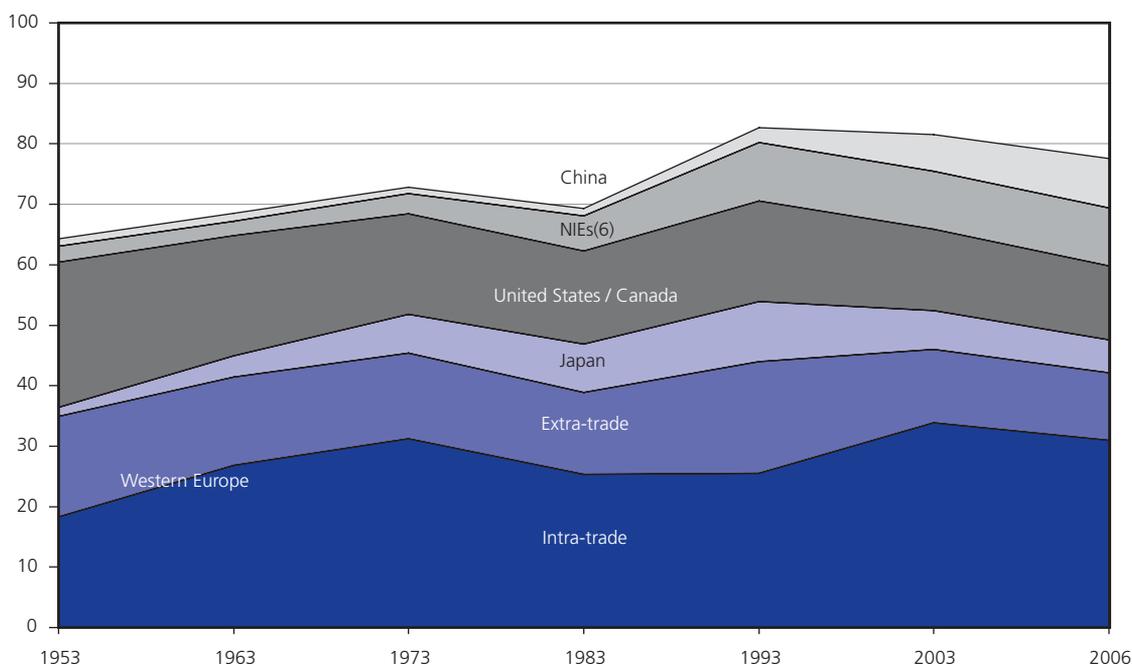
lost almost all their gains when oil prices fell back thereafter. In 1993, after the disintegration of the Soviet Union and the demise of the Council of Mutual Economic Assistance (CMEA) industrial countries' (i.e. western Europe, North America and Japan) share of world merchandise exports reached a peak, in excess of 70 per cent. Together with the six NIEs, they accounted for more than 80 per cent of world trade in 1993.

In the 1990s, Japan's share in world exports started to shrink significantly owing to the competitive pressure exerted by the NIEs and China. The stimulus provided by the creation of the North American Free Trade Agreement (NAFTA) in 1994 was not sufficient to reverse the downward trend in the share of Canada and the United States in global trade. Similarly, the European integration process which continued to deepen and expand to cover the central European countries and the Baltic states could not halt the relative decline of European exports.

The reduced share of the industrial countries can be attributed first to the rise of China, the recovery of the Commonwealth of Independent States (CIS)³ and in more recent years to the boom in commodity

Chart 1
Share of major exporters in world merchandise trade, 1953-2006

(Percentage)



Note: Break in series between 1993 and 2003. Western Europe becomes Europe including Eastern Europe and Baltic States. NIEs - Newly Industrialised Economies comprising Chinese Taipei; Hong Kong, China; Rep. of Korea; Malaysia; Singapore and Thailand. Source: WTO Secretariat.

prices which boosted the shares of Africa, the Middle East and Central/South America, regions which export mostly minerals and other primary products. Increased competition from China in the world trade of manufactured goods was concentrated initially in textiles trade and other labour-intensive goods, such as footwear and toys, but expanded quickly into consumer electronics and IT goods. More recently, China's biggest gains in market share were in iron and steel products. China more than tripled its share in world exports between 1990 and 2007 and is likely to become the number one merchandise exporter in 2008.

These shifts in regional shares do not indicate how international trade progressively split into three broad groups in the first three decades after WWII. The first group consisted of the "old" industrial countries which complemented market-oriented domestic economic policies with increasingly liberalized trade under the General Agreement on Tariffs and Trade (GATT). The second group, comprising the Soviet Union, the rest of eastern Europe and China, consisted of centrally planned economies in which state-owned firms followed government diktat in production and trading decisions. International trade played a relatively minor role in these economies, although some cooperation within the group was organized under the umbrella of the CMEA. Some of the CMEA countries were also members of the GATT, although their participation remained rather limited.

The third group, developing countries, comprised many nations that had gained their political independence between 1946 and 1962. Many opted for a mixed system in which governments tended to intervene in order to encourage industrialization. In general, this led to import-substituting policies that relied on high tariffs and non-tariff barriers to protect domestic industry. It can hardly be a surprise that under these conditions the share of industrial countries in world trade increased (above all, trade among industrial countries) while those of the centrally planned and developing economies decreased. The limited intra-regional trade links of the two latter groups could not offset the impact caused by the marginal role of international trade in these economies.

This tripartite trading system started to falter with the success of a group of East Asian economies in combining high per capita income growth with strong trade expansion in manufactured goods.

Among the contributory factors were economic policy re-orientation in Mexico and China in the early 1980s combined with the fall of the Berlin Wall and the dissolution of the Soviet Union a decade later.

The prominent role played by the industrial economies in world merchandise exports up to the 1990s was closely linked to their very large share in exports of manufactured goods, the product category most in demand. The long-term shifts in the composition of world merchandise trade show a strong rise in the share of manufactured goods and a marked decline in agricultural products and non-fuels minerals.⁴ The share of agricultural products (including processed food) declined from more than 40 per cent in 1950 to less than 10 per cent since 1999. The share of fuels in world merchandise exports has fluctuated sharply due to a marked variation in prices, with highest shares recorded in 1974, 1981 and 2007 (20 per cent of world trade on each occasion).⁵

Among manufactured goods, there has been a long-term decline in the relative importance of iron and steel as well as that of textiles. The share of clothing experienced a substantial increase in the first two decades after WWII and exceeded that of textiles from 1980 onwards. Road motor vehicles also increased their share in world trade between 1950 and 1973, while office and telecom equipment were the most dynamic products in the 1990s. In 2001, the dotcom crisis arrested the dramatic growth of office and telecom products. Due to falling prices and less buoyant demand, these products could no longer expand their share in world exports of manufactured goods.⁶

The industrial countries accounted for 85 per cent of world exports of manufactured goods in 1955 but their share declined to about two-thirds in 2006. In contrast to manufactured goods, the share of industrial countries in exports of agricultural products (including processed food) rose strongly from 40 per cent in 1955 to about 60 per cent in 2006 (see Appendix Chart 1). The share of industrial countries in world exports of fuels and other mining products was already low in 1955 (less than 40 per cent) and decreased to around 30 per cent in 2006.

Between 1955 and 2006, a decline occurred in the share of the industrial countries in world manufactured exports. There is a noticeable

difference in the timing of the decline (see Chart 2). Industrial countries' share of world exports of clothing, textiles and office and telecom equipment decreased steadily from 1955 onwards. For iron, steel and chemicals, the decline began in 1973. It occurred much later for automotive products (around 1983). For relatively labour-intensive products, such as textiles and clothing, the share of the industrial countries was well below the average for manufactured goods as a whole. Their share in this sector also declined much earlier while the share of the more capital- and research-intensive product groups such as chemicals and automotive products continued to be above average for manufactured goods as a whole. The decline in these capital- and research-intensive sectors has been more moderate and sets in much later.

The mirror image to this relative decline of the industrial countries is the rise of a highly diverse group of developing economies that now account for more than two-thirds of world clothing exports and more than one-half of world exports of textiles and office and telecom equipment. The strongest increase in the share of developing countries was in office and telecom equipment, a sector in which

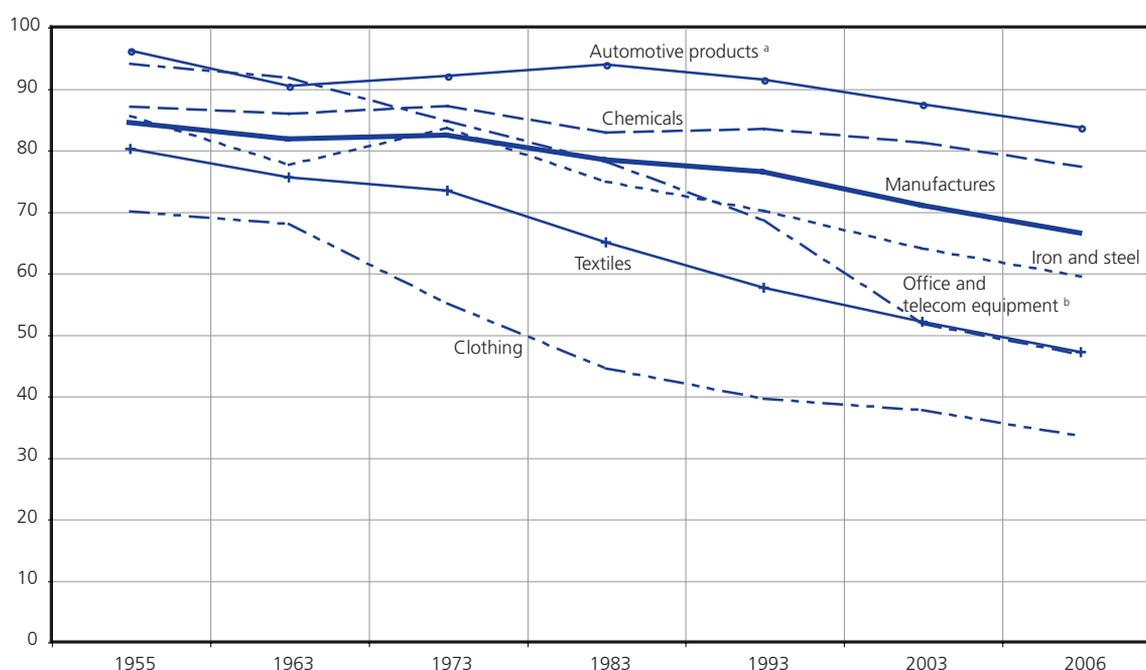
the fragmentation of production has been the most visible.⁷ For all manufactured goods, the developing countries' share is slightly more than a third, double their share 25 years ago (see Appendix Chart 2).

The structure and size of international capital flows has varied greatly over the last 60 years. In the aftermath of WWII, the economies of Europe and Japan suffered large trade deficits and could generate only limited savings for rebuilding their capital stock. The Marshall Plan, the European Payments Union and at a later stage United States' foreign direct investment (FDI) provided the necessary liquidity for the expansion of international trade.

The famous dollar shortage of the immediate post-WWII period faded when the United States started to run into current account deficits. A number of countries placed a part of their dollar earnings with international banks in London and created a pool of dollar liquidity outside the control of the US Federal Reserve Bank system. This was soon labelled as the Euro-dollar market. The need to hold dollar reserves was further reduced when the United States abandoned the fixed dollar-gold relationship in 1971. The currencies of the major traders started to

Chart 2
Share of industrial countries in world manufactures exports by product group, 1955-2006

(Percentage)



^a Road motor vehicles for the years 1955-73.

^b Break in time series between 1973 and 1983.

Note: EU(15) before 2003 and afterwards EU(25).

Source: GATT, *Networks of World Trade*, 1978 for the years 1955-73 and GATT, *International Trade* 1985 for the year 1983, and WTO, SDB for the years 1993-2006.

float and the International Monetary Fund (IMF) no longer maintained an official reference price for gold.

Following the oil price hikes in 1973-74 and again in 1979-81 the large increase of foreign exchange earnings of the oil-exporting countries led them to place a part of their revenues with international banks, which in turn lent funds to sovereign borrowers. While the “re-cycling” of earnings from the trade surplus countries to the deficit countries cushioned the adverse impact on trade, a critical situation emerged when the newly indebted countries faced higher dollar interest rates and falling commodity prices in the early 1980s. The tightening of monetary policy in the United States had a dramatic impact on many developing countries. The solution to the crisis came through a combination of domestic economic adjustment programmes combined with a change in trade policy orientation and debt forgiveness. These new reforms also included a partial liberalization of capital markets, and in particular a more welcoming attitude to FDI. These reforms involved both developing and developed countries and contributed greatly to the surge in FDI flows from the mid-1980s onwards.

FDI flows increased in the 1980s by 14 per cent annually and by more than 20 per cent annually in the 1990s, reaching a peak level of US\$1.4 trillion in 2000. The dotcom crisis in 2001 – caused largely by the internet bubble – sharply reduced FDI flows. These flows started to recover in 2004 and reached their previous peak again in 2007. It is estimated that the ratio of global FDI stock to world GDP exceeded one-quarter in 2006, five times larger than it was a quarter of a century earlier (see Table 1). The persistent US current account deficit and large dollar exchange rate fluctuations encouraged monetary integration in western Europe. It found its most visible expression in the creation of the euro, the common currency of 15 west European countries with a total population of more than 300 million people.

The flow of people across regions was a major feature of the globalization process in the 19th century. Between 1850 and 1913, more than 20 million people moved from Europe to new settlements, mainly in North and South America, Australia and New Zealand. These flows helped to absorb the fast growing European labour force which could no longer be productively employed in European agriculture, and which contributed to the massive expansion in agricultural output in the new areas

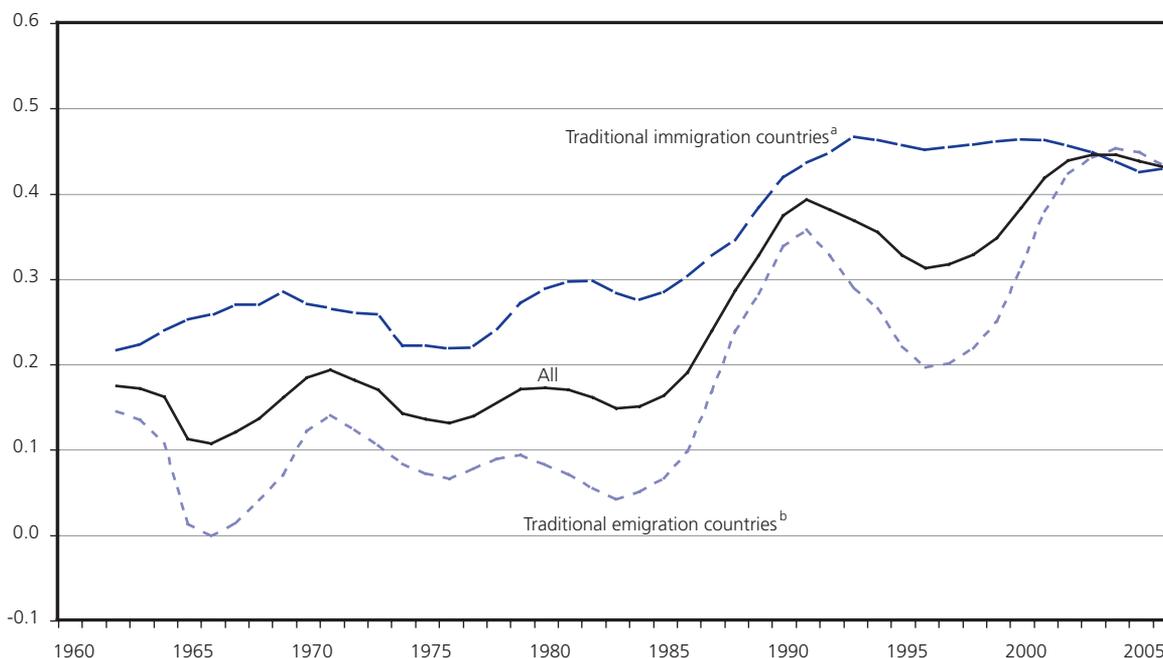
of settlement. The inter-war period saw severely limited migration flows to these areas of European settlement, but the situation started to change again in the second half of the 20th century. It is worth recalling that this period was characterized by unprecedented population growth. While the global population expanded by about 0.8 per cent annually between 1870 and 1913, the 1950-2005 period witnessed annual population growth of 1.7 per cent, or more than twice that observed in the former period (see Table 1).

Although there was a marked deceleration in global population growth in the 1973-2005 period, most of this decline was concentrated in the developed countries, Russia and China. In many developing regions, particularly Africa, population growth rates still remain very high by historical standards. These different rates of population growth are not matched by corresponding differences in economic growth rates, and this is reflected in growing income inequality and migration pressures. The traditional immigration countries of the past (United States, Canada, Australia and New Zealand) have seen an increase in recorded net migration since the early 1990s compared with the three preceding decades.⁸ Many previously net-emigration countries in western Europe have become immigration countries (e.g. Italy, Ireland, Portugal and Spain), with the result that a group of 18 west European countries have experienced net immigration rates since the mid-1990s similar to those observed in the “traditional” immigration countries in the 1960s and 1970s (see Chart 3).

For the industrial countries, cumulative official net migration amounted to 64 million people for the 1974-2006 period. But migration is not limited to South to North flows. Important migration flows can also be observed from South Asia to the Gulf region and in Southern Africa. The increase in migration flows has a number of positive impacts in economic terms but can also be a source of difficulties if integration into the host community proves challenging. One of the most visible impacts of the increase in migration flows is the rise in worker remittances. These have been estimated to be in the order of US\$400 billion in 2006, exceeding by far the official development assistance of OECD countries to developing countries (see Appendix Chart 3).

Chart 3
Net immigration into developed countries, 1960-2006

(Five-year moving averages, net immigration as percent of population)



a Traditional immigration countries comprise Australia, Canada, New Zealand and United States.

b Traditional emigration countries are composed of 18 western European countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

Source: OECD, Labour Force Statistics.

2. MAIN DRIVERS OF GLOBALIZATION

The main forces that have driven global integration have been technological innovations, broader political changes and economic policies. Table 2 attempts to provide a chronology of the major events and forces that have contributed to today's globalization.

In the case of technological innovations, chief among these driving forces of globalization were inventions that improved the speed of transportation and communications and lowered their costs. These included the development of the jet engine and its universal use in aviation for transporting people and goods and the adoption of containerisation in international shipping. Massive investments in road infrastructure have allowed large shares of trade to be carried by freight trucks in western Europe and North America. The other dramatic change was the revolution in information and communication technology. New products such as the microprocessor, the personal computer and the cellular phone have contributed to profound socio-political and economic transformation. This is equally true of the internet and the World Wide

Web. A more detailed discussion of how these innovations have affected trade can be found in Section C.

Less noted in the globalization literature are changes in production methods which created new tradable products (such as plastics), or expanded global production in food (green revolution) or made production more efficient (just-in-time methods). The large switch from coal to oil and gas in industrial countries was also an important step towards globalization, providing a large and cheap source of energy to power economic growth, and integrating the oil-exporting countries of the Middle East into the global economy.

The link between political developments and globalization has been far more complex. The dissolution of empires and the birth of the Cold War had the initial effect of fragmenting the world and the global economy into a first, second and third world. The divide between East and West reached its peak in the early 1960s with the construction of the Berlin Wall and the Cuban missile crisis. But well before these dramatic events occurred, the seeds of economic integration had been sown in

Europe, with the Marshall Plan providing a huge impetus to economic recovery and integration. Subsequently, with China's economic reform, the fall of the Berlin Wall and the collapse of the Soviet Union, the major political impediments to global economic integration ended.

A key driver of globalization has been economic policy, which resulted in deregulation and the reduction or elimination of restrictions on international trade and financial transactions. Currencies became convertible and balance-of-payments restrictions were relaxed. In effect, for many years after the end of WWII it was currency and payments restrictions rather than tariffs that limited trade the most. The birth of the Eurodollar market was a major step towards increasing the availability of international liquidity and promoting cross-border transactions in western Europe. Beginning in the 1970s, many governments deregulated major service industries such as transport and telecommunications. Deregulation involved a range of actions, from removal, reduction and simplification of government restrictions, to privatization of state-owned enterprises and to liberalization of these industries so as to increase competition.

In the case of trade, liberalization was pursued multilaterally through successive GATT negotiations. Increasingly, bilateral and regional trade agreements became an important aspect of (preferential) trade liberalization as well. But many countries undertook trade reforms unilaterally. In the case of developing countries, their early commercial policies had an inward-looking focus. Industrialization through import substitution was the favoured route to economic development. The subsequent shift away from import substitution may be owed partly to the success of a number of Asian newly-industrializing countries that adopted an export-led growth strategy, but also partly to the debt crisis in the early 1980s, which exposed the limitations of inward-looking policies.

Other points to consider include important actions that contributed to global macroeconomic stability and therefore provided an environment conducive to global integration. These would include the Volcker US Federal Reserve's successful steering of US monetary policy to put an end to US and hence global inflation in the early 1980s and the Louvre Accord, which stabilized major exchange rates. Finally, it would be remiss to exclude the role that international institutions such as the IMF, the

World Bank and the GATT played in the process of globalization. They have provided cohesion and greater coherence to international economic policymaking.

3. PUBLIC ATTITUDES TO GLOBALIZATION

Global integration in product, capital and labour markets has resulted in a more efficient allocation of economic resources over time. The outcome of integration is greater levels of current output and prospects of higher future output. Consumers have a wider choice of products and services at lower prices. Capital can flow to countries which need it the most for economic growth and development. To the extent that technology is embodied in capital goods or is closely linked to FDI flows, openness further improves the growth prospects of developing countries. Allowing workers to move across national borders can alleviate skill shortages in receiving countries or improve dependency ratios in rapidly ageing societies while alleviating unemployment or under-employment in countries providing these workers. Remittances from overseas workers or emigrants can represent a substantial share of national income for these countries.

These benefits are sufficiently tangible and large enough for international surveys of public attitudes to suggest broad support for globalization. A majority of respondents recognize that trade benefits consumers by offering them a broader range of choice and lower prices and that trade creates market access opportunities for domestic firms. But this is not to deny that there is also a lot of disquiet about the challenges that come with globalization.

Since 2002, the Pew Global Attitudes Project has conducted a series of worldwide public opinion surveys encompassing a broad array of subjects, including attitudes towards trade. Its latest global survey in 2007 (Pew, 2007) was perhaps the most ambitious, covering 47 countries and more than 45,000 interviews. The countries surveyed included: the major industrial countries, such as the United States, Japan and Germany; emerging economies, such as Brazil, China, India and Russia; and least-developed countries, such as Ethiopia and Mali. Pew found that in all 47 nations surveyed, large majorities believed that international trade was benefiting their countries. But accompanying this belief was a fear about the disruptions and

downsides of participating in the global economy. People were concerned about inequality, threats to their culture, threats to the environment and threats posed by immigration.

One interesting conclusion from the survey was that there is apparently stronger support for trade in some emerging economies than in industrial countries. Support for globalization appeared to be waning in the industrialized countries even though a majority of the public still supported it. For example, 78 per cent of Americans surveyed in 2002 said that trade was good for their country. In 2007, this was down to 59 per cent. Sharp falls in public support were also seen in Italy, France and even the United Kingdom. In contrast, there was near universal approval of trade in China and India. Ninety-one per cent of those surveyed in China expressed approval of trade. In India, a nearly similar proportion (89 per cent) believed that trade was good for the country.

The results of Pew's Global Attitudes Project (Pew, 2007) are mirrored by other surveys. Since 2004, the German Marshall Fund has undertaken annual surveys of public attitudes in the United States and countries of the European Communities (EC) towards trade and poverty reduction. The 2007

survey (German Marshall Fund, 2007) showed that US and European support for trade and for the World Trade Organization (WTO) remained high. In the United States, 64 per cent favoured trade while nearly half (48 per cent) also favoured the WTO. In Europe, 75 per cent had favourable views about trade and 58 per cent approved of the WTO. But the German Marshall Fund survey has detected a softening of support since 2004. Interestingly, when it came to job losses, the US and European public both rated outsourcing to another country as its main cause. Furthermore, public attitudes towards emerging economies appeared to be complicated, with China seen more as a threat, while India was perceived more as an opportunity.

For policymakers who embrace more open markets, there is much to take heart in these results. But rising public concern about some aspects of globalization should also cause them to ponder. For those who believe that the gains from global integration outweigh its costs, it would not be wise to leave these concerns unattended. Perhaps the answer lies in a balance between open markets and complementary policies, along with international initiatives that manage better the risks arising from globalization.

Table 2
Globalization chronology

Time	Economic	Political	Technological
1940s	<ul style="list-style-type: none"> Establishment of the Bretton Woods System, a new international monetary system (1944-71) 	<ul style="list-style-type: none"> Foundation of the United Nations (1945) 	<ul style="list-style-type: none"> Expansion of plastics and fibre products, e.g. first nylon stockings for women (1940)
	<ul style="list-style-type: none"> Establishment of GATT (1947) entering into force in January 1948 	<ul style="list-style-type: none"> Launch of the Marshall Plan (1948-57), a European recovery programme Founding of the Organization for European Economic Cooperation (1948) 	
	<ul style="list-style-type: none"> Soviet Union establishes the Council for Mutual Economic Assistance (CMEA) for economic cooperation among communist countries (1949-91) 	<ul style="list-style-type: none"> Decolonization starts (1948-1962). Independence of India, Indonesia, Egypt, for example China becomes a socialist republic in 1949 	<ul style="list-style-type: none"> Discovery of large oil fields in the Middle East, especially in Saudi Arabia (1948)
1950s	<ul style="list-style-type: none"> Treaty of Rome establishes the European Community (1957). EC and the European Free Trade Association (1959) favour west European integration 	<ul style="list-style-type: none"> Korean war (1950-53) Suez crisis (1956) 	<ul style="list-style-type: none"> Increased use of oil from the Middle East in Europe and Japan "Just-in-time" production implemented by Toyota
	<ul style="list-style-type: none"> Major currencies become convertible (1958-64) 	<ul style="list-style-type: none"> Decolonization in Africa (15 countries become independent between 1958 and 1962) 	<ul style="list-style-type: none"> Increasing usage of jet engines in air transport (1957-72)

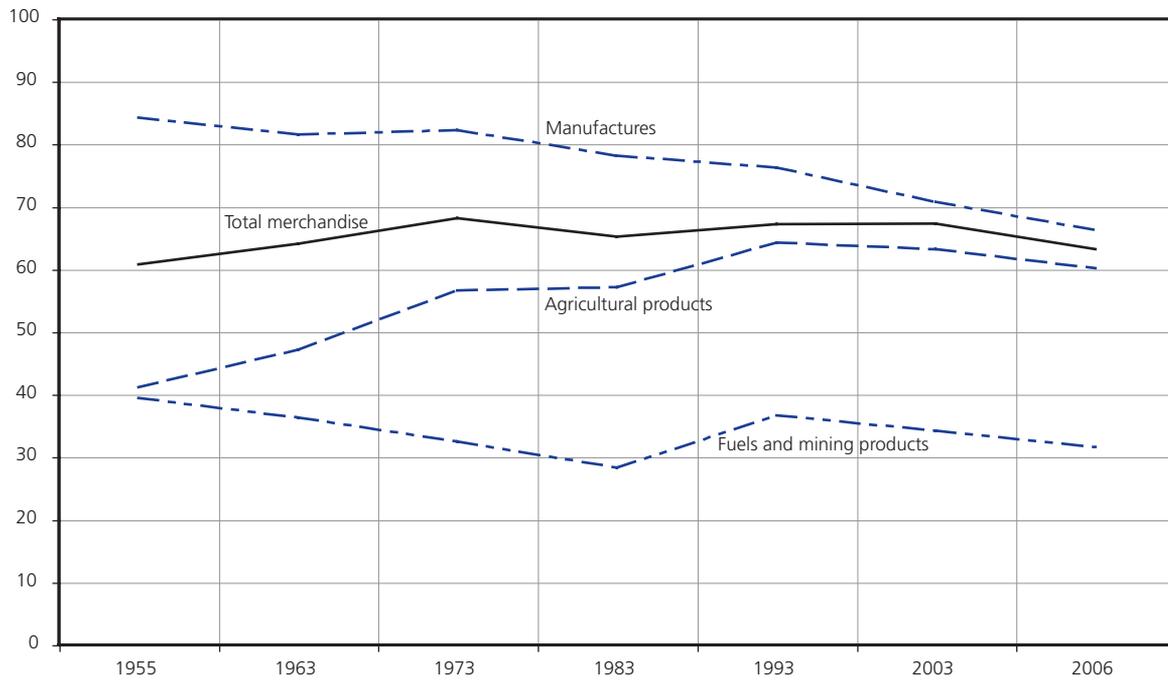
Time	Economic	Political	Technological
1960s	<ul style="list-style-type: none"> • Foundation of the Organization of the Petroleum Exporting Countries (OPEC) (1960) • Development of the Eurodollar Market in London which contributed to the expansion of international liquidity 		<ul style="list-style-type: none"> • First person in space (Yuri Gagarin, 1961) and first man on the moon (Neil Armstrong, 1969)
	<ul style="list-style-type: none"> • Kennedy Round, 6th session of the GATT (1964-69) • Rapid spread of automobiles and highways in the North accelerates demand and shift in fuels consumption (from coal to oil) 	<ul style="list-style-type: none"> • Erection of Berlin Wall (1961) and Cuban missile crisis (1962) highlight sharp confrontation between East and West 	<ul style="list-style-type: none"> • Integrated circuits become commercially available (1961) • Offshore oil and gas production developed
	<ul style="list-style-type: none"> • Trade policies of East Asian countries put more emphasis on export-led development than on import substitution • Elimination of last customs duties within EC (1968) 		<ul style="list-style-type: none"> • Green Revolution - transforming agricultural production in developing countries (1960s onwards) • First line of Japan's high-speed train system (shinkansen) opened in 1964 • Mont Blanc Road Tunnel (1965)
			<ul style="list-style-type: none"> • Increasing usage of containerization in ocean transport (1968 onwards)
1970s	<ul style="list-style-type: none"> • Departure from US dollar exchange rate gold standard (1971) • Tokyo Round of the GATT (1973-79) 	<ul style="list-style-type: none"> • Yom Kippur war (1973) helps to trigger oil price hike • EU enlargement to nine members (1973) 	<ul style="list-style-type: none"> • First single chip microprocessor (Intel 4004) is introduced (1971)
	<ul style="list-style-type: none"> • Oil price "shocks" (1973-74 and 1979) reverse decades of real oil price declines • Rise of Asian newly industrialized countries • China's economic reform (1978) 		
1980s	<ul style="list-style-type: none"> • Volcker Fed successfully extinguishes US inflation • Developing country debt crisis • Mexico starts market reforms and joins the GATT in 1986 	<ul style="list-style-type: none"> • Enlargement of the EU to 12 members • Fall of the Berlin Wall (1989) 	<ul style="list-style-type: none"> • IBM introduces the first personal computer (1981) • Microsoft Windows introduced (1985)
	<ul style="list-style-type: none"> • Louvre Accord promotes stabilisation of major exchange rates (1987) 		
1990s	<ul style="list-style-type: none"> • Indian economic reforms launched in 1991 • Establishment of the North American Free Trade Agreement (1994) • Asian financial crisis (1997) 	<ul style="list-style-type: none"> • Dissolution of the Soviet Union (1991) leads to the formation of 13 independent states 	<ul style="list-style-type: none"> • Eurotunnel opens in 1994 linking the United Kingdom to continent • The number of mobile phones increases due to the introduction of second generation (2G) networks using digital technology • Launch of the first 2G-GSM network by Radiolinja in Finland (1991)
	<ul style="list-style-type: none"> • Establishment of the WTO (1995) following Uruguay Round (1986-94) 		<ul style="list-style-type: none"> • Invention of the World Wide Web by Tim Berners-Lee (1989) - first web site put online in 1991. Number of internet users rises to 300 million by 2000
	<ul style="list-style-type: none"> • Adoption of the euro by 11 European countries (1999) 	<ul style="list-style-type: none"> • Maastricht Treaty (formally, the Treaty on European Union) signed (1992) 	
2000s	<ul style="list-style-type: none"> • Dotcom crisis (2001) 		<ul style="list-style-type: none"> • Container ships transport more than 70 per cent of the seaborne trade in value terms
	<ul style="list-style-type: none"> • China joins WTO (2001) 		<ul style="list-style-type: none"> • Number of internet users rises to 800 million in 2005
	<ul style="list-style-type: none"> • End of the Multifibre Arrangement (quantitative restrictions of textiles lifted) 	<ul style="list-style-type: none"> • Enlargement of the EU to 27 members 	

Endnotes

- 1 According to Annex III Table 4 of Lewis (1981) real world export growth averaged 3.8 per cent over the 1850 to 1913 period. Maddison (2001) (Table F 4) estimates that world exports grew by 3.4 per cent annually between 1870 and 1913. The number of years in which trade shrank was somewhat less in the post-WWII period than in the 1850-1913 period (7 (12) against 5 (9) in real (nominal) terms or 1.1 and 0.9 for every ten years).
- 2 Hong Kong, China, Malaysia, Republic of Korea, Singapore, Chinese Taipei, Thailand
- 3 Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan.
- 4 While the long-term rise of manufactured goods in world trade since 1950 is well known, it is less well known that the share of manufactures did not increase during the height of northern industrialization between 1850 and 1913. The share of manufactured goods increased in UK imports but decreased in United States' imports and stagnated in German imports. Between 1850 and 1913 the share of manufactured goods remained in a range of 36-42 per cent of world trade (in current prices) and is estimated to have stood in 1913 at 39 per cent, a lower rate than in 1850 (42 per cent), according to data provided by Tables 3 and 7 in Lewis (1981).
- 5 Measured in real terms the picture is of course quite different. Between 1950 and 1973 the real price decline of fuels stimulated demand and world fuel exports expanded faster in volume terms than total trade. However, during the period of relatively high energy prices (1974 through 1985) trade in fuels stagnated. Sharply lower real prices after 1985 stimulated a strong recovery in fuels trade in real terms.
- 6 In real terms, however, electronics goods continued to expand faster than other manufactures. The high value-to-weight ratio of electronic goods and the falling cost of air freight sustained the expansion of trade in this product group. More information on falling air transport cost is provided in Section D.1.
- 7 See Section D for a theoretical discussion of the fragmentation of production and its impact on trade.
- 8 There are indications that these estimates contain a severe downward bias as illegal immigration is insufficiently taken into account. According to separate estimates unrecorded immigration into the United States amounted to 0.4 million annually in the (1995-2005) period (see Table 46 of US Census Bureau, 2008).

Appendix Chart 1
Share of industrial countries in world exports by major product group, 1955-2006

(Percentage)

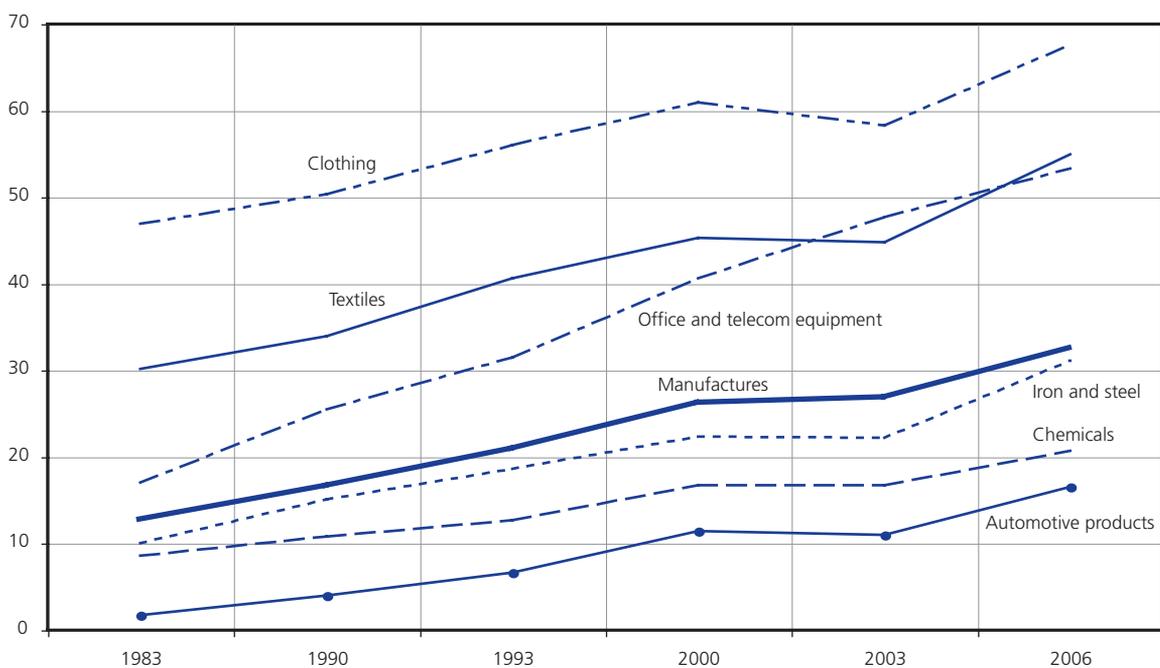


Note: EU(15) before 2003 and afterwards EU(25).

Source: GATT, Networks of World Trade, 1978 for the years 1955-73 and GATT, International Trade 1985 for the year 1983, and WTO, Statistical Data Board for the years 1993-2006.

Appendix Chart 2
Share of developing economies in world manufactures exports by product group, 1983-2006

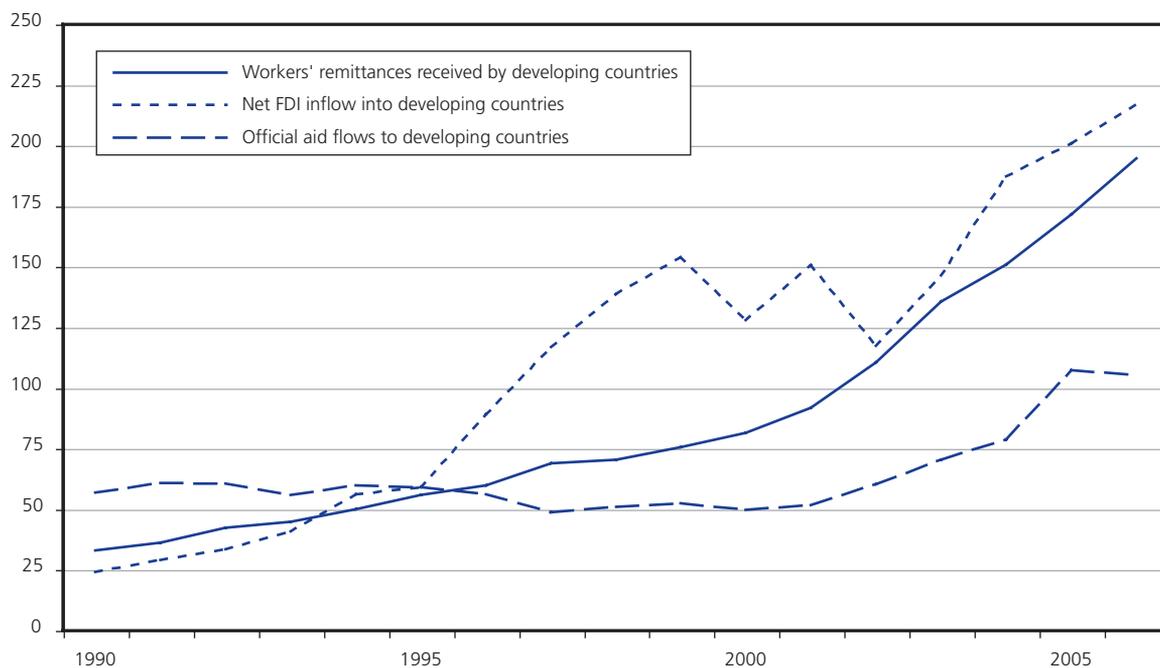
(Percentage)



Source: GATT, International Trade 1985 for the year 1983, and WTO, Statistical Data Base for the years 1993-2006.

Appendix Chart 3
Selected financial flows to developing countries, 1990-2006

(Billion dollars)



Source: World Bank, World Development Indicators, UNCTAD, World Investment Report 2007, OECD, Development Assistance Committee online database and WTO estimates.

C THE CAUSES OF TRADE

From an economic perspective, the case for freer trade rests on the existence of gains from trade and most economists typically agree that there are gains from trade. In recent years, however, free trade has increasingly come under fire and it is not uncommon to hear trade sceptics say that economists' arguments in favour of free trade and in particular comparative advantage may have been valid at the time of Ricardo (in the early 19th century) but that they are no longer valid in today's globalized world. This section critically assesses the relevance of economic theories of international trade in today's global trading environment. Most trade models are designed to answer two closely related questions: what goods do countries trade and why. While the main focus of this section is on the causes of trade, the discussion often touches upon the question of the patterns of trade.

This assessment of the relevance of trade theories is based on an overview of the theoretical models as well as of the empirical literature. This section begins by examining how robust the theories are and how far they can be generalized. This is an important part of the discussion – in particular, when the traditional approach is considered. This is because the traditional case for gains from trade is largely theoretical. In fact, it could even be argued, as Leamer and Levinsohn (1995) do, that “though obviously important and theoretically robust, the existence of gains from exchange is fundamentally a premise of economics, not a testable implication of a particular model”. Bearing this in mind, this section also reviews empirical work that tests trade theories and that attempts to estimate the relative importance of different types of gains from trade.

The idea that there are gains from trade is the central proposition of normative trade theory.¹ The gains-from-trade theorem states that if a country can trade at any price ratio other than its domestic prices, it will be better off than in autarky – or self-sufficiency.² More generally, the basic gains from trade propositions are that:³ i) free trade is better than autarky; ii) restricted trade (i.e. trade restricted by trade barriers) is better than autarky; and, iii) for a small country (i.e. a country too small to influence world prices) free trade is better than restricted trade.

Samuelson (1939) showed that there are potential gains from trade for small countries provided world

prices diverge from autarky prices. Kemp (1962) showed that restricted trade is better than no trade. He also extended the argument to the large country case, proving that free trade is potentially superior to autarky, in the case when there are many commodities and factors and with variable factor supplies. As noted by Deardorff (2005a), most treatments of the gains from trade say that if trade could potentially benefit all members of a country's population (assuming their preferences and income were identical), it is regarded as benefiting the country because some form of income redistribution among the country's consumers is assumed to be feasible. Beyond the feasibility of income redistribution in the form of lump-sum transfers (which is necessary to avoid market distortions associated with taxes), these results are based on a number of other key assumptions, notably constant returns to scale,⁴ perfect competition,⁵ no other market distortions, such as externalities,⁶ and the flexibility in the prices of factors of production (principally capital and labour) that ensure full employment. While the main message of the gains-from-trade theory remains valid when some of those assumptions are relaxed (for example, feasibility of lump-sum transfers), attempts to relax others (such as constant returns to scale) introduce significant complexities (Corden, 1984).

These basic propositions about the gains from trade, however, are not the end of the story. First, as pointed out by Corden (1984), the divergence between autarky and free trade prices is only an approximate explanation of the gains from trade. A full explanation of those gains should link them to the causes of trade – that is, to the elements that give rise to divergence between autarky and free trade prices. Those elements are the ones that lie behind the sources of comparative advantage. They would include differences in technology or differences in endowments. Second, economic theory points at other forms of gains from trade that are not linked to differences between countries. In particular, countries trade to achieve economies of scale in production⁷ or to have access to a broader variety of goods. Also, if the opening-up of trade reduces or eliminates monopoly power or enhances productivity, there will be gains from trade additional to the usual ones. Finally, trade may have positive growth effects.

This section covers the traditional gains from trade and their underlying causes, the gains from trade highlighted in the more recent trade theories, and the dynamic gains from trade. Each subsection starts with a brief presentation of a theory focusing on these specific gains from trade. The robustness of the theories to changes in their main assumptions is examined. Finally, the empirical evidence concerning the proposed rationales for international trade is reviewed.

Before considering the simplified theoretical frameworks (models) which focus on any particular source of gains from trade, it is important to emphasize that patterns of international trade typically reflect the interaction of several different causes. International trade theories and specific applications of the theories (models) should not be seen as mutually exclusive. This is of particular importance when trying to assess their relevance. The validity of a particular theory should be assessed on the basis of its capacity to explain trade in its limited domain. North-South trade might be explained by models which link trade patterns to differences between countries, while a model of monopolistic competition may best characterize trade between similar countries.

1. THE TRADITIONAL APPROACH: GAINS FROM SPECIALIZATION

Until recently, most trade models explained the commodity pattern of trade in terms of the law of comparative advantage.⁸ Before turning to particular models, such as the Ricardian model or the Heckscher-Ohlin model, which focus on particular product and/or country characteristics that determine the relative autarky price, it may be worth restating what comparative advantage means, and what it does and does not imply.

Comparative advantage is one of the most basic ideas in economics. Deardorff (1998) usefully distinguishes between the definition of comparative advantage and two versions of the law of comparative advantage. Comparative advantage can be defined as the “low relative cost of a good compared to other countries in autarky”. The double comparison across both goods and countries is the critical element. It indicates that it is impossible by definition for a country to have a comparative disadvantage in every good. In practice, every country will have a comparative advantage in something. There are two

laws of comparative advantage: one “positive” which predicts what countries can be expected to do and one “normative” which suggests what they should do. The positive version predicts that if permitted to trade, a country will export goods in which it has a comparative advantage. The normative version suggests that if permitted to trade, a country will gain through specialization.

Focusing on the normative side, the main contribution of the law of comparative advantage is to point to the fact that there are many more circumstances under which international trade is beneficial than most people appreciate. This can be illustrated using the example of an engineer and a nanny. Assume that the engineer is a good mother, better than the nanny at taking care of her child. The engineer, however, earns US\$ 500 an hour in her professional capacity while the nanny charges US\$ 12 an hour. Excluding from the question what is best for the child and fun for the mother, it makes economic sense for the engineer to pay the nanny to watch her child. As mentioned, the idea of comparative advantage is incorporated in several theories which are now considered.

(a) Differences in technology

As already mentioned, differences between countries are one of the main reasons why they engage in trade. The Ricardian model and its extensions point to technological differences as the source of comparative advantage. In order to keep the model as simple and the focus as clear as possible, a number of assumptions are typically made. One of these, i.e. that labour is the only factor of production, is specific to the Ricardian model. Most of the others, such as perfect competition, no trade costs, constant returns to scale, fixed endowments and international immobility of factors are standard in traditional trade models. With labour the only factor of production, differences in technology are modelled as differences in the amount of output that can be obtained from one unit of labour.

Using an example with two countries and two goods, Ricardo showed that even when one of the two countries has an absolute advantage in both lines of production, i.e. it can produce more output with one unit of labour in both sectors, there is scope for mutually beneficial trade if both countries specialize according to their pattern of comparative advantage. A country has a comparative advantage

in the production of good X if it is relatively more productive in the production of this good. More precisely, a country has a comparative advantage in the production of steel, for example, if the opportunity cost of steel in terms of the other good is less than in the other country.⁹ See Box 1 for a more detailed presentation of the Ricardian model.

The main results from the simple Ricardian model have been summarized by Deardorff (2005b):

“[...] comparative advantage can be usefully defined in terms of a comparison of relative autarky prices, which also represent marginal

opportunity costs in autarky. A difference in relative autarky prices, and thus the presence of comparative advantage, implies the potential to increase world output by reallocating resources within the two countries. Combined with market structures of perfect competition, comparative advantage also implies that unless policies interfere with market incentives, countries stand to gain from trade in the sense that at least one country will gain and neither will lose. And this gain from trade is achievable only if countries each export the good in which they have comparative advantage.”

Box 1
A numerical presentation of the Ricardian model

Along the lines of Ricardo’s own presentation of his model in 1817, a simple numerical example with two countries (A and B), two goods (logs and iron bars) and one single input (labour) can be used to illustrate how countries can gain from trade through specialization according to comparative advantage based on differences in technology.

Technology in each of the two countries A and B is summarized by labour productivity in the production of logs and iron bars. Labour productivity is expressed in terms of unit labour requirements. Labour productivity in the log industry in Country A, for example, noted a_{AL} , is the number of hours of labour required to produce one unit of log. The table below illustrates unit labour requirements in countries A and B.

Unit labour requirements

	Logs	Iron bars
Country A	$a_{AL}=1$	$a_{AI}=3$
Country B	$a_{BL}=4$	$a_{BI}=4$

In this example, unit labour requirements for both industries are lower in Country A than in Country B, which means that labour productivity is higher in A in both industries. Thus, Country A has an absolute advantage in both industries. From looking at absolute advantage, it can be concluded that there is no scope for mutually beneficial trade between A

and B. How could producers in B compete with those in A if they are less efficient ? Ricardo suggested that what matters is not absolute but comparative advantage. In this example, the ratio of the labour required to produce one iron bar to that required to produce one log in Country A ($a_{AI}/a_{AL}=1/3$) is lower in Country A than in Country B ($a_{BI}/a_{BL}=1$). This amounts to saying that Country A has a comparative advantage in the logging industry. The flipside of this is that Country B has a comparative advantage in the production of iron, as the ratio of the labour required to produce one bar of iron to that required to produce one log in Country B ($a_{BI}/a_{BL}=1$) is lower than in Country A ($a_{AI}/a_{AL}=3$).

Comparative advantage can also be established using the notion of opportunity cost. A country is said to have a comparative advantage in the production of a particular good if the opportunity cost of producing that good in terms of the other good is lower in that country than it is in the other countries.¹⁰ The opportunity cost of one log is defined as the number of iron bars the economy would have to give up producing in order to produce an extra log. Producing an extra log would require $a_{AL}=1$ unit of labour, which could have been used to produce $1/a_{AI}=1/3$ of an iron bar. The opportunity cost of iron in terms of logs in Country A is thus $a_{AL}/a_{AI}=1/3$, compared with $a_{BL}/a_{BI}=1$ in Country B. With constant unit labour requirements, these opportunity costs are constant.

In the absence of trade, the relative prices of logs and iron bars in each country would be determined by the relative unit labour requirements. In Country A, the relative price of logs would be $P_{AL}/P_{AI} = a_{AL}/a_{AI} = 1/3$. In B it would be $P_{BL}/P_{BI} = a_{BL}/a_{BI} = 1$. Opening up for trade between A and B allows producers in A to sell logs at a higher price in B, while producers in B start selling iron bars in A. If $P_{AL}/P_{AI} > a_{AL}/a_{AI}$, wages in the logging industry will be higher than in the iron industry, that is $P_{AL}/a_{AL} > P_{AI}/a_{AI}$. Workers will wish to work in the higher-wage industry and thus the economy will specialize in the log industry. Eventually trade will equalize the relative prices in A and B. It can be shown that the normal result of trade is that the price of a traded good relative to that of another good ends up somewhere between its autarky prices. In this case, the new relative price of logs will be in the range between $1/3$ of an iron bar and 1 iron bar.

This pattern of specialization and trade produces gains from trade. Trade can be seen as an indirect method of production that is more efficient than the direct method. In direct production of iron in A, one hour of labour produces $1/3$ of an iron bar. If, for instance, the after trade relative price of a log in A is $1/2$ of an iron bar, the same hour of labour can be used to produce 1 log which can then be traded against $1/2$ of an iron bar. Similarly, in B, one hour of labour would produce $1/4$ of a

log in direct production, while the same hour could be used to produce $1/4$ of an iron bar which could then be traded against $1/2$ of one log. Both countries clearly gain from trade.

It is interesting to examine what this simple example tells us about relative wages. After specialization, which happens to be complete in this simple model, Country A produces only logs. Hourly wage in A must be 1 log, as one hour of labour produces one log in A. Similarly, hourly wage in B must be $1/4$ of an iron bar since it takes four hours of labour to produce one bar. Assuming that the price of logs is 10 dollars per unit while that of an iron bar is 20 dollars per unit, which corresponds to the terms of trade, then hourly wage in A is 10 dollars while hourly wage in B is 5 dollars ($1/4$ of 20 dollars). The relative wage of workers in A is $10/5 = 2$. Note that this result only depends on the level of productivities and the relative prices. It does not depend on the absolute price of a log or of a bar. The fact that the relative wage lies between the ratio of the two countries' productivities in logging (where A is twice as productive as B and the same ratio in the iron industry, where A is only about 1.3 times more productive) explains why trade is profitable for both countries. In logs, A can compensate its higher wage with its higher productivity while in iron, B can compensate its lower productivity with its lower wage rate.

The simplified two-goods, two-countries presentation of the Ricardian model often fails to convince non-economists who ignore how far it can be generalized and who question its validity in today's world. It is, therefore, worthwhile to examine the robustness of its main results to changes in some of the underlying assumptions. A distinction needs to be made between the robustness of the law of comparative advantage on the one hand, which is not an exclusivity of the Ricardian model, and the idea that comparative advantage is rooted in technological differences on the other hand.

One of the main differences between the Ricardian model and other trade models is the assumption that marginal costs do not change with the level of production. An important ramification of the constant costs assumption is that it implies complete specialization of the trading partners, which is not necessarily realistic. The problem is that with non-constant marginal costs, comparative costs are not uniquely defined. As the discussion of other trade models will show, however, with non-constant costs, countries' behaviour is not very different except that trading countries can continue to produce both goods.

Box 2

Ricardian models with more goods and more countries

This box examines how the Ricardian model functions when the two-goods and two-countries only assumption is relaxed.

With N goods and two countries, the Ricardian model can be generalized using the concept of chain of comparative advantage. Numbering the goods in order of Country A's relative labour requirements:

$$\frac{a_{A1}}{a_{B1}} < \frac{a_{A2}}{a_{B2}} < \dots < \frac{a_{AN}}{a_{BN}}$$

where a_{Ci} is Country C's unit labour requirement for good i , it can be shown that Country A will produce all of the goods for which:

$$\frac{a_{Ai}}{a_{Bi}} < \frac{w_B}{w_A}$$

while B will produce all the ones with a ratio of unit labour requirement larger than the ratio of wage rates.¹¹

The Ricardian model can also easily be generalized to more than two countries if the number of goods is kept at two. A ranking similar to the one in the multi-goods case can be constructed over the countries' relative labour requirements:

$$\frac{a_{11}}{a_{12}} < \frac{a_{21}}{a_{22}} < \dots < \frac{a_{M1}}{a_{M2}}$$

where a_{ij} is Country i 's unit labour requirement for good j , where $i=1..M$ and $j=1,2$. In this case, all exporters of good 1 will lie to the left of all exporters of good 2.

The Ricardian model, however, does not generalize as easily to more than two goods and more than two countries simultaneously. Deardorff (2005b) discusses a number of attempts to come up with strong generalizations in the multi-goods, multi-country case. His conclusion is that comparative advantage only predicts trade patterns in simple cases.

To move closer to reality, it is important to consider how the Ricardian model functions when the two-goods-only assumption is relaxed. As explained in Box 2, with multiple goods and multiple countries, the Ricardian model only predicts trade under strong simplifying assumptions. In models with more realistic assumptions, such as trade barriers, intermediate inputs, and large numbers of both countries and goods, it fails to do so.¹² This does not mean that the law of comparative advantage is useless under realistic assumptions. In the more realistic models, comparative advantage continues to predict and explain gains from trade. Even if, as discussed in the introduction, part of the gains from trade results simply from perfect competition, comparative advantage also plays a role. While the basic gains-from-trade theorem indicates that free trade improves a country's welfare if the prices it faces with trade diverge from autarky prices, comparative advantage provides the reason why prices with trade differ from those in autarky and thereby ensures positive gains from trade.

Comparative advantage may not allow strong generalizations under more realistic assumptions,

but it may allow weak generalizations. Indeed, instead of indicating whether any particular good will be exported or imported by any particular country, comparative advantage can provide average relationships such as, for instance, that the trade-weighted average of the country's autarky prices of goods it exports, relative to world prices, is less than the trade-weighted average of the relative prices of its imports (Deardorff, 2005b). Along the same lines, Deardorff (1980) formalizes such average relations in the form of correlations. For instance, he derives a negative correlation between autarky prices and quantities of net exports across all goods and countries.

Having derived the more general correlations, it is interesting to examine how robust they are. Deardorff (2005b) discusses a number of assumptions, distinguishing between those that are consistent with comparative advantage correlations, including gains from trade, and those that are not. Starting with the ones that are consistent, he notes that both the gains from trade and the average relationships continue to hold in the presence of restrictive trade policies as well as with transport

and other real trade costs. The correlations also hold for all types of goods (final, intermediate or both) and even for services. Differentiated products can be accommodated as long as markets are perfectly competitive. Also, the correlations remain valid for all sorts of preferences. The two main assumptions on the other hand that cause problems for the theory of comparative advantage, both as a source of gains from trade and as a predictor of patterns of trade, are domestic distortions caused by externalities or market power, for instance, and increasing returns. These assumptions do not reverse the story but rather complicate it.

(b) Differences in resource endowments

The Ricardian model assumes that labour is the only factor of production. Under this assumption, the only possible source of comparative advantage is differences between countries in labour productivity. Clearly, differences in labour productivity are not the only source of comparative advantage. Differences in resource endowments must play a role. Countries that are relatively better endowed with fertile land than others are likely to export agricultural products. The idea that international trade is driven by differences between countries' relative factor endowments is at the heart of the Heckscher-Ohlin model. This model, named after the two Swedish economists – Eli Heckscher and Bertil Ohlin – who developed it, is probably the most influential model of international trade. The Heckscher-Ohlin model provides an alternative explanation of trading patterns. Because it takes into account more than one factor, it also has implications for the internal distribution of income. The gains from trade in the Heckscher-Ohlin framework, however, are of the same nature as in the Ricardian model. They are gains from specialization that arise because of differences between countries. The Heckscher-Ohlin model only focuses on another source of comparative advantage.

The standard version of the Heckscher-Ohlin model assumes that there are two countries, two goods and two factors of production. It also assumes that technologies and tastes are identical across countries, that factor endowments differ and that factors are mobile between industries but not between countries. Under those assumptions, four core propositions can be derived:¹³

1. The Heckscher-Ohlin theorem states that a country has a production bias towards, and hence tends to export, the good which uses intensively the factor with which it is relatively well endowed.
2. The Stolper-Samuelson theorem states that an increase in the relative price of one of the two goods raises the real return of the factor used intensively in producing that good and lowers the real return of the other factor.
3. The Rybczynski theorem states that if goods prices are kept constant, an increase in the endowment of one factor causes a more than proportionate increase in the output of the commodity which uses that factor relatively intensively and an absolute decline in the output of the other commodity.
4. The factor-price equalization theorem states that, under certain conditions, free trade in final goods is sufficient to bring about complete international equalization of factor prices.

Using a simple example with two countries – A (assumed to be well endowed with labour) and B (assumed to be relatively rich in capital) – and two goods (automobiles, the production of which is assumed to require relatively more capital, and clothing, that requires more labour), the four propositions can be illustrated in the following way. The Heckscher-Ohlin theorem tells us that A exports clothing and imports automobiles. The Stolper-Samuelson theorem tells us that a tariff on clothing (more likely in B, which imports clothing) would raise real wages and reduce real return on capital. The Rybczynski theorem tells us that immigration would raise the output of clothing more than proportionately and reduce the output of cars. Finally, the factor-price equalization theorem tells us that even without allowing for international mobility of labour and capital, trade alone would, under certain conditions, equalize wages in A and B and rates of return on capital in A and B.

Again, the question arises whether the core propositions that have been derived in the standard basic model can be generalized. This question is important because together with the law of comparative advantage, the four core propositions can be seen as the central body of international trade theory. Among the extreme assumptions

which underpin the core results are that of low and even “dimensionality”. The sensitivity to higher dimensions of the basic propositions, because it is a key issue for the practical relevance of the dominant trade theory, has been an area of active research since the 1940s. The two-goods, two-factors model is special not only because of the assumption regarding the number of goods but also because this number of goods equals the number of factors.

Economists have analyzed all possible cases: those with an even number of goods and factors, those where the number of goods is larger than the number of factors, those where the number of factors is higher, and finally the general case with N goods and M factors. Several authors have surveyed this large volume of theoretical work.¹⁴ Their conclusions are relatively nuanced. In general, dimensionality matters in the sense that many of the results from the basic 2×2 model are lost with higher dimensions. Generalizations run into difficulties in all cases, even or uneven. Ethier (1984) nevertheless optimistically concludes that the basic messages of elementary theory still come through to a relatively large extent. Like the law of comparative advantage, the Heckscher-Ohlin theorem survives as a correlation or in an average sense, while the Stolper-Samuelson and Rybczynski theorems survive in undiluted strength but they only apply to some factors or goods but not necessarily to all.

As mentioned above, a number of other assumptions underpin the Heckscher-Ohlin theory. The ramifications of those regarding intersectoral and international factor mobility as well as of those regarding the nature of the products traded are discussed below. Models with economies of scale, imperfect competition and differentiated products are considered in sub-sections 2 and 3. Another important assumption of the model is that factor markets are perfect. Realizing that factor market imperfections can be significant in some countries, economists have examined the effect of three major types of distortions: wage differentials, generalized “sticky”¹⁵ wages and sector-specific sticky wages. These distortions introduce various types of “pathologies”.¹⁶ Brecher (1974), for instance, shows that the minimum wage country levels of employment and welfare may be less with free trade than with no trade. This would be the case if trade leads the minimum wage country to export the capital-intensive good under incomplete specialization. If, on the contrary, free trade leads

the home country to export the labour-intensive good, employment and welfare increase regardless of the degree of specialization.

(c) Empirical evidence

In the introduction to their 1995 review of empirical evidence on international trade theory, Leamer and Levinsohn (1995) note that “international microeconomics is primarily a theoretical enterprise that seems little affected by empirical results”. In their view, the reason for this is neither a lack of empirical work by economists, nor a lack of appropriate data. Rather, their review is premised on the idea that economists “have not done the job right”. Why is that? In his earlier survey of empirical tests of trade theories, Deardorff (1984) identifies the difficulty of constructing sound theoretical tests of trade theories as the major obstacle to their testing. This difficulty, in his view, arises from the nature of the theories themselves, which “are seldom stated in forms that are compatible with the real world complexities that empirical research cannot escape”. It is not clear what the Heckscher-Ohlin model in its standard form with two goods, two countries and two factors tells us about the real world where there are many of all three and it therefore has been difficult to agree on a valid test.

While progress has been relatively limited with regard to the testing of trade theories, there have been some improvements in empirical applications of these theories. The available evidence, though it does not prove much, sheds some light on the factors that contribute most to the understanding of international trade. This sub-section provides a brief overview of empirical work on the traditional models of international trade. It first considers evidence regarding gains from trade and comparative advantage and then summarizes the main results of empirical tests of the Ricardian and Heckscher-Ohlin models.

Very little is known about the empirical magnitudes of the gains from international trade and the mechanisms that generate these gains. In particular, very limited evidence is available on how much specialization according to comparative advantage can contribute to an economy’s overall income. This may come as a surprise given the flurry of estimates of gains from trade liberalization obtained through the use of Computable General Equilibrium (CGE) models. However, while CGE models can be a very

useful tool for policy analysis, they do not provide hard evidence on the gains from trade. This is because CGE models are typically “theory with numbers” in the sense that they rely on a number of behavioural and other assumptions and offer assessments of potential gains from trade.

A relatively recent study by Bernhofen and Brown (2005) provides the first piece of hard evidence on the magnitude of the static gains from trade resulting from comparative advantage. The specificity of Bernhofen and Brown’s study is that it embeds the analysis of the gains from trade within a theoretical framework that also identifies the underlying cause of international trade. They use Japan’s 19th century trade liberalization as a natural experiment to estimate the effects of trade on national income. They first provide supportive evidence that Japan’s trading pattern after its opening up was governed by the law of comparative advantage and then take the next step and estimate the gains from trade resulting from comparative advantage. They estimate that at most the gain in real income was 8 to 9 per cent of GDP.

Irwin (2001) uses another of the few historical examples where a country has moved from self-sufficiency – or autarky – to free trade or vice versa rapidly enough to allow the use of time series data to estimate the gains from trade. He calculates that the welfare cost to the United States of the nearly complete embargo imposed by the US Congress on international trade between December 1807 and March 1809 was some 5 per cent of GDP. This cost, however, does not represent the total gains from trade because trade was restricted in the pre-embargo situation.

Bernhofen and Brown’s work on Japan is remarkable because it provides the first and to our knowledge only direct test of the theory of comparative advantage. Direct testing of the theory of comparative advantage is notoriously difficult because it involves relating trade flows and specialization patterns to autarky prices which, by their nature, are almost always unobservable. Bernhofen and Brown (2004) test a weak formulation of the law of comparative advantage using the natural experiment of Japan’s opening up to trade in the 1860s.¹⁷ They carefully verify that Japan in the mid-19th century met the requirements needed to apply the theory. In particular, they show that before 1854 Japan was completely closed to trade while by the late 1860s it had fairly free trade and no export subsidies.

Their results provide a strong empirical case for the prediction of the theory.¹⁸

If direct tests of the law of comparative advantage are so difficult, what about testing the theories that explain comparative advantage? As explained above, the Ricardian model attributes comparative advantage entirely to differences in labour requirements of production. Unfortunately, testing the Ricardian model turns out to be as problematic as testing the law of comparative advantage. The main problem is that the Ricardian link between trade patterns and relative labour costs is much too sharp to be found in any real data set. Because of the complete specialization that the model implies, for instance, relative labour requirements ought to be unobservable. Deardorff (1984) discusses tests of a weaker link and concludes that they are deficient. Overall, while the Ricardian model can be seen as an important reminder that technological differences can be a source of comparative advantage, the one-factor model is too simple to study the impact of technologies on trade flows (Leamer and Levinsohn, 1995).¹⁹

The literature on testing and estimating Heckscher-Ohlin models is both voluminous and complex. While an exhaustive and systematic overview of this literature clearly falls beyond the scope of this Report, the following provides a quick summary of its main results.

Leontief (1953) is the earliest and probably the best known attempt to confront the Heckscher-Ohlin model with data. Given the United States’ relatively high capital-labour endowments ratio compared with other countries, in particular in the late 1940s, the Heckscher-Ohlin model would predict that the United States exported capital-intensive goods and imported labour-intensive goods. Surprisingly however, comparing the amount of factors of production used to produce US\$1 million worth of exports with the amount used to produce the same value of US imports, Leontief found that US exports were less capital intensive than US imports. This result, which contradicted the Heckscher-Ohlin theorem, came to be known as the Leontief paradox. A wide range of explanations were offered for this paradox, of which several concerned the fact that Leontief focused only on two factors of production, ignoring land and human capital.²⁰ In the following years, a number of studies redid the analysis, taking into account those factors.

The paradox persisted in the data from the earlier decades but seems to have disappeared since the early 1970s (Deardorff, 1984). Leamer (1980) provided the definitive critique of the Leontief paradox. He showed that Leontief had performed the wrong test. Even if the Heckscher-Ohlin model is true, the capital/labour ratios in exports and imports need bear no particular relationship to relative factor endowments if trade is unbalanced.

Leontief (1953) may be interpreted as an application of the so-called “factor content” version of the Heckscher-Ohlin theorem. Empirical application of the theorem has been of two forms, corresponding roughly to two versions of the theorem. The “commodity version” says that countries tend to export those goods which use relatively intensively their relatively abundant factors of production. The “factor content” version developed by Vanek (1968) (also termed the Heckscher-Ohlin-Vanek theorem), says that countries will tend to export the services of their abundant factors, embodied as factor content in the goods they trade. The test performed by Leontief was a partial test of the “factor content” version (Feenstra, 2004).

The first complete test of the “factor content” version of the Heckscher-Ohlin theorem was by Bowen et al. (1987). For a sample of 27 countries and 12 factors of production, they showed that the test failed. Their negative result was confirmed by other authors. Researchers then began to examine which parts of the theory were causing the problems.²¹ Building on this work, Davis and Weinstein (2001) show that with a few simple modifications, the Heckscher-Ohlin-Vanek model is consistent with data from ten OECD countries and a rest-of-the-world aggregate. These modifications include, in particular, the introduction of cross-country differences in technology, a breakdown of factor price equalization, the existence of non-traded goods, and costs of trade.

A number of issues have been left unresolved by Davis and Weinstein (2001). First, researchers are currently looking into extending the range of countries used for the tests (Feenstra, 2004). Second, trade in intermediate products needs to be adequately distinguished from trade in final goods. Third, technological differences have been shown to be a major determinant of trade patterns and their underlying causes should be identified. Fourth, researchers are investigating the role of the

integrated equilibrium assumption and factor price equalization (Davis and Weinstein, 2000).²²

In summary, most of the empirical work that attempted to test or estimate Heckscher-Ohlin models used inappropriate methods and is therefore largely irrelevant. Complete tests failed under the conventional assumptions of identical tastes and identical technologies with factor price equalization across countries. In recent years, however, studies using appropriate methods have shown that if technological differences and home bias are included in the model and if the assumption of an integrated world is relaxed, there appears to be a substantial effect of relative factor abundance on the commodity composition of trade. As pointed out by Feenstra (2004), recent work has been more about accounting for global trade flows than about testing hypotheses related to trade but it certainly has the merit to highlight the fact that there are multiple causes for trade. As the next sub-sections will show, economies of scale, product differentiation, or imperfect competition all play important roles.

(d) Intermediate inputs, services, tasks and fragmentation

As discussed in more detail later in this section, the most important development in world trade in the last few years has been the acceleration of the fragmentation of production of both goods and services and the associated development of foreign outsourcing and offshoring. Because the fragmentation of production involves trade in intermediate products and services, their role in international trade is viewed as increasingly important. This sub-section considers whether the principal results of the traditional theory of trade still hold in the presence of fragmentation, outsourcing and offshoring involving intermediate inputs and services.

i) Intermediate inputs

Deardorff (2005c) examines the role of comparative advantage in a Ricardian trade model with intermediate inputs. He finds that only an average relationship between comparative advantage and trade seems to be at all robust. The gains from trade, however, are unambiguous in these Ricardian models, with imported inputs actually providing an additional source of gain from trade. Deardorff (1979) shows that similar results hold in the

Heckscher-Ohlin case. With intermediate inputs, a trade barrier on an input that raises its price can make production of the corresponding final good too costly to survive, even though the country might otherwise be a relatively low-cost producer of the final good. Kemp (1964) shows that the Stolper-Samuelson and the Rybczynski theorems still hold in the presence of traded intermediate products. In a model where each final good can be used as intermediate input in the production of the other final good, Schweinberger (1975) shows the conditions under which the Heckscher-Ohlin theorem holds.

ii) Services

Hindley and Smith (1984) consider the question of the applicability of the normative theory of comparative cost to the services sector. They discuss two potential difficulties in applying this theory to trade in services: the pervasiveness of regulations and licensing in services industries and the fact that services can be traded in different modes. They argue that none of these potential difficulties appears to yield any prior reason to suppose that the theory does not apply. In their words, “services are different from goods in ways that are significant and that deserve careful attention, but the powerful logic of the theory of comparative advantage transcends these differences”. In other words, there is no reason to have any doubt on the potential for countries to gain from free trade in services.

Deardorff (1985) focuses on the positive issue of whether trade in services conforms to a pattern that is explainable by comparative advantage. He looks at three different characteristics of trade in services and considers in each case what they suggest for the validity of the principle of comparative advantage. The first of these characteristics is that traded services often arise as a by-product of trade in goods. The second is that trade in services frequently requires or is accompanied by international direct investment. The third is that while goods can be produced elsewhere from where they are consumed, services cannot. He argues that while the first two of those characteristics do not undermine the usefulness of the law of comparative advantage in explaining trade, the third raises a number of issues.²³ In the third case, he uses a model that is like the standard Heckscher-Ohlin model except that one of the two goods is a service that must be produced where it is consumed and one of the factors

is “management” which can contribute to services production “in absentia”. In this case, no version of the principle of comparative advantage is generally valid. Depending on the specific assumptions, weak versions of the law may apply.

Melvin (1989) includes capital services as a tradable in a Heckscher-Ohlin framework and shows that, contrary to the view of Hindley and Smith (1984), the introduction of services does require a different approach, which necessitates the reinterpretation of the law of comparative advantage.²⁴ If the tradable commodity uses the mobile factor service intensively, the country well endowed with capital will import the capital-intensive good, even though the relative price of this good was lower in this than in the other country in autarky. This result, at first glance, seems to contradict the law of comparative advantage and the Heckscher-Ohlin theorem. However it conforms with comparative advantage, as interpreted by Deardorff (1980), in the sense that it predicts that the country well endowed with capital exports capital services and imports the labour-intensive commodity. The Heckscher-Ohlin theorem also holds, for while the country which is well endowed with capital imports the capital-intensive commodity Y, it exports capital services, which are more capital-intensive than any good. One important implication of this model is that a service-exporting country will be observed to have a merchandise trade deficit. Such deficits, the author argues, would just reflect the country’s comparative advantage in the service sector.²⁵

Deardorff (2001) argues that for many services, the benefits from liberalization extend beyond the traditional gains from trade liberalization. Many services play a critical role of facilitating international trade in goods and other services. Trade liberalization for those services can yield benefits by facilitating trade in goods that are larger than might be expected from analysis of the services trade alone. Deardorff’s paper explores this idea using simple theoretical models to specify the relationships between services trade and goods trade. Services industries, such as transportation, insurance and finance, provide inputs needed to complete and facilitate international transactions in goods. Measures that restrict trade in those services create costs that limit the international flow of trade in goods. By reducing these costs, liberalization can stimulate international trade of goods.

Supportive evidence is provided by Blyde and Sinyavskaya (2007). They match goods data from the United Nations Commodity Trade Statistics Database (COMTRADE) with International Monetary Fund (IMF) Balance of Payments services data to investigate empirically the relationship between trade in services and trade in goods. They find that trade in services is important to facilitate trade in goods in all the 2-digit SITC goods categories. Investigating which types of trade in services are more important for international trade in goods, they find that trade in transportation and communication services generate the largest impact on trade in goods. Insurance, business and travel services are found to generate positive impact on the international trade of only certain types of goods. Lennon (2006) finds some evidence of complementarity between trade in goods and trade in services. Bilateral trade in goods explains bilateral trade in services: the resulting estimated elasticity is close to unity.²⁶ Likewise, bilateral trade in services has a positive effect on bilateral trade in goods: a 10 per cent increase in trade in services raises traded goods by 4.58 per cent.

iii) Trade in tasks and fragmentation

Revolutionary advances in transportation and (especially) communications technology have enabled an historic break-up of the production process by making it increasingly viable and profitable for firms to undertake different production stages in disparate locations.²⁷ This has resulted in offshoring of both services and manufacturing sector jobs and rapidly growing trade in intermediate products or tasks (see Box 3). This phenomenon has variously been called fragmentation, unbundling, offshoring,

vertical specialization, slicing-up of the value-added chain or trade in tasks. It will be considered in more detail in Section D. This sub-section only discusses how fragmentation has been integrated in traditional trade models and how it affects the main results of those models.

Two main approaches to the modelling of fragmentation can be distinguished. The first approach is to model fragmentation as trade in intermediates based on comparative advantage. The main insight is that offshoring is similar to technical progress in the production of final goods. Consider a world with two nations, Home (H) and Foreign (F), one final good (X) and one single production factor (labour). The production of X involves two tasks, 1 and 2, which are produced with labour.²⁸ Assume H has a comparative advantage in task 1 and F has a comparative advantage in task 2. With free trade in tasks, H specializes in the production of task 1, F specializes in the production of task 2. Specialization allows more of the final good to be produced (and consumed) in both countries (standard static gains from production and consumption efficiency). Since more of the final good can be produced with the same amount of primary factors, fragmentation is akin to technological progress in the final good. In other words, offshoring increases labour productivity, expressed as output of the final good per hour worked, in both nations.

Deardorff (2005a) examines in more detail the effect of fragmentation on traditional gains from trade in this first approach. He models fragmentation as the possibility to split a productive activity into parts that can be performed in different locations, much like a new technological possibility that becomes available

Box 3

Tasks, services and intermediate goods

It is important to point out that trade in tasks is potentially encompassing both trade in services and/or trade in intermediate goods.

Tasks can be classified as follows:

1. analytical tasks;
2. interactive tasks;
3. routine cognitive tasks;
4. routine manual tasks;
5. non-routine manual tasks.

If there is trade in tasks 1-3, this will be classified as trade in services. If there is trade in tasks 4-5, this will be classified as trade in goods, because it implies the sourcing of physical inputs (intermediates) produced abroad. Hence, trade in tasks can involve both trade in services and trade in goods.

Source: Spitz-Oener (2006).

to a country or to the world. Fragmentation, as he understands it, involves offshoring and thus trade of services. His conclusions about the gains from fragmentation are similar to the conclusions of trade theory about the gains from trade. Cases can be identified where fragmentation lowers the welfare of particular countries. If, for instance, fragmentation causes a change in relative world prices, it is possible that one country's terms of trade worsen to such an extent that it is made worse off, despite the new technological ability that fragmentation represents. Similarly, if fragmentation interacts negatively with existing distortions, such as tariffs, it can lower the welfare of particular countries and even of the world as a whole. However, on average, fragmentation is likely to expand world welfare because it will systematically expand what the world is able to do potentially with its given resources.

The second approach to fragmentation has been introduced recently by Grossman and Rossi-Hansberg (2006b). They present a theory of offshoring, or trade in tasks, which they refer to as a "new paradigm". Because their main contribution relates to the effect of fragmentation/offshoring on wages and distribution, it will be discussed in more detail in Section E of this Report.²⁹ The discussion here focuses on the linkages between the "new paradigm" and traditional trade theory. The main result is that in addition to comparative advantage gains from trade, fragmentation has a welfare-enhancing productivity effect on wages in the offshoring country, according to Grossman and Rossi-Hansberg.³⁰ A main difference between their approach and the first approach of fragmentation is that they factor in that a firm with better technology can use this technology abroad. There are also task-specific offshoring costs that are best understood as the communication and organizational costs that a firm pays when it sources the performance of a task abroad. The advantage of offshoring a task is that the firm combines its superior technology with cheap foreign labour when the task is performed abroad.³¹

To understand the thinking behind the model, consider two countries, North and South. Firms in North have superior technology. Wages are higher in North than in South because they are tied to technologies. North firms are interested in combining their superior technology with cheap labour in South. They will offshore a task if the initial wage gap is larger than the offshoring costs. The wage in South is assumed to remain

constant. The reason for this is that South firms are assumed to continue producing the final good using South technology which keeps the wage at the low level. The wage in North will increase because productivity increases. Productivity increases because offshoring releases domestic workers who can focus on the tasks where they have a trade-cost-adjusted comparative advantage. This productivity effect is independent of comparative advantage based on tasks. For the offshoring country, it comes in addition to the Ricardian gains from trade that existed in the first approach.

(e) Factor mobility

So far, models have been considered where the factor(s) of production are assumed to be mobile between industries but not between countries. In this sub-section, these assumptions are relaxed and consideration is given to how the gains from trade and comparative advantage results are affected. The assumption that there is no movement of factors of production between countries is maintained but the assumption of perfect factor movement between industries is further qualified. This sub-section ends by considering how traditional trade models take account of international mobility.

i) Internal mobility

The specific factors model assumes that an economy produces two goods using three factors of production in a perfectly competitive market. Two of the three factors of production, typically land and capital, are assumed to be sector-specific, which means that they can be used only in the production of a particular good, while the third, typically labour, is common to both sectors. Since mobility of factors in response to any economic change is likely to rise over time, the specific factors model can be interpreted as capturing medium-term effects and the models with perfect movement between industries as representing the long-term effects.

A number of interesting results – in particular, regarding the distributional effects of trade – can be derived from the specific factors model, which was used extensively prior to the ascendancy of the Heckscher-Ohlin model. Because there is only one factor that is used in both sectors, the allocational problem in the specific factors model is relatively simple. The wage rate and the equilibrium allocation of labour can be found by setting the

sum of labour demand in each sector equal to the available supply of labour. The wage rate can then be used to determine the rental rate of the two specific factors.

While the gains from trade result remains valid in the specific factors model, there are some issues with the law of comparative advantage and the effect of changes in prices or endowments that are different here from what they are in the Heckscher-Ohlin model.

First, trade produces overall gains in the limited sense that those who gain could in principle compensate those who lose while still remaining better-off than before.³² Second, as already mentioned, in a two-sector, multi-factor world, comparative advantage will not be an infallible predictor of a country's trade pattern. As demonstrated by Falvey (1981), however, while the statement that “a country will export those commodities in which it has a comparative advantage” is no longer a theorem, it appears to be a useful presumption, even in a multi-factor world. Third, the implications of the specific factors model are quite different from those of the Heckscher-Ohlin model. In the specific factors model, an increase in the price of a good raises the real return to the specific factor in that sector, lowers that to the other specific factor, and has an ambiguous effect on the real return to the mobile factor.³³ An increase in the endowment of a factor specific to a sector leads to a less than proportionate increase in the output of that sector and a decline in the output of the other sector. The return of the mobile factor rises, while those to sector-specific factors decline. An increase in the endowment of the mobile factor lowers the return to that factor and increases those to specific factors. Outputs of both sectors rise.

The specific factors model has been much neglected empirically (Leamer and Levinsohn, 1995). Grossman and Levinsohn (1989) provide some evidence suggesting that capital is sector-specific while Kohli (1993) finds that a sector-specific structure is broadly consistent with data for the US economy.

ii) International factor mobility

From an economic point of view, trade in factors is much like trade in goods. It is driven by international differences in resources and is beneficial in the sense

that it increases world production. The focus here, however, is not on explaining factor movements but rather on the interactions between trade in goods and factor mobility. A major and strong assumption in the models discussed so far is that factors of production cannot move between countries. In this sub-section, this assumption is relaxed and consideration is given to how this affects the law of comparative advantage and the validity of some of the main trade theorems. Trade literature has focused on capital movements, probably because labour is considered less mobile at least in the short term. However, some of the results would in principle apply to any factor.

The idea that trade is a substitute for factor movements dates back to the early 20th century and has been expressed by a number of eminent economists. This idea is based on the factor endowment theory of international trade elaborated by Heckscher and Ohlin. According to this theory, trade in goods is caused by differences in factor endowments between countries. Thus, on the one hand, movements of factors between countries that tend to equalize resources reduce incentives to trade. On the other hand, as already mentioned, exports of goods can be viewed as indirect exports of factor services. Trade in goods tends to equalize factor prices and thus to reduce incentives for factors to move.

Mundell (1957) laid out the argument that trade and factor movement can substitute for each other in a model where both trading countries share the same technology. When factor-price equalization holds, free trade implies commodity price equalization and a tendency towards factor price equalization even when factors are immobile while perfect factor mobility implies factor price equalization and a tendency towards commodity price equalization even when trade in goods is not allowed. When factor prices are not equalized, goods trade and factor movement are nevertheless substitutes but in a weaker sense (Wong, 1995).

Wong (1995) shows how the law of comparative advantage can be generalized to cover the movements of goods and capital. The general law of comparative advantage, however, is so general that it cannot be used to predict the direction of movement of a particular good or capital even if all the autarkic prices are known. Wong thus discusses the conditions under which patterns of trade and direction of international capital movements are

predictable. He shows that perfect capital mobility between countries preserves most of the core trade theorems in a Heckscher-Ohlin setting with two goods, two immobile factors and internationally mobile capital. He also shows that without the assumption of identical technologies, the analysis can become quite complicated. Comparative advantage and absolute advantage, defined in terms of price ratios in the countries, are no longer a fixed concept. In the presence of capital movement, they depend on the direction and level of capital movement. Reversal of comparative advantage and the transformation of absolute into comparative advantages are possible.

Norman and Venables (1995) investigate both the direction of trade and the question of which goods or factors are traded. They let goods be tradeable and factors of production be internationally mobile. Since goods trade alone does not equalize factor prices, there is an incentive for international factor mobility. From this general model, they are able to derive conditions on factor endowments and trade costs with the result that the equilibrium has no trade; has trade in goods only; has factor movements only; or has both trade in goods and factor movements.

The substitutability relationship between trade and factor movements is closely associated with the Heckscher-Ohlin endowments driven trade theory. Markusen (1983) demonstrates that factor movements and trade in goods can be complements in models where trade is driven by differences in technologies or by other factors.³⁴ To do this, he uses a simple model with two goods and two factors and assumes that both countries have the same factor endowments but that one of the countries is more efficient in the production of one of the goods. In this setting, the more efficient country exports the good that he produces more efficiently. In the initial trading equilibrium, factor prices are not equalized and if factors are allowed to move, there will be an inflow of the factor used intensively in the production of the export good. This will add a factor proportions basis for trade that will complement the differences in technology basis. Factor mobility will thus lead to an increase in the volume of trade.

Another interesting effect of international factor mobility is that it makes it important to distinguish between domestic and national welfare. Bhagwati and Brecher (1980) shows that in the traditional

Heckscher-Ohlin model of trade theory, a shift from autarky to free trade may reduce national welfare while it increases domestic welfare. Assume for instance that the importable good is labour intensive, labour is wholly national but capital is all foreign. A change from autarky to free trade will lead to exports of the capital-intensive good, which will reduce the real income of labour and increase the real income of capital. Free trade in this case would reduce national welfare.

2. “NEW” TRADE THEORY: GAINS FROM ECONOMIES OF SCALE, PRODUCT VARIETY AND INCREASED COMPETITION

This sub-section discusses the “new” trade theory, motivated to a large extent by the observed importance of intra-industry trade and of trade between similar countries (in terms of technology or resources) that traditional models had difficulties in explaining. Even in the absence of differences, countries gain from trade, since consumers have a wider choice of products at lower prices and firms can exploit economies of scale when having access to a larger market. Of course, the rationalization of production also implies that some firms go out of business. The size and relative importance of these effects have been subject to empirical investigation of pre- and post-liberalization episodes in a range of countries.

(a) Intra-industry trade and the volume of trade between similar countries

Perhaps one of the earliest and best-known studies on the importance of intra-industry trade has been by Balassa (1966) on the formation of the European Economic Community (EEC). He made a number of observations that have triggered the search for an alternative explanation of international trade beyond country differences and comparative advantage. He showed that the trade share of the dominant suppliers in an industry during the implementation of the EEC decreased in practically all industries in the 1958-63 period. This contrasts with the predictions of traditional trade theory, according to which inter-industry specialization in line with comparative advantage would be expected, with the largest supplier within each industry taking the lion’s share in the expansion of trade.

Rather than a concentration in traditional export sectors and increasing imports in sectors where countries were at a comparative disadvantage, Balassa observes that EEC countries reduced their reliance on industries in which they had been leading exporters before the establishment of the common market and began to exhibit an increasing uniformity in export patterns. As a consequence, in the absence of declining industries, the need for structural adjustment was limited with little evidence of resulting unemployment and the number of bankruptcies even falling following European economic integration.

Grubel (1967) confirms these results in the case of the EEC, showing that exports and imports within sectors exhibit a tendency towards equalization rather than national specialization. He also notes that the increase in trade between EEC members was mainly due to trade in manufactured goods rather than trade in raw materials. In response to criticisms that the importance of intra-industry trade was a function of the definition of industrial sectors, Grubel and Lloyd (1975) have shown that

significant intra-industry trade is also present at finer levels of statistical aggregation.

These observations are still valid today. For many countries, a large part of international trade takes place within the same sector, even at high levels of statistical disaggregation. Table 3 below shows the Grubel-Lloyd index,³⁵ which is a measure of the importance of intra-industry trade within a given industry, for various German and US sectors. A value of 0.97 for railway/tramway equipment, for example, means that German exports and imports of such products are almost identical. Such a result does not square with traditional trade theory, which predicts that a country is either an exporter or an importer in an industry, not both. If such was the case, the index should be low, zero at the extreme, as in the US footwear industry (0.11), where the United States has substantial imports, but hardly any exports. Looking at the top ten and bottom ten industries for each of these countries, it appears that the former comprise technologically more advanced products, while the latter industries involve comparatively “low-tech” activities.

Table 3
Grubel-Lloyd indices of intra-industry trade, 2006

United States		Germany	
Product (SITC-2)	Grubel Lloyd Index	Product (SITC-2)	Grubel Lloyd Index
Top 10 products			
Metalworking machinery	0.9980	Crude fertilizer/mineral	0.985
Dairy products & eggs	0.9941	Leather manufactures	0.975
Leather manufactures	0.9915	Railway/tramway equipment	0.970
Power generating equipment	0.9876	Sugar/sugar prep/honey	0.966
Electrical equipment	0.9740	Non-ferrous metals	0.953
Perfume/cosmetic/...	0.9479	Meat & preparations	0.947
Crude fertilizer/mineral	0.9405	Furniture/furnishings	0.946
Animal/veg oils processed	0.9393	Coffee/tea/cocoa/spices	0.946
Industry special machine	0.9186	Animal feed	0.937
Plastics non-primary form	0.9009	Organic chemicals	0.935
Bottom 10 products			
Cork/wood manufactures	0.2876	Dyeing/tanning/...	0.55
Furniture/furnishings	0.2830	Metalworking machinery	0.54
Gas natural/manufactured	0.2727	Fixed veg oils/fats	0.47
Petroleum and products	0.1798	Industry special machine	0.45
Travel goods/handbag/etc	0.1612	Vegetables and fruit	0.45
Hide/skin/fur, raw	0.1590	Pulp and waste paper	0.44
Oil seeds/oil fruits	0.1384	Petroleum and products	0.40
Apparel/clothing/access	0.1135	Gas natural/manufactured	0.24
Footwear	0.1110	Oil seeds/oil fruits	0.18
Manufactured fertilizers	0.0789	Coal/coke/briquettes	0.13

Note: Results are similar at the SITC-3 level.

Source: Calculation by authors based on UN Comtrade Database (2007).

Fontagné and Freudenberg (1997) revert to the issue of sectoral aggregation, recalling that the more products are considered as forming part of one industry, the more trade will be of the intra-industry type. In addition, they observe that the Grubel-Lloyd index, even for more disaggregated categories, lumps together trade in intermediate goods (e.g. engines) and final goods (e.g. cars) and would qualify such exchanges as “intra-industry”. The authors, therefore propose to use the most disaggregated trade classification that is available and to distinguish “vertical” two-way trade owing to the international fragmentation of the production chain from “horizontal” intra-industry trade. For the latter to actually capture trade in similar products only, they propose that the export and import unit values should differ by less than 15 per cent and that the lower trade flow (e.g. imports) amounts to at least 10 per cent of the higher trade flow (exports).

If these criteria are applied to a country’s bilateral trade relationships, trade is broken down into: (i) two-way trade in similar products (significant overlap and low unit value differences), i.e. “horizontal” intra-industry trade; (ii) two-way trade in vertically differentiated products (significant overlap and high unit value differences), i.e. “vertical” intra-industry trade; and (iii) one-way trade (no or no significant overlap). Using this methodology, it is evident that intra-industry trade remains important, but bilateral intra-industry intensities vary quite substantially in terms of the trading partners concerned.

Table 4 shows that over half of Germany’s trade with a number of European countries is of the “narrowly” defined intra-industry type. With other countries,

such as Malaysia and a number of other emerging economies but also some industrialized countries, a large part of trade is of the vertical kind, whereas one-way trade still dominates trade relations with a range of developing countries. These patterns indicate that countries share more intra-industry trade with each other the more similar they are in terms of economic size. For example, Chart 4 shows for Germany the positive relationship between intra-industry trade (here defined as “overlap” trade, i.e. both horizontal and vertical two-way trade) and a country similarity index developed by Helpman (1987).³⁶

The chart features high shares of intra-industry trade for many other industrialized countries of similar economic size, but also for emerging economies that are rapidly catching up in terms of GDP. While Germany has an almost balanced trade, for instance, in road vehicles with rapidly developing countries, such as Korea, some of the lowest intra-industry indices are found in relation to other developing countries, where Germany acts as either an importer (e.g. of oil from Azerbaijan or of apparel and clothing from Bangladesh) or as an exporter (e.g. of cars to Sudan) (not shown in the chart). These observations appear to suggest that the theories of comparative advantage remain valid for certain sectors and trading partners, where country differences in technology and resources continue to play a role. However, it is astonishing in view of the importance of intra-industry trade in other sectors and countries (as demonstrated for Germany, which features a 52 per cent share of horizontal intra-industry trade with France as one of its most important trading partners) that such large trade flows remained unexplained until the late 1970s. It was only at that point

Table 4
Fontagné-Freudenberg indices of intra- and inter-industry trade of Germany, top ten trading partners per type of trade

Partner	Horizontal	Partner	Vertical	Partner	One way
United Kingdom	0.56	Malaysia	0.49	Bangladesh	1.00
Switzerland	0.53	Italy	0.41	Zimbabwe	0.99
France	0.52	Spain	0.39	Madagascar	0.98
Austria	0.51	Belgium	0.38	Algeria	0.98
Netherlands	0.49	Portugal	0.37	Nigeria	0.97
Denmark	0.49	Netherlands	0.37	Macao, China	0.97
Czech Republic	0.47	France	0.36	Panama	0.97
US	0.47	Slovenia	0.35	FYROM	0.97
Belgium	0.45	Sri Lanka	0.34	Iran	0.96
Singapore	0.44	Hong Kong, China	0.34	Ghana	0.96

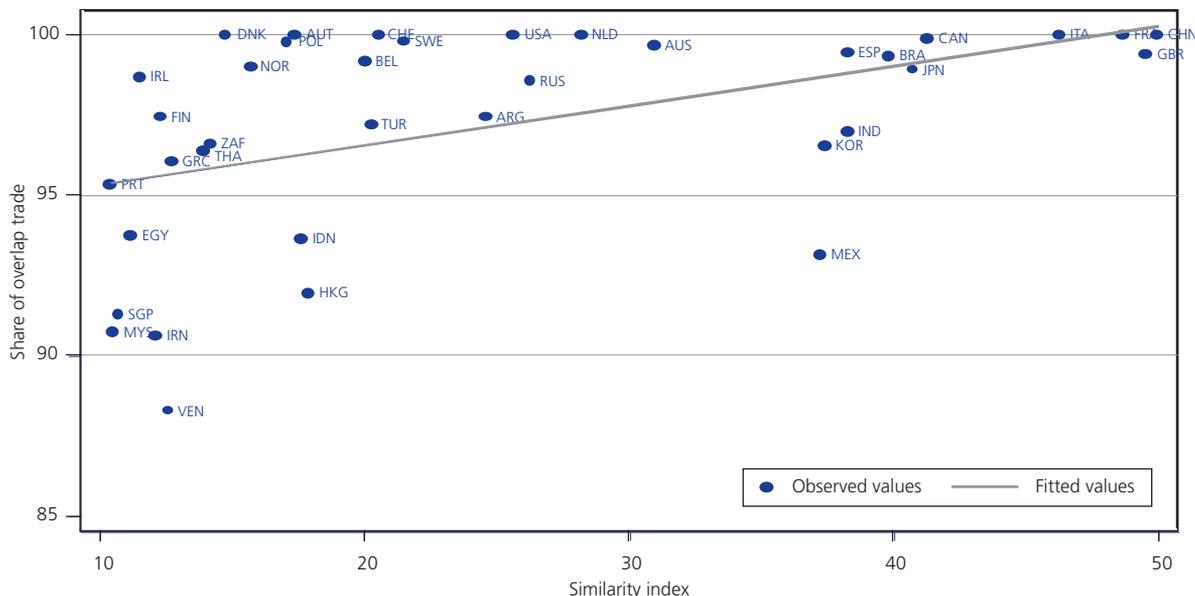
Notes: Data for Switzerland includes Liechtenstein, Belgium includes Luxembourg. “Horizontal” denotes the share of horizontal two-way trade, “vertical” the share of vertical two-way trade and “one-way” the share of one-way trade.

Source: Calculation by authors based on CEPII BACI database (2007).

Chart 4

Intra-industry trade and similarity in economic size, selected trading partners, Germany, 2004

(Percent)



Notes: Share of overlap trade is defined as the sum of exports plus imports in sectors characterized by two-way trade divided by the sum of total exports and imports (in per cent). GDP refers to real GDP.

Source: Calculation by authors based on UN Comtrade Database (2007) and World Bank (2007) World Development Indicators.

that, a complementary theoretical approach was developed that could explain trade in similar goods (e.g. in terms of skill-intensity) between similar countries (e.g. at similar levels of development and technological achievement).

(b) Imperfect competition and trade

This sub-section introduces Krugman’s monopolistic competition model as the best-known way of explaining the gains from intra-industry trade and from trade between similar countries. It also mentions the reciprocal dumping model, which highlights that, under certain conditions, even trade in identical products may be beneficial.

i) Monopolistic competition

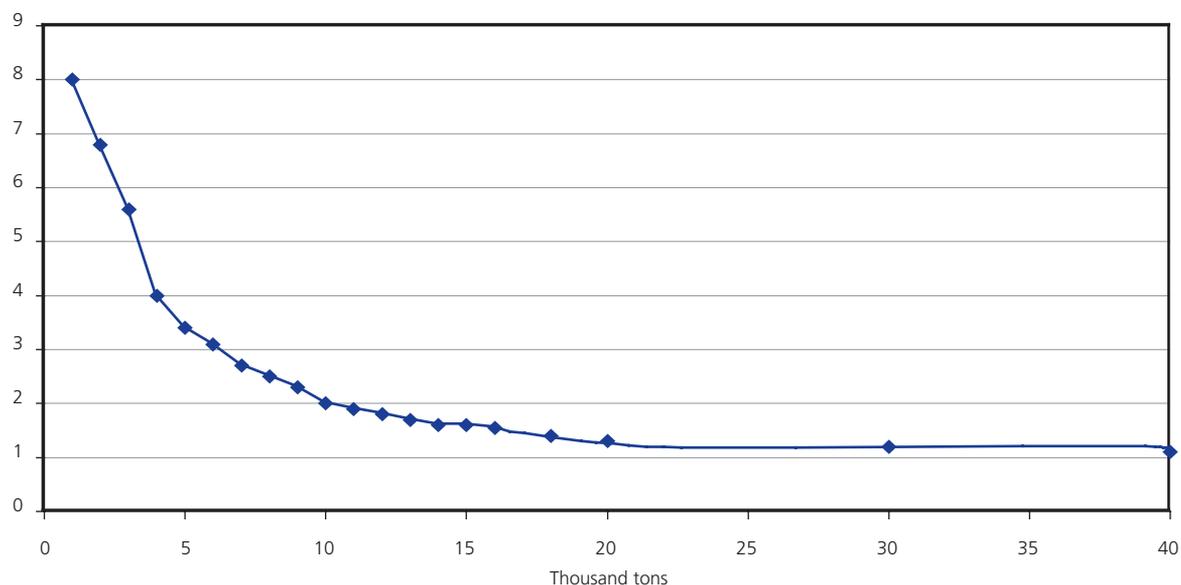
Since traditional trade models seemed unable to explain the above phenomena, a “new” trade theory was needed. Krugman’s monopolistic competition model (Krugman, 1979) is perhaps the best known approach, providing a simple but convincing theory of why similar (in terms of technology, endowments) countries gain from trading with each other and why a significant part of that trade may take place within the same industries. Two basic assumptions, both of which can readily be observed in the real world, are fundamental to Krugman’s model: “increasing returns to scale” and “consumers’ love of variety”.

In the presence of increasing returns to scale (also called “economies of scale”), firms that double their inputs more than double their output.³⁷ Such situations are quite common. In order to start a business (or maintain operations), firms typically face so-called “fixed” costs, i.e. they have to pay for certain goods or services independently of how much they ultimately produce. Such costs may relate to the time of employees spent on administrative issues or to investment in machinery and equipment. In addition, a firm incurs variable costs that increase proportionally to the level of output – for instance, a worker can only produce a given number of units per hour and any increase in production requires the hiring of additional workers at the going wage rate. Marginal costs, i.e. the costs of producing an additional unit of output, are therefore constant, but when the overall level of output rises, the fixed costs get distributed over a larger number of units, and, hence, the firm’s average costs of production decline.

Chart 5 is based on data from a study on slaughterhouses in Norway (van den Broek et al., 2006). It shows that such facilities benefit from economies of scale owing to the presence of significant fixed costs, notably from investments in infrastructure, insurance and personnel to oversee hygiene standards. The larger a facility, the lower its average costs.³⁸ Particularly capital-

Chart 5
Increasing returns to scale and average costs of production

(Norwegian kroner per kilo)



Note: The chart shows the unit cost curve for slaughterhouses in Norway as a function of volume.

Source: Van den Broek et al. (2006).

Box 4 **Economies of scale at Wal-Mart**

The retail company Wal-Mart exploits economies of scale in many ways. Wal-Mart has invested continuously in technology to match its stock with customer demand. For example, it introduced a bar code system early on and a software that connects its stores, distribution centres and suppliers, providing detailed data on the availability of stock. Such fixed investment in stock management is unlikely to pay off for smaller-sized operations. According to Basker (2007), the use of that technology has allowed Wal-Mart to grow and lower its operating costs further through the exploitation of increasing returns to scale.

Basker and Van (2007) estimate that a 10 per cent increase in total sales volume has decreased Wal-Mart's average cost by 2 per cent. The authors also point out that the availability of these technologies, by reducing the costs of tracking stock, has increased Wal-Mart's incentives to add new product lines to its stores, such as pharmacies and auto services. They note that the fact that Wal-Mart is a big retailer gives it a competitive edge in any activity involving a fixed cost, such as contracting with foreign suppliers, which allows Wal-Mart to import at a lower average cost than other retailers.

intensive industries, such as aircraft manufacturing or electronics production, tend to have large fixed costs and economies of scale that often lead to only a few producers worldwide. Increasing returns to scale can also be reaped in the area of services, especially when digital transmission allows for a centralization of certain activities. Box 4 provides a case study of the well-known retailer Wal-Mart.

Since goods can be produced more and more cheaply (i.e. for the same costs, more and more output can be produced), it is certainly economically efficient to produce at a larger scale. The reason why, at

the extreme, there is not only one firm producing a single type of product is that consumers prefer to choose from different varieties for each product they buy rather than buy the same one each time, i.e. they have a "love of variety". Taking the example of food, this means that consumers prefer a selection of different restaurants over one pizza restaurant. Consumers' love of variety favours the existence of many small firms, each producing a somewhat differentiated product, while the exploitation of economies of scale makes it worthwhile to organize production in larger firms.³⁹

Krugman has built these two opposite tendencies into a simple framework of “monopolistic competition”. With larger firms having a cost advantage over smaller ones, the market may cease to be perfectly competitive.⁴⁰ In order to abstract away from the complex issue of firm interaction in such a setting, the “monopolistic competition” market structure assumes that each firm produces a product “variety” that is “differentiated” from the varieties produced by other firms. Therefore, each firm has some leeway to set prices without having to fear that consumers immediately switch to a competing supplier for small differences in price. Since a firm has a “monopoly” in its particular variety within the industry, it can set its own price, and since each firm is small compared with the entire market, it does not take into account the impact of its own price on the prices of other firms. At the same time, while these varieties are not exactly the same, they are substitutes for one another, and each firm continues to face competition from other producers in the industry. In fact, the more varieties that exist (i.e. the lower each firm’s market share), the lower the price that a firm can charge. By the same token, the more firms there are, the less each firm sells (for a given size of the market) and the higher a firm’s

average costs. In market equilibrium, price must equal average costs, which, in turn, determines the total number of firms. If price exceeds average costs, new firms would enter the industry as long as profits can be made; conversely, if price is less than average costs, some firms would exit the market.⁴¹

What happens if two (identical) countries, each with a monopolistically competitive industry, open up to trade?⁴² According to traditional models on country differences (see Section C.1), there would not be any trade. By contrast, with differentiated goods and increasing returns to scale, trade opening enables firms to serve a larger market (and reduce their average costs) and gives consumers access to an increased range of product varieties. However, as consumers can choose among more varieties, they also become more price-sensitive. Hence, while each firm can produce a larger quantity than before (selling to both the domestic and the foreign market), they can do so only at a lower price. As total sales in the integrated market stay the same, and any individual firm is larger, some firms will go out of business. These effects are best illustrated with a hypothetical example (see Box 5).

Box 5

Gains from market integration

This hypothetical example is taken from Krugman and Obstfeld (2006). Assume that two countries, Home and Foreign, each have a monopolistically competitive car sector. Before trade opening, 900,000 cars per year are sold in Home and 1.6 million cars in Foreign. Apart from their different market sizes, the two countries are identical in terms of technology, resources and consumer preferences. Assuming certain fixed and variable costs of production as well as a given elasticity of substitution between varieties, Krugman and Obstfeld determine that there are six firms in Home and eight in Foreign. Given the respective market sizes of the two countries, each firm in Home sells 150,000 cars, while sales per firm in Foreign are 200,000.

Exploiting increasing returns to scale, Foreign firms can produce at a lower average cost and charge a lower price, which the authors determine to be US\$ 8,750 as opposed to US\$ 10,000 in Home. When Home and Foreign open up to trade, the size of the integrated market is 2.5 million cars (the sum of the two national markets in autarky). Each firm serving this larger market now produces more units (250,000 per firm) and the market price for a car has come down to US\$ 8,000. However, this also means that the integrated market can only support ten firms in total. In other words, while consumers have a wider range of choice (ten different car varieties instead of six in Home and eight in Foreign before trade opening), the total number of firms (ten) after market integration is less than the sum of firms in autarky (14).

Example	Home market, before trade	Foreign market, before trade	Integrated market, after trade
Total sales of cars	900,000	1,600,000	2,500,000
Number of firms	6	8	10
Sales per firm	150,000	200,000	250,000
Average cost	10,000	8,750	8,000
Price	10,000	8,750	8,000

In sum, the gains from trade in such a scenario are threefold. Firms produce larger quantities and better exploit their economies of scale (“scale effect”). Consumers in both countries can choose from a wider variety of products in a given industry (“love-of-variety” effect). At the same time, in an integrated market, they pay a lower price (“pro-competitive effect”). Because of these gains, it makes sense that similar countries trade with each other and export/import different varieties of the same good.

While consumers and producers win, those producers that go out of business “lose”. It is impossible to know from the above framework who these producers are and in which country the surviving firms will be located. It may be that each country specializes in producing a narrower range of product varieties under free trade than before (while, of course, all varieties are traded and available for consumption in both countries). Yet, firms may also decide to locate predominantly in one market. For instance, if trade is costly, production may concentrate in the larger domestic market (Krugman, 1980), even if there is some demand abroad. By producing near its largest markets, firms can realize economies of scale, while minimizing transport and other trade costs. Thus, the larger country will produce more varieties and be a net exporter in that industry (the so-called “home market effect”).⁴³

More about the expected trade patterns following liberalization can be gleaned if the basic Krugman model is combined with the traditional approaches concerning country differences discussed in Section C.1 above (Helpman and Krugman, 1985). As in the Heckscher-Ohlin model, one country may be relatively abundant in labour and the other country may be capital-abundant, and one of the two goods may be labour-intensive (e.g. food) and the other capital-intensive (e.g. manufacturing). However, unlike in the Heckscher-Ohlin model, one of the industries, manufacturing, has economies of scale,

with firms producing differentiated varieties in a monopolistically competitive market.

As stated earlier, in the absence of increasing returns to scale, the capital-rich country would export manufactured goods and import food, and vice-versa for the labour-rich country. If manufacturing is a monopolistically competitive sector, the capital-abundant country will still be an importer of food and a net exporter of manufactured goods. The other country, with a comparative advantage in food production, will export both food and manufactured goods, since it produces different varieties of manufactured goods, which some consumers in the capital-abundant country will appreciate. The trade patterns are depicted in Chart 6, with both countries exporting and importing manufactured goods, but with the capital-rich country running a trade surplus in manufacturing.

Ethier (1982) provides another approach to explain trade patterns on the basis of Krugman’s framework. His variant of the model focuses on trade in intermediate inputs, the production of which is subject to economies of scale that are internal to each firm. The cost of producing the final product is lower the larger the bundle of intermediate varieties used. In turn, the larger the production of the final manufactured good, the larger the number and scale of production of the intermediate. If trade in intermediate inputs is free, it does not matter where in the world the production of manufactured goods is located in order to realize these economies of scale. However, if trade in intermediate inputs is restricted, producers of final goods would still need to use all the intermediate varieties available in order to manufacture their products at the same cost. In the presence of trade costs, this will only be possible if all the intermediate and final good production is concentrated in the same country. Hence, this variant of the model can explain the existence of an industrial complex in certain countries. It implies that a reduction of trade costs reduces the need for a concentration of production in any one country.

Chart 6
Trade patterns with country differences in resources and a monopolistically competitive sector



Source: Krugman and Obsfeld (2006: 127).

Before looking at the empirical evidence on the predicted gains from liberalization and related trade patterns, when economies of scale play a role, another model of imperfect competition will briefly be reviewed. This model shows that, in view of certain market imperfections, trade may even be beneficial when countries exchange absolutely identical products.

ii) Reciprocal dumping

As described above, the monopolistic competition model highlights economies of scale as a rationale for trade in similar products and between similar countries. It recognizes that imperfect competition is a necessary consequence of increasing returns to scale at the level of the firm, but disregards most of its consequences. However, imperfect competition, notably the power of firms to price-discriminate between exported and domestically sold products, can itself give rise to international trade between similar countries.

Brander (1986) and Brander and Krugman (1983) describe a situation in which the same good is produced by a monopolist in each of two identical countries. In order to maximize profits, monopolists artificially restrict supply and set prices that are higher than under competitive conditions. While a monopolist could expand sales by reducing its price, it would receive a lower mark-up on all products sold and, therefore, make less profit than at the profit-maximizing price.⁴⁴ If the monopolist firm in each country charges the same price, no international trade will take place. However, if the foreign and domestic market can be segmented effectively, i.e. if a firm can charge a different price on the export than domestic market and domestic residents cannot easily buy goods designated for export, each

monopolist may decide to price-discriminate and enter the foreign market. This decision depends on whether the firm perceives its sales in the foreign market to be more responsive to price reductions than in the domestic market. In the presence of trade costs, this is likely to be the case, as each firm is a lower cost producer at home (where it does not incur the transport costs to ship the good abroad, for example) and will have a lower market share abroad than in the domestic market.

With lower market shares, a firm may double its sales for a given price reduction, but it would need to cut its price much further to double its sales when it has a high market share; hence, a firm is likely to see itself as having less monopoly power abroad and has a higher incentive to keep prices low for exports.⁴⁵ If trade costs are not prohibitive, it makes sense for both firms to “dump”, i.e. charge a lower price for exports than it charges domestically. By selling in the foreign market, each firm makes additional sales and, hence, profits, even if the price is lower than domestically, while the negative effect on the price of existing sales are imparted on the other firm, not on itself.⁴⁶

In this model, reciprocal dumping leads to two-way trade in the same product, even though trade is costly and, initially, prices have been equal.⁴⁷ With the monopoly being replaced by a duopoly situation,⁴⁸ consumers in each country benefit from a larger amount of the product in question at a lower average price. While the increased competition represents a benefit, it is, of course, wasteful to spend resources on the shipping of identical products (or close substitutes), and, depending on transport costs, the overall welfare effect may well be negative.

(c) Empirical evidence

While the “new” trade theory provides a persuasive account of why similar countries may find it beneficial to trade with each other, its usefulness ultimately depends on the actual evidence of the predicted gains from liberalization and its performance relative to competing explanations of trade flows. As far as the gains from intra-industry trade are concerned, most studies have focused on either one of the variety, scale or pro-competitive (price) effects of trade opening. Each effect will be discussed in turn before presenting some evidence about the explanatory power of the models presented in this sub-section compared with other approaches in regard to the observed patterns in international trade.

i) Gains from increased variety

Attempts to measure consumer gains from increased variety are quite recent (due to the detailed data and large computing power needed) and the few studies that now exist have found these gains to be substantial. Broda and Weinstein (2004) compute the welfare gains to consumers as a reduction in the overall price index due to the availability of new varieties, a method developed by Feenstra (1994).⁴⁹ The higher the share of total spending on a new variety, when it appears on the market, and the higher its degree of differentiation compared with existing varieties, the higher the reduction of the overall price index, i.e. the greater the gains to consumers.⁵⁰

Looking at highly detailed import data for the United States, Broda and Weinstein (2004) note a dramatic increase in imported varieties, from about 75,000 varieties in 1972 (or an average of 7,731 varieties from an average of 9.7 countries) to almost 260,000 varieties in 2001 (or about 16,400 varieties from an average of 15.8 countries). The authors divide the sample in two time periods and find that the variety-adjusted unit price for imports fell by 22.5 per cent compared with the unadjusted price over the 1972 to 1988 period (or about 1.6 per cent per year). For the 1990 to 2001 time period they calculate a variety-related price reduction of 5 per cent or about 0.5 per cent annually. Converting these price changes to real income changes, the authors find that welfare has increased by almost 3 per cent solely as a result of the increase in available product varieties.

In ranking US trading partners over time according to the number of exported products, Broda and Weinstein (2004) find evidence that countries do not simply export more of existing products but also supply a greater range of differentiated products as they develop and liberalize. In particular, during the time before 1990, the United States realized important gains from increased variety in imported goods from East Asia, notably the Republic of Korea. More recently, following the North American Free Trade Agreement (NAFTA), the number of varieties imported from Canada and Mexico have risen sharply, and China has continued to play a more and more important role as a supplier of differentiated products.

Feenstra and Kee (2007) examine the effects of trade liberalization on export variety more thoroughly for Mexican and Chinese exports to the United States. Constructing sectoral export variety indices, they find some indication that export variety increased more in sectors where trade liberalization was more pronounced. For example, large tariff reductions by the United States *vis-à-vis* Mexico in the NAFTA context took place in the electronics sector, whereas reductions in agriculture were much smaller. Accordingly, the variety of Mexican exports increased most in electronics and least in agriculture. However, the authors also show that by 2001, China’s export variety exceeded Mexico’s in sectors such as electronics, where Mexico had an initial market access advantage. Estimating that every 1 per cent increase in the export variety of China reduces export variety of Mexico by 0.5 per cent, the authors find evidence that the expected gains from trade liberalization in terms of increased variety must take into account simultaneous liberalization with other trading partners.

ii) Gains from increased competition

A number of empirical studies (examining liberalization in goods and, to a lesser extent, services) have focused on the effect of foreign competition on firms’ pricing decisions. Overall, it appears that trade liberalization has indeed reduced mark-ups of price over costs, although it has proven difficult to disentangle the effects of other relevant factors. Harald (2007) examines the effect of the creation of the European Union (EU) single market (announced in 1985 and implemented in 1993) on price over cost mark-ups using data on 10 EU member states and 18 sectors from 1981 to 1999. Taking cyclical

and technological factors into account, he finds that mark-ups went down in manufacturing by 31 per cent following integration, in particular in the chemicals, rubber and plastic products, metals and metal product sectors as well as parts of the machinery and equipment sector, such as electronic and optical equipment. Conversely, for services mark-ups have risen again slightly since the early 1990s despite the regime shift, which the author attributes to the comparatively weak state of the single market for services and the persistence of anti-competitive strategies in certain services sectors.

Evidence on the significant pro-competitive impact of trade liberalization is also available from developing country case studies. Krishna and Mitra (1998) find important decreases in price-cost margins for most industries in response to a range of liberalization measures undertaken by India in 1991. Harrison (1990) obtains similar results for Côte d'Ivoire following the implementation of a comprehensive trade reform in 1985. Both studies take other factors into account, such as the influence of technological progress and business cycles. Using data on almost 300 firms, Harrison even accounts for the possibility of variations in mark-ups not only across sectors but also across firms. Roberts and Tybout (1991) have put together a collection of developing country case studies (Chile, Colombia, Mexico, Morocco and Turkey), which examine the relationship between the exposure to trade and price-cost margins at both the industry and plant levels, taking the usual factors into account plus a measure of existing domestic competition. Owing to the latter, it becomes apparent that the pro-competitive effects of increased import penetration are particularly strong in highly concentrated industries, i.e. that the impact of trade liberalization is strongest where firms have a degree of market power prior to trade opening.

Finally, Hoekman et al. (2004a) undertake a cross-country analysis of 42 developed and developing countries in order to examine to what extent country differences may explain why trade opening has a more pronounced effect on mark-ups in some countries, taking other differences into account, such as a country's level of economic development or institutional environment.⁵¹ The authors find that both tariff cuts and reductions in other market entry barriers (proxied by the number of administrative procedures required to establish a new, domestic or foreign firm) have a negative effect on mark-ups, but that the effect of trade liberalization is less strong when administrative

barriers are more significant, since these may act as a substitute for lower tariffs. As an example, the authors estimate that Colombia could more than halve its average industry mark-up if it reformed its restrictive market entry regulations to the level found in Canada (least restrictive in the sample) and brought down its manufacturing tariff from the current 11 per cent to zero (like Hong Kong, China).

The study also highlights that the impact of tariffs on mark-ups decreases with country size, whereas the impact of entry regulations increases. In other words, smaller countries (that are naturally more open) will see a relatively larger reduction of industry mark-ups when they liberalize their tariff regime while larger countries obtain comparatively better results from reforming their domestic market entry procedures. For instance, Uruguay and Malaysia have the same average tariff level (around 12 per cent), but Malaysia is twice as large as Uruguay in terms of GDP per capita and a marginal change in tariffs in Uruguay has a 14 per cent larger effect on mark-ups than in Malaysia.

iii) Gains from increased economies of scale

While the importance of variety and pro-competitive gains from trade have been established empirically, there is mixed evidence at best of net increases in scale following trade liberalization. Head and Ries (1999) analyze the impact of the Canada Free Trade Agreement (FTA) with the United States for 230 Canadian industries (at the 4-digit SITC level). Following the conclusion of the FTA, almost all Canadian manufacturing industries exhibited substantial rationalization between 1988 and 1994, i.e. a decline in the number of plants accompanied by increases in output per plant.

The authors find that the scale increases experienced by the average industry over that time period cannot be explained by trade liberalization. Their analysis shows that the average US tariff reductions of 2.8 per cent caused a 4.6 per cent scale increase, which was more than offset by the scale decline of 6.1 per cent owing to Canada's own tariff reductions of 5.4 per cent. These effects are similar but larger in imperfectly competitive industries and smaller in high turnover industries, where free market entry and exit of plants appear to dampen scale adjustments.⁵² Roberts and Tybout (1991) obtain similar results looking at a panel of Chilean and Colombian firms over the mid-1970s to mid 1980s.

They examine to what extent changes in plant size can be explained by increased trade exposure, as measured by higher export and import shares or, alternatively, reductions in effective protection. Exposure to foreign competition in the domestic market reduces average plant sizes, while increasing export shares, at least in the short term, have the opposite effect. Again, size adjustment occurs more in industries with low turnover of firms, i.e. where market entry/exit is more difficult.

From these studies, it becomes evident that factors other than scale appear to explain the overall efficiency gains at the sectoral level following trade opening, notably the observed reallocation of market shares towards more productive firms. Such differences between firms have not been modelled in the theoretical approaches presented above, and empirical results of that nature have certainly given a boost to the development of the “new-new” trade theory (which explicitly takes account of firm “heterogeneity”) discussed in Section B.3.

One study that has opposed the effects of liberalization on scale versus selection of firms and shifts in market share is the one by Tybout and Westbrook (1995) on Mexican manufacturing plants covering the 1984 to 1990 period and the liberalization undertaken in 1985. The authors note significant improvements in productivity and average costs during this period. Improvements were largest in the more open sectors, measuring either import or export rates. A number of manufacturing sectors show modest increases in internal returns to scale, but these are only significant for the smallest plants, while the largest plants appear to have reached a minimum efficient scale. Thus, with large plants carrying more weight in sectoral aggregations, increases in openness are associated with relatively small-scale efficiency gains overall. More importantly, open sectors are characterized by some degree of market share shifting towards the more productive plants. However, for the most part, cost reductions and productivity gains are explained by a “residual” factor, which captures the effects from technological innovation, learning-by-doing and other phenomena that are difficult to quantify.

iv) Observed trade patterns and competing theoretical approaches

In order to compare the “new” trade theory with established approaches, a number of studies have further developed the new models, notably the

monopolistic competition model, to yield some empirically testable hypotheses. The question is whether the predictions by the model are consistent with the trade data, notably the results obtained from the gravity approach (see Box 6) and the Grubel-Lloyd measures of intra-industry trade that traditional theories had difficulties to explain, or whether other approaches, both new and old, can better explain the observed relationships.

Hummels and Levinsohn (1995) test the positive association between trade volumes and similarity in size (if countries also have identical preferences), as hypothesized by Helpman (1987) on the basis of a model of monopolistic competition and confirmed empirically by him for a group of OECD countries using a gravity set-up. Hummels and Levinsohn (1995) use instead a diverse sample of developing economies and find that the relationship between size dispersion and the variation in trade volumes, as predicted by the monopolistic competition model, still holds. Since these countries cannot be described as having identical demand structures and as trading predominantly in differentiated products, i.e. as fulfilling the assumptions highlighted by Helpman (1987), it is not clear that the monopolistic competition model necessarily provides the best rationale for such trade flows.

As an alternative test, the authors regress the Grubel-Lloyd indices on a range of measures of factor endowments in each country, such as income per worker or land-labour ratios. In so doing, they are able to confirm that the bilateral share of intra-industry trade is higher for countries that are more similar in terms of factor composition, as in Helpman (1987) and predicted by the monopolistic competition model. However, when more sophisticated econometric methods are employed, the empirical support for the theory becomes mixed. Rather than being explained by factor similarities, much of intra-industry trade appears to be specific to country-pairs and not explained by a common factor.

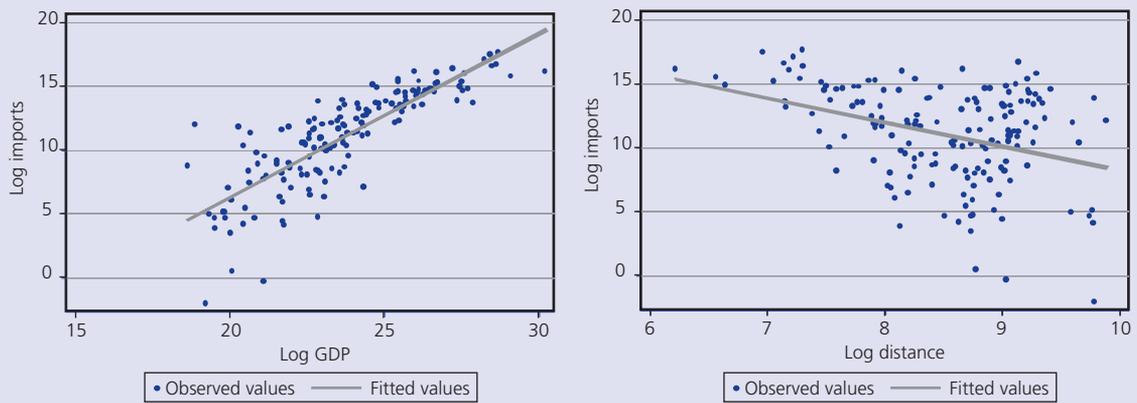
A number of authors have made the attempt to differentiate explicitly between competing models by deriving mutually exclusive, empirically verifiable predictions from each model. Feenstra et al. (2001) hold that the gravity equation is consistent with several theoretical models of trade that, nevertheless, predict certain differences in key parameter values. The authors confirm the predictions of the monopolistic competition model

Box 6
The gravity equation

The gravity equation was developed by Tinbergen (1962) in an attempt to predict the pattern of international trade that would prevail in the absence of distortions. He postulated that the value of bilateral trade between two countries was an increasing function of the gross national product (GNP) of both the exporting country (reflecting the assumption that export supply capacity depended on a country's economic

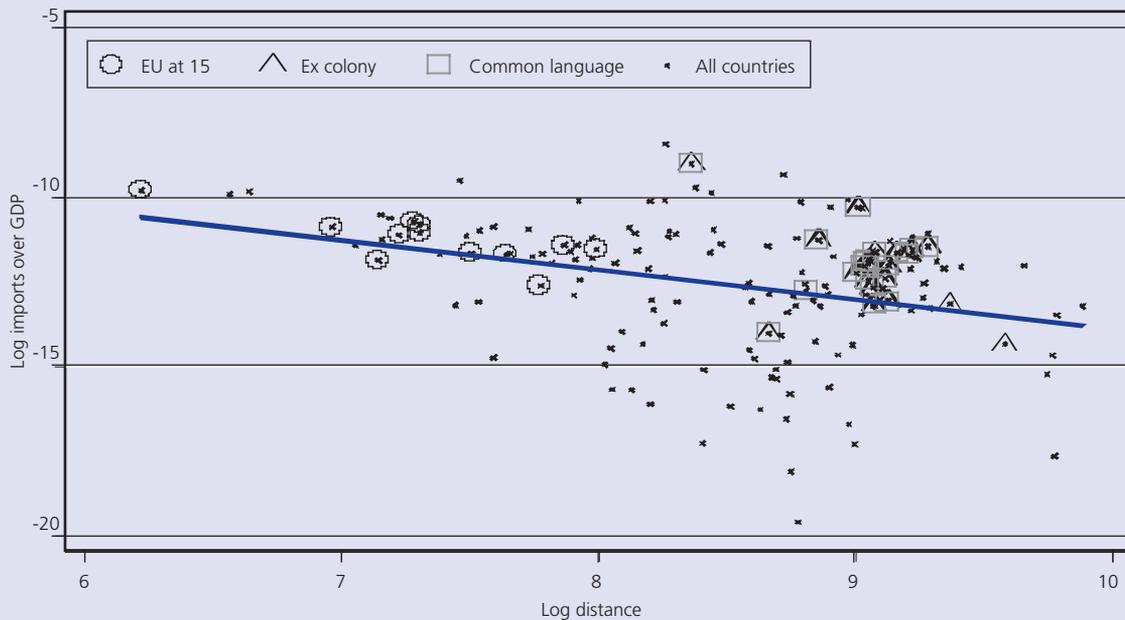
size) and the importing country (assuming that import demand also increased with a country's market size). At the same time, he observed that trade flows were influenced negatively by the "distance" between two countries, as a measure of transportation costs or other obstacles, such as the cost of information on the export market. These relationships are portrayed in Chart A for Spain.

Chart A
Bilateral trade of Spain as a function of GDP of both trading partners and as a function of geographical distance, 2006



Source: Calculation by authors based on UN Comtrade Database (2007).

Chart B
Bilateral trade of Spain as a function of geographical distance as well as other trade barriers, 2006



Source: Calculation by authors based on UN Comtrade Database (2007).

Trade with a range of trading partners increases with both countries' GDP and decreases with the geographical distance. The relative "distance" between trading partners is not confined to geography, but includes other "barriers" that increase trading costs, such as language differences, historical/cultural factors and, not least, trade barriers. In Chart B, the round dots mark Spain's trade with other EU members, the squares denote trade with other Spanish-speaking countries and the triangles refer to trade with former colonies. It can be seen that Spain trades relatively more with countries with which trade "barriers" are lower in one respect or another than with other countries at a similar distance.

This so-called "gravity equation", in reference to Newton's law describing the force of gravity as a function of the product of the masses of two objects and the distance between them,

has been extremely successful in explaining the determinants of bilateral trade flows and the impact of trade policies, such as the creation of free trade areas. Yet, it did not appear to offer any role to comparative advantage. The monopolistic competition model discussed below was the first model that provided a complete theoretical basis for the gravity equation. Previously, Anderson's (1979) Armington model had provided a first, albeit incomplete, theoretical foundation based on differentiation of goods by country of origin. Later, others, e.g. Eaton and Kortum (2002), have been able to derive the gravity equation from the Heckscher-Ohlin framework and Ricardian model respectively. The former is characterized by complete or at least a certain degree of specialization of countries in certain goods, while in the latter modelling approach, countries are not specialized, but owing to transport costs, any particular good is only imported from the cheapest producer.

and reciprocal dumping model with free market entry for differentiated products, while trade in homogeneous goods (i.e. bulk commodities and the like) appears to be better described by alternative approaches.⁵³

Similarly, Evenett and Keller (2002) estimate a gravity equation to test the predictions of the monopolistic competition and Heckscher-Ohlin models.⁵⁴ They split their sample of bilateral import data into two subsets with high and low degrees of intra-industry trade respectively. For the former, they expect trade to be based predominantly on product differentiation and increasing returns to scale and further subdivide the sample according to the level of intra-industry trade. The other subset is sorted according to each observation's differences in factor proportions.

For the first sample, the authors find that a higher share of differentiated goods in GDP is indeed associated with a higher share of intra-industry trade in total bilateral trade. Likewise, when

there is little intra-industry trade (second sample), trade rises with increasing bilateral differences in factor proportions. From these results, it may be concluded that a monopolistic competition framework emphasizing economies of scale and product differentiation is well-suited to explaining trade among industrialized nations ("North-North" trade). By contrast, factor differences appear to play an important role in the trade between developed and developing countries ("North-South" trade), which tends to focus more on the exchange of homogeneous goods.⁵⁵

Despite its obvious empirical relevance, the new trade theory must be seen as a complement to rather than substitute for traditional approaches which continue to play a role in the explanation of trade flows. At the same time, it has triggered further advances in trade theory addressing some unanswered questions, such as which firms will prosper and which ones decline under free trade and where production will take place. These are further discussed in Sections C.3 and D.

3. RECENT DEVELOPMENTS: PRODUCTIVITY GAINS

Until recently, trade literature has not focused much attention on the role of firms in international trade. Mainly for simplification purposes, trade theorists typically used the concept of a representative firm, assuming that all firms in a given industry are identical. In the 1980s, however, firm-level data sets with detailed information on production and trade at the firm level became available.⁵⁶ This information showed considerable differences (“heterogeneity”) between firms and suggested that these differences affected overall outcomes. Trade economists consequently developed a series of new trade models that focus on the role of firms and that explain the empirical findings. These models have identified new sources of gains from trade and new ways in which international trade may lead to resource reallocation (Bernard et al., 2007a).

(a) Differences among firms matter

This sub-section reviews recent firm-level empirical evidence which shows that: (a) most firms, even in traded-goods sectors, do not export at all; (b) of those firms that export, only a few export a large fraction of their production; (c) at the same time, at least some firms export in every industry, with the share of exporting firms being a function of the industry’s comparative advantage; (d) firms that export are different from non-exporters in a number of ways (they are bigger, more productive, pay higher wages and are more capital and skilled

labour intensive than non-exporters); (e) trade liberalization raises industry productivity.

Two important points about the data are worth mentioning. First, the focus is on evidence regarding exporting. This is because until recently, most of the firm-level evidence has been concerned with exporting and the new theories have been developed to account for export-related evidence. Data on US firms’ imports is only briefly reviewed, since this has only recently become available as part of the new transaction-level trade data. This information reveals that data on firms’ imports share many of the features of those on firm exports. Second, while for the time being most of the firm-level evidence is from developed countries, available developing country evidence is also covered in this sub-section. As discussed below, available information suggests that many of the insights drawn from early studies for US exporting firms is confirmed as applicable to other countries when similar firm-level data is made available.

The first point to note is that the share of exporting firms in the total number of firms is relatively small. In 2002, only 20 per cent of all US manufacturing plants and 18 per cent of all US manufacturing firms were exporting (Bernard et al., 2007a; Bernard et al., 2006a). Unfortunately, comparable figures are only available for a small number of other countries. As shown in Table 5, while the fraction for Norway is considerably higher at 40 per cent, figures for France, Japan, Chile and Colombia are in the same 20 per cent range as the US fraction.

Table 5
Share of exporting firms in total number of manufacturing firms

	Year	Share of exporters in total number of manufacturing firms
United States	2002	18
Norway	2003	39.2
France	1986	17.4
Japan	2000	20
Chile	1999	20.9
Colombia	1990	18.2

Note: US: U.S. Census of Manufacturers. Norway: all non-financial joint-stock firms in the manufacturing sector (approximately 90 per cent of the manufacturing industry totals). A firm is an exporter if its exports are over NOK 1000. France: comprehensive data set of French manufacturing firms; 113 countries and 16 industries are included; data fail to account for 20 per cent of total export data. Japan: Survey database of the Ministry of Economy, Trade and Industry which includes all manufacturing and non-manufacturing firms with more than 50 employees and a turnover exceeding 30 million Yen; firms that re-entered and started exporting after 1994 are excluded; unbalanced panel with 22000 observations a year. Chile: Encuesta Nacional de Industria Annual and National Customs Department data; 1991-1999; importers returning goods are recorded as exporters, might lead to overestimation. Colombia: Columbian Manufacturing Census; panel data; plants with 10 or more employees.

Source: United States: (Bernard et al. 2007a); Norway: (Mayer and Ottaviano, 2007); France: (Eaton et al. 2004); Japan: (Kimura and Kiyota, 2006) Chile: (Alvarez, 2004); Colombia: (Brooks, 2006) .

These figures should be interpreted cautiously. The Norwegian sample of firms, for instance, accounts for only 90 per cent of value added. In the Chilean and Colombian cases, only manufacturing firms with more than 10 employees are covered and the Japanese dataset only includes firms with more than 50 employees. If there are proportionally less exporters among the smaller firms than among the larger ones, these figures could be biased upwards.

While exporting is a relatively rare activity, evidence from the United States shows that it occurs in all manufacturing industries (Bernard et al., 2007a). It also shows that exporting is relatively more frequent and export intensity relatively higher in more skill-intensive sectors than in more labour-intensive sectors. Comparing the percentage of firms that export across US manufacturing industries in 2002, they found that 8 per cent of firms were exporting in the apparel sector compared with 38 per cent in the computer and electronic products industry. Similarly, comparing mean exports as a percentage of total shipments across industries, the authors found that the value of exports as a share of total shipments ranged from 7 per cent for firms in the beverages and tobacco products sector to 21 per cent for those in the computer and electronic products sector.

Evidence also shows that exporting is concentrated. A minority of the firms that export make up the bulk of exporting activity measured on a value basis. Based on a ranking of a country's firms in terms of their individual exports, the contributions

to overall exports of the largest exporters can be calculated. The shares of total exports accounted for respectively by the largest 1, 5 and 10 per cent of exporting firms are reported in Table 6 for a number of countries. Figures show that in most of the sample countries, the largest 5 per cent of exporting firms account for more than three-quarters of total exports.

These observations challenge both the old and the new trade theories. The old theory, for instance, can explain why export intensity is higher in skill-intensive sectors but it cannot explain why some firms export but many do not. Similarly, the fact that there are exporters in all industries is consistent with new trade theories but the fact that only some firms export is not.

An examination of firm-level evidence also shows that exporters are different. First, data suggest that US firms that export are more capital-intensive and skill-intensive with respect to their choice of inputs than are firms that do not export. If this suggests that the goods that these exporting firms produce are more capital-intensive and skill-intensive (in line with their input choice), then this would be evidence from the firm level of the United States exporting products in line with its current, underlying comparative advantage.⁵⁷ This result is confirmed by Mayer and Ottaviano (2007), who provide evidence that the export performance of European countries is better in those industries where they have a comparative advantage.

Table 6
Per cent of exports accounted for by largest exporters

	Year	Top 1%	Top 5%	Top 10%
United States	2002	80.9	93	96.3
Belgium	2003	48	73	84
France	2003	44	73	84
Germany	2003	59	81	90
Hungary	2003	77	91	96
Italy	2003	32	59	72
Norway	2003	53	81	91
UK	2003	42	69	80
Chile	1999	49.12	82.25	96.45

Note: Data description (for some countries see Note in Table 3): Belgium: Data taken from Balance Sheet Trade Transactions Dataset; for intra EU trade firms with >250 000 euros trade flows are considered; for extra EU trade firms with >1000 Euro (or one tonne) are considered. Exports reported at the eight-digit level. France: Data are taken from the French Customs. Exports are reported at the eight-digit level. Intra EU trade is reported only for >250 000 Euros; Extra EU trade is reported for >1000 Euros. Germany: Data taken from Federal Statistical Office; Establishment Level Panel Data; manufacturing sector only; covers firms with >20 employees only. Hungary: Data set contains 2043 firms, with exports >100 million HUF; this represents 60-70 percent of total exports. Exports reported at the six-digit level. Italy: Data taken from Capitalia database; survey on Italian manufacturing firms; for firms <500 employees and more than 11 the survey is selective; for firms >500 employees all are included. UK: Data taken from FAME database.

Source: United States: (Bernard et al. 2007a); Belgium, France, Germany, Hungary, Italy, Norway, UK: (Mayer and Ottaviano, 2007); Chile: (Alvarez, 2004).

Second, one of the most robust and most important results found across countries in this literature is that exporting firms are more productive than non-exporting firms. Bernard et al. (2007a) estimate that US exporting plants are more productive than non-exporting plants by 14 per cent for value-added and 3 per cent for total factor productivity. Similarly, Mayer and Ottaviano (2007) estimate that French exporters exhibit a 15 per cent higher total factor productivity than non-exporters and a 31 per cent higher labour productivity.⁵⁸ Given this relationship, a natural question is whether exporting causes firms to be more productive (a “learning by exporting” effect) or whether it is simply the case that more productive firms choose to become exporters, while less productive firms choose not to (a “selection” effect). Here, empirical evidence is mixed. Earlier studies, using data on US firms, followed by a number of studies on exporting firms in countries as diverse as Canada, Colombia, Germany, Mexico, and Morocco, supported the “selection” hypothesis.⁵⁹ Several recent studies, however, find evidence of “learning by exporting”.⁶⁰

Third, another related result is that exporting firms are larger, whether measuring their size by output (domestic shipments) or employment.⁶¹ The fact that these firms are larger also has important implications in relation to the discussion of the relation between trade and productivity. While exporting firms may or may not enjoy any higher productivity growth after they begin exporting (relative to non-exporting firms), evidence suggests that average industry productivity increases following trade liberalization, as a result of the contraction and exit of low-productivity firms and the expansion and entry into export markets of high-productivity firms.⁶²

Finally, there is also evidence that exporting firms pay higher wages than non-exporting firms. Even when examining only intra-industry variation and after taking firm size into account, there is still a wage premium for employees of exporting firms, compared with those of non-exporting firms. Box 7 illustrates how firm-level information can be analyzed using relatively simple techniques.

Box 7
Using firm-level data to analyze export behaviour

Using firm-level information from the Amadeus database, simple techniques are applied to investigate two sets of questions that have been highlighted in trade literature: the exporter premium and the self-selection into export effect. The sample consists of 28,621 medium to large French firms, of which 12,502 (48.9 per cent) recorded non-zero exports in the last available year. The top 5 per cent of exporters account for more than 84 per cent of total exports.⁶³

Exporter productivity premium

The productivity premium of exporters is the average percentage difference in productivity

between exporters and non-exporters, taking firm- and sector-level characteristics into account. It can be assessed using the following simple regression of export status on labour productivity:

$$\ln LP_i = \beta_0 + \beta_1 Export_i + \beta_2 \ln Age + \beta_3 \ln IntAssets + \epsilon_i \quad (1)$$

where *i* indexes firms; *LP* is labour productivity measured as operating revenue per worker; *Export* is an indicator variable for export status; *Age* is the number of years since the firm has been established; *IntAssets* is intangible fixed assets, included as a measure of fixed costs. A full set of sector dummies has been added to equation (1). The regression results are as follows:

OLS regression

Dependent variable: *ln productivity*

dummy for export status	0.095***
<i>ln age</i>	-0.094***
<i>ln intangible assets</i>	-0.023***
R ² 0.4022	Number of observations: 17986

Denotes significance at ***1%
 Constant and sector dummies not reported.

The exporter premium, calculated as $100(\exp(\beta_1)-1)$, is equal to 10.1 per cent. That is, after controlling for firm- and sector-level characteristics, exporters are on average 10 per cent more productive than non-exporters.

Self-selection

The hypothesis that high-productivity firms self-select into exporting is also tested. The test uses the estimation results of the following Probit model:

Probit regression

Dependent variable: Probit (export)	
In productivity	0.057***
In age	0.005
In intangible assets	-0.006***
In number of employees	0.041***
Pseudo R ² 0.2496	Number of observations: 17488

Denotes significance at ***1%
Constant and sector dummies not reported.
Marginal effects are reported.

$$Export_i = \beta_0 + \beta_1 LP_i + \beta_2 \ln Age + \beta_3 \ln Empl + \beta_4 \ln IntAssets + \varepsilon_i \quad (2)$$

where *Empl* is the number of employees, a measure of firm size, and where a full set of sector dummies is added. This produces the following regression results shown below. The estimated elasticity of productivity on the export dummy is positive and significant. Empirical support is found, therefore, for the idea that more productive firms self-select into exporting.

Access to increasingly detailed data that links firms to such characteristics as the number of products they produce and the number of foreign destinations they export to also reveals interesting characteristics of exporting firms (Bernard et al., 2007a). Evidence for the United States suggests that when firms export, they tend to export multiple products. More precisely, while most firms export a relatively small number of products, most exports are done by firms shipping many products. In Europe, data show that top exporters export many products to many locations (Mayer and Ottaviano, 2007). Firms exporting more than ten products to more than ten markets account for more than 75 per cent of total exports. Earlier research also examines the question of “product-switching” and questions related to how firms change their mix of product offerings in response to the pressures of globalization. It also examines how many markets an exporter ships to and to what markets in particular.

This sort of new approach on newly available data suggests many exciting future avenues to improving understanding of how firms that compete in global markets are behaving. Note there is also evidence from US import data on within-product

differentiation (Schott, 2004) that is consistent with a theory of within-product specialization that may reflect differences in product quality, i.e. that rich countries export varieties with high unit values and lower-income countries export varieties with lower unit values.

Finally, using this newly matched data on firm-level transactions, these researchers are able to compare US firms that import with firms that do not import.⁶⁴ The first interesting finding is the high degree of positive correlation between importing firms and exporting firms – firms that import are more likely to export than non-importing firms, and firms that export are more likely to import than non-exporting firms.⁶⁵ Bernard et al. (2007a: Table 8) illustrate a number of other common characteristics between US firms that import and US firms that export – in both cases, the firms are larger, more productive, pay higher wages and are more capital and skill-intensive than firms that do not import.

Missing from this literature, however, is information on firms in industries aside from manufacturing. In particular, because of data limitation, empirical

economic research has had very little to contribute thus far to information on ways in which firms in service industries may be similar or different from those in manufacturing.

Most of the extremely detailed information discussed in this sub-section on what differentiates exporting firms from non-exporting firms or importing firms from non-importing firms relies on detailed data for the United States and European countries. In studies referenced above, a number of these characteristics on productivity and size have been confirmed when examining exporting and non-exporting firms in other countries as well. Nevertheless, there are potential avenues of research, especially in the case of developing countries, that would be worth pursuing. For example, Tybout (2000) describes some extremely interesting characteristics of the size distribution of manufacturing firms in developing countries that may result from an historical environment of protectionism and heavy domestic regulation – oligopolies of extremely large plants with large market shares co-existing with a set of very small plants that are unwilling and/or unable to grow in order to take more advantage of economies of scale.

(b) Models with differences among firms

In the last few years, a new strand of trade models have been developed that incorporate firm-level differences to account for the new firm-level facts discussed above. As summarized by Baldwin (2006b), these so-called “new new” trade models differ from the “new” trade theory models discussed in sub-section 2 by allowing for differences with respect to firms’ marginal costs and fixed market-entry costs that are added to the standard fixed cost of developing a new variety.

This sub-section presents the thinking behind and the basic features of the model introduced by Melitz (2003).⁶⁶ The main reason for focusing on this particular model is that it is proving to be a particularly effective platform for modelling trade with differences among firms (Baldwin, 2006b). In the Melitz model, only a subset of firms exports and there are exporters in most industries. A number of key implications of these features are emphasized, notably the impact of liberalization on average industry productivity through a selection mechanism and its effects on the number of firms

as well as on the number of varieties for consumers. Other models based on differences among firms, embedded in either new trade theory models or in Ricardian models, are subsequently considered and compared with the Melitz model.

The Melitz model is in the tradition of monopolistic competition trade models. More precisely, it introduces differences between firms into the Krugman (1980) model of “new” trade theory. The economy is endowed with a single factor of production: labour (L). There is a single industry that produces horizontally differentiated products. Each firm produces one single variety using a technology with increasing returns to scale. Competition is imperfect but there are many firms. Firms vary in terms of their total factor productivity. Each firm is assumed to draw its productivity level in a “lottery” after paying a one-time fixed sunk cost of entry (or “invention cost” as Baldwin calls it). This can be thought of as a way to model a situation where the firm invests in research and development (R&D) to develop a new variety and there is uncertainty involved in the R&D process regarding the marginal cost of producing the new variety.

In addition to the sunk “invention cost”, if it enters the domestic market, the firm has to pay a fixed entry cost. Similarly, if it wishes to export, it has to pay the fixed cost of entering the export market. Depending on the level of its productivity, the firm will thus either produce or exit, and if it produces, it will either produce only for the domestic market or be an exporter. Only firms with sufficiently low marginal costs will be able to sell enough to cover fixed costs. Firms with the lowest marginal costs will find it profitable to pay the entry cost for both the domestic and the export market, while firms with intermediate productivity levels will find it profitable to pay only the entry cost for the domestic market. In other words only the most productive firms become exporters.

In summary, considering a ranking of all firms according to their productivity level, there are three outcomes for firms and two cut-off conditions – that is, two threshold levels of marginal cost. The least productive firms (i.e. those with a marginal cost above the first threshold level) exit the market, those between the first and the second cut-off points enter but only sell on the domestic market and those with the highest levels of productivity (i.e. with a marginal cost lower than the second threshold level) both export and sell domestically. The threshold

marginal cost for entering the local market depends on the fixed entry cost of entering the domestic market as well as on prices and demand conditions. Similarly, the cut-off marginal cost for entering the export market is a function of the fixed cost of entering the export market, the trade costs, the price and demand conditions.

In this setting, Melitz (2003) shows that increases in the exposure to trade through either a transition from self-sufficiency to trade or a reduction of trade costs will force the least productive firms to exit and reallocate market shares from less productive to more productive firms. He further shows that increased exposure to trade will always deliver welfare gains.

When entry into new export markets is costly, Melitz shows that exposure to trade offers new profit opportunities only to the more productive firms that can afford to cover the entry cost. This also encourages more market entry as prospective firms respond to the higher potential returns associated with good productivity. At the same time, falling trade costs also reduce the minimum level of productivity that firms need to export successfully and thus, the highest-productivity non-exporters enter the export market and existing exporters see their sales grow as they take advantage of new markets. The increased demand for labour by the more productive firms and new market entrants increases overall wages and forces the least productive firms to exit. In other words, the minimum level of productivity needed to survive increases, prompting the lowest-productivity firms to exit and average industry productivity to increase.

Baldwin and Forslid (2004) systematically study the positive and normative aspects of the effects of trade liberalization in the Melitz model. As far as the positive effects of trade liberalization are concerned, they emphasize two main results. First, as mentioned, liberalization has a strong impact on average productivity via a selection effect (the least productive firms drop out of the market) and a reallocation effect (from the less to the more productive firms). Second, trade liberalization leads to an anti-variety effect. Freer trade reduces the number of varieties produced in each country and under reasonable assumptions also reduces the total number of varieties consumed.⁶⁷ Using profits to measure the return to capital, the authors also show that the model displays classic Stolper-Samuelson-like behaviour.

Finally, turning to welfare effects, Baldwin and Forslid break down the total welfare impact into three partial effects: the negative anti-variety effect, the positive productivity effect, and a positive effect related to a substitution and share-shifting effect in favour of imported varieties. They show that considering all the effects together, the positive productivity and substitution/share-shifting effects outweigh the anti-variety effect, so that the overall impact of freer trade is unambiguously positive.

Bernard et al. (2007b) examine how firm, industry and country characteristics interact as trade costs fall in a model that embeds differences in firms into a framework of comparative advantage. The model they use has two countries, two factors and two industries. Each industry is populated by a continuum of firms that each produce a single differentiated variety within their industry. Firms vary in their level of productivity, industries vary in factor intensity and countries differ in terms of factor abundance. Using their model, they demonstrate that increased exposure to trade raises the productivity cut-off necessary for survival, which raises average productivity in both industries. In their model, the strength and importance of firm self-selection varies with the interaction between country and industry characteristics. The rise in productivity is more pronounced in the comparative advantage industry, because firms' export opportunities in this industry are greatest. This outcome magnifies the original differences between countries and thereby boosts the welfare gains from trade. By increasing exporters' profits, falling trade costs also reduce the export productivity cut-off level. Here too, responses vary according to country endowments and industry factor intensity. Another interesting effect is related to aggregate productivity growth. Increases in industry productivity reduce the price of the average variety in each industry and thereby elevate the real income of both factors. This effect may even be strong enough to raise the real wages of both factors. The possibility of such an outcome, which also depends on the model's parameters, contrasts sharply with the predictions of the traditional model.

Yeaple (2005) proposes an alternative explanation of the economic implications of international trade in the presence of differences among firms. In his model, firms are the same when they start out. Differences arise when they choose to employ different technologies and systematically hire different types of workers. In a two-sector economy, firms in one sector

produce a differentiated good. In this sector, firms can choose to employ a medium or high technology. The fixed investment costs for the high technology are higher than for the medium technology.

In the second sector, according to Yeaple, firms produce the same good, employing a standard low technology. Additionally, workers differ in their skills. High-skilled workers have a comparative advantage in using the high technology whereas medium-skilled workers have a comparative advantage using the medium technology. Therefore, in an equilibrium, firms that choose to use the high technology employ highly skilled workers. As the labour market is competitive, high-technology firms pay a higher wage.⁶⁸ Only firms that choose to use the high technology are able to do this and hence attract high-skilled workers. Firms that do not find it profitable to choose the high technology might still find it profitable to use the medium technology and to hire the medium-skilled workers. This might be possible because the medium technology firms pay a lower wage to their workers.

As in Melitz (2003), firms must incur a fixed exporting cost and hence at a sufficiently high level of the latter, only high-productivity firms find it profitable to export. If trading costs are reduced, more firms adopt the better technology, which leads to an improvement in sectoral productivity.⁶⁹ It is interesting to note that a reduction in trade barriers even between identical countries raises the relative demand for skilled workers and the skill premium.⁷⁰

(c) Empirical evidence

The interplay of differences between firms and fixed market entry costs represents the main driver of the Melitz model. As discussed in Section C.3.a, highly detailed data on trading relationships for the United States and France confirm the prevalence of differences at the firm level and also corroborate the existence of destination-specific fixed costs for exporting. In line with these observations, the predictions of the Melitz model both in regard to productivity gains and expected trade patterns have received considerable empirical support.

By comparing pre- and post-liberalization situations, a range of studies have examined the impact of trade reform on average industry productivities and the driving forces behind such developments

– in particular, the rates of firm survival and the relationship between plant productivity and the likelihood of firms to exit the market when confronted with increased competition.

Bernard et al. (2006b) test the predictions of the Melitz model on a panel of approximately 234,000 plants in 337 US manufacturing industries for the 1987 to 1997 period. They find that lower trade costs (resulting from an assumed reciprocal decrease in tariff and freight rates) indeed lead to higher aggregate industry productivity growth. In line with heterogeneous firm theory of intra-industry trade (Melitz, 2003; Bernard et al., 2003; Yeaple, 2005), the probability that a plant will go out of business rises with falling trade costs, and this probability is lower for high-productivity plants.⁷¹ Hence, the exit of lower-productivity firms provides an explanation for the rise in average industry productivity. Baggs et al (2002) are able to obtain similar results in relation to plant survival and sectoral productivity improvements for Canada in the context of the Canada-US Free Trade Agreement (between 1984 and 1998) and Muendler (2004) for Brazil in relation to liberalization efforts between 1989 and 1998.

In an attempt to distinguish the productivity impact of various economic policies, Eslava et al. (2005) find that it was trade opening, and not financial and tax reforms carried out simultaneously between 1982 and 1998, that increased the likelihood of firms exiting the market, in particular for low-productivity plants, and contributed substantially to overall productivity improvements in Colombia. Besides firm selection, Baggs et al. (2002) are also able to confirm a “share-shifting” effect, with Canadian tariff reductions leading to a reallocation of labour resources towards more productive firms. Similarly, Pavcnik (2002) observes aggregate productivity improvements in most sectors in Chile following a range of liberalization measures taken between 1979 and 1986 and is able to attribute sectoral productivity growth to both the exit of less productive firms and the reallocation of resources and market shares from less to more productive firms. As mentioned above in Section C.2.c, Tybout and Westbrook (1995) also find some evidence for shifts in market shares towards more productive firms in Mexican manufacturing sectors that were comparatively more open to trade.

Most of these studies also estimate the impact of falling trade costs on plant level (as opposed to average industry) productivity, although no

such effects can be derived from the basic Melitz model.⁷² According to Bernard et al. (2006b), the data on US firms only give a weak indication that plant productivity goes up when trade costs come down. Pavcnik (2002) observes productivity gains for firms in import-competing sectors and an increasing productivity divergence compared with firms producing non-tradables, but does not find further productivity increases for exporters (which are, however, as expected, more productive initially). For Canada, the evidence is mixed as well, with plant productivity growth also depending on a firm's initial level of productivity (plants at lower productivity levels making further progress) and on the separate impact of US as opposed to Canada's own tariff reductions (leading to productivity increases in high and low-productivity firms respectively) (Baggs et al., 2002; Trefler, 2004).

In order to explain the effect of trade opening on plant productivity, certain assumptions of the Melitz model need to be modified. This is what Bustos (2007) attempts to do by allowing for the possibility that trade liberalization prompts firms to invest and upgrade their technology in order to improve their productivity, an idea first developed by Yeaple (2005), as presented in Section C.3.b above. Looking at a panel of about 1,400 Argentinian firms and at a phase of trade liberalization between Argentina and Brazil from 1992 to 1996, she finds that companies in sectors benefiting from a comparatively higher reduction in Brazil's tariffs were more likely to export and increase their technology spending than firms in industries where trade opening was less ambitious. By demonstrating that both existing and new exporters seek to increase their productivity, she is also able to establish that when tariffs come down, it is the prospect of higher revenues from exporting that causes firms to invest in better technology rather than an exposure to new techniques and know-how from abroad.

Hence, Bustos (2007) shows both formally and empirically that the average productivity gains from trade at the sectoral level are not only explained by the exit of less productive firms (selection effect) and an expansion of market shares of the more productive firms (share-shifting effect) but also by the positive impact of participation in export markets on firm-level performance. A "learning-by-exporting" effect on firm-level performance has also been confirmed for a number of other emerging economies.⁷³ However, her approach only explains productivity improvements of highly productive firms targeting new export

opportunities, although technology upgrading could also play a role in helping firms at lower productivity levels to avoid exit from the market and, therefore, counter the selection effect to some extent.⁷⁴

Besides productivity gains, a second principal line of empirical research has shown that the Melitz model can best explain the hitherto neglected observation that liberalization increases trade not only within existing trading relationships ("intensive margin"), but also via an increasing number of exporters that have not traded before or via exports to destinations not previously targeted ("extensive margin"). Two principal research strategies can be distinguished: studies using firm-level data and studies employing aggregate trade data and an amended gravity approach (see Box 6 in Section C.2.c) that accounts for the many zero trade flows observed in bilateral trading relationships. Some of the studies mentioned above, such as Bernard et al. (2006b) and Muendler (2004), which examine the impact of trade opening on US and Brazilian firms respectively, confirm the prediction of the Melitz model that trade may grow at the extensive margin.

More precisely, Muendler (2004) is able to corroborate Melitz's proposition that among the firms not previously exporting, it is the high-productivity firms that become exporters following a reduction of trade costs. Both studies also find evidence that liberalization increases trade at the intensive margin. Bernard et al. (2006b) find that plants in industries that have undergone a relatively more important decline in trade costs experience higher export growth, while Muendler (2004) shows that existing exporters abandon exporting less frequently than before liberalization.

The Melitz model also had an impact on how gravity estimations should be conducted and, in turn, such studies could be used to probe into the model's explanatory power. According to the Melitz model, the absence of trade may be the consequence of firms' decisions not to enter an export market if their productivity level is not high enough to ensure that expected profits more than compensate for fixed market entry costs. Of course, zero trade may also be due to factors external to the firm, such as insufficient infrastructure. For these reasons, an assessment of the impact of liberalization and other policies on trade flows would be biased if only existing bilateral trade relationships were considered, as has long been the case, and/or if differences among firms were not taken into consideration.

Helpman et al. (2007) demonstrate that once zero trade flows are included in the estimations and the effects of trade barriers and country characteristics on the proportion of exporters are accounted for, higher trade volumes are not just a direct function of lower trade barriers. These higher volumes are also influenced in a more indirect manner by the increased proportion of firms that choose to export to any particular destination. The fact that the authors find these biases of traditional gravity estimations to be substantive provides strong support for Melitz's hypothesis on the importance of differences between firms in explaining international trade flows.

Baldwin and Harrigan (2007) use a gravity approach to determine which one of several theoretical approaches, including Melitz's specification of heterogeneous firms and Krugman's monopolistic competition model, most correctly predicts the effects of trade costs and country characteristics on the volumes and prices of internationally traded goods. The authors determine a higher probability of encountering zero trade flows with increasing distance and smaller market size and conclude that of the models examined, these results are consistent only with the Melitz model.

Baldwin and Harrigan also find that the positive relationship between export unit values and distance is only consistent with a more complex variant of the Melitz model, which is further discussed in the next sub-section (Melitz and Ottaviano, 2008). The latter model, however, predicts a negative relationship between the size of the destination market and the probability of exporting, in contrast to Baldwin and Harrigan's (2007) empirical results. The authors, therefore, propose their own adaptation of the basic Melitz model, which would also fit their finding regarding export unit values and in which firms are different in both quality and price. Firms producing high-quality/high-priced goods are most competitive and can more easily overcome distance-related trade costs, with the average goods prices in remote locations therefore being higher.

As this sub-section has shown, the Melitz model has been an important step forward in explaining observed trade patterns and the underlying gains from further trade opening. Furthermore, its basic framework has proven flexible enough to be extended in various directions and reconciled with other modelling techniques. This has allowed researchers to address a wider set of issues in

international trade, as will be discussed in the next sub-section.

(d) Extensions of the basic framework

Building on Melitz's basic ideas of differences among firms and fixed market entry costs, a number of authors have probed further into the presumed gains from liberalization and possible explanations of observed trade patterns.⁷⁵ Concerning the former issue, the question has been raised as to whether and how the predicted average productivity gains can be squared with the types of gains in the Krugman model discussed in Section C.2.b. This question is particularly relevant in light of the fact that in the Melitz model either no such effects exist (e.g. pro-competitive impacts in terms of reduced firm mark-ups) or, in the case of variety, the effect on the number of available varieties for consumption is ambiguous.

The similarity between trading partners is another important limitation of the Melitz model. The predictions concerning the gains from trade may need to be qualified if countries are dissimilar in terms of size or level of development (as emphasized by the traditional approaches discussed in Section C.1). As far as trade patterns are concerned, the flexibility of Melitz's approach has allowed researchers to address the question of how sectoral characteristics and changes in the broader trading environment determine a firm's decisions to trade rather than set up foreign operations or obtain components from abroad via arm's-length international outsourcing or foreign direct investment (FDI).

Melitz and Ottaviano (2008) have created an encompassing framework that combines the channels for the welfare effects identified by the "new" trade theory with the productivity gains from the selection and reallocation effects among firms that are different. In particular, this framework emphasizes that trade opening leads to a tougher competitive environment also for the surviving firms in the sense that average mark-ups are reduced (and, hence, prices are lower).⁷⁶ This is the case, since, in Melitz and Ottaviano's parameterization of the model, the direct effect of foreign competition on firm-level mark-ups outweighs the selection and share-shifting effects, leading to the survival of only the relatively more productive firms (with higher mark-ups than the less productive firms who exit).⁷⁷

Using data on several hundreds of thousands of firms from 11 European countries and 18 manufacturing sectors over the 1994 to 2003 period, Del Gatto et al. (2006) show that Melitz and Ottaviano's (2008) parameterization of the model is appropriate.⁷⁸ They then apply this model, asking by how much productivity and other performance variables would deteriorate if Europe was still in a state of autarky. Carrying out a simulation with prohibitive tariffs, they find that the costs of "Non-Europe" would be equivalent to a 13 per cent lower level of productivity, 16 per cent higher mark-ups and prices and 23 per cent lower profits on average. Starting from this hypothetical situation, they then examine the effect of a 5 per cent reduction in international trade barriers and obtain an overall productivity gain of 2 per cent along with a decrease in average mark-ups and prices of 2 per cent as well as an increase of average profits by almost 5 per cent.

Falvey et al. (2006b) extend Melitz's model in order to address the important question of whether the gains from trade with firms that are different remain invariably positive when the countries involved are of different sizes and at different levels of development. Regarding the latter, it is assumed that one country has a generally superior technology than the other, i.e. there are not only efficiency differences between firms but also differences at the national level. It turns out that opening up to trade generates the usual productivity effects in both countries, but that the distribution of gains across countries depends on their relative size and, in particular, their levels of technology. As far as size differences are concerned, the "home-market effect" (see Sections B.2 and C.1) is at work with a concentration of industry in the larger market, which also becomes a net exporter of the differentiated product. However, it is interesting to note that better technology can improve the situation of the small country, and, vice versa, i.e. the industry in the larger country may decline if its technology is sufficiently backward.

The most interesting result is that if countries are at different levels of development, the positive productivity effects of trade liberalization may not materialize for the technological "laggard" country. When trade barriers come down, both countries lose part of their domestic market, but exporting firms usually more than make up for the loss. However, if one country is technologically more advanced, it is harder for foreign firms to conquer

that market than vice versa. If sufficiently large technological differences exist, the productivity gains for firms in the technological leader from new exporting opportunities may be so large that they overcompensate the benefit that exporters in the technologically backward country receive from a decline in trade costs and, thus, result in a loss of competitiveness of the latter.⁷⁹ However, for less pronounced technology differences between countries, both sides continue to benefit from reciprocal trade liberalization.

The question of whether the technological gap can be as large as to reverse productivity gains for the technological laggard remains an empirical matter.⁸⁰ Regrettably, with the required firm data being mostly limited to advanced economies (United States and a number of European countries), no case studies appear to exist for the moment that could appropriately assess the impact of liberalization between different countries using information at the firm level.

Helpman et al. (2004) extend the Melitz model by introducing several sectors (instead of only one), some of which are characterized by more firm heterogeneity than others. Their goal is to show that the extent of the differences among firms in productivity plays an important role in explaining the structure of international trade, notably the volume of FDI sales relative to the volume of exports. To that end, they assume the existence of more types of firms. In addition to the less productive firms that are active only in the domestic market and the exporting firms that supply both the domestic and export markets, the authors distinguish a third group of very productive firms that choose horizontal FDI⁸¹ instead of exporting to sell their products in the foreign market. The authors assume that setting up a foreign affiliate (involving costs for establishing a subsidiary, duplication of overhead production costs, etc.) is more expensive than exporting (which entails, for example, only the establishment of a distribution and servicing network).

This set-up allows Helpman et al to predict that the ratio of exports to FDI will be lower in sectors with higher transport costs (since these costs can be saved via FDI)⁸² and in sectors where plant-level returns to scale are relatively weak (since not much is lost if production is not concentrated in one country). The ratio of exports to FDI resulting from this "proximity to market" vs. "concentration"

trade-off is shown to further depend on the degree of differences in each sector, i.e. the variety of firm size (measured by domestic sales), which, among other things, depends on how firm productivity is dispersed.⁸³ Less dispersion implies that the mass of firms is concentrated at the low-productivity/high-cost end of the distribution.⁸⁴ In other words, the more heterogeneous the sector, the more equal is the distribution of firm productivities. This implies that there are relatively more highly productive firms, and these firms will access foreign markets via FDI rather than exports. The authors then test empirically whether these three factors can indeed be seen as key determinants of the observed cross-sector and cross-country variation in export sales relative to FDI flows.

Using export and FDI data of US firms in 38 countries and 52 industries and different measures of size dispersion, Helpman et al are able to confirm the predictions of their model. In particular, it appears that differences between firms constitute as important a dimension in explaining the observed trade-off between exports and FDI sales as tariffs and freight rates (i.e. costs of exporting) and plant-level fixed costs (proxy for the importance of economies of scale) decline.⁸⁵

Finally, the basic idea of differences in firm productivity has been combined with theories of organizational choice and location of production decisions in order to address the observed importance of vertical FDI and arm's-length trade of intermediate goods in certain sectors. The paper by Antras and Helpman (2004), which has already been mentioned in the context of fragmentation in Section C.1.d and the "industrial organization" aspects of which will be more fully explained in Section D.3.b, is built around the core features of the Melitz model.

According to Antras and Helpman, firms vary in their productivities and can either make or buy their intermediate inputs domestically or in a foreign country, with each of these four options being associated with different fixed costs. Outsourcing involves search costs and contractual issues,⁸⁶ while vertical FDI may imply an increased need for monitoring, communication and other management-related costs (so-called "diseconomies of scope"), with the former being assumed to be less costly than the latter, both at home and abroad. Similarly, it is assumed that both outsourcing and integration are cheaper to conduct domestically than in

connection with a foreign provider (i.e. arm's-length international outsourcing or going multinational via vertical FDI). In view of this ordering of fixed costs, firms with relatively higher productivities pursue vertical integration over outsourcing and only the most productive firms do so abroad (where, again, the relatively less productive firms outsource at arm's length and the more productive ones invest in a foreign subsidiary).

This framework allows Antras and Helpman to make predictions about how changes in the sectoral environment, such as trade opening, affect the prevalence of organizational forms and therefore also trade. For instance, a decline in trade costs abroad (or a lower wage rate) leads to more arm's-length international outsourcing and, to a lesser extent, more FDI, and trade volumes are bound to rise. An improvement in the institutional environment abroad may make FDI more attractive relative to arm's-length international outsourcing without affecting overall trade flows; conversely, a better institutional framework at home, while also making integration preferable over outsourcing, including abroad, still leads to a net reduction in imports.

Antras and Helpman's approach can also serve to explain how differences across sectors determine organizational choice and trade patterns. Similar to Helpman et al. (2004) in relation to horizontal FDI, the authors demonstrate that in industries with more productivity dispersion across firms, less outsourcing should be observed both domestically and abroad and more vertical FDI will be undertaken, which increases overall imports. In industries with a relatively higher importance of non-routine activities, such as R&D, that are less readily outsourced than marketing tasks, for example, the authors expect a lower proportion of firms to import components, with the share of FDI still going up relative to arm's-length imports. These issues will be further discussed in Section D.2.b, specifically in relation to offshoring.

This section has discussed yet another source of gains from intra-industry trade, namely productivity improvements at the industry level that come on top of the variety, scale and pro-competitive gains introduced in the preceding section C.2. The analysis has been made possible by the availability of detailed firm-level data confirming the existence of significant differences in firm characteristics and trading patterns. Although these gains are of a static nature (i.e. reflect a comparison of the

situation before and after trade opening in terms of resource allocation, product availability, prices etc.), access to a larger variety of intermediate inputs, increased market size and confrontation with foreign competition may also affect firms' incentives to innovate and invest in research and development.

In fact, some of the empirical studies reviewed in Section C.3.c have found evidence of increases in the productivity of individual firms following trade opening. With technological progress being the principal driver of long-term economic performance, trade has the potential to result in important dynamic gains as well. These issues will be examined in a comprehensive fashion in the following sub-section.

4. DYNAMIC GAINS

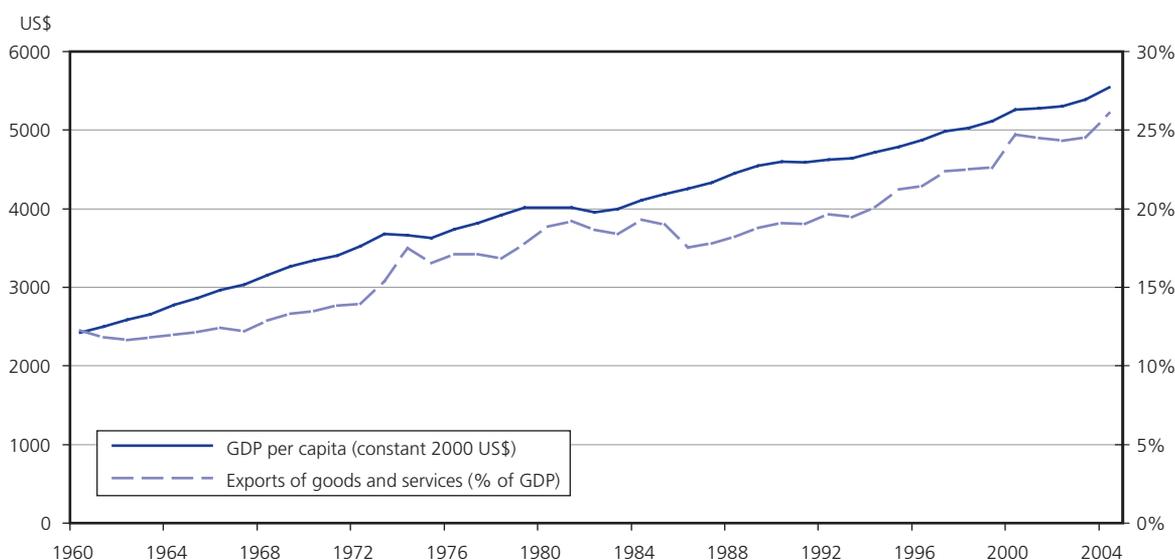
The analysis of the previous sub-sections has highlighted that in static approaches, the effect of trade liberalization is to increase real GDP at world prices. This is the result of an improved allocation of resources through specialization according to comparative advantage, exploitation of economies of scale and the selection of the most productive firms. But what happens when the analysis moves beyond a comparison of two static situations to consider

the more dynamic effects of policy changes? This sub-section will focus on the effects of trade on GDP growth, reviewing both the theoretical and the empirical literature.

(a) Trade and growth: an overview of theoretical predictions

The traditional theory of economic growth does not take international linkages into account. It is generally built on the assumption that countries produce and consume in isolation, so with no trade among them there can be no transfer of knowledge or technology across national borders associated with commercial relations. However, as discussed in Ventura (2005), the growth experiences of different world regions are intimately linked and cannot be analyzed in isolation. Three facts should be highlighted. First, the world economy has experienced positive growth for an extended period of time. Second, in the same period world trade has been growing at an even faster pace (see Chart 7). Third, the data illustrate a strong positive correlation between the growth of GDP and the growth in trade (see Chart 8). This correlation does not imply that one leads to the other,⁸⁷ but it reveals an important relationship between these two variables.

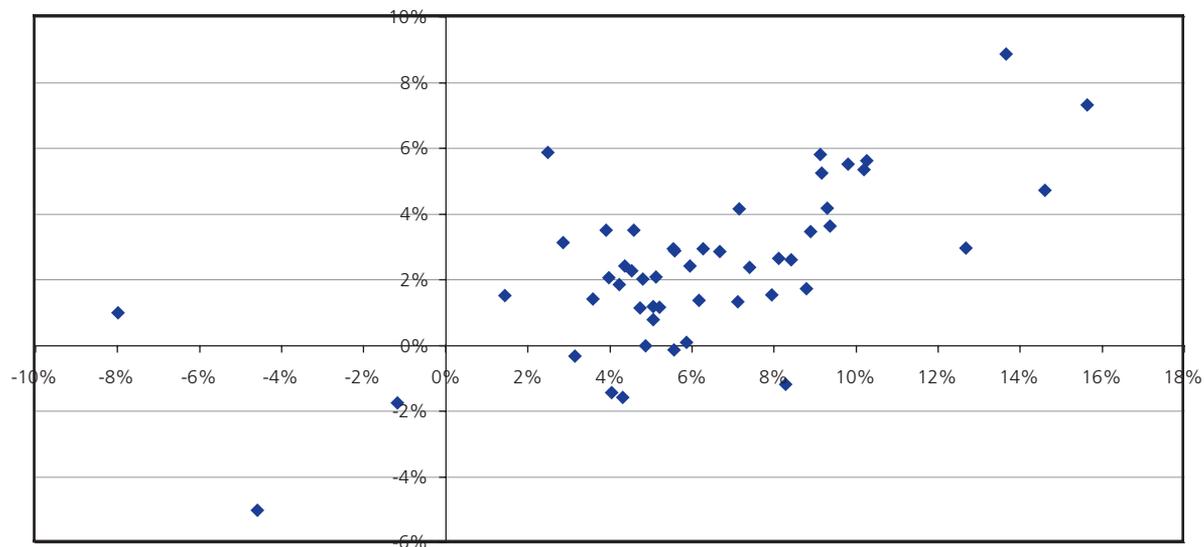
Chart 7
World GDP per capita and world exports, 1960-2004
(Per cent of GDP)



Notes: World GDP per capita is measured in constant 2000 US\$; World Exports contain goods and services exports and are presented as a share of World GDP.

Source: World Development Indicators 2007.

Chart 8
Growth in GDP per capita and in exports
 (Per cent of GDP)



Notes: GDP per capita growth is plotted against growth in exports of goods and services for different country groups as classified by the World Bank. These non-overlapping country groups are: East Asia & Pacific, High Income, Europe & Central Asia, Latin America & Caribbean, Middle East & North Africa, South Asia, Sub-Saharan Africa. The period covered is 1961-2005 and growth rates are averaged over five year intervals.
 Source: World Development Indicators 2007.

This sub-section begins by discussing models of international trade (in commodities and/or in intermediate goods) and economic growth where the latter is determined by the accumulation of factors of production, in particular investment in capital goods, such as machines and computers (also known as “models of exogenous growth”). These models help us understand how different forms of international trade (driven by differences in the abundance of factors of production or by technological comparative advantage) affect economic growth.

The key question of trade and growth is whether trade liberalization is responsible for higher growth rates. To address this issue, trade models have to

be employed that explicitly consider the factors determining technological progress (known as “endogenous growth models”) as technology is the engine of modern economic growth. Unfortunately, the predictions of endogenous growth literature are ambiguous and depend on the source of technological progress (“learning by doing” or innovation) and on assumptions about the diffusion of knowledge across countries. Therefore, whether the reduction of trade restrictions means higher growth is largely an empirical question, as discussed in Section C.4.b.

Box 8 reviews some basic findings of the theory of economic growth in a closed economy and clarifies some terminology that is used throughout this sub-section.

Box 8
Growth theory in a closed economy

Modern growth theory studies the factors determining growth of per capita output in the long term. Solow (1956) and Swan (1956) show that there must be a continual advance in technological knowledge in order to sustain a positive growth rate in output per capita.

The Solow-Swan model focuses on the role of capital accumulation in the growth process. It assumes a single sector in the economy with a neoclassical aggregate production function (i.e. a technology that exhibits constant returns to scale in the factors of production, capital and labour) and diminishing returns in the accumulation of capital. This last property is crucial, as it implies

that by continuing to equip workers with more capital goods, a point will eventually be reached where additional capital becomes redundant. In this model, in the absence of technological progress (e.g. new and more efficient uses for capital), the effects of diminishing returns would eventually cause economic growth to cease. In other words, the neoclassical model of economic growth displays a sustained positive rate of growth in per capita output only in the presence of an exogenous improvement in technology (hence, the name “exogenous growth model”).

What shapes technological improvements and, therefore, long-term economic performance? Endogenous growth theory formalizes the determinants of technical progress and its role in the process of economic growth. Arrow (1962) provides a first attempt to explain technical change by assuming that growth in technology is an unintended by-product of the production of new capital (a phenomenon named “learning by doing”). Learning by doing allows growth in technology to become endogenous in the sense that increased capital accumulation (for instance, due to a surge in the propensity of saving in a country) would affect the rate of technological change and, therefore, the rate of GDP growth. One limitation of the learning by doing approach is that technological change does not depend on deliberate economic decisions.

Recent research provides an explanation of intentional investment in innovation based on a well known argument by Schumpeter (1942). New technologies provide market power and investment in innovation is motivated by the prospect of future profits. Romer (1986) employs a model of monopolistic competition (Dixit and Stiglitz, 1977; Ethier, 1982) where there is a continuum of intermediate goods used in the production of the final good. Each intermediate good is produced by a local monopolist. Romer shows that growth in technology in this framework is the result of a continuous increase in the variety of intermediate goods. The underlying assumption is that a

large number of intermediate inputs raises the productivity of capital and labour (for instance, because of the increased specialization of labour across an increasing variety of activities). Romer (1990) extends this model by assuming that inventing new goods (by investing in R&D) is an intentional economic activity motivated by the pursuit of profits. Firms that intend to enter a new intermediate sector must pay a sunk cost of product development, which is compensated by monopoly profits (rents). This model exhibits increasing returns to scale in the intermediate good sector and endogenous growth in output per capita.⁸⁸

In the Romer model, a technological innovation consists of a new good that does not displace existing goods (“horizontal innovations”). However, technical change can also take the form of an improvement in the quality of an existing good (“vertical innovation”) that makes old goods obsolete. This obsolescence (or “creative destruction”, as Schumpeter (1942) first referred to it) was initially formalized by Aghion and Howitt (1992) and Grossman and Helpman (1991). Growth is generated by the R&D activities of new entrants aimed at introducing higher-quality products in the market that will replace the products of incumbent firms. These two approaches (horizontal and vertical innovation) are best seen as complementary, as they describe different contexts in which technological progress takes place.

Recent developments in economic growth literature have emphasized the role of economic institutions (e.g. property rights) and political institutions (e.g. the form of government) in the growth process. The underlying idea is that these institutions affect the organization of production and shape the ability of firms to accumulate and innovate (or adopt more advanced technologies developed elsewhere) and, ultimately, determines the growth rate of a country (Acemoglu, 2008; Helpman, 2004).

i) Trade and factor accumulation

Models that analyze the effects of international trade on the accumulation of capital have two key insights. First, when economies are open, growth in one region cannot be analyzed in isolation from the growth experience of other regions. Second, the interaction between trade and growth depends on the nature of trade in which countries engage.

When international trade is in intermediate goods (i.e. trade in inputs used in production of final goods) and is determined by differences in relative factor abundance across countries (as in the model of Heckscher-Ohlin in Section C.1.b), the prices of factors are determined in world markets. In a world with free trade, factor prices equalize and each country (if small relative to the rest of the world) will take these prices as given when it makes accumulation decisions. This simple result has important implications for economic growth, as factor prices shape incentives to invest and accumulate capital.

In particular, as shown in Ventura (1997), the growth process in the presence of international trade can be quite different from that predicted by the (closed economy) neoclassical growth model. Even if an integrated world economy cannot sustain growth through capital accumulation only (i.e. it is still subject to the law of diminishing returns), periods of exceptional growth may be achieved by small open economies through savings and investment. If a small open economy adopts policies that increase its investment rate, it can accumulate capital without affecting its relative price (which is determined in international markets), thus avoiding diminishing returns due to capital accumulation.

As argued by Ventura, an example of this mechanism at work is the growth miracle of the East Asian tigers in the 1970s and 1980s, where small open economies were able to grow with high investment rates for an extended period of time. According to the predictions of the traditional neoclassical growth theory, rapid capital accumulation in East Asian countries should have been associated with falling rates of return on investment in new capital (the law of diminishing returns). However, international trade made the difference. As capital stock grew, resources were shifted into capital-intensive industries whose output was for a large share exported. This allowed an extended period of (export-led) growth.⁸⁹

The interaction between international trade and economic growth is different when trade is driven by technological comparative advantage (as in the model of Ricardo in Section C.1.a). Acemoglu and Ventura (2002) build a model where each country specializes in the production of a single intermediate good used in the production of a final good (the so-called Armington technology). This implies that countries are small relative to the global market, but have market power in the goods they supply to the rest of the world. In particular, each country affects its terms of trade (the price of imports relative to exports) by varying the amount of exports. If, for instance, an economy increases its supply of a good in the international market, the price of that good declines, implying a worsening of the terms of trade of the country (an increase in the price of imports relative to exports).

Consider the effect of rapid capital accumulation and, therefore, growth in an open economy relative to the rest of the world. Faster growth increases exports and worsens the terms of trade which, in turn, reduces the rate of return on capital and moderates incentives to accumulate. The same (but opposite) effect would be at work were a country to experience a fall in its growth performance relative to the rest of the world. In other words, a model of Ricardian trade and growth implies that open economies will tend to experience similar growth rates in the long term (clearly, similar growth rates do not necessarily entail similar income levels across different regions of the world).

A lesson that can be drawn from these models is that the type of international trade a country engages in shapes its growth performance and the dynamic effects of trade liberalization (Acemoglu, 2008). Countries that specialize in the production of standardized goods, exploiting relative abundance of a factor of production (e.g. unskilled labour) can expect to face sustained growth through the accumulation of capital (i.e. with high savings and investment rates) as predicted by the model of Ventura (1997). On the other hand, countries that trade in highly specialized sectors (e.g. high-tech industries), where they are likely to have some degree of market power, are likely to face terms of trade effects of the sort described in Acemoglu and Ventura (2002).

The models discussed in this sub-section predict important effects of international trade on economic growth. However, such effects are bound

to disappear in the long term. The reason is that these models do not take into account the role of international trade on the major factor determining the growth process (improvements in technology). This will be the focus of the next two sub-sections.

ii) Trade and learning by doing

Does international trade encourage sustained growth? As economic growth in the long term depends on technological advances, models of endogenous growth are needed to address this question. These models highlight the major factors determining technological progress, which in turn lead to improvements in the productive use of factors of production and growth. This sub-section starts by reviewing models that provide a sceptical answer to the question of the dynamic effects of trade liberalization (Young, 1991; Matsuyama, 1991; Galor and Mountford, 2006). The argument is based on the presence of learning by doing externalities in some sectors of the economy – that is, improvements in productivity in the overall economy engendered by the experience of producing in some specific sectors. The next sub-section analyzes the effects of international trade on incentives to innovate (i.e. to invent new or higher-quality goods and/or new or more efficient production processes).

Consider for simplicity a world with two countries (A and B) and two sectors (1 and 2). Sector 1 is characterized by some form of learning by doing externalities so that increasing production in this sector augments the overall productivity of the economy. Such opportunities are not present (or only to a smaller extent) in the other sector. Assume further that Country A has a small initial comparative advantage in the production of Sector 1. International trade in this economy leads each country to specialize fully in the sector in which it has a comparative advantage from the first period, implying static gains from trade (as in the standard Ricardian model). However, in subsequent periods, the productivity of the country specialized in Sector 1 (Country A) increases, while the productivity of the other country stagnates. The reason is that, by specializing in Sector 2, Country B loses the opportunity to exploit the learning by doing externalities of Sector 1.

In short, in these models with learning by doing, trade has different effects. The static benefits of international trade may come at the cost of dynamic losses for some countries and gains for

others. Because of initial conditions, trade prompts a number of countries to specialize in sectors of the economy with low growth potential. As a result, these countries may be negatively affected by opening their economies to international markets. These models are often mentioned as an argument in favour of trade restrictions in countries that fear dynamic losses from trade liberalization.

While it is a clear theoretical possibility, the relevance of the “wrong specialization” argument hinges on two assumptions that do not have strong empirical foundations. First, specialization in the “wrong” (or “right”) sectors is a permanent feature of trade relationships. However, as the example discussed for Chinese Taipei in Box 9 on “Success stories of export-led growth” shows, export structures may well change over time. Second, and more importantly, these models assume that knowledge does not flow across countries. However, as discussed in Section C.4.b, international trade is associated with an increase in knowledge spillovers. This implies that, contrary to what is predicted by these models, it is certainly possible that knowledge developed in Sector 1 in Country A positively affects productivity (and, therefore, growth) in both sectors in Country B.

iii) Trade and innovation

A different avenue through which trade can affect economic growth is by reinforcing or dampening incentives for firms to innovate. There are several mechanisms at work. First, trade liberalization increases the size of the market (scale effect). Second, to the extent that knowledge travels with the exchange of commodities and inputs, trade liberalization enlarges the scope of knowledge spillovers. Third, an increase in the degree of openness of an economy will typically enhance product market competition (competition effect). Fourth, decreasing trade barriers affect the distribution of production in different areas of the world (international product cycle). Last, trade liberalization may have an influence on institutions and government policies that shape economic incentives of firms. All these mechanisms affect economic growth through their effect on technical change.

Trade, market size and knowledge spillovers

The core message of groundbreaking work on endogenous growth in open economies is that trade

liberalization is conducive to an improvement in long-term economic performance (Rivera-Batiz and Romer, 1991; Grossman and Helpman, 1991). The effect of trade on growth in these models can be seen as the dynamic analogue to the static gains from trade of Krugman's model in Section C.2. Consider two economies trading intermediate goods used in the production of a final good. The possibility of freely trading with the other economy creates a larger market, thus increasing profitable opportunities for producers of intermediate goods. This greater profitability increases incentives to invest in R&D and translates into a higher rate of innovation (i.e. the rate at which new varieties are introduced) and a higher growth rate for the global economy.

This basic insight has been extended in a large number of directions. Some of these extensions reinforce the positive effect of trade on the pace of endogenous technical change. This is the case of models where inputs produced in one country increase the productivity of R&D in the other country after trade liberalization (international knowledge spillovers). In particular, if under free trade R&D activity in each country benefits from the discoveries made in other countries, trade liberalization will increase incentives for firms to engage in research, thus boosting economic growth. However, other extensions of this framework point to the presence of potential counteracting effects. These might originate from differences across countries in human capital (Grossman and Helpman, 1991), size (Feenstra, 1990) or the initial stock of knowledge (Devereux and Lapham, 1994).

Moreover, endogenous growth models do not take into account the differences between firms. As shown in Baldwin and Robert-Nicoud (2007), once firm-level differences are taken into account, trade can either increase or reduce the rate of innovation and, ultimately, economic growth. It is important to emphasize that, notwithstanding the presence of such counteracting effects, the ultimate result of trade on innovation may still be positive, provided that there are large international knowledge spillovers. This further motivates the significance of empirical investigations into cross-border knowledge flows (discussed in Section C.4.b).

Trade and competition

There is a general consensus that international trade reduces domestic firms' market power and that static gains are associated with this pro-competitive

effect (Helpman and Krugman, 1985). Whether an increase in competition associated with a wider exposure to international markets has positive effects on firms' incentives to innovate has been the object of a recent academic debate. From a theoretical point of view, this affect is ambiguous. The traditional work relating competition and growth dates back to Schumpeter (1942) and predicts that competition should reduce innovation as it lowers the monopoly rents that a successful innovator can expect to enjoy. However, several recent theoretical works show that competition can have positive effects on incentives to innovate. Aghion et al. (2005) build a model where firms may choose to invest more in R&D in an effort to escape competition. In this framework, more intense competition leads to higher R&D investment and innovation. Peretto (2003) obtains a similar result in a trade model where a reduction in tariffs increases firms' exposure to foreign competition and increases incentives to invest in cost-reducing innovation that allows firms to cut prices and acquire larger market shares.

Ultimately, the relationship between competition and innovation is an empirical question. The literature has pointed to a positive relationship between product market competition and innovation (Nickell, 1996; Blundell et al., 1999) and, more recently, to a hump-shaped relationship (Aghion et al., 2005), where the Schumpeterian (i.e. negative) effect on innovation tends to dominate only for high levels of competition. A possible interpretation of the available empirical evidence is provided by Aghion et al. (2005). They argue that the effect of competition on growth actually depends on the technological characteristics of a sector or an industry – specifically, the distance of the sector from the world technology frontier (i.e. the most advanced technology). In particular, the effects of lowering barriers to international trade on innovation and growth are positive overall, but trade liberalization may hurt some sectors that are further from the technology frontier (Aghion and Griffith, 2007).

Trade, innovation and imitation

The discussion up to now has focused mostly on the effects on innovation of trade between similar countries. However, international trade also links countries that are at different stages of development and this type of "North-South" trade is the fastest growing component of world trade. Accordingly, an important question is whether trade between

countries at different stages of development fosters world growth.

An important empirical fact is that most innovations take place in a small number of advanced economies and are later transferred to the rest of the world.⁹⁰ The presence of international trade enriches the process of technology diffusion in several ways. In particular, trade determines a process of an “international product cycle”, whereby certain innovative products previously produced in technologically advanced economies are imitated and produced in less developed countries. A case has been made both for and against strong intellectual property rights (IPRs). On the one hand, less imitation stimulates new inventions by increasing the expected reward to innovators. But on the other hand, this raises the cost of innovation by increasing wages in more advanced economies (as more production will be carried out there) and by limiting the entry of new competitors (Helpman, 1993; Maskus, 2000).⁹¹ Recent cross-country evidence, however, generally points to a positive effect of IPR protection on growth and on investment in physical capital and R&D (Gould and Gruben, 1996; Ginarte and Park, 1997; Kanwar and Evenson, 2003; Falvey et al., 2006a).

Another important consideration relates to the fact that less advanced economies have different technological needs from more advanced countries and that innovations developed in the latter group may be inappropriate for the former (Acemoglu and Zilibotti, 2001). Weak IPRs in less advanced economies encourage firms in advanced nations to target the needs of their own markets, thus lowering productivity in sectors where developing countries are specialized. This negative growth effect may spill over to advanced economies, thus lowering world growth. Bonfiglioli and Gancia (2007) formalize this mechanism and provide supporting evidence. Overall, this literature suggests that a proper design of IPR rules may well foster beneficial technical change and increase growth (Maskus, 2000).

Trade, institutions and policies

The quality of the institutional framework has long been recognised as an important component of a well-functioning market. A large number of recent studies highlight the importance of a sound institutional framework for economic growth (see Box 8). Countries with “better institutions” tend to invest more in infrastructure, training and education, are more efficient in this respect and innovate more.

A key question is whether trade can have a positive effect on institutions that promote growth (Rodrik, 2000b). Several direct and indirect channels may be at work. First, trade reform may imply adoption of external requirements. For instance, membership of the WTO requires the embracing of certain institutional norms (e.g. transparency in trade policy, and rules on industrial policy or property rights consistent with WTO provisions). Tang and Wei (2006) find that WTO/GATT accession has favourable effects on growth by committing countries to policy reform. Second, institutional reforms (and the preferences that underlie such reforms) may be the indirect consequence of the workings of market forces associated with trade. Acemoglu and Robinson (2005) show that democratization may result from changes in income distribution associated with trade liberalization. The empirical work of Rodrik et al. (2004) confirms that international trade has a positive impact on the institutional framework, thus suggesting that trade liberalization can indirectly enhance growth performance by improving institutional quality.

If trade can improve the institutional framework, its effect on government policies is in principle ambiguous. While economic integration is rapidly advancing, international political integration is advancing at a slower pace or not advancing at all. The increase in international spillovers associated with trade may prompt national governments to choose worse policies as they do not fully internalize the effects of their decision on the rest of the world (Ventura, 2005; Epifani and Gancia, 2008). An example is government subsidies, when at least part of these subsidies are redistributed by governments in response to rent seeking (i.e. activities of firms, such as lobbying or bribing, aimed at obtaining private benefits from policy-makers). When firms engage both in R&D and rent-seeking activities, trade liberalization – by increasing competition in the market – may prompt firms to increase their demands for public subsidies and, therefore, to devote more resources to rent-seeking and less to R&D. This shift from a productive to an unproductive activity may reduce innovation and growth (Brou and Ruta, 2007).

(b) Empirical evidence on trade and growth

The previous sub-section shows that, while the presumption is that free trade entails dynamic gains,

recent theoretical models point to the existence of several offsetting effects. The impact of trade policy on economic growth is thus an important empirical question, which is the focus of the present sub-section. This question is tackled from three points of view: the cross-country evidence on the impact of trade on growth rates, the microeconomic evidence on the effect of trade liberalization on firms' productivity, and the evidence on the relationship between trade and international knowledge spillovers. While the conclusions of the macroeconomic evidence have been questioned recently, the evidence on knowledge spillovers and firm productivity provides a more clear-cut (even if indirect) answer about the positive effect of international trade and growth.

i) Macroeconomic evidence (openness and growth in cross-country analyses)

As highlighted in the introduction, there is a high correlation between the rate of economic growth and the volume of international trade. However, these data do not necessarily imply that trade leads to growth. In the past few years, a large body of literature has investigated this relationship. Although many of these studies find a positive effect of several measures of international trade on economic growth, this macroeconomic literature can hardly be seen as conclusive.

Researchers have focused on two different trade-related indicators, namely trade volumes and trade policies. This distinction appears to be crucial, since changes in trade policy (e.g. changes in tariff rates) are often not accompanied by a change in trade volumes (Dollar and Kraay, 2002). On the other hand, a change in trade volumes can take place without a policy change (e.g. increased trade volumes due to a reduction in transport costs).

Trade volumes and economic growth

A number of studies (Sachs and Warner, 1995) find a positive relation between volumes of international trade and economic growth,⁹² even after taking into account other differences across countries and controlling for their effects. Moreover, the relationship appears to be extremely robust regarding different trade model specifications (Levine and Renelt, 1992) when considering all countries for which reasonable data are available. However, these studies do not provide a convincing answer when it

comes to determining whether trade causes faster growth or whether economies that grow quickly also trade more.

Recent work (Frankel and Romer, 1999; Ades and Glaeser, 1999; Alcalá and Ciccone, 2003; Alcalá and Ciccone, 2004) directly addresses this problem of causality using econometric techniques. In particular, Frankel and Romer (1999) find that higher volumes of trade drive economic growth. However, a consensus on the reliability of the results has not yet been reached. The method used by Frankel and Romer (1999) relies on the assumption that country geographical characteristics influence growth exclusively through the trade channel. However, critics of this approach – most notably Rodríguez and Rodrik (1999) – point out that geographical and other characteristics of countries may affect growth through various other channels (for instance, the presence of disease may affect public health, the quality of human capital and therefore growth performance).

Trade policy and economic growth

A different set of papers focuses on the link between trade policy and growth. This is obviously of interest as policies can be directly changed by governments. However, studies have shown mixed results. The main difficulty with this approach relates to the availability of suitable measures of trade policy. First, detailed data on trade restrictions are scarce before 1985. Second, many types of trade restrictions (tariffs, quotas, embargos, import and export licences etc.) are set up differently across countries. This implies substantial difficulties in systematically measuring these indicators of trade policy. Not surprisingly, results obtained in this literature have turned out to be dependent on the nature of the trade policy.

One example is the measure constructed by Sachs and Warner (1995) named “number of years of open economy”. Using this variable, Sachs and Warner (1995) found that trade openness is associated with higher growth rates. Several later studies confirmed this result (Sala-i-Martin, 1997; Fernandez et al., 2001). However, these findings strongly hinge on the fact that this trade openness indicator includes a black market premium on exchange rates and state export monopolies as trade barriers (Rodríguez and Rodrik, 1999). Without these variables, no conclusion on the relation between trade policy and growth can be drawn. More recently, Wacziarg

and Welch (2003) built an alternative measure of openness and report a robust positive relation between trade liberalization and growth. The main advantage of their measure is that it allows them to exploit not only differences across countries but also changes over time within countries.

Apart from the measurement challenges mentioned above, a debate continues on the existence of causal links and the direction of any causality (as already discussed for trade volumes). Since government policy responds to economic and political objectives, it cannot be viewed as independent and therefore the distinction between cause and effect is again not clear (Rodrik, 2005). Moreover, it is often difficult to disentangle the effects of trade liberalization from other domestic policies that governments may implement simultaneously and which may also have important effects on growth (Rodriguez and Rodrik, 1999).

ii) International knowledge spillovers

As the discussion of theoretical models emphasized, international knowledge spillovers are crucial for the realization of the dynamic gains from trade. An important area of empirical research investigates the relevance of international flows of knowledge, finding support for the proposition that R&D carried out in one country has positive effects on trading partners.⁹³

In order to study the importance of trade for the diffusion of international technology, a general approach of the empirical literature is to study the effect of foreign technology (as measured by foreign R&D, patents, etc.) on total productivity of the factors of production. The literature also stresses the importance of the sectoral composition of imports in determining technology spillovers. The empirical research distinguishes between imports originating from developed countries and those originating from developing countries, and between imports of technology-intensive goods and imports of non-technology-intensive goods. The idea is that imports originating from industrial countries have a higher embodied technology content than imports from developing countries. Similarly, imports of capital goods or imports of machinery and equipment have a higher average technological content than total manufacturing goods.

A benchmark study was conducted by Coe and Helpman (1995) in which they found that technological spillovers are higher when a country imports relatively more from high rather than low-knowledge countries (i.e. there is an import composition effect). Second, they concluded that, for a given composition of imports, technology transferred from abroad is greater the higher the overall level of imports. Coe et al. (1997) extend this analysis to examine the diffusion of technology from highly industrialized countries to 77 developing countries. They show that total factor productivity in developing countries is positively and significantly related to the R&D in their industrial country trading partners. They show that this effect is stronger when employing machinery and equipment import data as opposed to overall manufacturing or total (goods and services) import data. Several other studies confirm that international knowledge spillovers are more important when imports have a larger content of capital goods and machinery (Xu and Wang, 1999; Gera et al., 1999).

In addition to the “direct” (i.e. bilateral) R&D spillovers which are related to the level of R&D produced by the trading partner, “indirect” spillovers may exist even if countries do not trade with each other. A simple example clarifies this point. Assume that there are three countries: A, B and C. It is possible that Country A benefits from the technology produced in Country C, without importing from this source, if Country B trades both with A and C. Lumenga-Neso et al. (2005) find that “indirect” trade-related spillovers are empirically as important as the “direct” ones discussed above. This result points out the importance of an open multilateral trading system for the diffusion of technology, as what matters is not how much knowledge a country’s trading partner produces but how much knowledge the trading partner has access to through trade relations with the rest of the world.

Some empirical studies that examine the evidence of international technology diffusion use patent data (rather than R&D statistics) as a measure of technology transfer. Sjöholm (1996) examines citations in patent applications of Swedish firms to patents owned by inventors in other countries. He finds a positive correlation between Swedish patent citations and bilateral imports, a result consistent with the hypothesis that imports contribute to international knowledge spillovers. Branstetter (2001) extends this technique to consider firms

both in the United States and Japan. This study highlights the possibility that knowledge spillovers may be asymmetric – that is, while there is no evidence that American firms benefit from the R&D activity of Japanese firms, the reverse is generally true. Finally, Bottazzi and Peri (2007) find evidence that R&D in the United States increases patent applications in trading partners. Their data suggest that such effects are stronger after five to ten years (i.e. there is a delay in the diffusion of knowledge spillovers).

iii) Microeconomic evidence (trade and firm productivity)

Recent evidence on the relation between trade and productivity growth focuses on firm-level data. The effects of trade policy reforms are an essential indicator of what is happening to an economy as a whole, as aggregate growth is a reflection of improvements at the firm level. While the debate on the macroeconomic effects of trade on growth is still quite open, the microeconomic evidence provides more clear-cut answers on the dynamic gains from trade.

Firms that engage in exporting are generally more productive than non-exporters. An important question is whether exporting has a direct impact on firms' productivity (and, hence, on economic growth). A related question concerns the effects of trade liberalization episodes on the productivity of domestic firms. These issues are briefly considered below (for more extensive analysis, see Section C.3).

Early studies find no evidence of improved productivity at the plant level as a result of beginning to export (Bernard and Jensen, 1999; Clerides et al., 1998). However, more recent research using firm-level data from several developing countries reveals that exporting is associated with a boost in firms' productivity.⁹⁴ These findings may suggest that the aggregate gains from exporting are larger for emerging market economies than they are for advanced countries due to the presence of some form of "learning by exporting". In addition, several studies conducted for different trade liberalization episodes in both developed and developing countries provide new evidence on the positive effects of trade on firm productivity.⁹⁵

Box 9 Success stories of export-led growth

A series of important studies in the early 1970s demonstrated the high cost of protectionism in developing countries (Little et al., 1970; Balassa and Associates, 1971). They set in motion a major rethinking of the role of trade in development. The idea that trade can become an engine of growth was accentuated by the success of a number of economies in East Asia. Starting in the 1960s, Chinese Taipei, South Korea, Hong Kong and Singapore used exports to promote sustained growth and industrial transformation, as Japan did at the end of World War II. While these five countries represent only 4 per cent of the world population, they have become an important pillar of the modern industrial world and of the international trading system in a short period of time. Firms from this region are leaders in industries such as electronics, shipbuilding and automobiles and overall these five economies continue to grow faster than many other industrialized countries.

Once these economies moved away from import-substitution regimes and made firm commitments to more export-oriented and outward-looking policies, the pressure of global competition pushed them to keep costs low and to achieve higher and higher levels of performance. Coupled with other important ingredients (e.g. efficient administration based on merit, a large labour force eager to improve its skills and living standards, large levels of aid from international organizations and technology transfers from the United States), this policy shift resulted in export growth rates reaching 20 per cent (or more) per year over extended periods of time. According to Vogel (2008), the response to the challenges generated by more outward-oriented policies created a "virtuous circle". Companies and workers increased their effort to learn more, improve standards, boost productivity and absorb new technologies. The ability to compete in international markets increased confidence, which fuelled new rounds of efforts and success. In each round, more

Changes in the product structure of Chinese Taipei's merchandise exports, 1963-2003

(Percentage shares)

	1963	1973	1983	1993	2003
Agricultural products	59.3	15.4	8.0	5.1	2.5
Mining products	2.7	0.9	2.4	1.7	3.5
Manufactures	38.0	83.6	89.1	93.0	93.7
Iron and steel	3.0	1.3	2.5	1.6	3.9
Chemicals	5.1	1.5	2.4	5.1	8.1
Other semi-manufactures	11.7	12.1	11.6	9.6	6.8
Machinery and transport equipment	1.5	23.5	26.2	44.4	55.7
Office and telecom equipment	0.3	16.3	13.9	23.8	35.8
Electrical machinery and apparatus	0.3	2.7	3.6	6.5	8.1
Textiles	11.7	12.8	7.2	9.6	6.2
Clothing	3.0	16.1	11.9	4.4	1.4
Other consumer goods	1.8	16.3	27.4	18.4	11.6

Source: WTO Secretariat.

advanced knowledge, technologies and skills were acquired that allowed these countries to specialize in new sectors.

Chinese Taipei exemplifies this virtuous circle. In the 1960s it turned from traditional import substitution to a strong export-oriented development strategy. This policy shift led to increases in the average ratio of exports to GNP from 8.8 per cent in the 1950s to 18.5 per cent in the 1960s, 42.4 per cent in the 1970s and 50.3 per cent in the 1980s. Average GNP growth rates were 10.2 per cent in the 1960s, 8.9 per cent in the 1970s and 7.6 per cent in the 1980s. The table above shows how economic growth was accompanied by a change in the economy's export structure, moving away from agricultural products and textiles in the 1960s to clothes and "other consumer goods" (including toys and watches) in the 1970s and 1980s, and finally to office and telecom equipment in the 1990s. This indicates that international trade can play an important role in shifting an economy's resources into the most dynamic economic activities.

The most vibrant economy of recent years has been undoubtedly China. From 2000 to 2007, it alone accounted for 13 per cent of the world growth in output. This contribution is likely to increase in the next two decades according to recent estimates (Winters and Yusuf, 2007). From a historical perspective, the growth of China is unprecedented. When growth in the United States reached its peak in the middle of the 19th century, income doubled within a single generation. At current growth rates, income in China would rise a hundredfold within one generation. Similarly, the increase in China's share of world exports has no historical precedent. Analysts debate the extent to which the performance of the Chinese economy is export-led. There is little doubt, however, that its growth process shares important similarities with the economic history of the other East Asian success stories. First, the take-off coincided with a shift towards outward-oriented policies. Second, China has demonstrated over time the ability to upgrade its performance in more technologically advanced sectors.

5. CONCLUSIONS

Two centuries of economic research on trade have substantially improved our understanding of the gains from trade and thus the causes of trade. An overview of the economic literature shows that early contributions are still relevant but that they are insufficient. New theories have been developed

to account for new forms of trade and for new information on trade. The old, the new and the "new new" theories should be seen as primarily complementary. No single cause can explain the complex trading relations that we observe today. In 2017, economists will celebrate the anniversary of the first publication of David Ricardo's "Principles of political economy and taxation". After two

centuries they still consider the law of comparative advantage as one of the most important results in economics and perhaps even the “only proposition in social sciences that is both true and non-trivial”.

As explained, one of the main contributions of the law of comparative advantage has been to point out the fact that there are many more circumstances under which international trade is beneficial than most people appreciate. More recent theories have provided further causes for trade, identifying gains that can explain trade flows left unexplained by the traditional model. Recent empirical work confirms that beyond differences in technology and differences in endowments, other factors play an important role in the explanation of trade patterns. Finally, traditional and new trade theories have been extended to analyze the dynamic effects of trade on the economy. This line of research points out that another cause of international trade is its potential to enhance economic growth.

The overview of trade literature undertaken in this section focused on the causes of trade. It only touched upon a number of very important issues that trade models also address. Patterns of trade were only discussed in relation to the causes of trade. Patterns of trade will be discussed in more detail in Section D, which focuses on two phenomena that deeply affect trade flows: the geographical concentration of production and the fragmentation of the production process. Also, the predictions of the trade models regarding the distribution of income will be addressed in Section E. Finally, policy issues are addressed in Section F. The results reviewed in this section and the models presented will serve as a basis for these discussions. Table 7 below provides a summary of some of the basic characteristics of the trade models that were reviewed. It should facilitate the reading of subsequent sections.

Table 7
Trade theories

	Traditional trade theory Ricardo, Heckscher-Ohlin	“New” trade theory Krugman(1980)	Heterogeneous firms models Melitz (2003)
Gains from trade (causes)			
Specialization	Yes	No	No
Economies of scale	No	Yes	Yes
Pro-competitive	No	Yes	No
Variety	No	Yes	No ¹
Aggregate productivity (through selection/ reallocation)	No	No ²	Yes
Trade patterns			
Inter-industry	Yes	No	No
Intra-industry	No	Yes	Yes
Exporters and non-exporters within industries	No	No	Yes
Distribution			
Trade liberalization affects relative factor rewards	Yes	No	No

¹ Variety effects are ambiguous. See Section C.3.

² In the Krugman model, “productivity” in the integrated market also increases in the sense that the same total amount is produced at lower average cost due to exploitation of scale economies. However, the Krugman model is silent about which firms remain in business, since it does not include differences among firms. Once firms are distinguished according to their productivity level, as in the Melitz model, the exit of less productive firms itself leads to improvements in overall industry productivity.

Note: The table refers to the basic versions of the models (row 2). As discussed in the text, models that combine features from different approaches presented in the table have been developed.

Source: Based on Table 1 of Bernard et al. (2007a).

Endnotes

- 1 Normative trade theory is concerned with making welfare judgments about trade and trade related policies and events. (Corden, 1984)
- 2 For a simple explanation, see Markusen et al. (1995). For a more elaborate discussion, see Wong (1995).
- 3 This formulation is in Deardorff (2005a). See Corden (1984) for more details.
- 4 That is, production costs per unit of output are constant regardless of the level of output.
- 5 The assumptions required for perfect competition include the following: no supplier or consumer can affect prices (the complete absence of any monopolistic power in the market), any adjustment to change is instantaneous, and all consumers and producers are in possession of complete (perfect) information.
- 6 Externalities arise when economic activity produces effects that are not properly priced in the market place. A firm that pollutes the environment without paying for the social costs of pollution is generating a negative externality. A firm that generates new knowledge which others can avail themselves of without paying for the costs of generating the knowledge creates a positive externality.
- 7 Economies of scale arise when the cost of producing a unit of production falls with the level of output.
- 8 Sub-sections 2 and 3 consider other prominent theories that focus on different kinds of gains from trade and provide different explanations of the patterns and causes of trade.
- 9 The opportunity cost is the cost of choosing one option over another (sometimes the next best alternative).
- 10 Haberler (1930) showed that what is important for trade, the gains from trade, and comparative advantage, even in the Ricardian model, is not labor costs *per se*, but rather the opportunity cost, at the margin, of producing one good instead of the other. See Deardorff (2005b)
- 11 Dornbusch et al. (1977) simplified the Ricardian model with many goods. See Krugman and Obstfeld (2006).
- 12 This conclusion is not restricted to comparative advantage as embedded in the Ricardian model. It generalizes to comparative advantage embedded in the Heckscher-Ohlin model.
- 13 See Krugman and Obstfeld (2006) for a simple presentation of the Heckscher-Ohlin model and Jones and Neary (1984) for a formal derivation of the core propositions. Ethier (1984) states eight propositions reflecting the principal variants of these theorems.
- 14 See for instance Feenstra (2004), Bhagwati et al. (1998) and Ethier (1984).
- 15 “Stickiness” of prices (and wages) implies that these are not completely flexible. In other words, prices do not adjust quickly and “clear” markets, i.e. equilibrate supply and demand.
- 16 The effects of the three types of distortions are discussed in Bhagwati et al. (1998).
- 17 They test the Ricardo-Haberler-Deardorff theorem. This fully-specified multi-country, multi-good general equilibrium formulation of comparative advantage was developed by Deardorff (1980) and simply states that $p_{AT} > 0$ where p_A is a country’s N-good autarky price vector and T is its corresponding N-good net import vector. See Bernhofen (2005) for a summary of the test.
- 18 Kiyota (2007) suggest that the test of the law of comparative advantage by Bernhofen and Brown (2004) is not correct when trade is not balanced. They show that the empirical test of the law of comparative advantage sometimes fails when trade imbalance is taken into account.
- 19 As discussed below, empirical work on the Heckscher-Ohlin model highlights that technological differences are a major determinant of trade patterns.
- 20 Other explanations of the paradox included the fact that contrary to what Leontief assumed, US and foreign technologies are not the same, that the data for 1947 may be unusual because of the proximity to WWII or that the US was not engaged in free trade as the Heckscher Ohlin model assumes.
- 21 Trefler (1995) identified anomalies in the data which further research could aim to understand. In particular, he showed that measured net factor trade is approximately zero, a result he described as “the case of the missing trade”. See the overview of this literature in Davis and Weinstein (2003b).
- 22 The integrated equilibrium concept assumes that a world with imperfect mobility of factors of production across regions or countries may replicate the essential equilibrium of a fully integrated economy, provided that goods are perfectly mobile. This paradigm has played a central role in international economics.
- 23 Section C.1.e discusses how international factor movements fit into the theory of comparative advantage.
- 24 The model has two sectors (X, Y), two factors, labour L (immobile across nations) and K, which represents internationally-mobile capital services. K could represent managerial services that could be provided without any physical factor movement at all as in Deardorff (1985). X is labour-intensive, Y is intensive in capital services. .
- 25 As it is the case with models with more goods than factors, when both goods are tradeable there is a production indeterminacy due to the footlose nature of capital services.
- 26 An elasticity measures the responsiveness of one economic variable to another, usually comparing percentage changes. Here, an elasticity of unity implies that a one per cent increase in the trade of goods in related to a one per cent increase in services trade.
- 27 This sub-section draws on Baldwin (2006c).
- 28 The terms “intermediate goods”, “stages of manufacturing” or “production blocks” could be used instead of “tasks”.
- 29 See also the discussion of the contribution of the “new paradigm” to the explanation of the decision to offshore in Section D.
- 30 Consider a simple setting with 2 nations (H and F) and one final good, produced using two tasks. Assume H has a productivity edge over F in both tasks, and this edge is equal for both tasks (this rules out offshoring based on comparative advantage because H does not have a comparative advantage in either task). When it offshores a task to F, H uses its own technology. However, there are task-specific offshoring costs that deteriorate H’s technology when used in F. H firms will offshore a task if the wage gap (equal to the productivity gap in this framework) more than offsets offshoring costs. Offshoring will boost the real wage in H (productivity effect), while keeping the wage in F unchanged.
- 31 The traditional offshoring literature assumes that technology is country-specific, not firm-specific, so that a firm uses the technology of the country where it operates.

- ³² Krugman and Obstfeld (2006) discuss overall gains from trade in the specific factors model. Bhagwati et al. (1998) formally show that factor immobility cannot be an impediment to gains from trade. Free trade will still dominate autarky, because immobility between sectors eliminates the production gain but leaves open the consumption gain.
- ³³ These comparative statics results are formally derived in Bhagwati et al. (1998) for example.
- ³⁴ Markusen (1983) shows that trade and factor movements are complements when trade is caused by differences in demand, by increasing returns to scale, by imperfect competition or by domestic distortions.
- ³⁵ The Grubel-Lloyd index is calculated as $1 - \frac{|X - M|}{X + M}$, with X and M denoting exports and imports respectively. If, in a sector, a country is either only an exporter or only an importer, the second term will be equal to unity and, hence, the index will be zero, indicating the existence of inter-industry trade. Conversely, if in this sector, a country both exports and imports, the index will be closer to one the more similar in value imports and exports are.
- ³⁶ Helpman (1987) demonstrates that two countries of unequal size do not trade as much as two countries of similar size, holding constant the sum of both gross domestic products (GDP). Helpman's similarity index is defined as $1 - \left\{ \frac{GDP_i}{GDP_i + GDP_j} \right\}^2 - \left\{ \frac{GDP_j}{GDP_i + GDP_j} \right\}^2$, where GDP_i refers to real GDP. See Feenstra (2004: 146).
- ³⁷ In this section, only economies of scale internal to the firm are discussed, i.e. cost reductions depend only on the size of the firm itself. By contrast, average costs for any firm may also be lower the larger the industry to which it belongs (independently of the size of the individual firm). Such an industry is then characterized by external economies of scale. The concentration of an industry in one or few locations, like the semiconductor industry in Silicon Valley, will be further discussed below in Section D.2.
- ³⁸ Due to transport costs, the authors identify an optimal number and location of production sites. The trade-off between plant size and transport costs will be reverted to further below.
- ³⁹ To be clear on terminology, "differentiated product" refers to one type of product (say, ice-cream), for which different varieties exist (chocolate, vanilla, etc.). In other words, the term "varieties" refers to different forms of the same type of product.
- ⁴⁰ An oligopolistic market structure is likely to develop, where firms in their pricing decisions not only consider consumer demand, but also the expected responses of competitors to their behaviour. These responses, in turn, depend on competitors' expectations about the firm's pricing decisions and so on, giving rise to a complex web of strategic interactions. These issues do not affect the basic nature of the gains from trade in a setting with increasing returns of scale, while complicating matters tremendously.
- ⁴¹ This is known in the literature as the "zero profit condition".
- ⁴² For the moment, trade is supposed to be costless.
- ⁴³ The home market effect is further discussed in Section C.1.a.
- ⁴⁴ To maximize profits, a monopolist sets the price at a level, where marginal revenue equals marginal cost.
- ⁴⁵ In other words, with a lower market share in the foreign than domestic market, a firm's exports typically face a higher elasticity of demand than its domestic sales.
- ⁴⁶ The firm makes an additional profit as long as its exports sell at a price (net of trade costs) that, even if lower than the domestic price, is still higher than its marginal costs.
- ⁴⁷ Of course, by presuming Cournot competition, i.e. each firm expects that its own output decision will not affect the decisions of its rival, the model excludes the possibility that both former monopolists could collude and prevent mutual entry from happening.
- ⁴⁸ Krugman (1990) shows that these results continue to hold when there are more than just two firms.
- ⁴⁹ The underlying idea is the concept of consumer surplus. When a good is not available and demand is zero, it should be valued at its reservation price, i.e. the maximum price a buyer is willing to pay for it. When it appears in the market, there will be positive demand and the price will be less than the reservation price and the consumer welfare gain can be calculated as the area under the demand curve between the two price levels.
- ⁵⁰ Of course, the possibility that other varieties simultaneously disappear, leading to an increase in the price index, is also taken into account.
- ⁵¹ The median mark-up for the 21 developed countries in the sample is 1.60 and for the 21 developing countries it is around 1.90. This difference could be due to greater market uncertainty in light of which investors are likely to demand higher returns. Also, average tariffs tend to be higher and entry regulations more numerous in developing countries, which also explains the higher mark-ups.
- ⁵² The result that home and foreign tariff reductions have opposite effects on scale is consistent with the monopolistic competition model. Without foreign market opening, the market size for domestic producers stays unchanged, while the reduction of own tariffs increases the number of firms in the domestic market. The authors show that these patterns are also consistent with an oligopoly model of segmented markets and imperfect competition (Cournot) among firms, similar to the reciprocal dumping model discussed above, since home tariffs raise the delivered costs of foreign firms, inducing them to contract which and, hence, cause domestic firms to expand.
- ⁵³ The alternatives are the Armington model, i.e. national product differentiation by country of origin, and reciprocal dumping model with entry barriers respectively.
- ⁵⁴ In the terms of the authors, the monopolistic competition set-up is referred to as the "IRS" model indicating the existence of "increasing returns to scale" and product differentiation as opposed to the Heckscher-Ohlin framework assuming constant returns to scale ("CRS") and homogenous products. Their results reject the presumption of complete specialization for both the Heckscher-Ohlin and monopolistic competition models. Conversely, the authors find support for imperfect specialization of production among countries, whereby the degree of specialization is a function of relative factor abundance. In other words, the main comparison in the paper is between the Heckscher-Ohlin model with incomplete specialization and a framework that combines this approach for CRS goods with an IRS framework such that not all goods are assumed to be differentiated.
- ⁵⁵ This conclusion provides an explanation of the puzzle identified by Hummels and Levinsohn (1995) that was mentioned in the previous paragraph: the correlation between size similarity and trade volumes among OECD countries found by Helpman (1987) is due to the importance of IRS-based trade, while such a correlation among non-OECD countries can be explained with specialization driven by differences in relative factor endowments.
- ⁵⁶ For the time being, access to firm level data is still limited and the potential for improvement in this area

- is considerable. A first problem is mere existence of the data, as statistical agencies within countries must repeatedly perform firm-level surveys which are costly to administer. Second, if statistical agencies within a national government are decentralized, firm-specific information from one agency's survey (e.g., manufacturing activity) may be difficult to link to data collected by another agency (e.g., customs), let alone to data from surveys involving a different economic actor (e.g., matching individual-level surveys on labor market activity to firm-level surveys on manufacturing activity). Third, firm-level data that would be comparable across countries is in particularly short supply. For independent researchers, access to firm-level data is complicated for confidentiality reasons. In relatively concentrated industries, even using codes to mask the firm's name may not be sufficient as merely examining the data may reveal the identity of the firm. Firms would prefer this information not be available to the general public (more specifically, their competitors), as it may reveal details and confidential information about business strategies and trade secrets, for example. Thus, while the quality of firm-level data is quite high in the United States, the number of academic researchers working in this area is quite limited because of research barriers to entry demanded by such confidentiality concerns. For example, to access data on these firms from the US Bureau of the Census, non-government researchers have to go through a process of becoming government employees (nominally) and receive "Special Sworn Status," and even then access to the actual underlying data may be limited. Nevertheless, as the results of this exciting new area of research reveal, if more such data were collected and additional barriers to its access by economic researchers were removed, it would provide a tremendous amount of useful information with insights for policy formulation.
- This approach and results are consistent with Schott (2004), which exploits product-level US import data from high- and low-wage countries, showing that unit values within products vary systematically with exporter relative factor endowments and exporter production techniques – empirical facts that reject the factor proportions theory of specialization across products but which are consistent with such specialization within products. Nevertheless, the evidence on comparative advantage theory at the micro level may break down once we move across countries, as apparently the relationship between exporting and capital as well as skill intensity also holds in some developing country-level studies as well such as the one on Chile by Alvarez and Lopez (2005). This is inconsistent with a comparative-advantaged based theory that firms in such countries that would be taking advantage of relative endowment differences more intensively would be more unskilled labor intensive than non-exporting firms in developing countries.
- The technique used to estimate TFP is the one proposed by Olley and Pakes (1996). It is used to control for simultaneity. Simultaneity might occur, if a firm has private information and hence adjusts the factor demand to the change in its TFP.
- Examples of country-level studies include Colombia (Roberts and Tybout, 1997); Mexico, and Morocco (Clerides et al., 1998); France (Eaton et al., 2005); Germany (Bernard and Wagner, 2001); and Canada (Trefler, 2004).
- See Van Biesebroeck (2005), Aw et al. (2000) and De Loecker (2007).
- Mayer and Ottaviano (2007) provides evidence for several European countries while Bernard et al. (2007a) provide evidence for US firms.
- See the discussion in Sections C.3.c and C.4.b.
- We only have access to the top firms, which are selected according to the fulfilment of at least one of the following criteria: minimum Operating Revenue: €15m; minimum Total Assets: €30m; minimum number of employees: 200. This leaves us with a sample of 28621 firms.
- To clarify, this is not a comparison of import-competing firms, as this research is described in the next section. This section refers to the characteristics of US firms that purchase products from abroad, a segment of trading activity previously neglected in both empirical work and in most theoretical models of trade as well.
- If access to imported products leads to productivity gains to US firms (e.g., new technologies embodied in imported intermediate inputs), this may contribute one explanation to why exporting firms have higher productivity than non-exporting firms.
- The simplified presentation of the Melitz model in this subsection draws heavily on oral presentations of the model by Jeffrey Schott and Richard Baldwin at the WTO Secretariat.
- The number of varieties consumed in each nation falls if the fixed entry cost for imported varieties exceeds the fixed entry cost for local varieties.
- Competitiveness of the market implies, that each worker is paid her marginal product. Therefore the model generates an endogenous wage distribution.
- This follows the discussion of a fall in trade costs in Yeaple (2005).
- The skill premium refers to the extra income carried as a result of the level of skill embodied in jobs.
- The papers feature subtle differences as to how the relationship between the probability of exit and falling trade costs is modelled. However, these differences cannot be properly distinguished in empirical work, as acknowledged in Bernard et al. (2006b).
- To recall, in this model, average industry productivity increases as less productive firms exit the industry and not as a consequence of productivity increases in individual firms via technological change.
- See, for instance, Aw et al. (2000) for firms in Rep. of Korea and Chinese Taipei and De Loecker (2007) in regard to Slovenian firms. Van Biesebroeck (2005) obtains similar results for a panel of firms in Sub-Saharan Africa.
- Such an approach may be one way to explain the productivity improvements of lower productivity and import-competing firms following trade opening observed by Baggs et al. (2002) and Pavcnik (2002).
- To recall, both types of questions focus on the rationale for international trade: (i) If countries trade, what are the specific gains they expect; and (ii), what other factors determine the decision to trade.
- Essentially, trade opening increases market size. The observation that selection is tougher in larger markets has been made by Syverson (2008) who has focused on the effects of US market size (across regions) on the distribution of US establishments. He finds further support for the existence of larger average plant sizes in larger markets along with higher average plant productivity and lower average prices.
- Of course, for surviving firms, average firm size and total profits increase, as does product variety for consumers.
- Combes et al. (2007) show that Melitz and Ottaviano's (2008) results do not depend on the chosen parameterization.
- This "overcompensation" can only happen in the model if the technological laggard is at the same time the larger country.

- ⁸⁰ Unlike welfare effects of reductions in trade costs, which can be positive or negative for one of the countries depending on the technological gap, Demidova (2006) notes that in this model productivity improvements in one country invariably result in welfare losses in the other country. This is the case, as an improvement in a partner's productivity, other things equal, leads not only to a reduction in the production of the differentiated product, but also to a fall in consumed varieties, since the fall in consumption of domestic varieties is not fully compensated for by increases in consumption of foreign varieties. However, she also emphasizes that this result is only valid when both countries produce varieties of the differentiated product. If one country specializes in a different (here: homogenous) product, productivity improvements by its partner in producing the differentiated product increases its own welfare via improved terms of trade.
- ⁸¹ "Horizontal" refers to the same stage of processing, while "vertical" refers to different stages of processing, i.e. the production of intermediate inputs for further use in the production of final products.
- ⁸² The same is true the higher the fixed costs of exporting are in relation to the additional costs of investing in a foreign country.
- ⁸³ For early work on multinational enterprises stressing the proximity vs. concentration trade-off see Brainard (1997) and Markusen (1995). See also the discussion in Section D.1.
- ⁸⁴ Underlying is a Pareto-distribution, which is well-suited to describe phenomena like wealth or performance, where only few individuals achieve the highest values and a large mass is concentrated at the low end.
- ⁸⁵ A range of robustness tests is conducted employing a range of industry-specific control variables and estimation methods that, for instance, allow for the possibility of affiliates re-exporting a portion of their production abroad to third country, i.e. interdependence between a firm's decision to operate an affiliate in one country and its decision to locate affiliates in other countries.
- ⁸⁶ More precisely, a contract is likely to be incomplete since for reasons of asymmetric information and transaction costs, not all possible contingencies can be foreseen and included in the contract. Ex-post, i.e. once the contract is concluded (and "relationship-specific" investments have been made), both sides have an incentive to "defect" on certain promises they made and renegotiate. Such problems can be avoided if a supplier is integrated in a company and management can exercise vertical control over the supply chain.
- ⁸⁷ Refer to Section C.4.b for a discussion of this point.
- ⁸⁸ For an extended discussion of recent contributions based on the Romer model, see Gancia and Zilibotti (2005).
- ⁸⁹ For further discussion on the economic performance of East Asian countries, refer to Box 9 on "Success stories of export-led growth".
- ⁹⁰ For recent evidence see the Global Economic Prospect, World Bank (2008).
- ⁹¹ A number of other papers find that this result depends on the specific channel of technology transfer as FDI and licensing (Glass and Saggi, 1998; Lai, 1998; Yang and Maskus, 2001).
- ⁹² This is often measured as exports plus imports as a ratio of GDP, or simply as the ratio of exports to GDP.
- ⁹³ See Keller (2004) for an extensive review.
- ⁹⁴ E.g. Aw et al. (2000), Van Biesebroeck (2005), etc., discussed in Section C.3.a.
- ⁹⁵ E.g. Pavcnik (2002), Trefler (2004), etc., examined in Section C.3.c.

D TRADE, THE LOCATION OF PRODUCTION AND THE INDUSTRIAL ORGANIZATION OF FIRMS

Section C has explored the possible reasons why countries trade and highlighted how different modelling approaches, based on comparative advantages or on economies of scale, explain different types of trade: inter-industry trade among different countries and intra-industry trade among similar countries. Traditional trade models and the so-called “new” trade theory models can predict which countries will specialize in the production of certain goods and how many varieties of the same product they will exchange. However, they cannot predict the location decisions of firms. Further, they assume that production takes place within the boundaries of the firm. Therefore, they can neither explain why production is not randomly distributed in space nor what determines the decision of a firm to outsource.

Trade depends on where the production of goods and services takes place and how the production process is organized. Both decisions are internal to the firm. By internalizing the location decision and the organizational decisions of firms into trade models, the new economic geography literature and the recent literature on offshoring provide explanations for two empirical phenomena: the geographical concentration of production in some locations, and the process of international fragmentation of production through the breaking-up of the supply chain. This section examines these phenomena.

Although apparently contrasting, these two phenomena can co-exist. It is not uncommon that firms in certain business lines locate in the same neighbourhood. The pre-existence of a large market that can facilitate the search for the appropriate suppliers or the workers with the appropriate skills can be the reason why firms agglomerate in a certain region. For example, a textile district, a furniture district and so on can be found in the same neighbourhood in northern Italy. This phenomenon can co-exist with a firm’s decision to spread different stages of the production process across different countries. For example, firms in the textile business may opt to leave their headquarters and design activities in the north of Italy, while sourcing the manufacturing activity from a foreign firm.

A common denominator in both these phenomena is the role of trade costs. Reduction in trade costs can be an important cause of both agglomeration and fragmentation. But the extent to which they are compatible has not yet been explored in economic literature. On the one hand, the new economic geography literature predicts that a fall in trade costs will lead to an initially greater geographical concentration of production and a subsequent reduction of concentration as trade costs fall to a sufficiently low level. On the other hand, recent theories of fragmentation predict that a reduction in trade costs will lead to greater fragmentation of production, with firms geographically spreading the different stages of their production process. Much in the same way as high trade costs in trading final goods imply that goods are made in the same country where they are consumed, high trade costs associated with parts and components imply that inputs are produced in the same country where they are processed. When trade costs of final goods fall, production and consumption can take place in different locations. Similarly, when trade costs of intermediate inputs fall, different stages of the production process can take place in different places.

This section will present existing evidence on the fall of transport costs and will clarify how widespread the phenomena of agglomeration and fragmentation are and what are their driving forces. In particular, it will explore the implications for patterns of trade and predictions in terms of the intra-firm versus arm’s-length trade.

1. FALLING INTERNATIONAL TRADE COSTS

A broad definition of trade costs includes policy barriers (tariffs and non-tariff barriers), transportation costs (freight and time costs) as well as communication costs and other information costs, enforcement costs, exchange rate costs, legal and regulatory costs and local distribution costs. In terms of an *ad valorem* tax equivalent, international trade costs have been estimated to represent 74 per cent and local distributional costs 55 per cent (Anderson and van Wincoop, 2004). This section focuses on international trade costs and reviews the evidence on their evolution over time.

(a) Tariffs

The contribution of tariffs to total trade costs has decreased over time. Tariffs have progressively been reduced since the establishment of the General Agreement on Tariffs and Trade (GATT) in 1948. Estimates based on a sample of developed countries show that the average import tariff fell from approximately 14 per cent in 1952 to 3.9 per cent in 2005. A plausible guess for the tariff average prevailing before the Geneva Round of negotiations (1947) is that “in 1947 the average tariff rate was situated between 20 and 30 per cent” (WTO, 2007c).

Tariffs went down for both developed and developing countries. The formation of the European Union (EU) and the North American Free Trade Agreement (NAFTA) accounted for most of the tariff reductions among developed countries. An important contribution has also been provided by preferential tariff treatment in favour of least-developed countries (LDCs), bringing duty-free access for most of them to major developed countries.

It is worth highlighting that nominal tariff cuts may be reflected in more important reductions in the effectively applied rates in vertically fragmented processes. For a given tariff cut worldwide, the reduction in total trade costs due to tariff barriers is more important the higher the number of times a product crosses the border during its different production stages. For example, if the value added in each intermediate production stage is assumed to be infinitesimally small, a 1 per cent tariff reduction lowers the cost of producing by N per cent, with N being the number of production stages, since between every production stage the intermediate good crosses a border and incurs a tariff.

When the fragmentation of the production process is taken into account, tariff reduction can explain the magnified and non-linear effect of tariff reductions on growth of world trade. In particular, using data for the United States, Yi (2003) shows that tariff reduction can explain over 50 per cent of US growth of world trade between 1962 and 1999.

(b) Non-tariff barriers

Non-tariff barriers (NTBs) represent a large category of import restrictions. They include

quantitative restrictions, subsidies, anti-dumping and countervailing duties, customs valuations and standard and technical regulations.

Measuring non-tariff barriers is a hard task. A common method is to construct a measure of the prevalence of NTBs, such as the percentage of tariff lines covered by NTBs. However, this measure does not provide an indication of the degree of restrictiveness of the specific type of NTBs. Estimation of the degree of restrictiveness requires a well-specified economic model (e.g. Kee et al., 2006 and Maskus et al., 2005).

Unfortunately, lack of data does not allow an estimation of the evolution of the degree of restrictiveness of NTBs over time. Data on the existence of NTBs exist, but they have a very narrow coverage and they are hardly comparable over time. A higher number of NTBs over time is more likely to be the result of a better recording of NTBs rather than an increase in the number. The elimination of voluntary export restraints (VERs) during the Uruguay Round (1986-93) and the phasing-out of the quota system in textiles and agriculture by developed countries as well as improved transparency in terms of notification of standards and technical regulation are remarkable achievements and point to a reduced incidence of NTBs.

A branch of the economic literature looks at the so called “border effect” to infer the evolution of trade restrictiveness. In a recent paper, Mayer and Zignago (2005) find that in the 1990s, on average, a country traded around 89 times more within its national borders than with another country. This average figure hides a wide variation of the coefficient of the border effect for trade among developed countries and trade between developed and developing countries. In particular, the border effect is much higher when the exporter is a southern country than when the exporter is a northern country. In the same period, a developed country imported on average 281 times more from itself than from a developing country and 61 times more from another developed country.

Mayer and Zignago also estimate the evolution of the border effects coefficients in the period 1976-99. They find that overall restrictiveness is three times less in the 1990s than it was in the end of the 1970s and that over the same period the level of access to northern markets for a southern country became 17 times

easier. The use of the border effect methodology does not allow identification of whether the remaining difficulties in market access are due to residual tariffs and non-tariff barriers or other factors, such as differences in quality of goods. However, Mayer and Zignago's estimations suggest that tariffs are not particularly important in explaining the fall of the border effect, thus suggesting that the fall in non-tariff barriers may be.

(c) Transport costs

Transportation costs are estimated to be typically higher than tariffs. In 2004, aggregate expenditure on shipping for total imports was three times higher than aggregate tariff duties paid (Anderson and van Wincoop, 2004). A study by the World Bank (2001) shows that for the majority of the United States' trading partners transport cost incidence for exports is higher than tariff costs incidence. For sub-Saharan African countries, this is five times higher.

Transport costs, much in the same way as tariffs, penalize goods produced in multiple stages across different countries, since producers need to pay for moving goods at each stage of the production process. A decline in transport costs will therefore be particularly beneficial for trade in vertically specialized goods.

Acquiring evidence on the evolution of transport costs is surprisingly complex. The problem is mainly lack of data on direct measures of transport costs and difficulties in providing indirect measures of these costs. This arises from changes over time in the type of products traded and in the mode of transport used to move goods around.¹

A summary of the evolution of transport costs on the basis of the most recent studies is outlined below.

i) Land transport

Land transport consists of road, railways and pipelines. Most trade occurring between countries that share a border takes place via land. Hummels (2007) estimates that 90 per cent of trade between neighbouring countries and the United States occurs via land. Of this, road is the principle mode of transport. Data for the EU also show that road is the most important means of land transport. In

Europe, around 72 per cent of trade volumes are shipped through the road network.

Data on the evolution of land transport costs are scarce. Available data suggest that land is the cheapest mode of transport and that this cost has been falling over time. Focusing on the United States, Glaeser and Kohlhase (2003) report a decline in land transport costs across all modes of land transport over the period 1947-99. With regard to transport by road, they calculate that while rising fuel prices and regulations kept prices at their 1947 level until 1985, since the Motor Carrier Act of 1980, trucking costs have been falling by 2 per cent per year, enabling the cost-reducing effect of technological improvements to take place. Figures for railroads show a decline from over 18 cents per ton-mile in 1890 to 2.3 cents in 2000 (in 2001 US dollars).

In a recent paper, Combes and Lafourcade (2005) build an indicator for road cost transport for France over time which takes into account infrastructure, vehicle and energy used, as well as labour, insurance, tax and general charges borne by transport carriers. On the basis of this index, they show that road transport costs strongly declined between 1978 and 1998. Driving factors of this fall were the deregulation (this includes the abrogation of the road compulsory freight rates and licence quotas as well as the insurance tax reforms on freight transport allowances) of the road transport industry and technological progress. Infrastructure investments are found to determine mainly which region took the most advantage of the reduction of costs, rather than the average trend over time.

ii) Ocean transport

Trade among countries without a common border takes place mainly via the ocean. In particular, ocean shipping is the principle mode of transport for bulk commodities (such as oil, petroleum products, iron ore, coal and grain). These represent a large share of trade in terms of weight, but are a small and falling share of trade in terms of value.

Three important technological and institutional changes have lowered shipping costs: the development of open registry shipping (i.e. registering ships under flags of convenience to circumvent regulatory burdens and especially manning costs), scale effects from increased trade and containerization. Standardized

containers allow the use of a multi-modal transport system, without unpacking and repacking.

However, there is no clear direct evidence of a downward trend in ocean shipping prices. A recent study by Hummels (2007) shows that the price index for tramp lines (mainly used for commodities, spot market price, no fix schedules), although showing a steady decline when deflated for the United States GDP deflator, does not show a downward trend when deflated for the bulk commodities price index (a proxy for the *ad valorem* shipping cost). As Hummels stated, this indicates that “while the cost of shipping a ton of wheat or iron ore has steadily declined, the price of shipping a dollar value of wheat or iron ore has not” (Hummels, 2007: 142-143; also see Chart 9).

Similarly, liner prices (that is the price to ship general cargoes and various manufacturing products) do not show a downward trend. The liner price index for German imports indicates that prices increased from 1970 to 1985, and some evidence suggests that this increase occurred more broadly than solely in Germany.

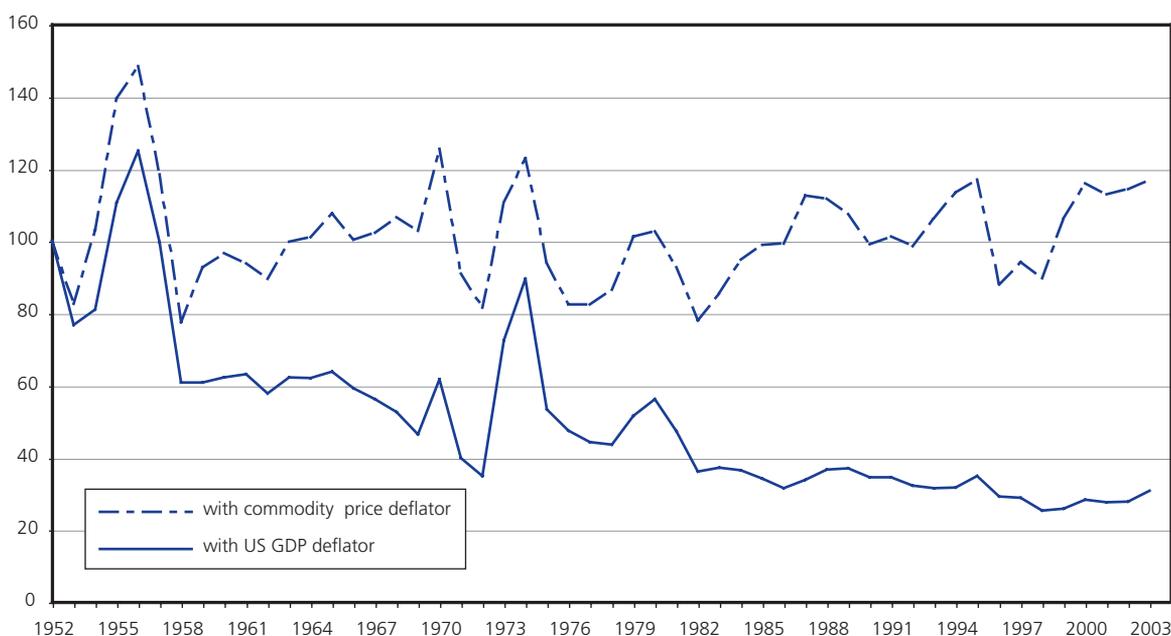
The cost-reducing effect of containerization in the 1970s was outweighed by increases in fuel and port

costs. But there have been other unobserved quality improvements that have lowered the indirect costs of ocean shipping. Most importantly, shipping times have lowered significantly. There are two reasons for this: first, technological improvements have significantly increased the speed of ships. Second, improved efficiency at the port, mainly due to containerization, has resulted in a reduction in the time required to load and unload ships. When this is taken into account, the quality-adjusted cost of ocean shipping has gone down.

iii) Air transport

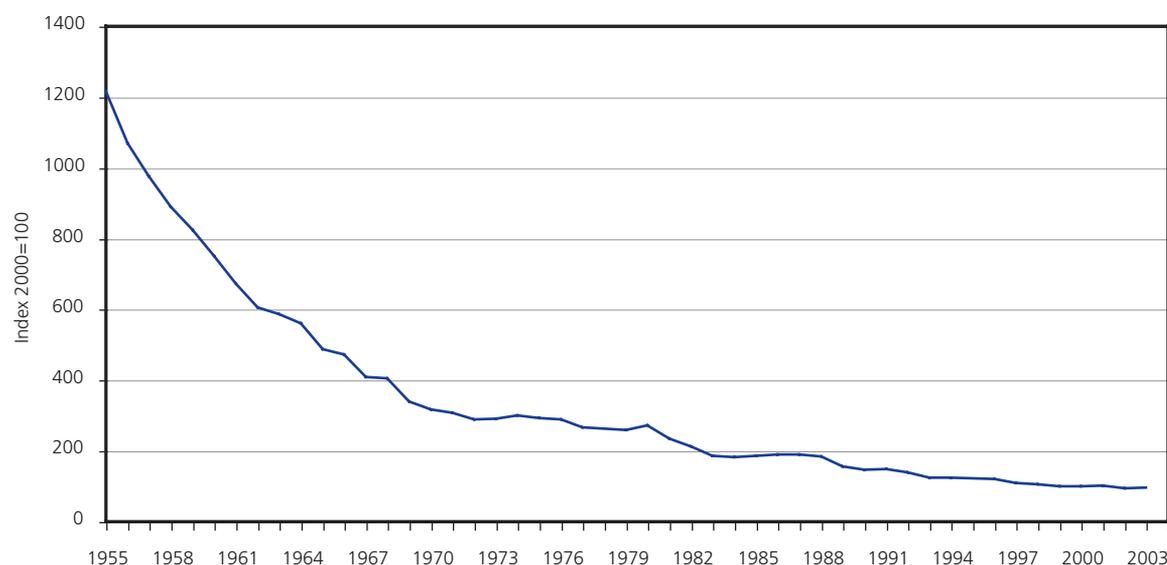
Air transport costs (measured in terms of revenue per ton-kilometre) dropped by 92 per cent between 1955 and 2004 (see Chart 10). The largest drop took place over the period 1955–72 (8.1 per cent annually), the period when the use of jet engines became widespread. More recently, changes in the regulatory set-up also helped to reduce air transport costs. For example, Micco and Serebrisky (2006) show that between 1990 and 2003 the introduction of the Open Skies Agreements (OSAs)² reduced nominal air transport costs by 9 per cent and increased by 7 per cent the share of imports arriving by air within three years of an OSA being signed.

Chart 9
Tramp price index



Source: Hummels (2007).

Chart 10
Worldwide air revenue per ton-km



Source: Hummels (2007).

The drop in air transport costs reflected in Chart 10 is due to a large extent to the reduction in the price of long-haul transport. For example, Table 8 shows that in the case of Germany, while the average air price index for six intercontinental destinations (New York, Mexico City, Hong Kong, Tokyo, Sydney and Johannesburg) fell from 96 US\$/kg in 1954-56 to below 50 US\$/kg in 1997-99, in the same period the average index for the three European destinations (London, Paris and Rome) increased from 95 US\$/kg to 106 US\$/kg.

As a consequence of the reduction of air transport costs, the share of trade occurring via air has been growing rapidly. Looking at ton-miles shipped, it increased by 11.7 per cent per annum in the period 1975-2004. Air transport represents a significant share of trade values. For the United States, air transport represents a third of its import value and half of the United States' exports outside North America. Similarly high figures are estimated for selected Latin American countries for which data are available (Hummels, 2007).

In particular, air transport tends to be more convenient than ocean transport, especially on long-distance shipments (Harrigan, 2005). Hummels (2007) shows that the marginal cost of an additional mile of air transport is dropping rapidly, thus making the use of air transport more convenient on long haul. In particular, air transport is more likely to be the preferred means of transport than ocean

transport for goods with a lower weight/value ratio. One reason for this is that the marginal cost of fuel to lift 100 kilograms into the air is higher than the cost of carrying it on a boat.

iv) Time cost of transport

The time required to export and import a good is an important barrier to trade. In particular, there are two aspects of time that represent a cost for trade. One is the lead time, that is the length of time between placement of an order and receipt of the goods. This depends on the distance between customers and suppliers, the speed of the mode of transport chosen, the type of product, the management of the supply chain and the logistics as well as the type of administrative procedures related to exporting or importing, waiting time for shipment and delays related to testing and certification of goods. A long lead time represents a cost and therefore an obstacle to trade because it raises the costs of uncertainty and variation in demand for the final products. If, for example, future demand for a fashion product has been underestimated, the seller may run out of stock. This has costs in terms of foregone sales and the possibility of losing customers.

The other aspect of time that represents an obstacle to trade is the variability of delivery time. The more variable the delivery time, the greater the buffer stocks needed to face demand. High variability of delivery time would make it very hard to organize

Table 8
German real air transport prices by destination, 1954-99
 (Indices, 1954=100)

	Index		Average annual percentage change
	1954-56	1997-99	
Intra-Europe			
Rome	95	105	0.2
Paris	95	111	0.4
London	95	114	0.4
Average of 3 destinations	95	110	0.3
Inter-continental			
Hong Kong, China	97	24	-3.2
New York	95	27	-2.9
Bangkok	97	28	-2.9
Montreal	95	28	-2.8
Caracas	95	36	-2.2
Mexico City	95	37	-2.2
Teheran	97	50	-1.5
Tokyo	97	66	-0.9
Johannesburg	97	73	-0.7
Tel Aviv	98	73	-0.7
Cairo	97	73	-0.7
Sydney	95	72	-0.6
Rio de Janeiro	97	88	-0.2
Average of 13 destinations	97	52	-1.4

Note: Based on outbound (Frankfurt/M.) freight rates in US\$ per kg deflated by (WTO) world export unit value index of manufactured goods.
 Source: German Federal Statistical Office, Fachserie 17, Reihe 9, various issues and WTO calculations.

“just-in-time” delivery, where inventories are kept to a bare minimum and inputs arrive at the factory only when they enter the production process. “When just-in-time technology is introduced, delayed delivery of a component can hold up the entire production and cause costs that are much higher than the market price of the delayed component. Therefore, no discount can compensate the customer for unreliable delivery time, and firms with high variability of lead time will not be short-listed for contracts that require just-in-time delivery” (Nordas, 2007a: 35).

Direct estimates of the tariff equivalent of time find that each day in transit is equivalent to a 0.8 per cent tariff (Hummels, 2007). Calculated on a 20-day sea transport route (the average for imports to the United States), this amounts to a tariff rate of 16 per cent. This is much higher than the actual average tariff rate. Using gravity models, recent studies find that a 10 per cent increase in time to export reduces trade by between 5 and 25 per cent (see, for example, Hausman et al., 2005; Djankov et al., 2006; Nordas, 2007a; 2007b and Nordas et al., 2006) depending on the sector and export destination.

The ten-fold decline in air shipping prices since 1950 means that the cost of speed has been falling dramatically (Hummels, 2007). This has had two major effects on time as a barrier to trade: first, shipping times have been falling over time. Technological improvements in transport services (jet engines and containerizations) have not only had beneficial effects in terms of cost savings but also in terms of time savings. The average shipping time to the United States declined from 40 to 10 days between 1950 and 1998 (Hummels, 2001).³ Evaluated at an average cost per day of 0.8 per cent *ad valorem*, the use of faster means of transport is equivalent to reducing tariffs by 24 per cent.

Second, variability of delivery time can more easily be buffered. This is because lower costs for air transport allow a more intensive use of air transport to hedge for market volatility. In addition, advancements in communication technologies have allowed the development of an effective multi-modal transport system. This has helped to reduce both time of delivery and uncertainty of delivery. The use of radio frequency identification tags, the internet and transponders on product packages allows factories and warehouses to keep track of where a product is at any time. Sharing information among terminal

operators, shippers and customs brokers can help manufacturers and logistic contractors to manage the supply chain and fulfil the need of just-in-time delivery (World Trade Organization, 2004).

(d) Costs of connecting people

In order to trade, people need to communicate. Traders need to acquire information about profitable international trading opportunities and preferences of consumers. Final good producers need to search for the appropriate supplier. Effective telecommunications provides a low-cost channel for searching, gathering and exchanging information. Inefficient communication is a particularly important barrier in just-in-time production processes, where the logistics of transport modes and time of delivery rely on flow of information.

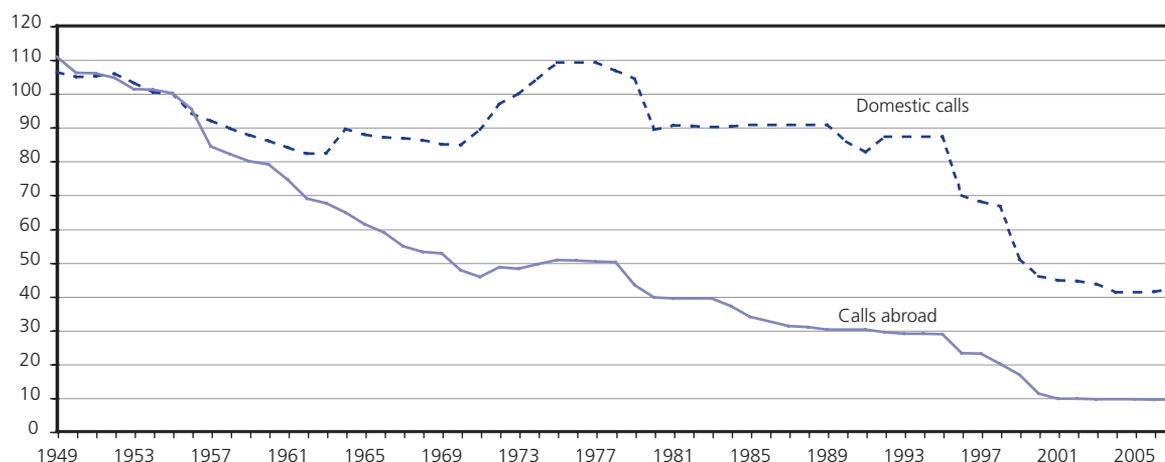
The importance of effective communication for trade results from a variety of studies. Nearly all estimations using gravity models introduce a variable measuring the ease of communication between countries. Language is a key variable that economic literature is used as a proxy for information costs. Common language helps business because it provides a direct way to communicate. A standard result is that common language promotes trade. English is not more effective than other major languages. However, diversity of languages spoken does boost foreign trade. Importantly, literacy increases trade too (Melitz, 2002).

Effective communication is particularly important for trade in goods of different varieties. From a theoretical point of view, the argument is that differences in

manufactured goods in terms of both characteristics and quality limits the scope for prices to convey all the necessary information. Therefore, connections between buyers and sellers are needed to facilitate the flow of information. In this respect, the costs and quality of communication links are likely to be important in determining the ease with which information flows. Using a gravity model, Fink et al. (2005) find that higher communication costs (measured as the average per minute bilateral calling price charged in the importing and exporting country) have a negative effect on trade and that this negative impact is as much as one-third larger on trade in varied goods than on trade in homogenous goods.⁴

Costs of connecting people have been falling over time. First, costs of making international calls have fallen. Chart 8 shows the price of local and international phone calls on fixed lines for Germany from 1949 and 2007. Both have fallen, but the price of calls abroad experienced a more significant drop. Technological developments and regulatory reforms have contributed to a substantial reduction in the costs of telecommunications services. Second, the value of the telecommunications network has increased. Telecommunications is a network service and as such the value of the network for each consumer increases with the size of the network. Technological developments have allowed a much wider diffusion of telecommunications services, thus making the use of the network more valuable. Third, internet access has increased over time. The internet provides a rich source of information as well as a channel for advertising, marketing and searching. Finally, movement of people across countries has increased, as costs of transport have declined.

Chart 11
Prices for domestic and foreign phone calls of Germany, 1949-2007
 (1955 = 100 in local currency, at current prices)



Source: Germany, Federal Statistical Office, Fachserie M Reihe 7 and Fachserie 17 Reihe 7 various issues.

To sum up, empirical evidence shows an overall downward trend in trade costs in the last half century. This includes traditional trade costs (such as tariffs and non-tariff barriers) as well as transport and communication costs. This is especially true if quality improvements are taken into account. For example, although there is no clear direct evidence of a downward trend in the cost of transport by ocean, there is clear evidence of a reduction in shipping times (both because of the increased speed of ships and the less time required to load and unload ships). When this is taken into account, the quality-adjusted cost of ocean shipping has gone down. An interesting feature of the fall in transport costs is that in particular costs to distant destinations have fallen the most.

Recent economic literature has stressed the importance of trade costs in determining the patterns of specialization and trade. In the new economic geography literature, the size of trade costs is a major factor in determining where a firm chooses to locate. Furthermore, in the recently developed literature on international fragmentation of production, trade costs have been seen as influencing the choice between outsourcing or in-sourcing, sourcing inputs through intra-firm or arm's-length trade. The next two sub-sections will look at these theories in more detail.

2. GEOGRAPHICAL CONCENTRATION

The discussion of the new trade theory in Section C.3 provided an explanation of the sources of welfare gains from international exchange. Countries that trade are able to benefit from increasing returns to scale in production from the increased variety of products and from increased market competition. The “new” trade theory provides an explanation why countries with similar endowments trade with one another and further predicts that this trade will be primarily intra-industry trade. Although there may be some element of overstatement involved, it could be said that quite apart from the home market effect (a country will export the product for which there is a large demand at home) the new trade theory leaves the pattern of trade – which country exports what – largely undetermined. This is quite unlike the traditional theories of trade, in which the pattern of trade can be readily predicted from the technological characteristics or factor endowments of a country.

In this sub-section, a much more detailed treatment of the home market effect, and other related predictions, together with the available evidence for them will be presented. They will be discussed in the context of a closely related literature - the “new economic geography”⁵ – which employs many of the same assumptions as “new” trade theory and provides additional insights about the location of production and hence the pattern of international trade. Apart from the home market effect, the two other predictions about the pattern of trade and the location of production which will be discussed are the magnification effect and the core-periphery proposition. In both cases, falling trade costs are an important starting point in the analysis.

In the magnification effect, the theory envisages that a reduction in trade costs will amplify the home market effect. In the core-periphery argument, the theory foresees that falling trade costs will produce an initial period of divergence, where manufacturing production becomes concentrated in a “core” while a “periphery” specializes in non-manufactured goods. This is brought about by the presence of “agglomeration effects”. But agglomeration effects are accompanied by centrifugal forces which promote dispersion. A further reduction in trade costs is expected to reverse this process of concentration, with manufacturing production becoming increasingly dispersed among countries in the periphery.

Given the focus on falling trade costs and the implications for the pattern of production and trade, the discussion below may give a relatively narrow perspective of the new economic geography. Thus it is important to highlight that the theory has been applied to look at a wide range of issues as well. Despite being less than two decades old, the theory has been used to explain major episodes of globalization in history (Crafts and Venables, 2003). Work has also been undertaken to examine how public policy issues, involving trade, tax and regional policies, are likely to be affected by the theory (Baldwin et al., 2003).

(a) New economic geography

Many of the elements of the new economic geography framework are familiar from “new” trade theory. The manufacturing sector produces a wide range of differentiated products. Production of these manufactured goods is subject to increasing

returns to scale. Markets continue to be competitive in that entry of new products continues until profits are driven to zero. Consumers have a preference for product variety. Labour is free to move across economic sectors within a country. There are costs involved in transporting manufactured goods from the producer to the final user or consumer.

In one important branch of this literature, two new elements are added. First, manufacturing firms are assumed to demand variety and this is met through their requirement of intermediate manufactured inputs (Krugman and Venables, 1995). In order to produce the final output, a manufacturing firm requires not only labour but also other intermediate manufactured inputs. This makes the manufacturing sector a large consumer of its own output. There are two sources of demand, therefore, for manufactured goods: demand for final goods by consumers and demand for intermediate goods by firms. This intermediate demand creates forward and backward linkages in the manufacturing sector. The forward

linkage refers to the utilization of the firm's output by other firms as intermediate inputs to their own production activity. The backward linkage refers to the provision by other firms of the intermediate inputs required by the first firm.⁶ This, as shall be seen later, is the way that agglomeration occurs. Second, the theory allows for a constant return-to-scale sector, which is traditionally called the agricultural sector. Unlike manufactured products, there are no transport costs associated with the production of agricultural goods.⁷ Agriculture competes with the manufacturing sector for the available pool of workers.⁸

Some indication of the importance of manufactured intermediate inputs in the manufacturing sector can be gleaned from Box 10 below, which analyzes the input-output structure of the sector in several OECD countries (Canada, France, Germany, Italy, Japan, the United Kingdom and the United States) as well as two emerging economies (Brazil and China).

Box 10

The importance of intermediate goods in manufacturing

The new economic geography assigns an important role to the input-output linkage among manufactured goods in its explanation of agglomeration effects. Some indication of the importance of intra-industry linkages can be seen from the input-output tables of a number of industrial countries (Canada, France, Germany, Italy, Japan, the United Kingdom and the United States) and emerging economies (Brazil and China). The data come from the OECD's Input-Output Database: 2006 Edition (Yamano and Ahmad, 2006). This database contains 48 standardized industry input-output tables (using the third revision of the International Standardized Industrial Classification) based on data for the year 2000. Out of these 48 industries, 22 can be classified as manufacturing (from manufacturing food products and beverages to recycling).

As expected, the role of manufactured goods as intermediate inputs in manufacturing was clearly much more prominent than in the non-manufacturing sector. In the United States, for example, the average share of intermediate

manufactured inputs in the output of the manufacturing sector was 35 per cent (see Box table). By way of contrast, the share of intermediate manufactured inputs in the output of the non-manufacturing sector was less than 9 per cent. The ratios are quite similar in the other major OECD countries. In Germany, the ratio was 40.8 per cent in manufacturing to 8.5 per cent in non-manufacturing. In emerging economies, such as Brazil and China, the share of manufactured intermediates in the manufacturing sector was between 40 and 50 per cent.

Within manufacturing itself, the sectors with the highest share of use of intermediate manufactured inputs in the OECD countries are motor vehicles (58.6 per cent) and office accounting and computing machinery (54.3 per cent). For the emerging economies, the sectors with the highest share of use of intermediate manufactured inputs were electrical machinery and apparatus (55.8 per cent) and motor vehicles (53.1 per cent). The chart below shows the share of intermediates in selected manufacturing sectors in the United States, Japan and Germany.

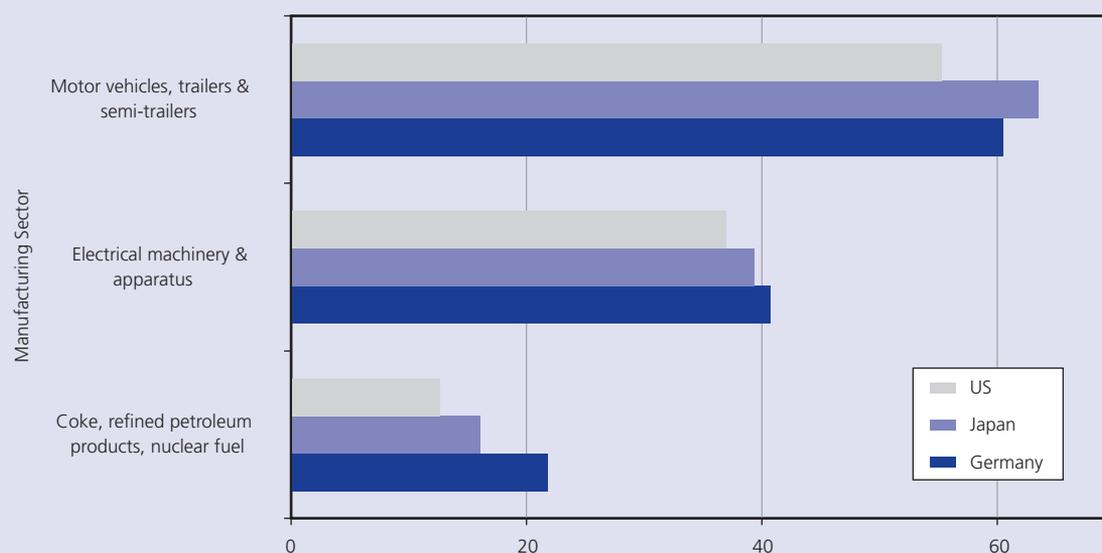
Share of intermediate manufactures by sector, 2000

Countries	Manufacturing sector (in per cent)	Non-manufacturing sector (in per cent)
OECD countries		
Canada	40.8	10.5
France	40.8	9.4
Germany	40.8	8.5
United Kingdom	33.8	9.0
Italy	39.7	9.8
Japan	40.5	10.4
United States	34.9	8.9
Emerging economies		
Brazil	38.7	15.2
China	48.3	28.1

Source: OECD Input-Output Database: 2006

Share of manufactured intermediates in output

(Percent)



Source: OECD Input-Output Database: 2006

(b) Home market and magnification effects

The key concern in this sub-section is to examine how falling trade costs are likely to affect the pattern of trade. As was stated earlier, the home market effect predicts that a country will export those goods for which it has a large home market. In effect, the large domestic product serves as a base for exports. It turns out that reduction in trade costs magnifies the importance of market size in determining which country concentrates in producing and exporting manufactured goods.

Consider first the home market effect.⁹ Imagine two countries (call them Countries 1 and 2), each

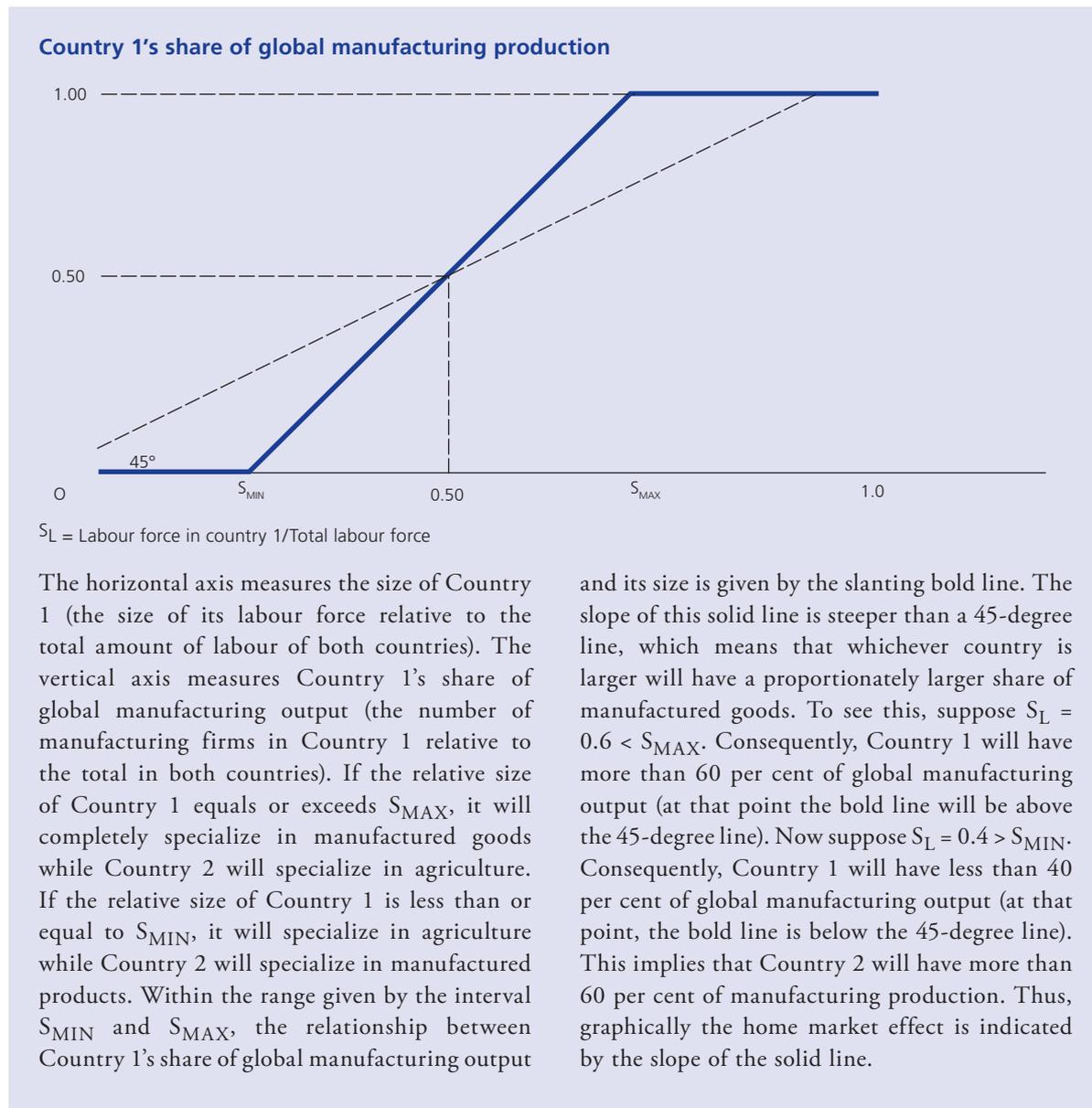
of which produces two goods: a constant returns-to-scale agricultural product and a differentiated increasing returns-to-scale manufactured product. Labour is the only input used in production and the size of the labour force will be used as a proxy for the size of the economy. The country with the larger labour force is assumed to be the economy with the large home market. For this analysis, the wage rate is assumed to be constant and the same in the two countries.¹⁰ To make things simple, a constant share of income is assumed to be spent on the agricultural and manufactured goods; but in addition, demand for the manufactured product is influenced by consumers' love of variety.¹¹ Finally, it is assumed that trade is costly for the manufactured good but not for the agricultural product.¹²

The structure of demand is such that output will be the same per firm in each country. By virtue of having similar wages, and given that free entry ensures that price equals average cost, “mill” or producer prices will also be the same in both countries. Because of trade costs, the price paid by a consumer for an imported good will be higher than the price received by the foreign producer.¹³

Equating demand in both countries to the available production of the manufactured good determines the equilibrium number of firms in the manufacturing sector in the two countries. Given that output of each differentiated product is the same, the number of firms in a country corresponds to the size of its manufacturing sector. So for example,

if the number of firms in Country 1 is six and the number of firms in Country 2 is four, it would mean that Country 1 produces 60 per cent of global manufacturing output. This turns out to depend on, among other things, the relative sizes of the country (the size of their labour forces). The larger the labour force of a country, the higher is its share of aggregate manufacturing output. In fact, if one country is sufficiently large, it is even possible for all manufactured products to be produced there, i.e. complete specialization in manufactured goods by the large country (Krugman, 1980). Box 11 provides a way of describing the home market effect in terms of the relationship between a country’s share in global manufacturing and its relative size.

Box 11
The home market effect



How then do reductions in trade costs affect the home market effect? It turns out that a reduction in trade costs will tend to magnify the home market effect. If trade costs are very low, even small differences in the sizes of the two countries can lead to a large concentration of manufacturing in the larger country. This also means that the threshold for complete specialization in manufacturing in the larger country is easier to achieve. In terms of Box 11, a reduction in trade costs increases S_{MIN} while at the same time decreasing S_{MAX} . As a consequence, the slope of the solid line becomes even steeper than before.

Some explanation for the magnification effect can be provided. If, for example, by virtue of the home market, the large country has the lion's share of global manufacturing output, the operation of increasing returns to scale makes manufactured products cheaper in the large country (by reason of its greater size). Even with the cost of transport factored in, it will be able to export manufactured goods to the smaller country. So a reduction in trade costs means that the large country can export

manufactured goods to its partner at an even lower price than before. The reduction in trade costs has the effect of amplifying the original advantage it had of possessing a large market.

(c) Agglomeration effects

The fundamental question that theories of economic geography attempts to answer is why economic activity is not randomly distributed across many locations. Instead, many industries tend to be concentrated in certain places or locales (see Box 12). This suggests that there are economic benefits from firms being located in close proximity to one another. These benefits can arise from knowledge spillovers between workers and firms who are in close proximity to one another (Marshall, 1920). Concentrating firms in a single location means workers in that area face less risk of unemployment. This can increase their incentive to upgrade their skills. The presence of a large number of similar firms can lead to the development of specialized inputs tailored to their needs.

Box 12

Geographic concentration: from Bangalore to Wall Street

The extent to which economic activity is concentrated geographically is visible in the way that certain towns, cities or regions become associated with particular industries.

Bangalore, which is located in the province of Karnataka in south-west India, is synonymous with India's information technology (IT) industry. While it makes up only two hundredths of 1 per cent of India's physical area, about a quarter of the Indian software industry is located in Bangalore.¹ The Software Technology Parks (STPs) of India estimates that more than 35 per cent of Indian software exports originate from the state of Karnataka, where Bangalore is located.² On the other side of the world, fabled Silicon Valley is the cradle of the IT revolution. Located in Santa Clara Valley in northern California, it was the birthplace of IT giants and innovators such as Hewlett-Packard, Intel, Advanced Micro Devices (AMD), Sun Microsystems, Apple, Adobe, Cisco Systems, Oracle, Symantec, NVIDIA, eBay, Yahoo and

Google. The founders of Yahoo and Google had all been students at nearby Stanford University.

The US film industry was synonymous with Hollywood, particularly during its "golden age", which lasted from the end of the silent era in American cinema in the late 1920s to the late 1950s. During the heyday of the big three US automakers (Ford, Chrysler and General Motors), automobile manufacturing was heavily concentrated in Detroit. In the 1920s, all major US advertising agencies had offices in New York City (along Madison Avenue). For at least four decades after the end of World War II, the city of Sassuolo in Italy was the centre of the Italian, and hence global, ceramic tile industry. At its height in the 1980s, before the advent of Spanish and Chinese competition, it was exporting US\$ 800 million worth of ceramics annually.¹⁴ New York (Wall Street) is the centre of US, if not global, investment banking.

These examples show that geographic concentration of economic activity occurs as much in services as in manufacturing. In many of these examples too, it is likely that geographic concentration of firms is due to technological rather than pecuniary externalities.

¹ Balasubramanyam and Balasubramanyam (2000).

² Software Technology Parks of India, <http://www.blr.stpi.in/perfanalysis.htm#>.

Similar to these other explanations, the new economic geography argues that concentration confers benefits not only to the firm which moves to a large market but also to the other firms that are already established there. This is the agglomeration effect. A firm chooses to locate in a particular region because it offers the most profitable venue for conducting its operations. But under certain economic conditions (increasing returns to scale, trade costs, and the existence of input-output linkages among manufacturing firms), this geographic concentration increases the productivity of all the firms located there. Establishing the firms in one place makes their total output larger than if each one had been operating in a different region.

There are two possible ways for agglomeration to occur. One way is through the movement of labour between sectors and geographical regions. But this would apply primarily to agglomeration in the domestic economy since labour is not mobile across national boundaries.¹⁵ The second way in which agglomeration can occur is through the use of intermediate inputs in manufacturing production (Krugman and Venables, 1995). Part of the output of manufacturing firms is sold to other manufacturing enterprises. Manufacturing firms also procure their intermediate input requirements from other manufacturing enterprises. These linkages on the output and input sides allow one firm's better sales and savings in input costs to be transmitted through the whole manufacturing chain.

First, consider the benefits that are likely to arise for a firm that establishes itself in a region with a large market for manufactured goods. Such a market offers a variety of intermediate goods which the firm can use to turn out the final product. The benefit of greater variety shows up as a reduction in the price paid for its basket of intermediate inputs.¹⁶ Since the firm is now geographically close to these suppliers, it also saves on the transport costs of its inputs and further lowers its cost of production. At the same time, the large market makes it easier for the firm to sell more of its final good to other firms. One important by-product of this move to the larger market is that the firm is able to produce at a larger volume than before, thereby driving down its average cost of production because of increasing returns to scale.¹⁷

But moving to this large market not only benefits this firm. Firms who are already established in the region will also benefit from the first firm's

decision to establish itself in the region. The availability of a new product will benefit the already established firms given their demand for variety. The introduction of a new product also reduces the price paid for their basket of intermediate inputs. Further adding to the reduction in production costs is the fact that the new product can be purchased locally, thereby saving on transport costs. A second benefit for the already established firms is the increase in demand for their final output, which will be used as intermediate inputs by the new firm.

Thus, a "virtuous circle" is created by this interaction of input-output linkages, increased variety, saving on transport costs and increasing returns to scale. Agglomeration involves an externality because the decision by the first firm to move to the large market benefits other firms. But the externality is a pecuniary one because the benefit from geographic concentration is transmitted through market prices, which differentiates this explanation from older explanations which emphasize technological spillovers. For most firms, the benefits take the form of a reduction in the price of the basket of intermediate inputs that they require. For other firms, the benefits come from the increase in the demand for their final good.

If there are only agglomeration effects, the virtuous circle that is created by a new manufacturing firm locating to a region with a large market should not end until all manufacturing is concentrated in that locale. But there are centrifugal forces which work against the agglomeration effects. They include changes in factor prices (i.e. the agricultural wage rate) and greater product market competition.

An expansion of the manufacturing sector requires workers to move from the agricultural sector to the manufacturing sector. Given that there are diminishing returns in employment in agriculture, the reduction in labour there increases the marginal product of labour. Since labour markets are assumed to be competitive and there is full mobility between the two sectors, wages must equalize across sectors (otherwise workers would have an incentive to move to the high-wage sector). This means that if manufacturing is to continue to expand, it must pay a higher price to persuade existing agricultural workers to move to the manufacturing sector. This tends to reduce the incentive for further expansion of the manufacturing sector.

A second factor working against agglomeration is the increase in product market competition. Consumers demand variety. While manufactured goods are differentiated and therefore not perfect substitutes, the appearance of a new product should nevertheless lead to a decline in the demand for all other varieties of manufactured goods. This means that further expansion of the manufacturing sector will be more difficult since an enterprise which is considering setting up business will have to expect less favourable market demand conditions for its product. Thus both wage and product market effects counteract the backward and forward linkages, which favour geographical concentration of the manufacturing sector. To consider the effect that any exogenous economic change, such as a reduction in trade costs, will have on the geographical location of the manufacturing sector – whether it will lead to increased concentration or to dispersion – it is necessary to weigh the strength of the agglomeration effects against the wage and product market effects working against it.

Some recent research has been able to quantify these agglomeration effects by measuring the increase in the total factor productivity of already established firms following the entry of a sufficiently large new firm (Greenstone et al., 2008). The effect appears to be statistically significant and economically substantial. On average, Greenstone et al. (2008) estimate that already established firms' output is 12 per cent higher five years after the entry of a new firm, assuming that inputs remain constant. Interestingly, they also find evidence of a relative increase in labour costs, indicating that centrifugal forces are simultaneously set in motion.

(d) Core-periphery

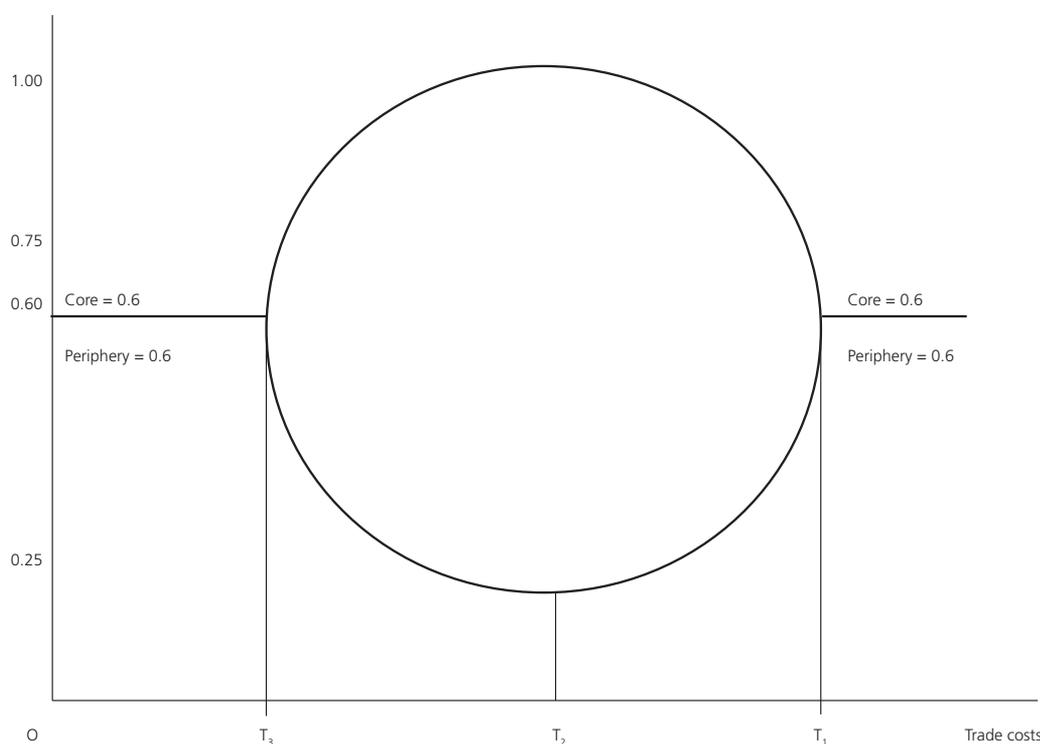
One key outcome from the interaction of agglomeration effects and centrifugal forces is the core-periphery result. As trade costs fall, there will be an initial phase where agglomeration effects dominate and produce a concentration of manufacturing in the core. But beyond a certain point, continued reduction in trade costs will allow centrifugal forces to emerge. In this second

phase, changes in wage rates and greater product market competition in the core counteract and ultimately reverse the agglomeration effects, with manufacturing being dispersed to the periphery.

If initial trade costs are very high¹⁸ – and the home (core) and foreign (periphery) countries are in identical circumstances, producing both manufactured goods and agricultural products – the high trade costs make it economically impossible for the home (core) country to supply the demand of the foreign (periphery) country for manufactured goods. This means that there is an absence of agglomeration effects at this point. However, if technological innovations progressively reduce trade costs, it becomes economically feasible for the home (core) country to supply the foreign (periphery) country. Agglomeration effects operate, with the result that manufacturing expands in the core.

A nearly opposite process takes place in the periphery. Its manufacturing sector shrinks, as manufactured goods are supplied by the core, although manufacturing production does not completely disappear. The reduction in trade costs triggers agglomeration effects in the core and leads to de-industrialization in the periphery. Exports from the core become increasingly dominated by manufactured goods while exports from the periphery are increasingly made up of agricultural products. The expansion of manufacturing in the core requires labour to move from the agricultural to the manufacturing sector. This can only be accommodated through an increase in wages in the core. A wage differential opens up between the core and the periphery which helps maintain some manufacturing in the periphery. If trade costs continue to fall, the forces of dispersion (wage and product market competition) begin to assert themselves to begin a reversal of the core-periphery outcome. At low trade costs, the wage differential between the core and periphery becomes more important in determining the competitiveness of manufactured goods. Thus manufacturing becomes dispersed to the periphery, where wages are lower than in the core.

Chart 12

Share of manufacturing in domestic production of core and periphery

Note: Chart 12 provides a picture of the relationship between trade costs and the concentration of manufacturing (sometimes called the “bifurcation” diagram).¹⁹ Trade costs are measured in the horizontal axis and the share of manufacturing in total output in the core and in the periphery is measured in the vertical axis. At high trade costs (T_1), there is no agglomeration and the share of manufacturing out of total output is the same in the core and in the periphery, at 60 per cent. Once trade costs decline below T_1 , agglomeration begins in the core and the periphery is de-industrialized. The share of manufacturing rises to almost 100 per cent in the core while it falls to about 25 per cent in the periphery. A further reduction in trade costs to T_2 leads to the wage and product market competition effects becoming more dominant and reversing agglomeration. At T_3 , further reduction in trade costs brings back the original symmetrical outcome.

(e) Empirical evidence

Head and Mayer (2004) provide a comprehensive survey of the empirical literature on agglomeration and trade. In this report, the focus will only be on the home market effect and the core-periphery prediction.

i) Home market effect

The pioneering studies on the home market effect were undertaken by Davis and Weinstein (1999 and 2003a).²⁰ In general, they provide support for the home market effect, particularly for manufactured goods. Among the more recent studies undertaken to empirically test the home market effect are Lundbäck and Torstensson (1998), Feenstra et al. (2001) and Weder (2003). These later studies

continue to find empirical confirmation of a home market effect. The effect is strongest for goods which are differentiated and subject to economies of scale. There is less statistical support for the home market effect with respect to homogeneous goods and goods produced with constant returns to scale.

In most of these studies, real GDP is used to represent the size of the home market, as in Feenstra et al. Weder uses domestic consumption (production plus imports less exports) as a measure of the size of the home market. In the Davis and Weinstein papers, the home market effect is measured by how much domestic demand differs from the pattern in the rest of the world. Lundbäck and Torstensson employ two alternative measures of the size of the home market, which they various call “demand bias” and “national preferences”.²¹

The early study by Lundbäck and Torstensson first runs separate regressions for each of the 17 OECD countries in their dataset. Each country regression has 49 observations, corresponding to the number of industries included in the analysis, where the dependent variable is the net exports of an industry and the explanatory variable is either “demand bias” or “national preferences” described earlier. The impact of demand bias on net exports of an industry is positive and significant in only 6 out of 17 country regressions. For three countries, industry demand bias has a significant negative impact on the net exports of these industries. While results for demand bias are unclear, the results for national preferences are more clear-cut. Industries with higher national preferences have significantly higher net exports in all countries. Second, they ran a regression for the pooled dataset of 17 countries. These results confirm the findings from the separate country regressions. Demand bias has no robust significant impact on the net exports of an industry but national preferences with respect to a certain industry significantly increase the industry’s net exports.

Feenstra et al. (2001) employ the gravity equation to test the home market effect. They apply it to three different types of bilateral trade flows: those involving differentiated goods, homogeneous goods and goods in between. They classify goods which are traded in organized exchanges as homogeneous goods. In-between goods are those not traded in an organized exchange but having some quoted “reference price” as, for example, in industry publications. Finally, differentiated goods are those which do not have any quoted prices. A home market effect exists if the coefficient on the exporter’s GDP (own income elasticity of exports) is larger than the coefficient on the partner country’s GDP. As expected, they find that the home-market effect depends on the type of good. It is stronger for differentiated goods and smaller for goods in the in-between category.²²

Weder (2003) tries to identify whether there is a home market effect for US and UK manufacturing exports to third countries. He uses data from 1970 to 1987 from 26 industries in the US and UK manufacturing sectors. He finds a significant positive relationship between the relative size of a US or UK industry and relative exports to third markets. Out of 26 manufacturing industries, he identified seven as having high economies of scale. For these seven industries, the relationship between

relative home-market size and relative exports is stronger.

ii) Testing the core-periphery hypothesis

This sub-section examines some of the evidence pertaining to the core-periphery hypothesis. Drawing on longer-term international trade and production data, it also presents some data that may have a bearing on this hypothesis (see Box 13).

At the outset, it is not clear to what extent the core-periphery hypothesis is intended as a stylized description of economic history that could artfully be teased out of simple economic models and to what extent it can be tested empirically. In fact, Krugman and Venables (1995) described the core-periphery argument (tongue in cheek) as “history of the world, part one”. Second, the diagram above suggests a complex relationship between falling trade costs and concentration. As Head and Mayer (2004) point out, nothing will happen to the concentration of manufacturing after an initial fall in trade costs. It is only somewhere between T_1 and T_2 in Chart 12, for example, that agglomeration takes hold. Thus, linear regressions between some measure of concentration and trade costs may not capture the effect. As a result, numerical simulations have often been employed to see whether reasonable parameter values can replicate the dynamic core-periphery hypothesis. These include the studies by Combes and Lafourcade (2001), Forslid et al. (2002) and Teixeira (2006). But the results of such simulations are of course highly sensitive to the choice of parameter values.

Combes and Lafourcade (2001) develop a multi-region multi-industry economic geography model of France under the assumption of imperfect competition.²³ They lower trade costs in incremental steps of 2 per cent until they have fallen by 30 per cent. They subsequently examine the resulting changes in the regional pattern of the variables. They look only at short-term equilibrium, i.e. the number of plants is kept fixed and no new market entry is allowed. They do not calculate long-term equilibrium (where new firms enter the industry until profits are driven to zero) because of the computational difficulties.

Combes and Lafourcade find that decreasing trade costs reduce the concentration of production for all ten industries. Regarding employment, they find

Box 13

Is there a core-periphery story?

The new economic geography tells a complex story about the thrust of economic development. It predicts that the initial phase of globalization will create a pattern of uneven development, with manufacturing increasingly being concentrated in a core and the periphery being left with primary production. But as globalization continues, manufacturing will subsequently become more dispersed.

The World Bank's Trade, Production and Protection database (Nicita and Olarreaga, 2007) contains information on manufacturing output and value added of about 100 developing and developed countries over the period 1976-2004, although data availability varies by country and year. The table shows the share of the core countries in global manufacturing output from 1976 to 2002 (note that this information differs somewhat from the usual focus of the new economic geography, which is the share of manufacturing in total output in the core and in the periphery). The "core" includes the United States, Canada, Japan, the original six members of the European Community (France, Federal Republic of Germany, Italy, Belgium-Luxembourg and the Netherlands) and Great Britain. Besides total manufacturing output, the table also shows the share of the core in the global output of certain

subsets of manufacturing: "basic" manufacturing, iron and steel and wearing apparel. "Basic" manufacturing includes iron and steel, machinery and equipment, transport and professional and scientific equipment (ISIC codes 371 to 385).

Based on the information, it appears to make sense to talk of a core. The group of industrial countries chosen as the core accounted for about 86 per cent of world manufacturing output in 1976. Their share of basic manufacturing was even higher, at 89 per cent. By 2002, their share of world manufacturing output was still about 81 per cent (82 per cent for basic manufacturing). Thus, world manufacturing is heavily concentrated in these industrial countries. Although there has been some decline in the core's share over the past quarter of a century, this decline has been relatively small. This may suggest that the current phase of globalization has not yet resulted in the reversion to greater symmetry that is predicted by the new economic geography. This focus on manufacturing as a whole may, however, hide changes at a more disaggregated level. In the case of iron and steel, for example, the core's share has fallen from more than 70 per cent to just about half of global output. In the case of wearing apparel, the degree of concentration was not very high even back in the mid-1970s.

"Core" share of global manufacturing output, 1976-2002

(Per cent)

Year	All manufacturing	Basic manufacturing	Iron and steel	Wearing apparel
1976	86.4	89.0	72.0	55.0
1980	85.5	88.5	71.3	54.4
1985	86.1	89.3	65.0	55.8
1990	83.8	86.7	70.6	63.9
1995	83.0	85.1	66.9	67.0
2000	81.3	83.3	60.3	62.6
2002	80.6	82.4	54.9	56.7

Source: World Bank Trade, Production and Protection database.

that a 30 per cent decrease in trade costs leads to an equal decrease in the average concentration of total employment. A uniform decline of 30 per cent in trade costs would change the spatial pattern of profits from a one-core (around Paris) to a two-core configuration, with the second core emerging in the north of Lyon. Furthermore, this decrease in trade costs would lead to dispersion at the national

scale but to more agglomeration within regions, i.e. within a region, concentration of production and employment tends to increase but at the national level concentration tends to decrease. Hence, in the short term, decreasing trade costs lead production and employment to be more equally distributed across regions but more concentrated within regions.

Forslid et al. (2002) investigate whether the results from two-country new economic geography models hold also in a model with more countries. They calibrate a computable general equilibrium model and simulate the effects of trade liberalisation on the location and concentration of manufacturing industries. A non-linear relationship between trade costs and concentration is observed for industries, with significant increasing returns to scale and important intra-industry linkages, i.e. metals, chemicals, transport equipment and machinery. There is increasing concentration initially as trade costs decline followed by a subsequent reversal as trade costs continue to fall. Four other industries, i.e. leather, food, minerals and textiles, which have a low degree of increasing returns to scale, display a negative relationship between concentration and trade costs. In these industries, initial trade costs prevented sufficient specialization according to comparative advantage, a pattern that is more in line with traditional comparative advantage trade theory.

Teixeira (2006) builds on the methodological approach of Combes and Lafourcade to study the impact of public investments in the Portuguese transport network, which would have reduced transport costs, on the spread of Portuguese industry. He first estimates the structural form of the Combes and Lafourcade model, using data on Portuguese investments in transport infrastructure from 1985 to 1998. The estimates suggested that infrastructure investments led to a reduction in transport costs but not to the dispersion of manufacturing firms. However, when the estimated model was simulated to examine the impact of a planned expansion of the transport network, the predicted outcome was dispersion of industry if transport costs are lowered sufficiently. He concludes that these results are consistent with the core-periphery theory, where reduction in transport costs first promotes agglomeration but eventually leads to dispersion.

Thus, these simulations give differing conclusions about the expected evolution of the core and the periphery. While Forslid et al. (2002) and Teixeira (2006) find a non-linear relationship between trade costs and concentration, Combes and Lafourcade (2001) find a relationship leading to dispersion of all industries. One explanation for the difference appears to be the nature of the industries being studied. The non-linear relationship between trade costs and concentration appears to be stronger for industries with significant increasing returns to scale

and strong intra-industry linkages. This is an area of empirical work that is likely to continue to attract considerable research attention in the future.

(f) A summing up

Two rather salient predictions have arisen from this discussion about reduction in trade costs and the location of production and pattern of trade. The first is the home market effect and the other is the core-periphery outcome. There appears to be some empirical substantiation for the home market effect, at least with respect to differentiated manufactured products. But it is less clear as to what extent the core-periphery can be empirically tested and verified. At any rate, global manufacturing continues to be largely concentrated in the OECD countries. It does not appear that the current phase of globalization (and the reduction in trade costs) has resulted in the kind of dispersion predicted by the new economic geography. The picture is bound to be more nuanced when manufacturing is examined at a more disaggregated level. It may be that the concentration-dispersion process has already started in certain manufacturing sectors, such as textiles and clothing, iron and steel, etc. The next sub-section continues to pursue this question concerning the impact of falling trade costs on the location of production. This is examined at the level of the production processes of the firm.

3. INTERNATIONAL FRAGMENTATION OF PRODUCTION

An important phenomenon over the last half century has been the increase in the trade in parts and components, and the related international fragmentation of production accounting for a large part of the superior growth of trade compared with GDP. More recently, firms are no longer only distributing production stages to different locations and importing intermediate goods, they are also “unbundling” office tasks. In particular, those tasks where the North-South wage gap is not justified by an offsetting productivity gap are being offshored. The classic example is the relocation of US call centres to India. This has prompted some economists to talk of a new era of globalization presently unfolding. The reduction of communication costs and the costs of trading ideas are commonly considered to be the causes of this second unbundling.²⁴

This sub-section will attempt to clarify the estimated size of these phenomena and recent trends. It will describe how the most recent theoretical economic literature on trade explains firms’ decisions to offshore and will identify the driving forces behind the process of internationalization of production. Two case studies, on electronics and on the financial sector, will provide more precise figures on the size of offshoring and what prompts it. The effects of international fragmentation of production on welfare have been discussed in Section B. Its effects on employment and wages are discussed in Section E.²⁵

(a) Offshoring of goods and services

The terms outsourcing and offshoring have been used in a number of different ways, both in the public debate and in economic literature.²⁶ Following the broad definition of the term, outsourcing is defined here as the “acquisition of an input or a service from an unaffiliated company” (Helpman, 2006). Offshoring is the sourcing of input goods or services from a foreign country. This includes sourcing from a foreign affiliate through foreign direct investment (FDI) and sourcing from a foreign non-affiliate through arm’s-length contracts. While FDI involves intra-firm trade, arm’s-length offshoring involves trade between firms (see Table 9).

A major problem when attempting to measure the magnitude and the trend of offshoring of goods and services is that the definitions shown above do not easily match the officially collected economic data. Therefore, estimates of the pattern and the size of offshoring have to rely on proxy measures.

Systematic empirical analysis of these phenomena are missing due to lack of data. Nevertheless, recent economic literature has highlighted, in general using data for the United States, four major facts. First, both merchandise and services offshoring has rapidly increased in the last two decades. Second, although

international outsourcing of intermediate goods is quantitatively more important than services, services offshoring has been increasing at a faster pace in recent years. Third, offshoring has rapidly expanded both via arm’s-length trade and via intra-firm trade. Fourth, these trends have been widespread across sectors and types of inputs (Helpman, 2006). As will be seen in the next sub-section, a growing body of trade models have recently been developed to understand these trends.

In this sub-section, empirical evidence will be reviewed. In addition, using the most recent input-output data issued by the OECD, insights into the importance of offshoring by country and sector will be provided.

i) Expansion of offshoring goods and services

International fragmentation of production was already present in the early 1960s. IKEA established production facilities in Poland in the 1970s. Similarly, services offshoring is not a new phenomenon either. “Already in the late 1980s Swissair had moved a lot of its accounting tasks to India; the City of London also turned to India for computer maintenance services” (Jones et al., 2005: 309). However, in the last two decades the expansion of production networks in East Asia and the economic transformation of eastern Europe appear to have significantly intensified these phenomena (Jones et al., 2005).

Available data do not allow the direct measurement of economy-wide offshoring in goods and services. In order to gain insights into the evolution of offshoring, economists draw on proxy measures. Box 14 provides an overview of the measures of international outsourcing commonly used in empirical literature. It highlights the pros and cons of alternative measures and discusses data availability.

Table 9
Source of input goods or services

		Outsourcing	
		affiliate	non-affiliate
offshoring	at home	domestic production within the firm	domestic outsourcing
	abroad	FDI intra-firm trade	international outsourcing arm’s length trade

Box 14

Alternative measures of international outsourcing²⁷

Economic literature suggests a number of ways in which offshoring may be measured. In this box, offshoring measures are classified in accordance with the relevant database.

A rough measure of offshoring can be obtained using trade data statistics. For manufactured goods, trade in intermediates is commonly used as a proxy measure for offshoring. This is generally done by defining trade in certain product categories (those which have the words “parts” or “components” in their description) as trade in intermediates. For services, trade in “computer and information services” and “other business services” are usually selected as a proxy for offshoring since these categories of services are more commonly demanded by firms rather than final consumers (see, for example, Amiti and Wei, 2005; OECD, 2007d and 2006c; van Welsum, 2004; and WTO, 2005).

Offshoring measures based on trade statistics, regarding goods or services, suffer from the arbitrariness of the definition of product groups. A good or a service might be either final or intermediate depending on the context. For instance, software programmes reported under the category “computer and information services” can be demanded both as final products by consumers and as intermediates by firms. Trade statistics do not allow a distinction to be drawn between these two uses.

An alternative way to measure offshoring is to use input-output tables. The advantage of using these data over trade data is that they allow goods/services used as intermediate inputs to be distinguished from those used for final consumption. However, the availability of input-output tables is limited. For instance, the input-output tables provided by OECD (3rd edition) cover 35 countries and at most two years (1995, 2000).

Economic literature has in general referred to two indexes of offshoring based on the input-output tables. These are:

a) the offshoring index

For a sector i and for a set of inputs (goods or/and services) j , this is defined as:

$$OI_{ij} = \frac{\text{imported inputs } j \text{ used by sector } i}{\text{domestic} + \text{imported non-energy inputs } j \text{ used by sector } i}$$

That is, offshoring is measured as the share of foreign inputs j in all non-energy inputs j used by sector i . Hence, the more inputs imported by a sector, the higher the index for the sector. A problem related to using this index as a measure for offshoring is that information on imported intermediate inputs by type of inputs and buying sector is required to build this index. This information is, however, not available for all countries. One alternative is to use the index suggested by Feenstra and Hanson (1996) that uses trade shares of a sector as a proxy for the inputs used by the sector. Another problem is that this index of offshoring considers inputs from all industries in the computation of the measure of offshoring. For example, the purchase of foreign steel by a carmaker would be included in the measure of offshoring, even if it would not usually be perceived as offshoring. Alternatively, Feenstra and Hanson (1999) suggest a narrow definition of offshoring. This definition limits the imported inputs in the definition of the index to those falling in the same sector as the importing sector.

b) vertical specialization

For country k and sector i , the index of vertical specialization is calculated as:

$$VS_{ki} = \left(\frac{\text{imported inputs}}{\text{gross output}} \right) * \text{exports of intermediate and final goods}$$

and indicates the value of imported intermediate inputs (goods and services) embodied in exported goods. This index has been introduced by (Hummels et al., 2001) and has, so far, only been used for manufacturing goods.

It is worth noting that this measure only captures a special case of offshoring: the case when the offshored goods are used for production of goods that are then exported. The advantage of using this restrictive definition is that it allows an indication to be provided of the contribution of the growth in vertical specialization to overall

trade growth. Hummels et al. (2001) find that growth in vertical specialization accounted for more than 30 per cent of export growth in most of the OECD countries in the 1970s and 1980s.

A problem with this measure of offshoring is that it is affected by the level of sectoral aggregation of data. Furthermore, it does not take into account when a country exports intermediate goods to another country that uses them as input in the production of export goods (Hummels et al., 2001).

Finally, offshoring measures can be built on the basis of firm-level information. These originate mainly from business surveys that are based on questionnaires or interviews. The main advantage of these types of measures over those based on aggregated data (trade and input-output data) is that they provide very detailed information. For example, these data allow a

distinction to be drawn between offshoring through intra-firm and arm's-length trade and indicate whether offshoring is performed as relocation and expansion of production.

However, firm-level data have a very limited coverage. Surveys usually concentrate only on one country, large firms and one sector. Moreover, the development over time is often not captured by the data. For instance, the Centre for European Economic Research (2005) investigated 4,440 German firms in 2004 and focused on IT outsourcing. The Bureau of Economic Analysis collects data on multinational enterprises in the United States. UNCTAD (2004) gathered information on 100 European firms from the top 500. Moreover, when the survey does not focus on offshoring directly, indirect measures similar to the macro-based measures have to be used, e.g. Görg et al. (2004) uses the ratio of imported inputs by a firm over total wages in the firm.

One commonly used proxy measure for the size of goods offshoring is trade in parts and components.²⁸ Using the classification for intermediates proposed by Yeats (2001)²⁹, Chart 13 shows data for world trade in total merchandise and trade in parts and component for the period 1988-2006. The chart shows that overall trade in parts and components has increased faster than total merchandise trade. However, this excess growth was stronger over the 1990s and has slowed down in the most recent years.³⁰

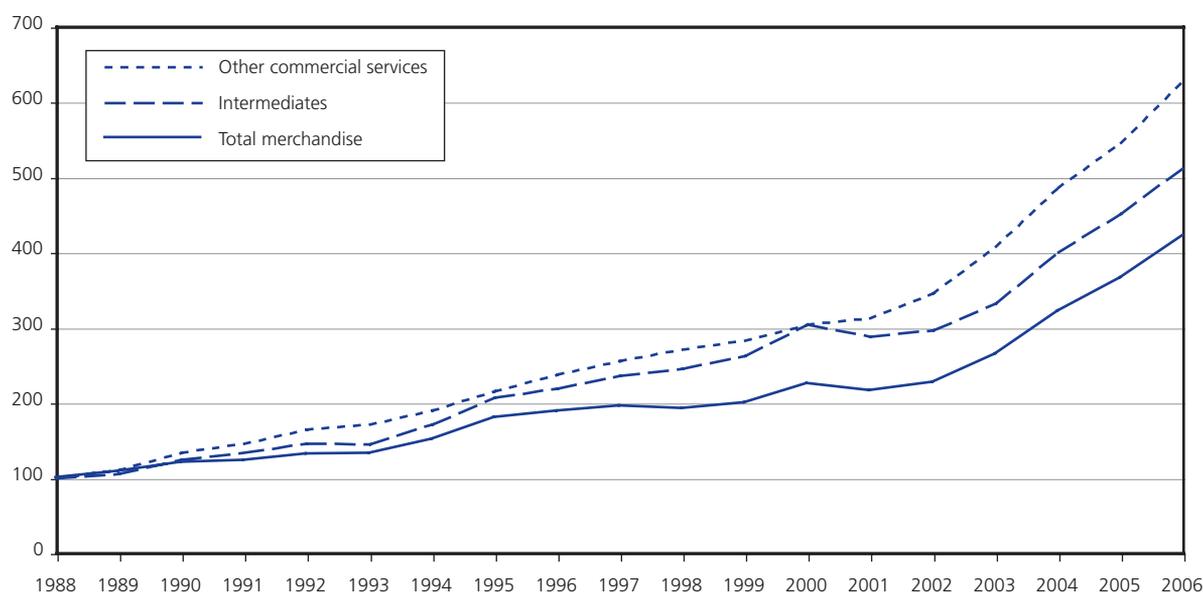
Regarding services, one economy-wide measure used in economic literature to study offshoring in services is the importing of “computing and information” and “other business services” (which include accounting and other back-office operations), as from the IMF's Balance of Payments Statistics. These categories – especially “other business services” – are chosen because they are mainly demanded by firms rather than final consumers. Therefore, they are a better substitute for outsourcing activities. On the basis of this, Amiti and Wei (2005) show that for the United States and for the United Kingdom evidence supports the view that services offshoring has been rising. For the United States, they estimate that the share to GDP of imports of computing and information plus other business services increased from 0.1 per cent in 1983 to 0.4 per cent in 2003.

For the United Kingdom, the share increased from 0.9 per cent to 1.2 per cent in the same period. Similar substitutes are used in other studies. For example, on the basis of the Bureau of Economic Analysis (BEA) classification, Grossman and Rossi-Hansberg (2006a) use imports in business, professional and technical services as a measure for offshoring in the United States.

Worldwide data on the export of “other business services” are available only for a short period of time (since 2000). In order to get an understanding of the evolution over time of offshoring in services, the category “other commercial services” is used as a substitute. The justification for this choice is that “other business services” are an important component of this category. For example, in 2004 “other business services” represented over 50 per cent of the category “other commercial services”. Therefore, it can be assumed that the category “other commercial services” capture offshored activities. Data on world trade in “other commercial services” for the period 1988-2006 are reported in Chart 13. The chart shows that “other commercial services” have been growing faster than trade in intermediate goods and that they experienced the fastest growth in recent years, especially since 2000.

Chart 13

Trends in world trade of total merchandise, intermediate goods and other commercial services, 1988-2006



Note: Data are normalized at 100 in 1988. Intermediates are classified as in Yeats (2001).

Source: WTO calculations based on UN COMTRADE and WTO statistics database.

In other words, to the extent that trends in trade in intermediate goods and trade in “other commercial services” are a good proxy measure for offshoring in goods and services respectively, data suggest that in the last two decades both offshoring in goods and services have grown at a faster pace than trade in final goods and that the growth in services offshoring has accelerated since 2000.

Evidence that offshoring has increased for both goods and services can also be inferred using more appropriate measures of offshoring than those based on trade data. However, these measures can in general be calculated only for a limited number of countries and years. For example, measuring offshoring as the share of imported intermediate inputs in the total (non-energy) intermediates used for production (a measure used by Feenstra and Hanson, (1996)), a recent study of the OECD (2007c) finds that between 1995 and 2000 offshoring of both goods and services increased for most of the 14 countries under consideration.³¹

On average, as shown in Table 10, for the 29 countries for which input-output data are available from the OECD, goods offshoring increased between 1995 and 2000, while services offshoring remained stable.³² In particular, services offshoring appears much smaller than goods offshoring. In 2000, 22 per cent of total intermediate goods used in production (of both goods and services sectors) were imported, while only 3.4 per cent of total services inputs were offshored. Since many services are non-tradable, the smaller figures for services offshoring relative to goods offshoring is to be expected.

Similarly, goods offshoring appears to have also increased when measured in terms of the index of vertical specialization developed by Hummels et al. (2001), a measure of the imported input content of a country’s exports. This is a more restrictive measure of offshoring than the percentage of imported inputs over total input, since it only accounts for those imported inputs that are embodied in goods that are exported. Hummels et al. (2001) estimate

Table 10
Worldwide offshoring of goods and services
(Percentage of imported inputs in total inputs)

World	1995	2000
Total	11.2	11.8
Goods	18.8	22.0
Services	3.4	3.4

Source: WTO calculations on OECD Input-Output data.

that between 1970 and 1990 vertical specialization grew by almost 30 per cent on average for the 14 countries under examination and accounted for 30 per cent of world export growth.³³ Calculations covering the period 1995 to 2000 show that vertical specialization increased for nearly all countries in the sample and that vertical specialization accounted for a significant share of each country's export growth (see Table 12 in the next sub-section).

In order to get an idea of the relative importance of offshoring via arm's-length trade and offshoring via intra-firm trade, firm-level data are required. At present, there is no systematic evidence on this. Data on multinational firms for the United States appear to suggest that "the growth of foreign outsourcing by US firms might have outpaced the growth of their foreign intra-firm sourcing" (Antras and Helpman, 2004: 554). Nevertheless, there is also evidence that intra-firm trade has increased as well (e.g. Hanson et al., 2005). For example, Feinberg and Keane (2005) show that sales from a Canadian affiliate to its United States parent firms in terms of total sales of the affiliate and vice-versa almost doubled between 1984 and 1995.

ii) Which countries offshore the most?

Table 11 identifies the five countries that rely the most and the least on imported inputs in their production of output respectively.³⁴ Figures represent the percentage share of importer inputs over total input – the measure of offshoring used

by Feenstra and Hanson (1996) (see Box 14 for more details). Three general patterns emerge from the table.

First, goods are offshored much more than services across all countries. For example, in Ireland 70 per cent of intermediate goods used for production are imported while only 33.4 per cent of services are imported. The percentage gap between goods and services offshoring is even greater for other countries. The relative high shares of services offshoring in Ireland is due to the large payments on fees and licences for software services imports. Second, those countries that offshore more goods typically also offshore more services. For example, Ireland, Belgium and Hungary are present among both the top five offshoring countries in goods and in services, while the United States, China and Japan belong to the bottom five countries for both goods and services offshoring. Third, small countries tend to offshore more than large countries. The top five offshoring countries are all small countries, while the bottom five countries are large. The driving force behind this pattern is that large countries in terms of labour and/or capital abundance find it easier to exploit economies of scale. If different stages of production are characterized by increasing returns to scale, then only large countries are able to exploit them for many stages and sectors, because of their large endowment of capital and/or labour. Conversely, small countries are more likely to concentrate their resources on a smaller number of stages of production and offshore the rest.

Table 11
Goods and service offshoring by country, 2000
(Imported inputs as per cent of total inputs)

Goods		Services	
Top five offshoring countries			
Ireland	70.6	Ireland	33.4
Hungary	63.2	Belgium	14.9
Belgium	57.0	Hungary	14.4
Slovak Republic	54.4	Norway	13.4
Austria	52.7	Czech Republic	13.3
Bottom five offshoring countries			
United States	17.8	Australia	3.9
India	12.7	France	2.8
China	12.6	Japan	2.1
Brazil	10.5	China	1.3
Japan	9.2	United States	0.5

Note: For some countries Input-Output data are not available for the year 2000. These are: Australia (1999), India (1999), Ireland (1998), Norway (2001); where brackets denote the year of the Input-Output table used.

Source: WTO calculations based on OECD Input-Output tables.

In particular, Table 11 shows high figures for goods offshoring for some eastern European countries, notably Hungary and the Slovak Republic. Similar results can be drawn using Hummels et al. (2001)'s index of vertical specialization, a measure of the import content of exports.³⁵ Table 12 shows this index for the years 1995 and 2000 for the countries for which input-output data are available from the OECD database. Countries are shown in a descending order according to the value of their index in 2000. Three of the top five countries are eastern European countries. The increasing involvement of eastern European countries in production networks is documented in a number of studies. For example, based on a firm-level survey, Marin (2006) shows the importance of vertical FDI and intra-firm trade between Germany and eastern

European countries. She estimates that in the period 1996-2000 the share of intra-firm exports in total exports from Hungary, the Slovak Republic and the Czech Republic to Germany was 16, 65 and 40 per cent respectively.

Table 12 also shows the contribution that increased vertical specialization has had on the growth of exports (as a share of gross output) by country. The figures show that between 1995 and 2000 the increase in vertical specialization accounted on average for more than half of the growth in the export/output ratios. For example, in the case of the Slovak Republic, the exports/output ratio increased by approximately 16 per cent between 1995 and 2000. Almost 70 per cent of this increase was due to growing vertical specialization.

Table 12
Vertical specialization (VS) and its contribution to export growth
(Per cent)

Country	Vertical specialization		Export/output change in percentage points	Contribution of VS to export/output change
	1995	2000		
Hungary	52.3	65.0	9.7	146.5
Czech Republic	41.8	53.0	11.1	87.5
Belgium	46.9	52.7	10.7	92.6
Slovak Republic	40.6	49.6	15.9	70.0
Netherlands	40.6	45.6	14.4	69.9
Korea, Rep. of	33.0	41.5	7.9	64.3
Portugal	32.2	41.2	10.0	65.0
Austria	34.6	40.3	11.8	61.8
Spain	30.6	39.9	7.3	68.3
Sweden	32.0	36.2	4.6	79.4
Finland	31.0	35.0	6.6	59.7
Canada	33.8	34.9	0.4	186.6
Poland	21.9	31.5	5.7	64.4
Denmark	30.6	31.4	7.9	37.1
Germany	23.0	29.9	9.9	53.1
Italy	26.2	28.7	3.3	49.7
Great Britain	26.3	26.2	-1.7	28.8
France	22.8	24.5	9.7	28.8
Greece	20.7	21.7	0.8	42.0
Turkey	17.9	21.7	3.9	33.6
China	16.6	21.0	2.1	42.7
Indonesia	17.2	20.6	12.9	25.2
Australia	15.7	17.4	2.6	31.3
United States	12.3	15.1	0.6	66.8
Norway	16.8	15.0	8.4	5.2
India	11.8	14.9	1.6	28.9
Brazil	11.6	14.3	1.3	31.0
Russia	13.2	14.3	9.0	16.6
Japan	9.5	14.0	3.5	28.6

Note: In this table the measure for vertical specialization has been normalized by total country export. For some countries Input-Output data for 1995 and 2000 are not available. These are: Australia (1995,1999), Greece (1995,1999), India (1994,1999), Portugal (1995,1999), Canada (1997,2000), China (1997,2000), Hungary (1998,2000), Norway (1997,2001) and Turkey (1996,1998). Years reported in brackets are those used for the calculations.

Source: WTO calculations based on OECD Input-Output tables.

iii) Sectoral composition of offshoring

At the sectoral level, there are two interesting questions: which sector offshores the most and what type of input or task is offshored the most? Most economic literature neglects the latter. One reason for this is that the data collected are not sufficient to allow specific tasks to be distinguished.

Table 13 reports the top five sectors that offshore goods the most and the top five sectors that offshore services the most.³⁶ The table shows that the industry that offshores the most is “office, accounting & computing machinery”, with 45.6 per cent of goods being imported in 2000. A very high tendency to offshore also emerges in other high-technology sectors, such as “radio, television & communication equipment” and “medical, precision & optical instruments”. For all these sectors, offshoring increased between 1995 and 2000. The fact that offshoring is widespread in high-technology industries should not come as a surprise. As will be discussed below, the need for high-quality inputs will affect the choice of the country in which the firm locates as well as the firm’s organizational form (integration versus outsourcing), but it does not determine necessarily the decision to offshore.

In general, offshoring of services is smaller than offshoring of goods. This is true for all industries, including services industries. This is not surprising, since many services are non-tradeable.

(b) The economics of international organization of production

In order to understand the recent trends in the world economy, and the increasing outsourcing to low-cost countries such as India and China, it is essential to understand what drives a firm’s decision to outsource and offshore. Traditional models of trade that assume that production takes place within the boundaries of a firm cannot explain the complex mix of trade and FDI patterns. A rapidly expanding literature introduces elements from industrial organization and contract theory in trade theory to explain international outsourcing.

There are two types of decisions that a firm has to take concerning intermediate inputs or services. First, a firm has to decide whether it wants to produce inside the boundaries of the firm or outside (in other words, a make or buy decision). Second, in either case, the firm has to decide whether to source the activity domestically or abroad (inshore or offshore). The outcome of these two decisions gives rise to international outsourcing.

With a view to explaining the factors driving the recent development in outsourcing (i.e. the increase in offshoring of services and goods to non-affiliate firms through arm’s-length trade), this sub-section reviews the models that explain firms’ decision-making, focusing on the factors that explain why firms offshore and, in particular, why they offshore to non-affiliate firms.

Table 13
Industries that offshore most at the world level
(Imported inputs over total inputs, per cent)

	1995	2000
Top five sectors offshoring goods		
Office, accounting & computing machinery	38.0	45.6
Radio, television & communication equipment	27.8	35.8
Medical, precision & optical instruments	26.1	32.9
Electrical machinery & apparatus, n.e.c.	25.3	31.1
Chemicals and pharmaceuticals	28.3	30.1
Top five sectors offshoring services		
Transport and storage	8.9	9.5
Computer & related activities	4.1	4.4
Post & telecommunications	4.4	4.2
Wholesale & retail trade; repairs	3.8	4.1
Other business activities	4.6	3.9

Source: WTO calculations based on OECD Input-Output tables.

i) The decision to offshore

Economic theory provides three main answers to the question as to why firms offshore. One is that offshoring allows the advantage of location to be exploited. That is, firms offshore to take advantage of the fact that some inputs/services are more cheaply produced abroad. Hence, production costs can be reduced. Another reason is that offshoring allows for a smoother workload for the regular workforce by contracting-out some tasks in peak periods. Finally, an offshoring decision may reflect the existence of economies of scale that are available to specialized providers of certain intermediate goods or particular services (Abraham and Taylor, 1996).

There are, however, additional costs related to offshoring. These include costs related to differences between countries (such as the costs of learning laws and government regulations of another country, different languages across countries or different currencies) as well as managerial costs (e.g. monitoring and coordination costs), costs of searching for the appropriate supplier, negotiating costs, etc. The decision to offshore is driven by the trade-off between the advantage of lower production costs and the disadvantage of incurring these other types of costs (be it fixed – that is, independent of the production volume – or variable costs). As will be discussed more extensively in the next subsection, the relative importance of managerial costs and other costs are the driving factors in deciding whether to offshore at arm's length or through FDI.

A simple model explaining why firms decide to offshore has been developed by Jones and Kierzkowski (1990 and 2001). They provide a very simple explanation for the increasing fragmentation of production. In their model, the traditional law of comparative advantage holds, but it applies at the level of components. It might be the case, they argue, that the various stages of production require different types of technology/skills or they may require inputs in different proportions. In these conditions, the benefit of fragmenting production across countries is that the firm can locate different stages of the production process in the country where there is a relative abundance of the type of skill/input used relatively more intensively in that stage of production. In so doing, the firm can lower costs of production. However, production fragmentation is costly. Separate production stages need to be coordinated and monitored.

Furthermore, this implies incurring transportation and communication costs, insurance costs and other connecting services costs.

In this set-up, technological improvements and deregulation can explain the increase over time of international fragmentation, as they reduce the costs of services links. Furthermore, the growth of the world economy has fostered this process. This is due to the fact that as production scale increases, the fixed costs of services can be spread over a larger output, thus implying lower average costs (costs per unit of output).

More recently, in response to the development that firms no longer only locate production stages in different areas and import intermediate goods, but also “unbundle” office tasks, Grossman and Rossi-Hansberg (2006b) have developed a so-called “new paradigm”, which puts “task” trade at the centre of the analysis rather than trade in goods. The idea is that, in order to produce a final good several tasks have to be performed. Some of these tasks can be offshored.

As discussed in Section C.1.d, the new paradigm of globalization differs from the previous theory of trade in that it explains trade at a finer level of distinction, that of tasks.³⁷ The new paradigm theory is based on the fact that international competition takes place at the level of individual tasks performed by a firm (e.g. assembly, packaging, data entry) rather than at the level of industry (as in the traditional comparative advantage theory of trade) or at the level of the firm (as in the recent “new-new” trade theory). The traditional law of comparative advantage holds, but it applies at the level of individual tasks, in the sense that each nation would export the task in which it has a comparative advantage.

An obvious pre-condition for offshoring (and, in general, for outsourcing) tasks is that the production of a particular input or a particular service task needs to be separable and tradeable. In this sense, technological innovation has been a driving force for the recent phenomenon of services offshoring. In fact, recent technological developments, especially in IT, have made it possible to separate geographically an increasing number of services tasks. Basically, services such as accounting, booking, payroll and others that relate to the collection, manipulation and organization of information can be codified, digitalized and separated from other activities within

firms. The possibility to transmit information electronically via the internet, for example, has rendered these services tradeable, thus making them candidates for offshoring. There are, however, tasks that cannot be offshored. One example is the task of cleaning offices.

Grossman and Rossi-Hansberg (2006b)'s model of trade in tasks also builds on two other key assumptions: (i) that offshoring firms can take their superior technology with them; (ii) that this "technology transfer" comes at a certain "offshoring cost" that differs across tasks (that is, technology transfers are easier for some tasks than for others). These two assumptions highlight two other important factors determining trade in tasks: that ideas (the technology used to perform a certain task) need to be transferable and that the cost of offshoring a specific task will partly determine which task to offshore.

One factor that determines how easily the technology to perform a certain task can be transferred is the degree of standardization of the task. Standardization of some tasks has been a factor driving increased offshoring. For example, the development of specialized software to handle accounting tasks has allowed workers to follow routinely a set of instructions for certain tasks. In other words, it has allowed the easy transfer of technology for accounting purposes. Similarly, automation has been a driving force in the development of a production network in the automotive industry. However, there are some tasks (most likely the "core" tasks of a certain industry) that need to be customized to the user. These tasks are less likely to be offshored. In line with this argument is the evidence on the distribution of tasks that are performed in the United States. Since 1970, the input of routine tasks (that is, tasks that require the repetition of a set of procedures that can be codified) in the US economy (measured relative to the distribution in 1960) has been falling, while that of non-routine tasks (defined as tasks for which proximity is more important)³⁸ has been rising. This is exactly what is to be expected if routine tasks can be offshored (Grossman and Rossi-Hansberg, 2006b).

ii) Offshoring: arm's-length transactions or vertical FDI?

The models discussed above explain why it may be beneficial to separate production stages across

countries, but they do not explain whether firms should source their inputs through vertical FDI or through arm's-length contracts. A growing body of economic literature addresses this issue and provides the micro-foundations for trade in intermediate goods and trade in services.³⁹

Embedding elements of contract theory into trade models, recent literature has provided some new insights into what determines firms' decisions on whether to outsource or to integrate and whether to offshore. This two-dimensional problem yields four possible outcomes: producing intermediate goods or services within the boundaries of the firm, purchasing them from a domestic unaffiliated firm (domestic outsourcing), importing intermediate services from an affiliated firm (intra-firm trade), and importing intermediate goods or services from an unaffiliated company located abroad (international offshoring). Table 9 represents these four possible outcomes.

One factor affecting a firm's decision to outsource is the "thickness" of the market. As Grossman and Helpman (2002) highlight, firms' decisions to outsource depend on the trade-off between the higher production costs associated with running a large and less specialized organization and the costs of searching for the appropriate supplier and dealing with contracting issues associated with outsourcing. In the case of vertical integration, where all tasks are carried out within the same firm, production costs are higher for two reasons. One is that firms incur "diseconomies of scope" because costs of coordination and monitoring increase with the size of the firm. Another reason is that vertically integrated firms do not benefit from the learning associated with specializing in one single activity.

On the other hand, specialized firms may be able to produce at lower costs, but they have other disadvantages. One of these is that the final good producer that outsources the production of a specialized component has to face the costs of searching for a supplier that will deliver the agreed quality and quantity of inputs at the agreed time.⁴⁰ If not, the production process may suffer delays or the firm brand name may lose prestige. If the market is large ("thick"), the probability that a firm finds the appropriate match is higher and if the supplier fails to deliver, the easier it is for the outsourcing firm to find an alternative solution. Therefore, outsourcing is more likely to succeed, the larger the industry and the larger the overall economy.⁴¹ In particular,

extending the model to a two-country world (the North and the South), Grossman and Helpman (2005) show that outsourcing in the South increases relative to outsourcing in the North when the size of the South increases.

Another important factor in determining whether to integrate or outsource and where to offshore is the quality of the institutional framework (Grossman and Helpman, 2003 and 2005). The quality of institutions matters because the contract between the final good producer and the supplier of the intermediate good in the arm's-length relationship needs to be enforceable. If not, the risk of outsourcing may be too high.

To understand this, consider the relationship between a producer and a supplier. Once the final producer has found a supplier, the latter may need to make an investment (new skills, new equipment, new product development) in order to customize the input to the needs of the final producer. When the investment required is relation-specific, that is it has little value outside this particular transaction, the final good producer may "hold-up" the supplier.⁴² That is, once the supplier has made the investment, the buyer may breach the initial terms of the agreement and offer a lower price for the input. Since inputs are customized to a specific final producer, they do not have a market outside the contractual relationship. Hence, the supplier has a very weak bargaining position once an agreement has been signed.⁴³ Anticipating the possibility that the final good producer may breach the contract, the input supplier will under-invest. This under-investment raises the cost of producing the final good.⁴⁴ As a consequence, the more important the "hold-up" problem, the less likely is the possibility of outsourcing.

How does the quality of the institutional framework affect the decision to offshore? If institutions are good, suppliers are able to enforce the contract, at least for the part of the surplus⁴⁵ that is verifiable. This makes it less likely that the supplier will under-invest, thus making international outsourcing more likely than FDI (Grossman and Helpman, 2003). In a model with different types of firms and with varying types of possible contracts across industries and countries, Antràs and Helpman (2007) show that better institutional frameworks for contracting in the South increase the likelihood of offshoring, but may reduce the relative prevalence of either FDI or foreign outsourcing. In particular, the quality of institutions will determine in which country a firm

chooses to offshore (Grossman and Helpman, 2005). In countries with a good quality of institutions, there will be less under-investment. Thus, the costs of producing customized intermediate inputs will be lower than in countries with a poor institutional environment.

Empirical evidence supports these predictions. Using US imports data for 1998, Levchenko (2007) shows that the institutional framework helps to determine a country's comparative advantage. In particular, countries with better institutions have a comparative advantage in goods with a complex production process that depend on strong institutions. These are goods that may be produced through a large number of production stages. He finds that the share of US imports in goods with complex production processes increases by 0.23 when a country improves institutional quality from the bottom 25 per cent to the top 75 per cent level.

It is worth noticing that the "hold-up problem" matters most when the intermediate input is specifically designed to match the need of a single final good producer.⁴⁶ Clearly, the more generic the input, the less risky it is for both the final good producer and the producer of the intermediate input to enter into a contractual relationship. Hence, standardization facilitates outsourcing. The institutional framework matters, in particular, for the production of non-standardized inputs. Therefore, countries with a good institutional environment have a comparative advantage in the production of intermediate goods that require a specific investment (less standardized products) by the supplier to customize the product to the needs of the producer of the final good.⁴⁷ Empirical evidence supports this prediction. In a recent paper, Nunn (2007) shows that countries with better contract enforcement specialize in industries that rely heavily on relationship-specific investments.

The choice between integration and outsourcing also depends on the factor-intensity of the industry. Distinguishing between capital-intensive sectors and labour-intensive sectors, the model built by Antràs (2003) predicts that vertical integration is the preferred form of sourcing intermediate inputs for capital-intensive sectors, while arm's-length trade is the preferred option for labour-intensive sectors. The reason is that in capital-intensive sectors, the relation-specific investment of the producer is more important. Thus, the producer will choose to integrate in order to keep a higher share of the profits and to get the

right incentive to adequately invest in the relationship with the supplier. The evidence supports theoretical predictions. In particular, for the United States, Antràs (2003) finds a positive correlation between intra-firm trade and capital intensity. Similarly, in a recent paper, Nunn and Trefler (2008) find that the intra-firm trade is higher in skill- and capital-intensive industries than in unskilled sectors.

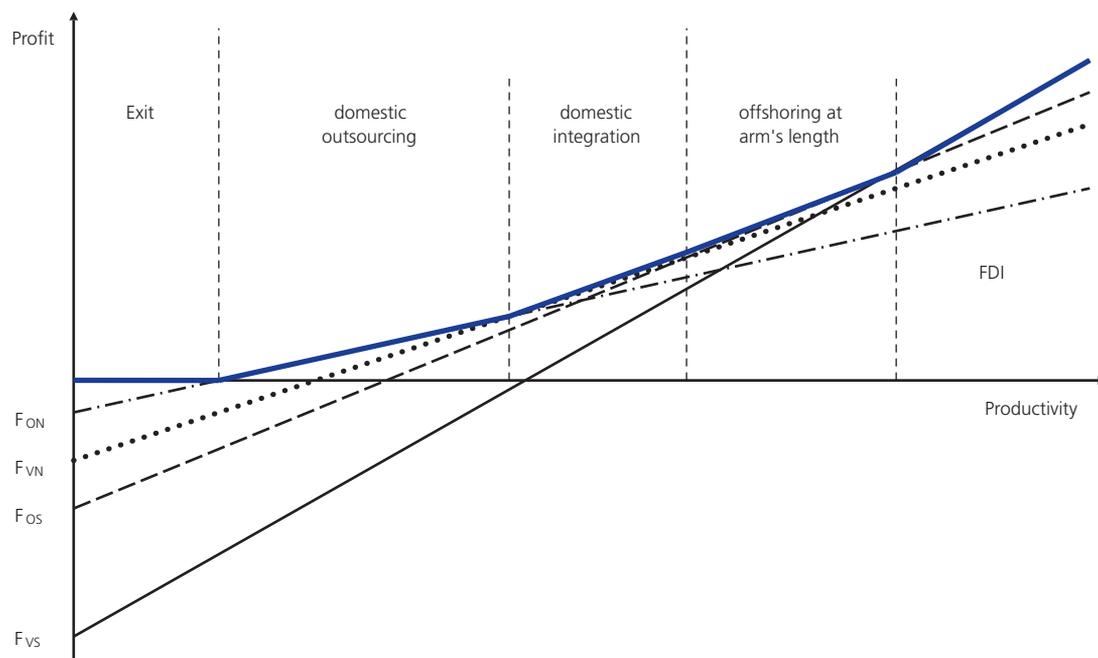
Combining differences in requirements for investment across sectors and differences in productivity across firms within a sector, Antràs and Helpman (2004)⁴⁸ show how firms' decisions to integrate or outsource vary with the level of technology of the firm. In their model, the trade-off between vertical integration and outsourcing is driven by the trade-off between "hold-up" problem-related costs and the fixed costs of the particular type of organization. In particular, they assume that fixed costs are higher under vertical integration (where the firm incurs high managerial costs) than under outsourcing (where there are search costs) and that offshoring has higher fixed costs than domestic sourcing (e.g. search costs for a supplier are higher when the supplier is located abroad due to differences in languages, need to acquire knowledge about the laws and practices and so on).

Under this cost structure, they show that in sectors where the production of the final good is component-

intensive, outsourcing prevails over vertical integration. On the other hand, in sectors where the final good producer provides headquarters-intensive services, all four organizational forms can co-exist. The prevalence of one form over another depends on the distribution of productivity across firms within the sector. In particular, in decreasing order of productivity, the most productive firms will engage in FDI, firms with a medium-high level of productivity will offshore internationally, firms with a medium-low level of productivity will integrate all activities within the firm, with no outsourcing. Finally, the least productive will either be driven out of the market or will outsource in the domestic market.

Chart 14 shows the profit profile of firms depending on their productivity under alternative organizational structures. The chart is based on a specific assumption of ordering the fixed costs, whereby fixed costs of vertical integration are higher than fixed costs of offshoring and fixed costs in the North are less than in the South.⁴⁹ Assuming that variable costs are lower abroad because of lower wages, profits increase faster (lines are steeper) when inputs are produced abroad rather than at home. Furthermore, profits increase faster (lines are steeper) under vertical integration than under outsourcing, irrespective of the location. This is because under outsourcing the final good producer

Chart 14
Vertical integration or outsourcing options for a headquarter-intensive firm located in the North



Source: Antràs and Helpman (2004: chart 4).

has to leave a larger part of the profits to the supplier in order to provide the supplier with the incentive to invest in the relationship. Firms will choose the type of organization that maximizes their profits. The bold line represents the profit-maximizing frontier. It shows that only highly productive firms engage in offshoring. In addition, distinguishing between offshoring and non-offshoring firms, within each group, outsourcing is chosen by the less productive firms.

Some interesting results emerge from this model. For example, the larger the wage gap between the home and the foreign country, the larger the share of firms that will choose to offshore. This is because a large wage gap will make it easier to cover the fixed costs of offshoring. By the same token, the lower the trade costs, the higher the offshoring (both at arm's length and through FDI). This implies that whatever factor reduces trade costs also increases offshoring. Therefore, the better the infrastructure in the two countries (the offshoring country and the country hosting the offshored activity), the higher the offshoring. Also offshoring will be higher in sectors where trade costs are lower (that is, those with a higher weight-to-value ratio). The greater the dispersion of productivity across firms in an industry and in sectors with higher component intensity, the higher the offshoring as well. Finally, an average increase in firms' productivity or a lowering of fixed costs for offshoring will also lead to more offshoring (e.g. a reduction in the time required to start up a business).

In another paper, Antràs (2005) shows that the relative prevalence of outsourcing and vertical integration, domestically or abroad, depends on the product cycles. In particular, all parts of the value chain of a new product are produced domestically. Over time, the production of components is offshored to subsidiaries, and components are imported through intra-firm trade. As the product matures, components are manufactured abroad and imported at arm's length.

It is worth highlighting that theoretical predictions over the prevalence of the various forms of organization for a firm depend on the specific assumptions of each trade model. A different hypothesis from that in Antràs and Helpman (2004) as to the ranking of fixed costs would lead to different patterns. Similarly, Grossman and Helpman (2004) build on a model where agency problems arise from managerial incentives⁵⁰ rather

than incomplete contracts. They predict a completely different pattern regarding the organization of firms. In this model, firms with the lowest and the highest productivity levels outsource, while firms at an intermediate level of productivity vertically integrate. Empirical evidence is needed to ascertain the strength of these alternative theories.

iii) Barriers hindering entry to international production networks

On the basis of the literature reviewed above, two factors can be singled out as those driving the process of international fragmentation of production. These are: (i) the decline in the absolute costs of trading goods and services. These include the reduction in tariff rates, lower transportation and communication costs and the reduction in the time required to exchange goods; (ii) the lower managerial costs of offshoring. These include costs of searching for the appropriate supplier as well as the costs of monitoring and coordinating domestic and foreign activities. Recent advances in telecommunications technology have helped to lower these costs.

Although international trade costs have declined, there are country-specific costs that may hinder a country's participation in international production networks and services offshoring. Since vertical specialization can be a source of technology transfer and a channel for companies in developing countries to enter new export markets, it is important to understand what factors can limit the chances of a country entering these networks.

The offshoring literature reviewed above has highlighted – together with the traditional factors of comparative advantage, such as factor prices, skills availability and the tax regime – new sources of comparative advantages that determine where a firm chooses to offshore. These include the quality of the institutional framework in enforcing contracts, the size of the market (which determines how easy it is to search for appropriate suppliers) and any factor that reduces the cost of offshoring (e.g. a reduction in the time to start up a business).

Table 14 shows the characteristics of high-income, middle-income and low-income countries in terms of some of these factors. In particular, the table reports indexes for: (i) the quality of transport infrastructure (a major factor in determining transport costs);⁵¹

Table 14
A cross-country comparison of some determinants of offshoring costs

	High-income countries	Middle-income countries	Low-income countries
Quality of transport infrastructures			
Quality of airport, Index 0-7 (2005)	5.9	4.2	3.3
Quality of port infrastructure Index 0-7 (2005)	5.5	3.5	2.9
Paved airports per 1000 sq km (2006)	2.6	1.2	0.1
Quality of communication infrastructures			
Telephone mainlines, per 1,000 people (2005)	499.6	210.1	36.7
Mobile phone per 1,000 people (2005)	837.8	376.7	76.5
Internet users per 1,000 people (2005)	523.4	114.3	44.0
Faults, per 100 fixed lines (2005)	8.4	16.8	40.5
Quality of institution for doing business			
Rule of law, index between -2.5 and 2.5 (2006)	1.2	-0.2	-0.9
Time to enforce a contract, days (2006)	548.2	629.1	625.0
Procedure to enforce a contract, number (2006)	34.2	38.2	40.8
Cost to enforce a contract, % of claim (2006)	20.0	28.7	53.6
Time-related barriers			
Time to start a business, days (2006)	22.2	51.3	58.3
Time to deal with licence, days (2006)	162.6	217.7	265.0
Export documentations, number (2006)	4.8	7.2	8.6
Time for export, days (2006)	11.3	25.0	41.0
Time for import, days (2006)	12.9	29.3	49.6

Source: WTO calculations based on World Bank Doing Business Database (2006), Governance Database (2006), World Development Indicator (2006); ITU (2007) World Telecommunication ICT Indicators; Global Competitiveness Report (2006) and CIA Factbook (2006).

(ii) the quality of communication and information technology infrastructures (a major component of trade costs); (iii) the quality of the institutional framework (since the quality of the legal system is essential to guarantee enforcement of contracts and the rule of law); and (iv) time-related barriers (the lengthy procedures required to start up a business as well as long waiting times at the border being likely to impede entry into production networks).⁵²

Table 14 shows that low-income countries are at a big disadvantage in terms of the quality of infrastructure and time-related barriers. As suggested by the economic literature on offshoring, this is likely to limit their participation in production networks despite their advantages in terms of factor prices. Section F.2 discusses the action that could be taken to remove some of the obstacles to entering production networks. These include national policies as well as international co-operation.

(c) Case studies

While there is extensive theoretical literature on the fragmentation of production, rigorous empirical studies in this area are difficult to find. This section, therefore, helps to clarify the relevance of these theories by examining certain industries

where fragmentation of production is particularly prevalent – namely, in the electronics sector and financial services.

i) Electronics

This section explores the implications of recent economic research on fragmentation to help us understand the forces shaping the production process and trading patterns in electronics. According to Table 14, a number of electronics sub-sectors are some of the most fragmented manufacturing industries.

Much of this section focuses its discussion on one particular electronics product – a laptop computer. Its production process exhibits many interesting features that illustrate the changing nature of offshoring within the electronics industry more broadly. While describing how this particular product is intertwined with the fragmentation phenomenon, some of the characteristics that differentiate the electronics sector from other manufacturing sectors are also examined. Such an analysis sheds light not only on the more fundamental forces driving the fragmentation process, but also ultimately its limitations.

What makes the production of a laptop computer an interesting case study to examine? By many accounts, the production of a laptop is the epitome of the fragmentation process.⁵³ First, creation of the final good requires various components, such as semi-conductors, a hard drive, motherboard, memory and display panels, that are frequently designed, produced and assembled in different locations, potentially in different countries, by firms with differing types of contractual arrangements with the end-good producer. Second, such a product is interesting to study because, in many instances, firms have established a sales process in which they permit and even encourage (through price incentives) the customer to create a highly specialized “made to order” product. This feature will highlight the sensitivity of this product to the increasing importance of “timeliness”, i.e. the difficulty that firms have to hold a large inventory. This is increasingly being recognised by economists as a new factor driving fragmentation.

Many computer firms that make laptops (e.g. Dell, IBM/Lenovo, etc.) have developed internet sales techniques which allow customers to tailor the design of their computers to their specific tastes or needs. The firm, therefore, has an important role at the beginning and end of the production process – e.g. designing the overall product as well as marketing (advertising, sales) it to end-users. One implication of accommodating customized demand, however, is that the producer becomes constrained in its ability to hold available inventory. Nevertheless, this level of customer demand would not be possible but for advances in telecommunications and information technology.

Many of the steps in the production of the laptop take place via a fragmented production process – e.g. the motherboard may be produced in Japan, the hard drive in Singapore, the memory in the Republic of Korea, the display panel in Chinese Taipei, the microprocessor in Malaysia, etc. – and everything is assembled into a recognizable computer in China. Economic research has documented a number of patterns in the production process and can help to explain the rationale for the fragmented approach and its implications.

First, consider the basic relevance of the decline since 1957 in air transport costs, as described earlier. This is likely to have substantial implications for an industry such as electronics for a number of different reasons. First, while the cost of air transport

has fallen, for any given weight of the product being transported air shipment is still much more expensive than ocean shipping. One implication of this is that the first products that would be cost-effective to ship by air once air transport prices start to decline would be lightweight products with high unit values.⁵⁴ Many electronics products fall into this category, including laptop computers. Second, the reduction in air transport costs may affect the production process for goods for which “timeliness” is important. In particular, Hummels (2001) documents a premium that customers appear willing to pay to receive products quickly by air.⁵⁵ The reduction in air transport costs not only helps explain why products such as laptop computers might be traded (imported and exported) internationally, but it can also help to explain why the production process has become so fragmented.

Consider again the full process by which laptops are produced and consumed as well as the model of Evans and James (2005), who argue that time is an important factor influencing global specialization and trade.⁵⁶ Time is valuable because it allows retailers to respond to fluctuations in demand without holding large quantities of inventory. Evans and James predict that products where timely delivery is important will be produced near the source of final demand. While this would appear to run counter to the example of the laptop computer, for which consumers are located primarily in the United States or Europe while production takes place largely in South East Asia, a closer inspection suggests that this is not necessarily the case.

With the availability of air transport reducing the timeliness factor for trade between the consumer markets and South East Asia, the source of almost-final demand (assembly of components) need not be in close proximity to consumer demand. Nevertheless, even with air shipping, the need for timeliness between the assembly needs and the production of component inputs may drive the localization of production of those components to be within an accessible distance. Indeed, in a related paper, Harrigan and Venables (2006) show that the need for timeliness leads to a geographical clustering of economic activity. If final assembly takes place in two locations and component production has increasing returns to scale, component production will tend to cluster around just one of the assembly plants.

In addition to the reduced cost of air shipping, there may also be “quality improvements”, although these

are more difficult to measure accurately. Nevertheless, in addition to a reduction in average shipping time, improvements in reliability might be measured via a reduction in the variance of shipping times. Technological innovations, such as improvements in methods for handling cargo, may also allow more sensitive products to be shipped internationally in addition to improvements in insurance coverage. Furthermore, there have also been substantial innovations in the telecommunications sector which allow greater fragmentation in the production process. For example, widespread adoption of bar codes and digital scanning results in less costly tracking of components and permits greater distance between different stages of the production process. So the production and assembly of the motherboard, hard drive, display panel, memory and microprocessor for a laptop need not all take place on a single factory floor – in fact, their production can take place at different factories in different countries at different times. Again, such innovations allow producers of intermediate goods and assemblers to hold smaller amounts of inventory. This is particularly important for products that rapidly depreciate in value.

Given the substantial differences in transport costs across countries, there is likely to be a role for the public sector in influencing how transport costs affect the fragmentation of the electronics industry.⁵⁷ For example, some of the improvements in the quality and cost of air shipping as an alternative to ocean shipping involve not only technological innovations in the manufacture of aircraft, but also improvements in logistics, public infrastructure and regulatory conditions. In the context of air shipping, important factors include customs clearance delays (trade documentation), the quality of adjoining transport links (such as road haulage and rail) as well as airport efficiency and openness to trade (for example, the number of airports with paved runways capable of accommodating cargo airplanes). Finally, for a fragmented process such as the production of laptops, it may also be important for the country to have reliable access to e-business networks as well as “electronic data interchange” between producers and freight-forwarding companies (Carruthers et al., 2003).

When it comes to understanding the fragmentation of the production process for a product such as a laptop computer, separate from the question of transport costs is the issue of contractual relationships between firms involved the production process. Specifically, are they subsidiaries of a multinational firm, or are

these arm’s-length transactions occurring between suppliers and buyers? Are these long-term and/or repeat contracts, or are these components purchased from a spot market?

While a laptop computer can be relatively customized by the consumer, he/she is typically asked to choose from an available menu of parts and components when designing the computer’s specifications. It is frequently the case, however, that these components tend to be standardized inputs. Thus, as in Antràs (2005), more arm’s-length trade is expected than intra-firm trade in this sort of sector. He shows that as a result of contractual difficulties, goods are initially manufactured in the North, where product development takes place. As the goods become more standardized, the manufacturing stage of production is shifted to the South to take advantage of lower wages. The organization of the production process is also affected by incomplete contracts. The model gives rise to a new version of the product cycle in which manufacturing is first shifted to the South to subsidiary firms, and only at a later stage to independent firms in the South.

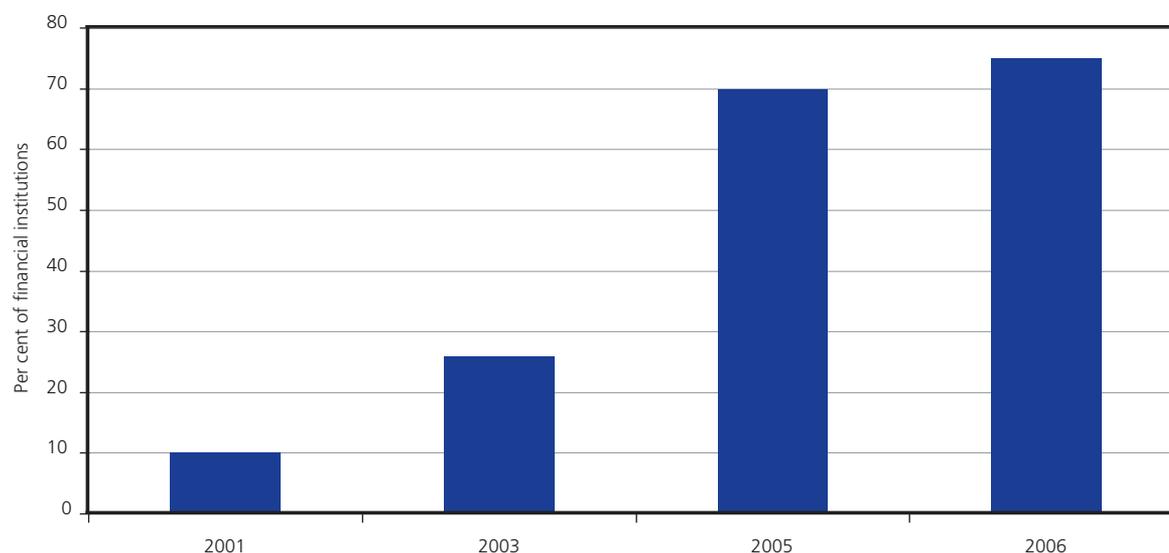
In another empirical study, Kimura and Ando (2005) show that the share of arm’s-length trade has increased at the expense of intra-firm trade within Japanese multinationals in East Asian countries over time. While this trend is observed for all machinery sectors, it is much stronger for the electronics sector. Clearly, as electronic goods become standardized, contractual difficulties arise less often, and arm’s-length trade with specialized producers becomes more efficient.

ii) Financial services

The financial services sector ranges from the basic provision of retail banking services (e.g. small-scale borrowing and lending, credit cards) to the provision of more sophisticated and longer-term borrowing and lending (mortgages, long-term investment vehicles) to various forms of insurance services (life, accident and property) as well.⁵⁸

There is little information about the extent of global offshoring by financial institutions. Whatever information is available comes primarily from international consulting firms that follow offshoring trends in the financial sector. This serves as the principal source of information for this subsection.⁵⁹

Chart 15
Per cent of financial institutions with offshoring operations



Source: Various issues of Deloitte Touche Tomatsu's Global Financial Services Offshoring Report.

As Chart 15 indicates, in 2006, over 75 per cent of major financial institutions had offshore activities, compared with less than 10 per cent in 2001. This dramatic expansion is matched by the equally large growth in offshore staffing. The latest annual survey by Deloitte Touche Tomatsu estimates that financial institutions employ an average of 2,700 offshore staff compared with 150 only four years ago.

Offshoring continues to be led primarily by US and UK financial institutions, but with other European financial institutions showing increasing interest. The main activities offshored are those involving the use of IT, lower value-added activities (such as payroll) and lower value-added contact with customers (such as scripted outbound sales calls). But offshoring has spread across nearly all business functions, with significant growth in transaction processing, finance and various aspects of human resources activity. Even activities requiring specific skills, such as financial research and modelling, have the potential to be ultimately offshored as well. In 2003, two-thirds of activity offshore was IT-related. However, by 2006, over 80 per cent of offshore activity involved a full range of business processes.

The main reason for offshoring in the financial services sector is to reduce costs. Offshore labour is often both affordable and highly qualified, enabling companies to reduce costs while maintaining or even improving the quality of the services they

provide to clients. The latest Global Financial Services Offshoring Report by Deloitte estimates that offshoring is saving the financial services industry an estimated US\$ 9 billion per annum, up from around US\$ 5 billion one year ago.

But this is not the only advantage provided by offshoring. Offshoring operations also give financial firms greater flexibility in their staffing so that they can respond to changes in market conditions. For financial services firms, it is often easier to alter the size of operations offshore than it is to make adjustments to the domestic workforce. Finally, cross-border mergers and acquisitions, where Western financial institutions take equity stakes in emerging market banks, naturally lead to an expansion of offshoring activity (Deloitte Touche Tomatsu, 2006).

India remains the prime location for offshoring, with around two-thirds of global offshored staff employed in the sub-continent. A number of other countries have also attracted offshoring activity. These include South Africa, Malaysia and the Philippines, where financial institutions can find the necessary skills and work quality. These countries have large pools of young, educated, technologically competent and English-speaking workers. There are a large number of graduates with finance, accounting, or management and information technology backgrounds, who are ideally suited to offshoring work in the financial sector. China's role in offshoring is less clear.

Deloitte's latest report states that China is becoming a more important destination for offshoring, with one-third of financial institutions having back-office (mainly IT) processes in China. However, a PriceWaterhouseCoopers (2005) report on offshoring in the financial sector states that China has yet to gain extensive ground, partly due to its relative lack of English-language skills and partly because of concern about its laws on intellectual property and data protection.

Offshoring is not without its risks and costs to financial institutions. For example, there is the risk of a political backlash at home because of domestic job losses. In the United States, a number of bills at both the state and federal levels have been proposed to place restrictions on offshoring practices. This is a risk that is not unique to financial institutions but one common to all firms that offshore part of their operations abroad. But a risk that ranks quite high for financial institutions concerns the need to ensure the confidentiality and integrity of financial information. Because of the cross-border nature of the transactions, offshoring has the potential to transfer risk, management and compliance to third parties that may not be subject to the same set of laws and regulations as those applied in the country where the financial institution is domiciled. This has been recognized as an important or systemic source of risk to the extent that the Bank of International Settlements (BIS) has proposed a set of principles to provide "specific and focused guidance" to financial institutions' outsourcing and offshoring activities. Finally, explosive growth in offshoring may put pressure on wages and other costs in countries such as India. Closely connected to rising labour costs are high turnover rates, which can affect the quality of offshore operations. These issues can halt the further expansion of offshoring.

Many basic features of the financial services sector, as described above, confirm earlier predictions of trade patterns based on comparative advantage and increasing returns to scale. For example, large exporting firms in more developed economies with an abundance of skilled labour (as well as a well-developed infrastructure and regulatory environment to deal with potential problems inherent in financial services) provide skill-intensive services to customers in other countries. To the extent that the exports are clustered in other developed economies (intra-industry trade), this may highlight the role of increasing returns to scale models and product variety and differentiation, but also the

possible importance of issues of diversification across markets to reduce industry-specific risk.

Nevertheless, as in the electronics industry discussed earlier, the provision of many types of financial services products are increasingly fragmented in a way that has the potential to allow not only outsourcing, but offshoring as well. The result is that many parts of the production process that used to take place within the "bricks and mortar" of a financial institution no longer need to be. Furthermore, certain tasks are outsourced to other firms at arm's length. That firm may be located in a different country with a comparative advantage in that particular component of the financial service product that is being provided to customers.

The following discussion of the role of fragmentation and offshoring in the financial services sector focuses on two sub-industries – retail banking and insurance services. It provides examples to highlight the different forces that are shaping the changing provision of financial services. Furthermore, while the amount of activity being offshored is difficult to measure, there are a number of particular areas where offshoring is occurring within financial services. This activity has been prompted by a number of factors, such as technological innovation and automation, telecommunications innovation and improvements in infrastructure, the forces of concentration as well as comparative advantage and increased trade liberalization in services.

Retail banking

Retail banks provide customers with the ability to save and borrow through services such as current accounts, savings accounts, and credit and debit card accounts, etc. Within the overall financial services sector, innovations associated with improvements in computers and digitization of data and IT have largely changed how many basic retail banking services are provided. An obvious example is the increase in the automation of retail banking services as banks replace a relatively low-skilled position of bank tellers with automated teller machines (ATMs) that allow customers to deposit and withdraw cash and other forms of payment.

Nevertheless, such technological innovations frequently have a more complex affect on the structure of institutions. By studying the changing demand for labour within a large bank, Autor et al. (2002) illustrate how a particular technological innovation – image

processing of cheques - can have complex effects on the structure of firms within the industry. They find that image processing led to computers taking the place of deposit-processing (low-skilled) jobs in part of the bank. In the jobs that remained, workers were required to have the ability to develop specialist skills. In another part of the bank, the exceptions-processing jobs became increasingly complex, increasing the demand for labour with particular sets of skills. The way that technological innovation increases the demand for labour skills turns out to be inherent in many of the changes taking place within the retail banking sector.⁶⁰

Other technological innovations are also affecting how services are provided, leading to substantial fragmentation of the delivery process.⁶¹ For example, customer services have been transformed from a situation whereby a customer might drop into a local bank or telephone for information about the status of their account to a “call centre model”. Customer service questions and answers for a set of relatively standardized products have been outsourced to employees at a centralized facility. Because the products are relatively standardized, the service can be relatively standardized as well, without requiring specialist (face-to-face) customer interaction. Furthermore, it can be located somewhere that will allow it to take advantage of lower costs – e.g. labour and capital infrastructure costs. Recent innovations in IT and the lower cost of telecommunications have resulted in a model where call centres can be subsequently offshored as well.⁶²

Nevertheless, there is some expectation that additional technological innovations will further affect the nature and scope of services provided by call centres. For example, just as the ATM made the basic functions provided by bank tellers redundant (e.g. accepting and distributing cash and payments), improvements in voice recognition software and the digitization of information will also change the nature of the call-centre provider. For simple or routine customer questions (e.g. account balance, latest transactions, etc.), software can be developed to allow a customer’s question to be answered by a computer – with access to a database of customer-specific information – at a lower cost than a low-skilled worker. This is already the case in a number of countries in which electronic banking is already replacing a number of the services recently provided by call centre operators, which before that were provided by ATMs, and before that by bank tellers.

The implication for the call centre industry is that the service jobs that remain may only be the most complex (i.e. those which cannot be automated). This may significantly affect the demand for call centre services – leading to an overall reduction in staff numbers or at least to a demand for workers with the skills necessary to process the complex problem-solving jobs that remain after digitization and computerization have handled the rest.

As financial services firms continually automate their products as well as their customer support for such products, they also increasingly demand skilled labour in the form of computer software and hardware talent. Increasingly, there are IT firms willing to provide such services offshore, further ensuring the international fragmentation of the financial services sector.

Automation, call centre activity and electronic banking may be particular to the retail banking industry. Nevertheless, similar to many other industries seeking to focus on their core areas of competence, retail banks may also outsource many other business tasks, such as payroll, human resources and accounting. While these aspects of retail banking are less visible to customers, they are just as much part of the industry.

Insurance

Insurance is another area of financial services that is facing changes brought about by new possibilities of fragmenting the production process. Unlike retail banking, which relies on relatively low-skilled labour, computer software and standardized products that do not require much customization to meet customer needs, the insurance sector involves products that are more highly customized and which require higher-skilled workers.

The insurance market is being affected by the ability to fragment part of its services.⁶³ Certain services can be automated, as products are sufficiently standardized. For example, in many areas of the United States, auto-insurance providers can offer customer-specific quotes electronically via the internet. A potential customer will provide the relevant information, and the insurer will cross-check key parts of the information provided by accessing other databases (e.g. credit agencies, law enforcement, etc.). Based on computer software and regulatory demands, insurance companies decide whether to offer insurance as well as the terms

and the price of the insurance. As noted in retail banking, where business is conducted over the internet, there is the possibility to fragment this part of the service (whether it be hand checking facts or using computer software), and to offshore it to a remote location.

However, while this approach is increasingly adopted in certain areas of the insurance industry for relatively standardized products or

services, other areas are less suited to this type of fragmentation. For example, the provision of other forms of insurance services requires substantial customization and is sufficiently complex to make offshoring less feasible. Nevertheless, this too may change in the face of continued improvements in telecommunications infrastructure (e.g. video conferencing) and harmonized legal environments (e.g. the ability to sue for breach of contract in other jurisdictions) etc.

Box 15

Implications for developed and developing countries of financial services offshoring

Financial services, and especially higher-end services such as insurance, are products that are likely to be closely linked with a high income (in other words, luxury goods). In this case, international demand is expected to increase as more countries improve their economic development and seek to engage in more sophisticated risk-management – both at the country level and at the individual level within these economies.⁶⁴ Demand for many insurance products – e.g. life, health, and property and accident – is likely to increase as incomes increase and for demographic and other reasons.

What are the potential implications from fragmentation and offshoring for the financial services industry for developed and developing countries?⁶⁵ It is difficult to predict with any degree of precision the net effects of this sort of increased trade within financial services firms (in terms of subsidiaries across borders or through arm's-length offshoring arrangements), especially in the face of changing demand conditions. On the consumer side of the transaction, financial services customers stand to gain through either lower prices (associated with lower input costs resulting from fragmentation of the production process and each task being undertaken where cost is lowest) and increased access to various products (e.g. 24-hours-a-day, seven-days-a-week access to financial accounts or information).

On the supply side, the forces of trade within the financial services sector are likely to be dominated by the same sorts of forces that affect trade in other areas of the economy – the resources and technology at the disposal of economies,

which shape comparative advantage, as well as agglomeration effects that may affect industry concentration through external economies of scale. There are, however, also important implications for the patterns of international trade in financial services as technology innovations and other infrastructure improves, allowing more stages of financial services provision to be fragmented. Nevertheless, from the examples noted above, comparative advantage is still expected to play a dominant role in affecting trade flows: e.g. low-skilled tasks will be offshored to countries where low-skilled labour is abundant; and high-skilled tasks will be allocated to locations in which high-skilled labour is abundant.

However, there are a number of other important conditions for countries to take part in this sort of financial services production network. For tasks requiring language skills (e.g. spoken English if the call centres are serving customers in the United States and the United Kingdom; French if the customers are in France, etc.), is there a sufficient language capacity in the local population? Second, is there sufficient investment in fibre optic networks and other IT hardware (as well as reliable electricity) to connect workers to the internet? Third, recent research has focused on the importance of the institutional framework for international trade, especially as there may be barriers resulting from the incompleteness of contracts. To this end, does the country provide sufficient enforcement of intellectual property rights (for more sophisticated financial services products) as well as enforcement of data privacy and security concerns?

4. CONCLUSIONS

Empirical evidence shows that production is concentrated in some geographical areas and that there is an increasing tendency for firms to source inputs and services internationally. Trade patterns depend on where production takes place and how firms organize their production chain. But traditional trade theories do not tell us anything about how firms choose where to locate and assume that production takes place within the boundaries of the firm. Therefore, these conceptual frameworks can explain neither geographical concentration nor the breaking up of the production chain.

This section aimed to provide an understanding of how firms choose where to locate production and how to organize their production processes, with a view to predicting patterns of trade. Recent economic research has focused on these issues and has highlighted that the overall downward trend in trade costs (tariffs as well as non-tariff barriers, including transportation and communication costs) can be a crucial factor for both phenomena: the agglomeration of production in some locations and fragmentation of the production process. The extent to which these two phenomena are compatible is not yet clarified in trade literature.

There are three important predictions about the pattern of production and trade that are associated with the new economic geography literature. First, a country will export products for which there is a large demand at home (home market effect). Second, a reduction in trade costs will amplify the home market effect (magnification effect). Finally, falling trade costs will produce an initial period of divergence among countries, with manufacturing production becoming concentrated in a “core” while the “periphery” specializes in non-manufactured goods (core-periphery effect). However, a further reduction in trade costs will eventually reverse this process, with manufacturing production becoming increasingly dispersed among countries in the periphery. There is some empirical evidence in support of the home market effect in manufactured products. But, it is less clear to what extent the core-periphery predictions are supported by data. Overall, manufacturing continues to be concentrated in OECD countries, but it cannot be excluded that at a more specific level (for example, in textiles and clothing, or iron and steel) the concentration-dispersion process has started.

Recent economic literature on fragmentation has also looked at the impact of falling trade costs on the location of production, but it has focused on the location of different production stages. In particular, this strand of literature predicts that a reduction in trade costs leads to greater fragmentation of production, with firms spreading the different stages of their production process to different locations. When trade costs associated with intermediate inputs fall, different stages of the production process can take place in different places, thus taking advantage of comparative advantage. Trade costs are only one factor determining the decision to fragment production. The likelihood of offshoring is higher in the case of standardized tasks. In addition, countries with a good-quality institutional framework, good-quality infrastructure, flexible administration (for example, short times to cross the border or to set up a business) as well as “thick” markets are more likely to be selected as source countries for offshoring.

No systematic evidence exists on the factors determining fragmentation. But sector-level case studies of electronics and financial services support the relevance of the theories described above. Data on quality of infrastructure, the institutional environment and administrative costs indicate that low-income countries are poorly placed to participate in production networks, despite their advantage in terms of costs. Some economic policies that may help to overcome these obstacles are discussed in Section F.

TECHNICAL APPENDIX

Indices of offshoring

This appendix shows the formulas used to calculate the indices of offshoring presented in Section D. An explanation of these indices is provided in Box 14. Hereafter, subscript c stands for country, i indicates the industry which imports a certain input and j is the input which is imported.

- Figures for offshoring at the country level reported in Table 11 were calculated as:

$$OI_c = \frac{\sum_i \sum_j (\text{imported inputs } j \text{ by industry } i)}{\sum_i \sum_j (\text{domestic + imported inputs } j \text{ by industry } i)}$$

Goods offshoring at the country level is measured as the ratio between the sum of inputs imported by all industries and the total inputs used by all industries. Services offshoring at the country level is calculated analogously by using service inputs instead of goods inputs. In order to compute the aggregate measure of world offshoring (as in Table 10) the summation is also made over countries. Hence, world offshoring is calculated by dividing the overall sum of imported non-energy inputs used by all industries and all countries by the sum of domestic and imported non-energy inputs.

- Vertical specialization (VS) indices reported in Table 12 are calculated as:

In matrix algebra's term, VS at the country level is calculated as:

$$VS = uII(I - DI)^{-1}X$$

where u is a $1 \times n$ vector of 1's, II is the $n \times n$ imported input coefficient matrix, I is the $n \times n$ identity matrix,

DI is the $n \times n$ domestic input coefficient matrix and X is the $n \times 1$ export vector and n is the number of industries. Vertical specialization is a scalar in current values of the respective currency.

- Contribution of the change in the VS to the change in the export-output ratio

The percentage change in the export-output ratio between 1995 and 2000 is decomposed into a VS component and a remaining unexplained component.

$$\Delta \frac{Exports_t}{Output_t} = \Delta \frac{VS_t}{Output_t} + \Delta \frac{(Exports_t - VS_t)}{Output_t}$$

$$\text{where } \Delta Z_t = Z_t - Z_{t-1}$$

The percentage contribution of VS to the change in the export-output ratio is:

$$\% \text{ contribution of VS} = \frac{\Delta \frac{VS_t}{Output_t}}{\Delta \frac{Exports_t}{Output_t}}$$

- Figures for offshoring at the industry level reported in Table 11 were calculated as:

$$OI_i = \frac{\sum_c \sum_j (\text{imported inputs } j \text{ by industry } i)}{\sum_c \sum_j (\text{domestic + imported inputs } j \text{ by industry } i)}$$

World industry offshoring measures how much an industry "offshores" its goods or service inputs respectively. It is calculated by taking the sum of imported non-energy goods inputs by an industry i and by all countries and dividing it by the sum of domestic and imported non-energy goods inputs used by the respective industry i at the world level.

Endnotes

- ¹ For a review of alternative measures of transport costs see WTO (2004) Box IB.3.
- ² Estimates are based on OSAs signed by the United States.
- ³ The shipping time is the weighted average of ocean shipping and air freight.
- ⁴ A similar result is obtained by Tang (2006).
- ⁵ Fujita et al. (1999) provide one of the most complete treatments of this literature. A more sceptical treatment can be found in Neary (2001). A key question about this literature has been to what extent its claims are really new and not a rediscovery of propositions in “old” economic geography. One interesting insight provided by Ottaviano and Thisse (2004) is that what is new about the new economic geography is that it has framed many of the old ideas within a general equilibrium framework. This has therefore made those ideas more amenable to empirical scrutiny and policy analysis.
- ⁶ The terms “forward” and “backward” linkages were first employed in Hirschman (1958).
- ⁷ In contrast, there is no transport costs involved for agricultural goods. Davis (1998) includes an analysis of what happens if transport costs also apply to agricultural goods. He argues that if differentiated and homogenous goods have identical transport costs, the home market effect disappears.
- ⁸ In some variants of the New Economic Geography, each sector has a factor of production specific to it – peasants in agriculture and workers in manufacturing. See Krugman (1991).
- ⁹ This explanation closely follows (Helpman and Krugman, 1985; Krugman, 1980).
- ¹⁰ This assumption will be relaxed in the discussion of the core-periphery proposition.
- ¹¹ Preferences are such that the consumer maximizes a two-level utility function. The top level is a Cobb-Douglas utility function involving the agricultural and manufactured goods. The lower-level or sub-utility function involves the manufactured good only. Since the manufactured good is differentiated, the lower-level utility takes the form of a Dixit-Stiglitz function.
- ¹² Trade costs take the form of “iceberg” costs. τ ($\tau > 1$) units of a manufactured good are exported to one’s trade partner but only 1 unit finally arrives at the point of destination. The difference ($\tau - 1$) is the cost of the resources needed to transport the product internationally, which “melts” away.
- ¹³ If p_{ij} is the mill price of the manufactured good produced in i and exported to j , consumers in j will pay a price equal to τp_{ij} .
- ¹⁴ Porter (1990).
- ¹⁵ Fujita et al. (1999) describe this assumption of labour immobility as the “defining characteristic of ‘nations’”.
- ¹⁶ As is typical in this literature, the price of a firm’s basket of intermediate inputs has the form of a constant elasticity of substitution (CES) price index. This price index is decreasing in the number of varieties of intermediate inputs.
- ¹⁷ Note that in much of the literature on the new economic geography, constant elasticity of substitution (CES) utility functions are often assumed. One consequence of this is that firms do not increase their scale of production as a consequence of trade liberalization. All the welfare gains of liberalization come from the availability of more varieties. See Krugman (1980).
- ¹⁸ This discussion follows the core-periphery mechanism described in Chapter 14 of Fujita et al. (1999)
- ¹⁹ The precise shape of the bifurcation diagram depends on what values of the parameters are assumed.
- ²⁰ It may be important to stress the methodological point made by Head and Mayer (2004) that in a world with more than two countries it is not clear how one defines the home-market effect.
- ²¹ “Demand bias” is measured by the expenditure share of the country for a good relative to the world expenditure share for that good. “National preferences” (or demand bias at the industry level) is based on the difference between the domestic market share of an industry and its expected domestic market share. Domestic market share at the industry level is defined as the ratio of (production-exports) to (production-export-imports). In order to compute the expected domestic market share, a regression of domestic market shares on world market shares is performed.
- ²² Interestingly, it is even reversed for homogenous goods.
- ²³ Specifically they assume firms act as Cournot players. This means that the firm decides on the profit-maximizing level of its output taking its competitors output decisions as given.
- ²⁴ Baldwin (2006a) refers to this phenomenon as the second “unbundling”. Whereas, the first unbundling is the separation of production and consumption that has characterized the latter half of the 19th century, that economic historians have linked to the technological improvements in ocean and land shipping – steam ships and railroad – have been the principal determinant.
- ²⁵ For an overview on services offshoring also see WTO (2005).
- ²⁶ In a previous WTO Report (2005) outsourcing was defined as the “the act of transferring some of a company’s recurring interval activities and decision rights to outside providers, as set in a contract”. Offshoring, in particular, referred to the case when the outside provider was located abroad. A similar definition is used by the OECD (2007c). This definition involves a management decision to substitute a product/service produced in-house by an imported product/service. In the present Report we opted for a broader definition of offshoring. The reason is that this is the definition adopted by the most recent theoretical literature on offshoring, and because it allows a relatively easier concordance with the statistical data.
- ²⁷ For further details on the calculations of the alternative measures of offshoring used in this report the reader should refer to the Technical Appendix
- ²⁸ See, for example, Yeats, 2001; Hummels et al., 2001 and Ng and Yeats, 2003.
- ²⁹ In Yeats (2001)’s classification trade in intermediates comprises all 3- or 4-digit SITC Rev.2 categories that contain the word “part” in their name.
- ³⁰ Using a different classification for intermediate goods (the Broad Economic Classification scheme of the UN), Nordas (2007a) finds that the share of intermediates remained approximately constant between 1996 and 2004. Similar patterns are also found by Hummels et al. (2001).
- ³¹ Austria, Belgium, China, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Spain, Sweden, United Kingdom, United States.
- ³² Details about the calculations of the various offshoring measures used in this report can be found in the Technical Appendix.
- ³³ These are Australia, Canada, Chinese Taipei, Denmark, France, Germany, Japan, Korea, Ireland, Italy, Mexico, Netherlands, United Kingdom, United States.

- ³⁴ The figures for offshoring calculated in this Report may differ from those calculated in a recent study of the OECD (2007c), using the same dataset. Deviations in estimated figures for offshoring are in part due to the fact that in this Report the inputs from “Agriculture, hunting, forestry and fishing” are considered as goods inputs, while this is not the case in the OECD study. Furthermore, we classify inputs from “Coke, refined petroleum products and nuclear fuel” as energy inputs.
- ³⁵ For details on the calculations of this index refer to the Technical Appendix. Also see Box 14 for an intuition about what the index intends to capture.
- ³⁶ Energy sectors are excluded from the calculations.
- ³⁷ See Section E.1 for the analysis of the distributional effects of trade in tasks.
- ³⁸ The distinction between routine and non-routine tasks does not correspond to the distinction between skilled and unskilled workers.
- ³⁹ For a review, see Helpman (2006) and Spencer (2005).
- ⁴⁰ As will be discussed below, the other disadvantage of outsourcing is the imperfect contracting between the input supplier and the producer of the final good.
- ⁴¹ A similar conclusion can be reached if there is an improvement in the matching technology.
- ⁴² The hold-up problem in the context of model of outsourcing is modelled in various papers, including Grossman and Helpman (2002), Antràs (2003) and Antràs and Helpman (2004).
- ⁴³ This occurs because contracts are incomplete. That is, it is impossible for the parties involved to fully specify the price-quality relationship and make it verifiable by a third party.
- ⁴⁴ Nunn (2007) for example assumes that the productivity of inputs increases with customization.
- ⁴⁵ Surplus is defined as revenues minus costs.
- ⁴⁶ Nunn (2007) for example assumes that customization makes the surplus increasingly less verifiable by third parties (e.g. a court). In turn, this increases the cost of outsourcing due to the hold-up problem.
- ⁴⁷ Mitra and Ranjan (2008) notice that the importance of institutions may be overstated as models do not take into account the possibility of repeated interaction between buyers and suppliers.
- ⁴⁸ This paper (already briefly introduced in Section C.3.d) builds on the heterogeneous firms model discussed in Section C.3.
- ⁴⁹ In terms of chart 14, $F_{ON} < F_{VN} < F_{OS} < F_{VS}$, where subscript N denote the home country and S denotes abroad, V stands for vertical integration and O for outsourcing. In all cases, profits are higher the more productive the firm (positively sloped lines).
- ⁵⁰ In this model, the supplier has better incentives under outsourcing, but the final producer has better monitoring opportunities under vertical integration.
- ⁵¹ See for example, Limão and Venables (2001), Nordas and Piermartini (2004) and Micco and Serebrisky (2006).
- ⁵² See sub-section D.1 for evidence on the importance of communication and time costs as a barrier to trade.
- ⁵³ The fragmented production process is a central character, for example, in Friedman (2005). For a discussion of electronics fragmentation in East Asia more broadly, see also Hobday (2001), as well as Akamatsu’s “flying geese” model of East Asian economic development.
- ⁵⁴ See also Harrigan (2005) who develops an approach in which comparative advantage depends on relative surface and air transport costs that differ across countries and goods. Carruthers et al. (2003: 132) report that while air freight only accounts for about 1 per cent of East Asia’s international trade when measured by volume (weight), it accounts for more than 35 per cent by value.
- ⁵⁵ More generally, Hummels (2001) estimates a demand for timeliness and argues that falling air transportation costs can then help explain trade growth. He finds that those goods with the highest estimated time sensitivity have exhibited the most rapid growth in trade.
- ⁵⁶ While their empirical application of the model is on a sector different from electronics (e.g., US apparel imports), there are intuitive implications for trade in electronics components being affected by some of the same features.
- ⁵⁷ See the discussions in Carruthers et al. (2003), Hummels et al. (2001), Limão and Venables (2001) and sub-section (b) above.
- ⁵⁸ We will not focus on other forms of financial services such as investment banking, though there is also interesting fragmentation of its production process occurring as well.
- ⁵⁹ Deloitte & Touche Tomatsu, for example, has published annual reports on global financial services offshoring since 2003 based on the responses from surveys conducted with a range of financial institutions. This section draws on information from Deloitte & Touche Tomatsu (2007), PriceWaterhouseCoopers (2005), and Basel Committee on Banking Supervision (2005).
- ⁶⁰ In the context of international trade in goods, using firm-level data to address a related question, Hanson et al. (2003) examine the substitutability between domestic and foreign workers of US multinational firms. They use [non-bank] data and find that higher sales in foreign affiliates leads, overall, to increased labour demand in US parents: success overseas leads to job gains in the United States. Nevertheless, the effect is not uniform across types of workers, i.e., they find that high-skilled foreign workers complements with US workers (so hiring a high skilled foreign worker is associated with hiring an additional high skilled US worker), while low-skilled foreign workers are substitutes for low-skilled US workers.
- ⁶¹ This section draws on the description of the industry provided in McKinsey (2005b).
- ⁶² This lower telecommunications costs is likely the result of a number of factors, such as the Internet serving to increase competition with traditional telephone providers (the result in investment in fibre optic communications as well as innovations such as Voice over Internet Protocol (VoIP) technology).
- ⁶³ This section draws on the description of the industry provided in McKinsey (2005a).
- ⁶⁴ Nevertheless, there may be a number of other structural impediments to this growth in developing countries. For example, UNCTAD (2005) highlights the lack of centralized credit reporting systems in developing countries that is expected to negatively affect demand for provision of financial services, including e-banking.
- ⁶⁵ Service industries, such as financial services, have been under real or perceived threat of offshoring job loss in developed economies that has sparked a recent political outcry and media frenzy. See, for example, Friedman (2005), Mankiw and Swagel (2006) and Leamer (2007). Concerns in developed economies include the question of how many high-skilled jobs will be lost (e.g., Blinder, 2006), and whether the essential logic and insights from international economics are now irrelevant (e.g., Samuelson, 2004; Bhagwati et al., 2004 and Dearnorff, 2006) in this “new” globalization environment. Jensen and Kletzer (2005) provide evidence from a new approach that attempts to estimate the question of what share of US service sector employment is potentially “offshorable.”

While they do find that a number of service sectors are likely tradeable internationally (because they are also traded domestically within the US), they find that the forces of comparative advantage are still at work within the services industry, i.e., they find that in line with US comparative advantage, that “while professional and business services are higher skilled and higher paying than manufacturing in general, tradeable services within these sectors are even higher skilled and higher paying than non-tradeable service activities.” (p. 18)

E DISTRIBUTIONAL CONSEQUENCES OF TRADE

Countries liberalize trade because they expect gains for their economy. Previous sections have provided detailed descriptions of the different mechanisms that allow countries to reap such gains from trade and have shown that the gains are likely to be significant. Why is it then that countries sometimes hesitate to reduce trade barriers and why is it that outright opposition to liberalization can sometimes be observed? This section provides some answers to these questions by focusing on the distribution of the gains from trade within countries.¹ Not all individuals within an economy necessarily become better off with trade liberalization and this section will pay particular attention to those individuals that may lose from trade liberalization, either temporarily or permanently. The last sub-section analyzes how to ensure that the most vulnerable individuals in an economy, i.e. the poor, are among those gaining from liberalization.

1. TRADE AND INEQUALITY

(a) What do trade models say about the distributional changes resulting from trade liberalization?

Trade liberalization provides new commercial opportunities for companies that are able to export and provides consumers, through imports, with access to cheaper and different goods. Those imports, however, may be in competition with local production and the relevant local producers may suffer from the new competitive pressure. New export opportunities and the increased competition from imports will lead to the expansion of some activities and the reduction of others and – as is often the case with changes resulting from policy reform – some individuals may gain and others may lose in this process. Since individuals do not necessarily know in advance whether they will be among the losers or winners, they may fear liberalization because of the uncertainty it brings. Others will focus on possible difficulties in the short term. For instance, they may be afraid of having to change jobs, even though they are likely to become better-off in the long term.

Regarding the long-term distributional consequences of trade reform, an important question is whether the relatively well-off or the not so well-off gain from

trade liberalization, i.e. whether trade liberalization is likely to increase or decrease inequality in societies. Economists today consider the answer to this question to be highly situation-specific, and economic thinking on this question has undergone certain changes over time.

The classical link between trade and income inequality is based on the Stolper-Samuelson Theorem developed in a traditional trade model (Heckscher-Ohlin) that assumed full employment. In this model, trade flows are determined by comparative advantage and the latter, in turn, depends on each country's resources.² As developing countries are typically well endowed with low-skilled labour relative to developed countries, the former were expected to start exporting low-skill labour-intensive goods to the industrialized world. Relative demand for low-skill workers would increase in developing countries and decrease in industrialized countries and the theorem predicted that inequality between high-skill and low-skill workers would probably increase in industrialized countries as a consequence of trade with developing countries.³ Along the same lines, inequality would be expected to decline in developing countries.

A similar argument could be made with respect to the gains of capital compared with labour. If industrialized countries are considered to be relatively rich in capital, capital-labour inequality would increase in industrialized countries as a result of trade and decrease in developing countries. The Stolper-Samuelson Theorem thus predicted that trade would lead to changes in rewards that were factor specific. Certain factors were expected to gain, independent of whether they were employed in exporting or importing sectors, or companies, while others were expected to lose, again independent of their employment. The theorem applies to trade among rather different countries – for example, industrialized versus developing countries – and predicts that relative rewards move in opposite directions as a consequence of trade.

Traditional theory is less useful for predicting the distributional effects of trade among similar countries. This is a potentially important question since industrialized countries trade more with other industrialized countries than with developing countries. The predictions of traditional theory also

appear to be in conflict with the evidence from firm-level data indicating that companies differ significantly within sectors, that only a subset of companies within a given sector exports and that those companies tend to pay higher wages than non-exporting companies (Bernard and Jensen, 1999).

More recent contributions to the economic literature have analyzed how trade among similar countries, i.e. among industrialized countries, may affect factor prices. Matsuyama (2007) argues that the act of engaging in international trade may require the services of skilled labour, meaning labour with expertise in areas such as international business, language skills and maritime insurance. As a result, increases in trade can lead to a worldwide increase in the relative price of skilled labour. Epifani and Gancia (2006) argue instead that trade can benefit skilled workers because they can better take advantage of larger markets. They show that skilled workers, in any country, tend to constitute a minority of the labour force and tend to be employed in sectors with high plant-level fixed costs that produce highly differentiated goods that are gross substitutes for less skill-intensive products. In such a situation, trade will lead to a rise of the relative output of sectors characterized by economies of scale, i.e. the skill-intensive sectors. As a result, the relative demand for skilled workers goes up.

Another set of models, in which fixed costs also play a role, allow for differences between firms and a so-called continuous distribution of skills among workers (Manasse and Turrini, 2001; Yeaple, 2005). In these models there is no clear line of separation between “high skill” or “low skill” workers, but rather a large variety of workers with different skill levels. In both models, the highest-skilled workers will end up by working in exporting companies after trade reform and in Yeaple (2005) those companies use more productive technologies. Therefore, only skilled workers can take advantage of the increased opportunities provided by trade, and the difference between their wages and those working in other, non-exporting companies increases as a consequence of trade reform. This mechanism would not only work for trade between very different countries but also for trade among similar, for example, industrialized countries. It also predicts increased inequality in all countries participating in trade. The prediction that exporting firms pay higher wages than non-exporting firms also corresponds to the firm-level evidence mentioned above.

Yeaple’s model uses a “new new” trade theory framework based on the so-called Melitz model discussed above.⁴ Davis and Harrigan (2007) use this to build a model that allows them to explain why, in the opinion of the public, globalization threatens “good jobs at good wages”. In their model, firms differ in two aspects that determine their competitiveness: their productivity and their ability to monitor workers. Firms with a lower ability to monitor workers have to pay higher wages to prevent workers from underperforming. The authors consider jobs at these companies to be “good jobs” since they are better remunerated than the economy-wide average for identical workers. Yet the fact that firms with a lower monitoring ability have to pay higher wages also renders them less competitive compared with other firms with similar productivity levels. Trade liberalization triggers the selection effect known from the Melitz framework, but implies in Davis and Harrigan’s (2007) model that particular pressure is put on what are considered to be “good jobs”. While trade tends to raise the real average wage, it leads to a loss of many “good jobs” and a steady state increase in unemployment.

The increased practice of international outsourcing of services inputs has led to an increased interest in the distributional effects of offshoring. Outsourcing is expected to affect wages through potentially three channels (Baldwin and Robert-Nicoud, 2007; Grossman and Rossi-Hansberg, 2006b).⁵

First, the outsourcing of tasks will lead to cost savings that have positive repercussions for all domestic wages. Second, the fact that tasks are outsourced will allow workers to look for jobs elsewhere. In the relevant literature, this effect is sometimes called the “labour supply effect” and tends to have a negative effect on the wages of workers performing tasks that are being outsourced. Third, offshoring may affect the terms of trade in large countries with repercussions for wages. If, for instance, a country is a net exporter of high skill-intensive products, and outsourcing takes place in the low skill-intensive sector, the expansion of production in the low skill-intensive sector will improve the country’s terms of trade, with positive effects on high-skill wages and negative effects on low-skill wages. In these circumstances, two of the three channels could thus have a negative effect on low-skill wages, while the third channel, i.e. the productivity channel, has a positive effect on low-skill wages. The overall effect is ambiguous, but is

more likely to be positive for low-skilled workers the larger the cost savings (or productivity) effect generated by offshoring in the sectors in which low-skilled workers are intensively used.⁶

The wage effects of offshoring will also to a large extent depend on which type of jobs will actually be offshored. Much of the empirical literature on offshoring has focused on this question. In particular, it has been argued that “routine jobs” can be more easily offshored than “non-routine” jobs. Some studies indicate that routine jobs are often medium skilled. This may explain why contributions to the empirical literature on globalization and labour markets in industrialized countries have increasingly moved away from the distinction between two types of workers – high- versus low-skilled – and include a group of medium-skilled workers in the analysis or even a higher level of differentiation. The relevant literature will be discussed in more detail in the next sub-section.

With respect to the short-term consequences of trade, models based on recent theories also lead to different predictions from the more traditional approaches. In the above-mentioned Heckscher-Ohlin model, production factors are supposed to be able to change employers and, in particular, sectors instantaneously. In reality, this is not the case, as it takes time for production factors to adjust to a policy reform. This is taken into account in the so-called “specific factor model” that is also based on traditional modelling approaches. This model assumes that, in each sector, there is one factor that is sector-specific and cannot change the sector of employment. In this model the sector-specific factor in the import-competing sector will lose from trade liberalization. This model has been interpreted as reflecting the short-term distributional impacts of trade reform.

Krugman and Obstfeld (2006) give the following example. Assume that a country produces food and textiles with the production factors of land and labour. Assume also that the country finishes by importing textiles and exporting food after trade liberalization. In the long term, this is good news for landowners and bad news for workers. However, in the short term, the owners of the land that is currently being used for textile production may suffer, while workers who are currently producing food may gain. Such short-term gains and losses often seem to determine political positions in debates over trade policy.

In this traditional approach, who wins and who loses from trade reform in the short-term is expected to depend on the sector of employment. The “new-new” trade theory has challenged this prediction. It predicts that both net-exporting and net-importing sectors will be characterized by expanding high-productivity firms and shrinking low-productivity firms (Bernard et al. 2007b). As a result, this approach predicts that trade reform will trigger job creation and job destruction in all sectors. For policy-makers, this implies that significant reshuffling of jobs takes place within sectors.⁷ This may be good news, since it is generally expected that it is more difficult for workers to move across sectors than for firms to change within the same sector. A move across sectors may, for instance, imply higher retraining costs for workers and longer search periods. On the other hand, the fact that adjustment occurs in all sectors implies that a wider range of jobs are at risk. While traditional trade models would suggest that policy-makers who wish to assist workers focus on so-called comparative disadvantage sectors, i.e. those that can be identified as import-competing sectors, more recent research suggests that such targeted intervention is not necessarily effective.

(b) Empirical evidence on trade and inequality

Although trade models differ widely in their predictions about how precisely the gains from trade will be distributed, they all predict that those gains will not be distributed equally within an economy. This is not necessarily a cause for concern. Given that trade leads to gains for the economy as a whole, everybody can be made better off if appropriate domestic policies are put into place. Nevertheless, the fact that trade may in some circumstances lead to increased inequality has received much attention in the public debate and also in the empirical trade literature.

In the context of increasing inequality in most regions of the world (see Table 15), a large amount of relevant empirical trade literature in the 1980s and 1990s focused on the question of whether trade is one of the main drivers of changes in inequality or only one among many others. Towards the end of the 1990s this literature converged to the view that international influences only contributed to about 20 per cent of rising wage inequality (see Box 16). Very recent literature reaffirms that other forces –

Table 15
Evolution of Gini coefficients by region, 1970-2000

Years	OECD	LAC	EAP	SAS	AFR	ECE
1970	0.352	0.561	0.444	0.380	0.649	0.298
1980	0.339	0.556	0.489	0.384	0.631	0.301
1990	0.353	0.552	0.485	0.381	0.651	0.307
2000	0.368	0.572	0.520	0.334	0.668	0.428

Note: LAC: Latin America and the Caribbean; EAP: East Asia; SAS: South Asia; AFR: Africa; ECE: East and Central Europe.
Source: Dikhanov (2005) "Trends In Global Income Distribution, 1970-2000, and Scenarios For 2015", Human Development Report 2005.

such as technological and institutional innovations, demographical changes and cyclical fluctuations – are more important than trade in driving changes in income distribution (Lawrence, 2008). This section focuses on two other issues that still leave economists puzzled.

The first issue relates to the relationship between trade and inequality in developing countries. It was originally expected that trade would lead to decreases in inequality in developing countries. This was good news because trade was therefore expected to reduce poverty through two mechanisms: its positive impact on growth and its favourable impact on income distribution. Empirical research has, however, shown that the second mechanism has not always been triggered by trade reform and numerous studies have examined why this has been the case.

The second issue concerns the question of who is likely to suffer from trade liberalization in industrialized countries, either in relative or in absolute terms. The focus of the debate on this question has changed quite significantly over time. Whereas the question was posed in terms of "high-skilled" versus "low-skilled" workers in the 1980s and 1990s, more recent studies make a distinction between "high-", "medium-" and "low-skilled" workers, reflecting some concern about the evolution of wages of medium-skilled workers. Other studies try to make even more nuanced distinctions between different types of skills. There has also been an increased interest in the evolution of the relative income of the "super rich" and in the evolution of the labour – as opposed to capital – share of income.

i) Has trade led to decreased inequality in developing countries?

Traditional trade theory predicted that North South trade leads to increased inequality in the North (capital and skilled labour gain, while unskilled labour loses) and decreased inequality in the South. In particular, it was expected that globalization would help the less skilled, who were presumed to be the locally relatively abundant factor in developing countries.

Empirical research has used different measures for inequality, as described in Box 16. Studies analyzing the link between trade and wage inequality in developing economies have produced mixed results. Most of the empirical evidence from early liberalizers in East Asia confirms the predictions of traditional trade models, while in Latin America, evidence suggests that trade liberalization has often coincided with an increase in both income inequality and wage inequality between high- and low-skilled workers. The same observation has been made for India after its liberalization measures in 1991 (Goldberg and Pavcnik, 2007). A large body of empirical literature has tried to explain this phenomenon and finds that the timing of trade liberalization, the tariff schedules in place before liberalization and technological change are some of the elements which explain why certain developing countries have experienced an increase in inequality after trade liberalization.

Box 16

Measuring inequality

Different measures of inequality have been used in the empirical literature analyzing the distributional effects of trade reform.

Wage inequality between high-skilled and low-skilled labour

Much of the empirical literature in the 1980s and 1990s focused on changes in the so-called skill premium, i.e. the wage difference between high- and low-skilled workers.

The measurement of skills varies depending on the kind of data available. Plant- or firm-level datasets typically differentiate between production and non-production or blue-collar and white-collar workers. Studies using these data consider the wage difference between white- and blue-collar workers to reflect skill differences. Although this categorization is rather imprecise, Goldberg and Pavcnik (2007) note that “cross-tabulations of matched worker and employer surveys at the plant level in the United States and the United Kingdom indicate a close relationship between the production/non-production status of workers and their educational level”.

The measurement of skills is sometimes based on occupational classification data. Some occupations require more skills than others, and based on this consideration, economists have attempted to match occupations with skills. Hijzen et al. (2005), for example, use the New Earnings Survey Panel Dataset (NESPD) in a study of the effects of offshoring on relative rewards. Measures based on occupational datasets score high in terms of international comparability because standardized classifications like SOC (Standard Occupational Classification) exist. Unfortunately the availability of datasets distinguishing workers based on their occupations is limited.

Another commonly used measure is wage data providing information on educational attainment – based on the assumption that the higher the level of education, the more skilled the worker. Internationally comparable data for educational attainment based on the International Standard Classification of Education (ISCED) exist

and economists often use this classification to distinguish three skill levels: low (up to primary education), middle (up to upper secondary education) and high (tertiary education).

Labour share of income

In recent years, empirical work on the impact of trade or globalization on inequality has become increasingly interested in the contrast between labour and capital income. One measure used to capture this difference is the labour share of income, i.e. the ratio of total compensation to workers over national income (International Monetary Fund, 2007b). Its measurement is subject to a number of methodological problems, especially how to define workers and what to include in compensations. One of the difficulties is how to deal with the income of the self-employed (Gomme and Rupert, 2004).

Gini coefficient

The Gini coefficient gives more detailed information on the entire income distribution of households in an economy and takes into account the fact that an individual household may have several sources of income. It is a measure of statistical dispersion, defined as a ratio with values between 0 and 1. A low Gini coefficient indicates more equal income or wealth distribution, while a high Gini coefficient indicates more unequal distribution. 0 corresponds to perfect equality (everyone having exactly the same income) and 1 corresponds to perfect inequality (where one person has all the income, while everyone else has zero income).

Percentile shares

Some studies, like International Monetary Fund (2007a), use the relative income shares of different income groups as the relevant measure of income inequality. The quintile share, for instance, is defined as the cumulative income of one-fifth of the population divided by the total income. The income distribution is perfectly equal if all the income shares are equal. A related measure is the ratio of the top 20 per cent of the population

versus the bottom 20 per cent. This could be interpreted as a measure of income polarization. Recent years have witnessed an increased interest by economists in measures of polarization in the light of evidence that growth in US inequality since 1990 has been concentrated in the top end of the distribution (Lemieux, 2007).

Information on labour shares, percentile shares and Gini coefficients tends to be based on

household income statistics. Atkinson (2003) points out that certain types of capital gains are typically not captured in such statistics which may have led to inequality being increasingly understated. In the United States, for instance, capital gains from the sale of stock holdings are not included in the income measure, nor is the net imputed return on equity in one's own home.

It has, for instance, been argued that the recent entry of China and other low-income developing countries in world markets has shifted the existing patterns of comparative advantage of middle-income countries, such as Argentina or Colombia. Wood (1999) postulates that, while in the 1960s and 1970s middle-income countries had a comparative advantage in goods of low-skill intensity, in the 1980s and 1990s, when low-income developing countries started exporting to the rest of the world, the comparative advantage of middle-income countries shifted to goods of intermediate skill intensity.

The effect of trade reform on income distribution may also depend on initial income levels, as argued by Milanovic (2002). His findings suggest that at very low average income level, it is the rich who benefit from openness. As income level rises, that is around the income level of Chile, Colombia or Czech Republic, the situation changes and it is the relative income of the poor and the middle class that rises when compared with the rich. It seems that trade openness makes income distribution worse before making it better – in other words, the effect of openness on a country's income distribution depends on a country's initial income level.

Another explanation for the increasing wage difference between high and low-skilled workers, i.e. the so-called skill premium focuses on the pattern of protectionism prior to trade liberalization in many developing countries, and on the skill intensity of the sectors that were the most affected by trade reforms. Several studies on countries including Colombia, Mexico and Morocco have noted that, contrary to expectations, it was the unskilled labour-intensive sectors that were protected the most prior to trade reform. As a consequence, when protection was lifted, wages of the unskilled went down.

It has also been argued in the trade literature that technological change and trade should not be treated as separate phenomena as they are likely to have an impact on each other. Several recent papers have postulated that, even though technological change may have played a greater role than particular trade policy changes in increasing inequality, technological change was itself a response to more trade openness so globalization was indirectly responsible for the increase in inequality. It could, for instance, be the case that the previously mentioned entry of low-income countries into world markets may have led to faster technological change in middle-income countries in their efforts to remain competitive. Goldberg and Pavcnik (2007), however, point out that the empirical evidence on the interaction between trade openness and technological change and their effect on inequality is so far mixed and inconclusive.

The “new-new” trade theory framework may provide another explanation as to why inequality increases have been observed in both developed and developing countries. As discussed in previous sections of this report,⁸ the main idea of the relevant trade models is that trade openness leads to an “upgrading” of firms, with the most productive firms expanding their operations while less productive firms reduce their operations. In order to establish a connection between compositional changes within an industry and the inequality debate, it would be necessary to show that “higher-quality” firms have a higher demand for skill so that “firm upgrading” triggers an increase in inequality (Goldberg and Pavcnik, 2007). Empirical evidence from the United States suggests that exporting is a skill-intensive activity (Bernard and Jensen, 1997). Harrison and Hanson (1999) also find that exporters employ a higher share of white-collar workers than non-exporting plants in Mexico.

Certain models analyzing the phenomenon of offshoring predict that it will trigger increased

inequality in developing countries. Antras et al. (2006) show that “globalization leads to the formation of international teams in which northern managers supervise teams of southern workers: offshoring”. Offshoring thus permits the geographic separation of production and problem solving and the relocation of physical production in the South. It leads to the creation of routine jobs and an increase in production in the South, and to the creation of knowledge-intensive jobs or firms and a decrease in production in the North. This implies that the pattern of trade is such that the South is a net exporter of physical goods while the North is a net exporter of knowledge services. Globalization also affects the level and structure of earnings of individuals, both in the North and in the South. In particular, globalization leads to an increase in “within-worker” wage inequality, that is wage inequality among non-managers, in the South. This is the case because globalization improves the quality of managers with whom certain southern workers are matched, thus raising the productivity of these workers and increasing their wages.

Overall it appears that the particular mechanisms through which globalization affects inequality are country, time and case-specific and that the effects of trade liberalization need to be examined in conjunction with other concurrent policy reforms.

Box 17

Inequality: how much is technology, how much is trade?

Much of the empirical work on trade and wage inequality for industrialized countries in the 1980s and 1990s focused on the relative importance of trade liberalization and technological change for explaining inequality in developed countries. Inequality was typically measured in terms of wage inequality between skilled and unskilled workers, where white-collar workers were supposed to represent skilled workers and blue-collar workers represented unskilled workers. The estimated impact of trade on the rise in inequalities differs widely across the various studies, some giving an overwhelming role to technological change and others claiming that trade was mostly responsible. Towards the end of the 1990s, Cline (1997) concluded in his overview of the relevant literature that international influences contributed by about 20 per cent to the rising wage inequality.

ii) How are the gains from trade distributed in industrialized countries?

With the increasing importance of the phenomenon of offshoring, the focus of the empirical literature analyzing the relationship between globalization and inequality has changed. A number of recent studies, for instance, analyze the relative importance of different aspects of globalization. In that literature a distinction is typically made between trade, offshoring and migration. As offshoring often implies cross-border movement of capital, there has been an increased interest in the gains of capital as opposed to the gains of labour from trade liberalization. The variables used to measure inequality have also changed. Recent literature has increasingly moved away from comparing the wages of blue- and white-collar workers and instead uses data based on occupational classifications or micro-level datasets that allow researchers to evaluate the “tradability” of different types of tasks or the extent to which tasks are repetitive and can easily be computerized.

Also in recent empirical studies, technology continues to be included as a factor affecting inequality and is typically found to be the main driving force of distributional changes (see Box 17).

More recent studies also find that technological change has a higher impact than trade on inequality. International Monetary Fund (2007a), for instance, finds that technology is the main driver of inequality, in terms of the Gini index. This, in particular, is the case in developing countries, whereas the study finds that technology and globalization (in this study defined as trade and FDI together) have a similar level of negative effect on equality in industrialized countries. Technology is also found to be the main force increasing the income share of the top 20 per cent of the population and decreasing the income share of the bottom 20 per cent. The effects of globalization on both are very small. International Monetary Fund (2007b) compares the effect of technological change and globalization on the labour share of unskilled workers and finds that technological change has a dominant effect. In that study the term “globalization” embraces trade, offshoring and immigration.

Skilled versus unskilled labour

Recent waves of offshoring of skilled jobs, for instance in the IT industry, have raised awareness that high achievements in formal education do not necessarily provide a guarantee for a bright professional future. Increasingly there is discussion about which types of skilled jobs will be maintained in open industrialized economies.

In fact, the empirical literature on the link between trade and changes in wages between high and low-skilled workers has never been very explicit as to the skill levels of those taking advantage of increases in wages for skilled labour. As mentioned previously, many relevant studies have used data on the wage difference between white-collar and blue-collar workers. White-collar workers do indeed include management-level employees who have probably a high level of education. But they also include administrative staff with relatively low levels of education. In contrast, blue-collar workers may well include employees with an engineering degree. The white- versus blue-collar distinction thus only gives a rather rough approximation of skill differences and is not a very useful indicator for those wishing to adjust skill supply to changes in skill demand.

More recent studies have used data based on educational or occupational classifications, or micro-level datasets that allow researchers to evaluate the “tradability” of different types of tasks or the extent to which tasks are repetitive and can easily be computerized. Ekholm and Hakkala (2006) and OECD (2007c) are two examples of studies that define skill groups according to educational attainment. Ekholm and Hakkala (2006) analyze the effect of outsourcing on skill demand in Sweden and OECD (2007c) performs a similar exercise for Japan. Both studies distinguish three skill levels:⁹ lower secondary, upper secondary and tertiary education. Both studies find that outsourcing has shifted demand away from the intermediate skill level, i.e. workers with upper secondary education.

Hijzen et al. (2005) show different results for the United Kingdom and find that international outsourcing has had a negative effect on the demand for the most unskilled workers. These authors, however, base their three skills groups on an occupational classification. In particular, they consider managers, administrators and professional occupations to be high skilled. The semi-skilled

group comprises associate professional and technical occupations, clerical and secretarial occupations, craft occupations, personal and protective service occupations and sales occupations. The unskilled group comprises plant and machine occupations and “other occupations” that are considered unskilled.

A third strand of literature uses micro-level datasets and focuses on the type of tasks performed by workers. This approach and the terminology used is linked to recent theoretical work analyzing the phenomenon of offshoring in terms of “task trade” (Grossman and Rossi-Hansberg, 2006b). So far the relevant empirical work has mainly attempted to define which types of tasks can be traded and may potentially be offshored. Whether a country ends up importing, i.e. and thus offshoring, these tasks or exporting them, will – as in the case of “ordinary” good trade – depend on aspects like comparative advantage.

Van Welsum and Reif (2006) and van Welsum and Vickery (2005) argue that tradable services are characterized by four features: IT intensity, output that is IT transmittable, tasks that are codifiable, and tasks that require little face-to-face interaction.¹⁰ Such tasks may include high-skilled jobs, such as security analysts, or low-skilled jobs, such as switchboard operators, and are not necessarily sector specific. Blinder (2007) approaches the question of tradability in a somewhat different way and focuses on two questions. First, does a worker need to be in a specific location in the home country to perform the job (for example, child care worker). If the answer is yes, the relevant job is qualified as highly “non-offshorable”. If the answer is no, the second question asks whether workers have to be physically close to their work unit to perform their job. If the answer to that question is no, the relevant job is classified as highly “offshorable”.¹¹ Van Welsum and Vickery (2005) estimate that 20 per cent of total US employment is offshorable and Blinder (2007) considers 22-29 per cent to be offshorable. Neither study provides straightforward insights into how many jobs have been or will actually be offshored.

At this stage, trade economists do not appear to have clear answers as to how trade and offshoring will affect the demand for skills in the near future. It has been argued that trade and offshoring flows may change continuously and thus lead to frequent changes in the demand for skills. This argument seems to be confirmed by signals from employer

organizations indicating that it is increasingly hard to predict which skills their members will need in only two to three years' time.

Labour versus capital

Labour income represents only a fraction of total income and studies focusing on wage inequality, such as the ones discussed in the previous paragraphs, therefore only provide limited information on changes in income inequality. Developments in the agricultural sector, which still plays a predominant role in many developing countries, are not reflected in data on manufacturing wages. In addition, wage data do not give any information on possible additional revenues of workers – for instance, through investments in shares. More importantly, changes in the returns to capital are not captured by the evolution of wage inequality. This is an important shortcoming in a time where capital is expected to obtain a disproportionately large share of the gains from globalization, leading to some concern about the divergence between capital and wage income. One of the reasons for this evolution is that with the increasing integration of very populated economies, such as China and India, the global supply of labour has significantly increased, thus exacerbating the relative scarcity of capital. As a consequence the value of capital is bound to go up (Rogoff, 2005).

In a recent study, the International Monetary Fund (2007b) analyzes the effect of globalization on labour shares (as opposed to wage inequality or income distribution). “Globalization” is measured in this study as the combination of trade, immigration and offshoring. The study also differentiates between employees in skilled sectors and those in unskilled sectors.¹² The study finds that technological change and globalization have had a negative impact on the share of workers in unskilled sectors and that the effect of technological change was stronger. The study also finds that the impact of globalization was greater on the share of workers in skilled sectors than in unskilled sectors and that this effect was mainly driven by offshoring activities.

Ochsen and Welsch (2005) analyze the factors determining the distribution of functional income in West Germany for 1976-94. They find that the shares of capital and high-skilled labour benefited from technological progress, whereas the share of low-skilled labour was adversely affected by technological progress. The effect of technology

on the two labour shares was enhanced by the substitution of intermediate inputs for low-skilled labour. To the extent that this substitution involves imported intermediates, increased trade openness hurts low-skilled labour. That is, trade seems to have hurt low-skilled labour mainly by imported intermediates taking the place of low-skilled labour. However, the overall contribution of trade to changes in income distribution was small, as the year-to-year variation in the low-skilled labour share can be attributed to input prices, technological progress and trade-induced structural change in the proportion 19:77:4.

Changes in earnings distribution: increasing dispersion at the top end

A phenomenon that has received a great deal of attention in very recent literature on income distribution is the one of increasing earnings dispersion at the top of the distribution. Lemieux (2007) describes that growth in US inequality since 1990 has been concentrated in the top end of the distribution, while inequality in the low end of the distribution has declined, at least for men. These recent developments are not consistent with standard models of technological change that were suggested as the leading explanation for the growth in inequality in the 1980s.

Atkinson (2007) examines evidence for 12 OECD countries and finds that the evolution of the income of the bottom 10 per cent of the population between 1980 and 2005 differed significantly across countries. Leaving aside eastern Europe (Poland and Czech Republic in his sample), the data do not show a general pattern of decline in the bottom 10 per cent. In France, the income of the bottom 10 per cent in the income distribution even increased. Much clearer is the rise in top earnings since 1980, and the fanning out of the upper part of the distribution. The income of the top 10 per cent rose by more than 15 per cent in the United Kingdom and the United States, by close to 10 per cent in Western Germany and by close to 40 per cent in Portugal (since 1982).

Atkinson argues that these changes at the upper-end of the income distribution can not be explained by technological change. He provides other explanations, one of them referring to the so-called superstar theory, that is associated with Rosen (1981) and has also been explored in trade literature

(Manasse and Turrini, 2001). According to this theory, technological change and trade openness give the most talented individuals the possibility to exploit their talents more widely. Accordingly their earnings rise exponentially, while less brilliant individuals experience a declining demand for their services, because technology and openness allow for demand to be redirected to the exceptional individuals. Lawrence (2008) also makes reference to the same argument when stating that “globalization more broadly construed has played some role in increasing the size of relevant markets and thus incomes of CEOs, sports stars, entertainers, and software producers”. He further argues that what he calls super rich inequality has to a large extent been driven by factors of domestic origin, such as technological changes, institutional developments such as financial deregulation, changes in US corporate practices and rising asset markets.

(c) Trade, inequality and calls for protectionism

If some individuals lose or expect to lose from trade liberalization, they may want to push policy-makers towards protectionism. Those expecting to gain from trade liberalization, on the other hand, are expected not surprisingly to be in favour of trade liberalization. Depending on how policy-makers take their decisions, distributional consequences of trade reform rather than overall welfare effects may affect policy decisions. If policy-makers want to win an election and expect a majority of voters to be in favour of trade liberalization, they are more likely to pursue pro-trade policies. If policy-makers are heavily dependent on campaign contributions, their decisions may depend on whether the better-organized and better-paying lobbies are in favour of or against liberalization.

The discussion in previous sections has shown that traditional trade theory provides varying views on who would vote in favour of free trade. The Heckscher-Ohlin (H-O) framework, where there is free movement of labour across sectors, predicts that production factors that are relatively abundant in a country will gain from trade liberalization, while those that are relatively scarce will lose. In labour abundant countries, for instance, labour will gain from trade liberalization, while other owners of other factors – like capital or land owners – will lose. In the Ricardo-Viner (R-V) model, rewards tend to vary by industry of employment. In the latter set-up,

some or all employees cannot move across sectors and those employed in import-competing industries are expected to lose from trade liberalization, while those employed in exporting industries are expected to gain. The R-V model has often been considered to reflect the short-term effects of trade liberalization, while the H-O framework reflects the long term.

If trade policy is determined by a majority vote, the tariff will be determined by the sources of income of the average voter. In economies that are not perfectly egalitarian, i.e. in all economies, median voters’ capital/labour endowment is lower than the relative capital/labour endowment of the overall economy (Alesina and Rodrik, 1994). Mayer (1984) has shown that in this case and if trade is of the Heckscher-Ohlin type, median voters will be in favour of positive tariffs in countries that import labour-intensive goods, i.e. industrialized countries, and will be in favour of import subsidies in countries that import capital-intensive goods, i.e. developing countries.

In practice, import subsidies are rarely observed. There are several possible explanations for this. One focuses on the fact that individuals often do not know in advance whether they will be among the winners or losers of trade liberalization. Fernandez and Rodrik (1991) show that in this case there is a tendency for voters to prefer the status quo. This occurs even in a model where everyone is perfectly informed about the overall gains and losses in each industry as the result is entirely driven by the assumption that individuals cannot predict their individual returns. Therefore, there is a tendency to apply tariffs to offset import competition and to preserve the status quo for income distribution.

Dutt and Mitra (2002) find quite strong empirical support for Mayer’s median voter model based on another prediction generated by it. If the set-up is used to compare countries with varying degrees of inequality, the median voter model predicts that in capital-abundant countries increased inequality leads to higher tariffs, while in labour-abundant countries increased inequality leads to reduced tariffs. In other words, increased inequality is expected to be associated with more restrictive trade policies in industrialized countries, but with more open trade policies in developing countries. Dutt and Mitra (2002) find these expectations confirmed in their empirical analysis.

The notion that increased inequality in capital-abundant countries may lead to calls for higher tariffs also reflects the ongoing debate on protectionism in the United States. Dew-Becker and Gordon (2005) drew attention to the fact that median salaries and income in the United States had grown far less than average income in recent decades, because half of the income gains had gone to the top 10 per cent of the income distribution.¹³ Scheve and Slaughter (2007) argue that stagnating or falling incomes explain the increasingly protectionist sentiment in the United States: “policy is becoming protectionist because the public is becoming more protectionist, and the public is becoming more protectionist because incomes are stagnating or falling”.

There is also empirical evidence that voting or voting intentions within individual countries correspond to what the Heckscher-Ohlin framework would predict. Scheve and Slaughter (2001), for instance, find that in the United States lower skills, measured by education or average occupation earnings, are strongly correlated with support for new trade barriers.¹⁴ Balistreri (1997) compares the predictions of the Heckscher-Ohlin framework with survey data on Canadians’ views about the proposed Canadian-US Free Trade Agreement (CAFTA). He finds that individuals holding occupations that were relatively abundant in Canada were in favour of CAFTA, whereas the opposite was true for individuals in occupations that were scarce when compared with the United States.

The median voter approach applied to a Heckscher-Ohlin set-up fails to explain the frequently observed phenomenon that a relatively small industry that does not have support from the majority of eligible voters succeeds in gaining tariff protection. Mayer (1984) shows that the specific factor multi-sector model, i.e. the Ricardo Viner model, is more appropriate for studying such industry-specific efforts to raise a given tariff. In such a model, higher tariffs on a given import lead to significant gains for the average specific-factor owner in the protected industry but to rather small losses for average specific-factor owners in all other industries. The small number of big potential gainers, therefore, has much greater incentives to participate in the political process than the large number of small potential losers, whenever significant voting costs exist.

Mayda and Rodrik (2005) use cross-country datasets on attitudes towards trade to compare the validity

of the Heckscher-Ohlin and the Ricardo-Viner predictions. They find that pro-trade preferences are correlated with an individual’s level of education, in the manner predicted by Heckscher-Ohlin. But they also find support for the specific factors approach (Ricardo-Viner) as they find that preferences over trade are also correlated with the trade exposure of the sector in which an individual is employed. Individuals in non-traded sectors tend to be the most pro-trade, while individuals in sectors with a revealed comparative disadvantage are the most protectionist.¹⁵

Grossman and Helpman (1994) also use a specific-factor model in their commonly called “protection for sale” set-up. In this set-up, policy-makers care for voters’ well-being but also for campaign contributions. Those involved in import-competing industries may choose to join forces and to try to influence policy decisions through campaign contributions. Grossman and Helpman (1994) show that tariffs will be higher in industries that are better organized, that have more political power (reflected in their model by a higher ratio of domestic output in the industry to net trade) and that have lower import demand elasticities (reflecting the fact that the demand for imports is less sensitive to price changes). Olson (1965) has shown that smaller groups will find it easier to organize collective action. This explains why relatively small sectors such as agriculture or textiles have received a lot of protection in industrialized economies (Krugman and Obstfeld, 2006).

Bombardini (2005) points to an empirical issue that is not explained by the Grossman and Helpman (1994) approach: data show that sectors with a larger firm size dispersion tend to have higher levels of protection. She develops a model that is able to explain this finding. In this model, firms differ in size and lobbying is costly. Her model predicts that what matters for the strength of a lobby (and therefore the equilibrium level of protection) is not the size of the sector *per se*, but the share in total sector output of those firms that make a contribution to the sector’s lobby. This share of industry output produced by firms participating in the lobby, in turn, is a result of the coordination of individual firms and depends on the size distribution of firms within the sector. In other words, in sectors with larger firm size dispersion, the largest firms will hold a larger share of the total industry output and a set of lobbying firms will emerge that is in the position to appropriate a large share of the

benefits of protectionism. Their lobbying activity is behind the empirical regularity that sectors with a larger firm size dispersion have higher levels of protection.

In Bombardini's (2005) set-up, firm size determines the benefits from lobbying. "New-new" trade theory attributes an even larger importance to the notion of firm size as it links the benefits from trade reform to firm size. In particular, set-ups with fixed market-entry costs and firm variations (Melitz, 2003) yield the theoretical prediction that large firms in a given sector will support reciprocal trade liberalization while small firms will oppose it. By contrast, all firms will oppose unilateral liberalization of their final goods market. The reason for this is simple. Unilateral trade liberalization would raise the degree of competition in the local market (by allowing more firms to enter), thereby depressing market shares and profits. Therefore, all domestic firms – irrespective of their size – are expected to oppose it. When it comes to reciprocal trade liberalization, the story is starkly different. Such a liberalization yields selection and share-shifting effects that are favourable to large, export-oriented firms and detrimental to small, domestic-oriented firms. The former will support it, the latter will oppose it.¹⁶

2. TRADE AND STRUCTURAL ADJUSTMENT

Having an economy that is open to trade implies both the opportunity to sell goods and services to foreign markets as well as an additional source of competition from abroad. Trade openness, therefore, implies an additional source of economic "shocks" that can affect – positively or negatively – domestic firms, workers and other productive inputs. Trade liberalization and a continued openness to trade result not only in the growth of some domestic firms that take advantage of access to new markets but also the decline of other domestic firms that shrink and go out of business when confronted with a new source of competition. As firms grow or shrink, workers may leave one job to start another.

Until recently, empirical research in international trade has focused on industry-level adjustment – i.e. industries taking advantage of comparative advantage or scale economies would expand in response to export opportunities and withdraw resources from industries shrinking in the face of

newfound competition from imports. However, new sources of data at the firm and worker level within these industries have allowed researchers to inquire into the adjustment process at a much more detailed level of analysis.

(a) How do import-competing firms adjust to trade reform?

One area in which there has been a recent increase in empirical research involving firms, plants and international trade is how import-competing firms respond to trade liberalization. According to standard comparative-advantage based models of trade, introduction of import competition through trade liberalization leads to a reduction in the size of one area of the economy as resources are shed and picked up in the growing sector of the economy. As observed in the earlier discussion on firms and exporters of various types, however, the theoretical predictions of representative firm models do not always match actual practice. What does the data suggest for the import-competition side of the market?

Economists have investigated a number of firm-level experiences across a variety of countries.¹⁷ In order to address these questions, researchers have focused on countries for which firm or plant-level data was available over time and in which there was a relatively clean "natural experiment" via a trade liberalization shock.¹⁸ Thus, there have been a number of studies assessing firm-level characteristics of the shock of trade liberalization in countries (and time periods) as diverse as Chile (1973-79), Turkey (1983-86), Cote d'Ivoire (1984-86), Mexico (1984-89), Canada (1988-96), Brazil (1991-94) and India (1991-97).

A central focus of the major studies in this literature is on what economists refer to as the "import discipline hypothesis", i.e. that an increase in trade openness forces previously shielded domestic producers to respond in ways that are efficiency- or welfare-enhancing from an economic point of view. For example, firms shielded from imports may not have faced much competition (acting as monopolists or engaging in collusive arrangements, for instance). This allowed them to charge high price mark-ups over marginal costs. Furthermore, firm-level productivity may improve for various reasons, including more competition leading to increased effort and increases in innovative activity,

with trade liberalization allowing access to imported inputs and technologies. Surveys of this literature, such as Tybout (2003), point to three central findings.

First, firm-level mark-ups of price over marginal cost tend to decline when firms are faced with increased foreign competition, a result that is consistently discovered across different countries and across differing measures of competition (for example, import penetration ratios, effective protection rates, tariff rates). The implication of these reduced mark-ups is not clear, however, and depends substantially on the underlying market structure in these countries. One potential implication of these reduced mark-ups is a reduction of market power by previously dominant domestic firms, and thus a reduction in monopoly profits. On the other hand, an alternative implication in more competitive market structures could be that reduction in the size of the mark-up creates negative economic profits for firms in high fixed-costs industries that had not anticipated that trade liberalization would lower prices to such an extent that they would not be able to cover their costs of entry.

As previously discussed in Sections C.3.c and C.4.b, a second common finding in this literature is that plants that survive the arrival of new competition from imports show a substantial improvement in their efficiency. For example, in Pavcnik's (2002) study of Chile, one-third of the increase in aggregate industry productivity following trade liberalization was associated with productivity improvements within plants, presumably as they reallocated existing resources to more productive activities.¹⁹ A similar result is found in Trefler's (2004) research, which found that Canadian plants became more productive after increased import competition from foreign firms following Canada–US Free Trade Agreement tariff cuts.

A third result from this literature is that import-competing firms tend to shrink – in terms of output or employment – when foreign competition intensifies. For example, studies on countries as diverse as Canada (Head and Ries, 1999), Chile and Colombia (Roberts and Tybout, 1991) present evidence that an increase in import competition (evidenced by tariff reductions, reductions in effective rates of protection or increased import penetration ratios) is accompanied by a reduction in the size of very large plants in these countries.²⁰

Nevertheless, there remain many unanswered questions associated with the impact of trade liberalization on the behaviour of domestic firms competing with imports. First, while the result of trade liberalization may be a substantial increase in industry-level productivity and lower prices that generate across-the-board gains to consumers, Erdem and Tybout (2003) point out that researchers have not yet addressed the question of the short- and long-term costs associated with this efficiency gain. Knowledge about the associated costs is important because it has implications for domestic policy-makers when it comes to designing complementary adjustment policies that may help workers find new jobs. This is a severely under-examined area in the research literature.

Second, there has been relatively little formalized examination of the idea that increased openness – involving increased access to varieties of inputs – leads to firm-level productivity gains. Finally, as has been made clear regarding the evolution of the literature on exporting firms described earlier, it is highly likely that researchers do not even know what information is missing. It is only through additional access to increasingly detailed data and creative empirical approaches to difficult measurement and estimation issues that research will be able to provide additional insights.

Another line of research has also examined how other countries have responded to different types of changes in economic conditions that have affected their import-competing sectors. For example, while the United States did not experience a drastic trade liberalization “shock”, Bernard et al. (2006c) examine the firm-level response in US manufacturing industries in the wake of increased competition from low-wage countries over the 1977-97 period.²¹ This US line of research mirrors the research described earlier regarding the response of exporting firms to globalization. Researchers examined how firms adjusted to the new environment presented by globalization – for example, by exiting the market, reallocating inputs within industries, or changing the product mix within industries. They found that greater exposure to low-wage country imports is negatively associated with plant survival and employment growth. In terms of different firms (plants) within the same industry, they found that greater industry exposure to low-wage country imports led to a bigger difference in the relative performance between capital- and labour-intensive plants. Finally, they examined data on products that

plants are producing over time and infer a positive association between exposure to low-wage country imports and industry switching into products that are less likely to compete with imports from low-wage countries.

An example of a particular industry in the United States that has undergone adjustment following trade liberalization is the textile sector. Using plant-level data, Levinsohn and Petropoulos (2001) find that more intense international competition has led to a substantial restructuring within the industry. Textiles has experienced a tremendous capitalization and a reallocation of inputs used to produce output that competes with foreign-produced goods. While they note that industry productivity has increased substantially because individual plants are becoming more productive, much of the effect appears to be driven by a reduction in reliance on labour and an increased use of capital.

(b) How do labour markets adjust to trade-liberalizing reform?

The previous section illustrated how the adjustment process associated with globalization can have different effects on firms within an industry, depending on the firm's characteristics. Similarly, there is increasingly interesting and important research that examines the effects of trade liberalization on labour markets. As was observed in the case of firm-level versus industry-level studies, one observation is that much more upheaval in the labour market appears to take place within sectors rather than across sectors in response to trade liberalization.²²

Like the previous literature on firms, this research on labour markets is largely focused on activity in a number of developing countries that have experienced substantial episodes of trade liberalizing reform. The research attempts to identify the adjustment response of workers in sectors that, after a substantial cut in the import tariff, find themselves facing an increase in import competition. The research focuses on countries where episodes of large-scale trade liberalization have been accompanied by the collection of household survey information. This allows the researchers to assess various channels through which trade liberalization may subsequently affect the labour market. This includes examining employment changes both within and across industries as well as between

the formal and informal sectors of the economy, and looking into changes in wages facing these workers.

One country that has been examined in detail is Colombia because of its trade liberalization in the 1980s and the availability of household data from the Colombian National Household Survey, which records labour market experiences in a variety of sectors (and how this might correspond to changes in trade policy). Attanasio et al. (2004) are unable to find any evidence that industry-level employment is affected by the shock of import liberalization. They conclude that there is little labour reallocation across industries in the aftermath of the Colombian trade reforms. This is somewhat surprising given the predictions of models of international trade.²³ On the other hand, Attanasio et al. (2004) and Goldberg and Pavcnik (2005) document that there is evidence of larger reductions in the “wage premium”, i.e. the industry-specific component of a worker's wages that is not explained by their individual characteristics, for sectors with larger tariff cuts.

The surprising stability in the share of industry employment before and after reforms suggests that there may be other ways that the labour market is being affected in addition to wages. One such possibility is through increases in the size of the “informal economy” – typically defined as the sector of the economy where there are no worker benefits and no enforcement of labour market regulation (for example, workers' rights, minimum wages, etc.) – and thus through changes in the quality of jobs that workers take on as employees move out of the “formal” labour market and into the “informal” market. In countries that researchers have recently studied, such as Brazil and Colombia, the informal economy possibly plays an important role as there is evidence that it has been growing (as a share of the overall economy) during the period of trade reforms. Nevertheless, as the growth of the informal economy could have been caused by other factors unrelated to trade liberalization – for example, growth of the services sector in which informal labour markets are more predominant or simultaneous labour market reforms in these economies – an answer to the question of any link can only be found through a careful econometric examination of the data.²⁴

Goldberg and Pavcnik (2003) examine whether trade liberalization leads to the growth of the

informal economy by exploiting cross-sector variation in the size of tariff cuts undertaken as part of the liberalization reform. They are unable to find a robust link between trade liberalization in Brazil and Colombia and the shift of workers into the informal economy. The only potential evidence that they find is during a period in Colombia in which it had substantial labour market rigidities. Nevertheless, in the period under which Colombia's labour market reforms took place, the positive relationship between trade liberalization and the growth of the informal economy within an industry is severed. Thus they conclude that at least in these particular countries' trade liberalization episodes, any change in the underlying composition of labour market activity away from the formal economy to the informal economy is not related to the size of the tariff cuts. Labour market regulations are more likely to have a direct impact on employment activity.²⁵

(c) What happens to workers after trade reform according to survey data?

At the same time that economic research has increasingly been able to study at the "micro-level" how individual firms and plants adjust to changes in the trading environment, micro-level data has also allowed researchers to examine how individuals adjust. This topic is arguably important as the development of domestic policies aimed at easing the adjustment burden facing individuals as a result of globalization may benefit from access to this analysis. This sub-section describes the findings of this research as well as some of the limitations of this research area.

Substantial research has analyzed questions on the characteristics of workers who lose their jobs, their chances of re-employment and the adjustment process that workers face after losing their jobs.²⁶ Here we focus on what researchers have discovered about workers who lose their jobs for trade-related reasons.

A very sophisticated analysis for the United States involves Kletzer (2001) using data from Displaced Worker Surveys from 1979 to 1999 to examine whether individuals who experience job loss for trade-related reasons are systematically different from workers who experience job loss for "other" reasons.²⁷ Her research explores a number of important questions, including whether there

are important characteristic differences between these categories of workers and whether there are important differences in terms of re-employment between these categories of workers after job loss. For example, in a country such as the United States which has a separate Trade Adjustment Assistance (TAA) programme for workers who lose their jobs for trade-related reasons, the answers to these questions have the potential to be very useful to policy-makers active in this area.

Her research on the characteristics of the two types of workers – displaced for trade-related and non-trade related reasons – in US manufacturing suggests the following. On average, the two groups appear quite similar in many respects – while import-competing workers are slightly older, they have similar levels of job experience as well as educational attainment. The main difference is that trade-displaced workers in manufacturing are much more likely to be women. The primary explanation for this relates to the fact that the US industries facing the heaviest competition from imports during this period (for example, footwear, and clothing) employed a higher ratio of women. The evidence for European workers appears to be quite similar (OECD, 2005b, Table 1.2).

The next important question seeks to provide evidence on whether there are substantial differences in re-employment across the two categories of displaced workers. The evidence presented by Kletzer (2001) from the Displaced Worker Surveys in the United States suggests the following. Within the manufacturing sector, both categories were re-employed at quite similar rates, in the 63 to 68 per cent range at the time of the follow-up survey. However, there was a statistically significant difference between the general re-employment rates of men (69 per cent) and women (56 per cent) within manufacturing. As workers who lost their jobs from one plant in an industry may find it less costly to re-employ at a different facility within the same industry in the short term (i.e. in the absence of any changes in their skills), this lower re-employment rate for women probably reflects the fact that they are more likely to be employed in a manufacturing industry with stiff import competition in the first place – i.e. an industry in which there is not as much overall re-employment taking place.

On the other hand, OECD (2005b, Table 1.3) reports that re-employment rates for displaced European workers in manufacturing are much

lower (52-57 per cent) than is the case in the United States. The authors attribute this to potentially less flexible European labour markets. Nevertheless, when it comes to the question of whether there is a differential in re-employment between trade-displaced and other displaced workers in Europe, there is not a substantial difference between these groups.

Another important question regarding re-employment for these different categories of workers is the wage they receive once they are re-employed. Kletzer (2001) reports that there is not much difference between re-employment wages across the two categories of workers in the US manufacturing sector. It is useful to examine in more detail what happens to earnings among trade-displaced workers. Kletzer finds that, among trade-displaced workers in manufacturing, the average weekly earnings loss is 13 per cent, although there is also substantial variation in this loss across different types of workers. She presents evidence that 36 per cent of the trade-displaced workers either suffer no wage loss or observe a wage increase after re-employment, while 25 per cent of the trade-displaced workers observed an earnings loss of 30 per cent or more. Those that suffered the larger earnings losses were more likely to be older, have longer work experience and be lower-skilled production workers.

A final question examines the sectors in which these two categories of displaced workers become re-employed. Kletzer (2001) again finds little difference between trade-displaced and other displaced workers in this respect. Nevertheless, it is interesting to examine where import-displaced workers are re-employed as the basic trade model predicts that workers who lose their jobs in import-competing industries would move into exporting industries that are simultaneously expanding to take advantage of access to new markets. The data for the United States show that while 50 per cent of re-employed trade-displaced workers find jobs in manufacturing, only a small share of them are re-employed in export-intensive manufacturing. Only 10 per cent of displaced workers find new employment in the retail sector, although the data suggest that earnings losses are greatest for those that are re-employed in this sector. Earnings losses are smallest for those that find re-employment within the manufacturing sector. Similar results are evident for the re-employment of European workers (OECD, 2005b, Table 1.4).

Regarding the US Trade Adjustment Assistance (TAA) Programme,²⁸ Decker and Corson (1995) assess whether inclusion of a new worker retraining option in a 1988 revision to the programme affected re-employment opportunities for trade-displaced workers. They compare unemployed workers that received TAA before the 1988 reform with workers that received TAA after the reform. The authors are unable to provide evidence that training had a substantial positive impact on earnings of the workers being trained under the TAA programme. Although not pursued in this particular study, it would also be interesting to know more about the experiences of two sub-categories of trade-displaced workers – i.e. one that applies for and receives TAA and one that does not – in order to assess the outcome of such specially tailored policies beyond simply the effectiveness of introducing a training component.

(d) How do potential exporting firms adjust to new foreign market opportunities?

As an earlier section described in extensive detail, a number of interesting characteristics of the differences between exporting and non-exporting firms have come to light by examining firm-level data. This section briefly considers what this research literature says about how such firms adjust once the opening of foreign markets creates the possibility to export. Some of this research has important implications for policy, especially in terms of structuring Aid for Trade.

One of the earliest and most robust results found across the various countries studied in this literature is that exporting firms are more productive than non-exporting firms. This is by and large a “selection” effect, with the more productive firms choosing to become exporters, while less productive firms choose not to.²⁹

Nevertheless, a recent study by Lileeva and Trefler (2007) presents some of the first evidence that some exporters do become more productive after the decision to export has taken place.³⁰ Studying Canada’s trade liberalization experience under the Canada-US Free Trade Agreement (CAFTA), they find that the lower-productivity Canadian plants that were prompted by tariff cuts to start exporting managed to increase their labour productivity after exporting began. Furthermore, the authors identify

potential mechanisms through which this “learning by exporting” result may occur: plants engaged in more product innovation after exporting and had high adoption rates of advanced manufacturing technologies.

In addition to exporters adjusting by making changes that may affect their productivity, the extremely detailed data in some of these studies will allow future research to identify the extent to which firms may make adjustments both to respond to opportunities and to overcome challenges presented by exporting. For example, data on product-level transactions undertaken by individual firms will help to shed light on the relative importance of various fixed costs to exporting. In particular, are they specific to products or to market destination?³¹ Future research using new techniques and newly available data could help to improve understanding of how firms competing in global markets are adjusting.³²

Missing from this literature is information on firms outside the manufacturing sector. In particular, because of data limitation, empirical economic research has contributed little so far to understanding whether firms in service industries have important similarities or differences to manufacturing firms. Similarly, most of the extremely detailed information on exporting firms relates to developed economies. While a number of the basic findings about productivity and firm sizes have largely been confirmed when examining exporting and non-exporting firms in other countries as well, there are new potential avenues of research, especially in the case of developing countries, that would be worth pursuing. For example, Tybout (2000) provides some extremely interesting information

about variations in the size of manufacturing firms in developing countries, which may result from a tradition of protectionism and heavy domestic regulation. He finds that oligopolies of extremely large plants with large market shares co-exist with a set of very small plants that are unwilling and/or unable to grow in order to take advantage of economies of scale. So how can such firms possibly overcome the challenges of becoming an exporter?

3. TRADE AND POVERTY

One of the biggest challenges facing the world community today is how to eradicate poverty in the world. Under the Millennium Development Goals, the international community has committed to reduce poverty by half by 2015 with several key targets relating to trade. Trade reform has long been part of national economic policy packages aiming at promoting economic efficiency and growth. Trade liberalization creates many new opportunities. Both theory and empirical research have well documented the long-term benefits from improved resource allocation and efficiency that follow from trade liberalization. Trade openness is believed to have been central to the remarkable growth of developed countries since the mid-20th century and an important factor behind the poverty alleviation experienced in most of the developing world since the early 1990s (see Table 16).

While it is widely acknowledged that trade liberalization has the potential to help the poor increase their income and expenditure, it is also known that trade liberalization tends to create some losers. Is it possible that the poor are among the losers or that low-income groups are pushed into poverty? If yes, how does this happen and can it

Table 16
Percentage of population below US\$ 1 (PPP) per day

	1990	1999	2004
Developing regions	31.6	23.4	19.2
Northern Africa	2.6	2.0	1.4
Sub-Saharan Africa	46.8	45.9	41.1
Latin America and the Caribbean	10.3	9.6	8.7
Eastern Asia	33.0	17.8	9.9
Southern Asia	41.1	33.4	29.5
South-Eastern Asia	20.8	8.9	6.8
Western Asia	1.6	2.5	3.8
Commonwealth of Independent States	0.5	5.5	0.6
Transition countries of South-Eastern Europe	<0.1	1.3	0.7

Source: MDG Report 2007, United Nations.

be avoided? This sub-section tries to answer these questions by examining a number of ways that trade can affect the most vulnerable groups in society. It discusses whether trade liberalization, in the short term, can harm poorer individuals and whether, even in the longer term, successful open trade regimes may leave some people trapped in poverty.

Although the relationship between trade liberalization and poverty has received considerable attention in recent years, establishing the precise link between changes in trade policy and the overall effects on poverty has proven to be a difficult task. One of the difficulties lies in the fact that trade affects individuals in various ways. It may affect their income – through effects on employment, distribution of resources and/or growth – and it may affect their expenditure through its effect on the prices of consumer goods (Winters, 2006). Trade reform may also affect the poor through its impact on government revenue and spending. The combined impact of these different effects tends to be difficult to assess. This may explain why most of the evidence on trade and poverty is indirect evidence that focuses on one or two of the ways that trade may affect poverty (Harrison and McMillan, 2007). There are surprisingly few studies on the direct linkage between trade and poverty.³³

The structure of this sub-section reflects the economic literature on the ways that trade reform affects poverty. It starts with a review of recent studies examining the linkage between trade, growth and poverty. It then focuses on how poverty is affected by entrepreneurial activity or labour market (through profits, wages and employment), by household consumption and production (the transmission of changes in prices to households) and by government (where trade reform affects government revenues and thus possibly the scope for more spending on the poor or where it leads to taxation that may put a disproportionate burden on the poor – see Section C.4).

i) Trade, growth and poverty

One of the main channels through which trade reform affects growth is by reducing the anti-export bias of trade policy and leading to a more efficient allocation of resources. However, this is a one-off gain in efficient allocation and need not affect the economy's long-term growth rate. In the long term, trade liberalization can affect the

economy's rate of growth by creating incentives for investment. In addition, trade reform usually encourages innovation and FDI, which can result in the acquisition of advanced technologies and new business practices that increase overall productivity and growth in domestic firms (see Section C.4).

Much has been written on the link between trade and growth from both a theoretical and an empirical perspective and this linkage has been the subject of some controversy. The finding that trade openness, broadly defined, promotes growth, as reported by Dollar (1992), Sachs and Warner (1995) and Dollar and Kraay (2002), has been questioned by Rodriguez and Rodrik (1999) on the grounds that their measures of trade liberalization and their econometrics are inconsistent.

In their controversial study, Dollar and Kraay (2002) find a positive relationship between trade, growth and poverty reduction. The authors select a group of countries that they call "globalizers"; countries with large tariff reductions and a high trade to GDP increase since the 1980s. For this group of countries, they establish a positive link between the change in trade volume and growth rates. Furthermore, looking at the distribution of the gains from increased growth they find that the income of the poorest fifth of society increases proportionally and conclude that trade is good for the poor.³⁴ The reliability of findings such as the one in Dollar and Kraay (2002) on the basis of cross-country studies has been questioned, but the result has been replicated in time-series analysis for individual countries. Tsai and Huang (2007), for instance, find a one-to-one relationship between the growth of the average income of the bottom 20 per cent of the population and growth of the mean income of Taiwan's population over the period 1964-2003. Their findings also suggest that trade has contributed to increasing the mean income of the poor, not only through its impact on growth, but through a positive impact on distribution, i.e. on the share of income accruing to the poorest fifth of society.

Other studies have used more sophisticated methods to examine the relationship between growth and poverty. Ravallion (2001) estimates the link between growth and poverty by using data from household surveys of several developing countries. The estimated "elasticity" of poverty – measured as US\$ 1 per day – is positive. Hence, growth reduces poverty on average. However, an examination

of the variance of the result suggests that the poverty-reducing effect is more pronounced for some countries than for others. Datt and Ravallion (2002) perform a similar analysis using a sample of 15 states in India. They find a positive relationship between non-farm output and poverty alleviation, with large variations across states. In particular, they find that the poverty-reducing effect of growth was lower in states with low levels of initial rural development and education.

In pursuing an even more ambitious approach, Cline (2004), merges estimated links between growth and trade, and country-specific links between poverty and growth with General Equilibrium (GE) analysis of global trade liberalization.³⁵ This permits him to create an estimate of the aggregate long-term poverty reduction that might arise from such reforms. His estimates are large, totalling nearly 650 million people – the majority in Asia – where the absolute number of poor (based on a US\$ 2 per day 1999 purchasing power parity (PPP) poverty line) is large and trade growth is relatively high following multilateral trade liberalization. However, Cline’s growth-based estimates of poverty reductions stemming from trade liberalization are considerably larger than those obtained by the World Bank Development Prospects Group (World Bank, 2004).

ii) Labour markets: the factor price, income and employment link

The previous paragraphs emphasized the potential role for trade in stimulating growth and thus indirectly increasing the income of the poor. But trade also affects labour markets and may influence relative incomes through this channel. Lopez (2004), for instance, differentiates between the short- and the long-term impact of different policies and finds that trade openness raises inequality and stimulates growth at the same time. He, therefore, refers to trade liberalization as a win-lose policy.

As discussed before in Section C.1.b, the effect of trade liberalization on labour markets has traditionally been discussed in the framework of the Stolper-Samuelson theorem (Samuelson and Stolper, 1941) which suggests that the “abundant factor” should see an increase in its real income as a consequence of a country opening up.³⁶ This reasoning has been used by some authors, such as Krueger and Berg (2003) and Bhagwati and

Srinivasan (2002), to support the idea that trade liberalization benefits unskilled labour, and thus the poor, in developing countries. Yet, the discussion in Section E.1 above has shown that there is evidence for both increased and decreased inequality in developing countries following trade reform.

The effect of trade reform on labour markets in developing countries may also be more complex than suggested in traditional trade theory because of the particularities of those labour markets. Developing countries tend to have a large pool of informal labour, and the poor often form part of that informal labour force. If trade increases the demand for labour in the formal economy, this can lead to a reduction of poverty in two ways. First, if the wage in the formal economy is higher than in the informal economy, an increase in formal employment reduces the number of people in poverty. The second scenario assumes that the wage in the formal economy is equal to the subsistence wage or the wage in the informal economy. Subsequently, a shift in labour demand reduces poverty only if the implicit wage in the subsistence or informal economy increases following trade liberalization either due to a reduction of labour supply in the subsistence sector or a reduction of overcrowding.³⁷

Another issue, not discussed so far, is the potential effect of rigidities in labour markets. Traditional trade models expect workers to move easily from (import-competing) sectors where employment declines to (exporting) sectors where employment increases. But numerous studies have observed a lack of movement of labour following trade reform. This is the case in Revenga (1997), Harrison and Hanson (1999) and Feliciano (2001) for Mexico and Currie and Harrison (1997) for Morocco. Labour market rigidity may lead to temporary unemployment, with potentially severe consequences for the poor. In this context, Winters (2000) calls for an increased focus on transitional unemployment as a possible consequence of both trade reform and labour market rigidity.

Hertel and Reimer (2005) emphasize in their overview that labour market rigidities may be one of the explanations for the increase in “horizontal” rather than “vertical” inequality that has been observed in the study by Ravallion and Lokshin (2004). In this study of prospective trade reforms in Morocco, they distinguish vertical inequality (impacts on households at different income levels) from horizontal inequality (impacts on households

at the same initial income level), and find that the latter tends to dominate in their results. This finding reflects the fact that households with identical consumption patterns and identical income levels may be affected differently by trade reform if they draw their income from different sources.

iii) Prices, household consumption and production

The trade and poverty literature has paid particular attention to the effect of trade on agricultural prices and their effect on poor households. This is the case because food represents a particularly large share of expenditure for poor households. In addition, in most developing countries a large share of poor households lives in rural areas and are agricultural producers either for subsistence or at a commercial level. Changes in agricultural prices may, therefore, affect poor households differently, depending on whether they are net consumers or net producers of agricultural products.

If trade leads to an increase in agricultural prices, this is likely to be good news for net producers of agricultural products, who are likely to increase production. Such price increases may also prompt some rural households to start selling crops on the market rather than using their entire production for subsistence. In other words, net consumers of agricultural goods may turn into net producers. Those who remain net consumers, however, are likely to be affected negatively by an increase in agricultural prices.

Several studies have, indeed, found that poor urban households are affected differently by changes in agricultural prices than poor rural households. Analyzing the effects of the financial crisis in Indonesia, Smith et al. (2000) find that full family income in urban areas fell by twice as much as in the rural areas (43 per cent versus 21 per cent) during the first year of the crisis. Friedman and Levinsohn (2001) come to a similar finding. They find that almost all Indonesian households suffered strongly from the crisis, but the impact on the urban poor was more severe. Their explanation is that poor rural households were able to offset some of the effect by subsistence farming. Ackah and Appleton (2007) analyse the effect of higher food prices in Ghana following trade and agricultural reform beginning in 1983. They report that the rural poor do not suffer more than the rural non-poor. On the other hand, the urban poor are worse off by a change

in prices. Minot and Goletti (2000) simulate the effect of the elimination of an export quota on rice in Vietnam and find that urban and rural non-farm households would be hurt by the resulting increase in rice prices, while farmers would gain.

The impact of agricultural trade liberalization will also depend on the extent to which the prices of inputs are affected, with reductions in input prices being more likely than reductions in output prices to affect poor households in rural and urban areas equally. Klytchnikova and Diop (2006) analyze the impact of the liberalization of trade for irrigation equipment and fertilizers in Bangladesh during the early 1990s. They find that liberalization resulted in significant increases in rice productivity, which was associated with significant declines in rice prices for both producers and consumers. In their study, this price decline benefited both urban and rural poor households as they turn out to be net consumers. Large net sellers, on the other hand, are among the better-off households in rural areas in their samples and those households lost from liberalization. Gisselquist and Grether (2000) also analyze the case of liberalization of trade in agricultural machinery in Bangladesh. In addition, they examine the effects of the deregulation of seed production and trade in Turkey during the 1980s. The two case studies lead them to conclude that the deregulation of the trade of inputs can lead to significant increases in the range and quality of inputs available to farmers, which in turn raises productivity and income.

Reaction to price changes triggered by trade is not always immediate. It is sometimes also lower than expected because price changes occurring at the border are not necessarily fully transmitted to producers and consumers in the country. With respect to the first point, the study by Ravallion (1990) addresses both the short- and long-term impact of an increase in the price of rice on rural wages and poverty in Bangladesh. Based on his short- and long-term estimates of wage elasticity, he concludes that the average landless poor household loses from an increase in the rice price in the short term (when wage increases are relatively small), but gains in the long term (after five years or more), as wages, with respect to the price of rice, rise over time. Porto (2005) looks at the responses of households – net producers or net consumers – to trade reforms in rural Mexico. In a static scenario, net producers should benefit from an increase of prices, whereas net consumers are worse-off because they have to reduce consumption. In a

dynamic environment, consumers can switch their consumption to less expensive goods (substitution effect). Furthermore, former net consumers might increase or start production of the product that has increased in price. As a result, they turn into net producers and gain from the price increase. Porto (2005) finds that the dynamic gains of an increase in price outweigh the losses and thus make rural households better-off.

The transmission of border price changes to producers and consumers may differ between industrialized and developing countries due to differences in transport costs and other costs of distribution. In their survey of the empirical evidence on trade liberalization, Winters et al. (2004) highlight the important role of transactions costs between the border and the consumer or producer. They argue that price transmission is likely to be particularly ineffective for poor people living in remote rural areas and that producers or consumers in these areas may, in extreme cases, be completely insulated from changes taking place at the border.

A study by Arndt et al. (2000) in Mozambique underscores the empirical significance of marketing margins in low-income countries. The authors report producer-consumer margins as high as 300 per cent and argue that this tends to discourage rural households from participating in markets, hence limiting the potential impact of trade reforms on their livelihood. Along similar lines, Nadal (2000) explains that the lack of a fall in corn production in Mexico following price decreases due to the North American Free Trade Agreement (NAFTA) liberalization was due to the fact that Mexican corn was produced largely for subsistence purposes. De Janvry et al. (1991) also show that missing markets for labour and staple foods substantially dampen the supply response of Mexican peasant households to price changes for cash crops like corn. To this end, de Janvry et al. (1991) conclude that most small Mexican corn producers are hardly affected by price declines under the early 1990s NAFTA.

Nicita (2004) simulates the effect of Mexican tariff changes, allowing for a differential pass-through by region based on a measure of distance to the United States, the primary source of Mexican imports for many products. In line with most of the relevant literature, he finds incomplete pass-through of tariff change to consumers, with the extent of pass-through being smaller for agriculture than for manufactured goods. Ultimately, agricultural

tariff cuts have little or no impact on the more remote regions of Mexico. Nicita (2004) argues that his findings are due to high transportation costs, making local production more profitable in regions further from the border.

iv) Tax revenue and social expenditure

Winters et al. (2004) identify the effect of trade liberalization on government revenue as one of the key concerns for many developing countries. Indeed, the share of trade taxes in total revenue is negatively associated with the level of economic development, with many low-income countries earning half or more of their revenue from trade taxes. Trade liberalization thus has the potential to significantly reduce government revenue, with possible repercussions for the poor.

One response to declining tariff revenues is to seek alternative sources of revenue. Depending on the choice of tax replacement, the poor may be adversely affected (Hertel and Reimer, 2005). This is highlighted by Emini et al. (2005) for the case of Cameroon, where the authors simulate the impact of different tax-replacement tools on poverty. They view a rise in value-added tax (VAT) as the most likely tax-replacement tool and find that this tool is favourable to the poor because they consume disproportionately goods that are favoured by the exemptions in Cameroon's VAT scheme. When a uniform consumption tax is used instead, the impact of trade reform on poverty is quite adverse.

Baunsgaard and Keen (2005) analyze data on tax revenues in a search for evidence on whether countries have actually recovered from other sources the revenues lost from past episodes of trade liberalization. They find that high-income countries clearly have done so and that for middle-income countries, recovery has been in the order of 45-60 per cent. Troublingly, however, revenue recovery has been weak in low-income countries, recovering at best 30 cents of each lost dollar in trade tax revenue.

If losses in tariff revenue are not fully recovered, public expenditure may have to be cut. The question arises as to whether the poor are likely to be adversely affected by this. Winters et al. (2004) conclude from the literature on structural adjustment and public expenditure that social expenditure has tended to be relatively protected, when compared

with capital expenditure in countries reducing public expenditure. Looking at the evidence on public expenditure in sub-Saharan Africa, for instance, Sahn (1992) does not find any evidence of systematic increases or decreases in real levels of total and social sector expenditures, or in social sector spending as a share of total expenditure.

Reductions in government expenditure may also be offset partially by increases in private investment. This is illustrated by Dorosh and Sahn (2000), who use a CGE approach to examine the consequences of macroeconomic policy reform on real incomes of poor households in Cameroon, the Gambia, Madagascar and Niger.³⁸ They simulate a cut in real government expenditure by 10 per cent and find that urban households are affected more than rural households because government employment is concentrated in urban areas. But they also find that increases in private investment partly offset the decline in government expenditure, with increases in private investment reaching 4.5 per cent in Cameroon and even 20.3 per cent in Niger.

v) Trade and poverty: lessons from economic research

This short overview of the literature on trade and poverty highlights that the linkages between trade and poverty are multiple and complex. It is, therefore, hard to predict the effects of trade reform on poverty, and past experiences have shown that those effects are not necessarily uniform across the developing world. Although empirical evidence suggests that trade liberalization tends to reduce poverty rates, there is ample opportunity for policy-makers to exploit further the positive linkages. The discussion in this sub-section has also shown that some of the poor may actually become worse-off even when poverty rates decline, and this should be a matter of concern to policy-makers. Among the numerous tools that can be used to stimulate the positive effects of trade reform, those affecting transaction costs and supply constraints are those most related to trade policy. Not surprisingly, therefore, both researchers and policy-makers dealing with trade issues have examined these policy tools in the context of trade reform in developing countries, as discussed in more detail in Section F.

4. CONCLUSIONS

Policy reforms usually do not affect all individuals equally. Trade reform is no exception to this rule. Although trade reform tends to create gains for the overall economy, those gains are unlikely to be distributed evenly. Traditional trade theory made rather straightforward predictions as to the distribution of the gains from trade: comparative advantage would determine the competitiveness of individual sectors, leading some to export and others to import; short-term effects on workers would reflect the sectoral impact of trade reform, while long-term effects on revenues would differ across production factors and would depend on the countries' relative endowments of these factors. For developing countries, the prediction was that sectors intensively using low-skilled labour would export and that this would lead to gains for low-skilled workers. Inequality was, therefore, expected to decrease in developing countries, while the opposite was likely to happen in the industrialized world.

Recent research presents a much more complex picture of the changes that trade liberalization is likely to trigger and of the resulting consequences. In particular, recent research emphasizes that firms within a given sector are not identical and that it is necessary to analyze individual firms to understand export behaviour. This literature predicts that exporting firms are likely to be found within all sectors and that all sectors also contain firms that suffer from trade liberalization and reduce production. As a result, the effects of trade reform on production can no longer be explained along sectoral lines. There are indications that the increasing importance of offshoring in the services sector reinforces this phenomenon.

According to recent research, the effects on workers' revenue and employment are likely to be more complex than initially thought. For a long time, trade economists used to think of workers as being divided into clear categories and typically only made a distinction between "low-" and "high-" skilled workers. Trade was expected to affect all workers within a given category in the same way. Empirical evidence has shown that this is not the case and that workers with apparently similar qualifications or with similar occupations can earn very different wages depending on where they work. Yet, what is relevant is not in which sector they work, but rather whether they work for a company that exports or not,

as exporting companies systematically pay higher wages. While traditional trade theory predicted that the effects of trade on wages would be different for industrialized and developing countries, some strands of recent literature emphasize mechanisms that trigger similar effects across countries. These mechanisms could explain why increases in inequality have been observed after trade reform in certain developing countries. Recent empirical work also reflects the need for more nuanced definitions of skill difference in order for research to generate useful policy guidance.

With respect to the effects of trade on developing countries and, in particular, the poor in developing countries, there seems to be agreement that those effects are likely to be country and situation-specific. In general, however, empirical evidence continues to support the idea that trade is good for the poor, although trade is likely to affect individual households differently. The strength of the poverty-reducing effect of trade appears to be country-specific and will to a large extent depend on the policies accompanying trade reform. This is one of the subjects which will be discussed in more detail in the next section.

Endnotes

- ¹ This section does not deal with the distribution of wealth between nations, that has been raised, for instance in the debate triggered by Samuelson's (2004) argument that certain types of technological change in developing countries may have negative effects on industrialized countries' wealth in a free trade regime.
- ² To be more precise: it depends on countries' relative factor endowments.
- ³ According to the Stolper Samuelson theorem, some wages may even go down in absolute terms.
- ⁴ See Section C.3 of this Report.
- ⁵ See the discussion in Section C.1.d on offshoring.
- ⁶ See (Baldwin and Robert-Nicoud, 2007) for a more exhaustive discussion of how the different channels interact in a set-up with two sectors and two production factors.
- ⁷ Wacziarg and Wallack (2004) focus on the pattern of reallocation of labour following trade liberalization. They examine the impact of trade liberalization episodes on movements of labour across sectors for 25 countries, mainly developing and transition economies, and find weakly negative effects of liberalization on the extent of intersectoral labour shifts at the economy-wide 1-digit level of disaggregation. They find increased sectoral change after liberalization at the more disaggregated 3-digit level within manufacturing, although the estimated effects are statistically weak and small in magnitude. They also find that the effects of liberalization on labour shifts differ across individual countries, in a way related to the scope and depth of reforms.
- ⁸ See Section C.3.
- ⁹ Scheve and Slaughter (2007) distinguish seven educational categories for US workers – high school dropout, high school graduate, some college, college graduate, non-professional master's, Ph.D., and M.B.A./J.D./M.D. They argue that only those in the last two categories, with doctorates or professional graduate degrees, experienced any growth in mean real money earnings between 2000 and 2005. Workers in these two categories comprised only 3.4 per cent of the labour force in 2005, meaning that more than 96 per cent of US workers are in educational groups for which average money earnings have fallen. In contrast with earlier decades, since 2000 even college graduates and those with non-professional master's degrees – 29 per cent of workers in 2005 – suffered declines in mean real money earnings. They do not analyze the causes of those reported changes in inequality.
- ¹⁰ In a paper that analyzes how the increased use of information technologies has affected the demand for different skills, Spitz-Oener (2006) classifies tasks along related lines. She finds that in Germany information technologies have acted as a substitute for routine activities – be they cognitive or manual – and have complemented interactive and analytical activities.
- ¹¹ In addition, Blinder (2007) distinguishes two intermediate categories.
- ¹² Data for labour shares do not allow the authors to differentiate between skilled worker and unskilled workers directly.
- ¹³ See also the discussion on increases in the income of the top decile in the previous section.
- ¹⁴ Their measure for trade-policy preferences comes from the National Election Studies (NES, 1993) survey, an extensive survey of political opinions based on an individual-level stratified random sample of US population.
- ¹⁵ Studies that have found support for the specific-factors model include Magee (1978), Irwin (1994) and Irwin (1996).
- ¹⁶ Do and Levchenko (2006) use this set-up in a political economy model explaining the relationship between openness and the quality of institutions. In particular, they assume that the quality of institutions determines market entry costs, with market entry costs being lower in countries with better institutions. The larger a company the easier to cope with market entry costs. Large companies may therefore favour bad institutions, as high market entry costs keep their smaller competitors out of the market and increase their market power. In this model openness may either increase or decrease the quality of institutions. According to the authors the detrimental effect of trade on institutions is most likely to occur when a small country captures a sufficiently large share of world exports in sectors characterized by economic profits.
- ¹⁷ This section draws on influential surveys such as Tybout (2003) and Erdem and Tybout (2003). Examples of country-level studies include Chile (de Melo and Urata, 1986; Pavcnik, 2002); Mexico (Tybout and Westbrook, 1995), Canada (Trefler, 2004), Brazil (Muendler, 2004), India (Krishna and Mitra, 1998), Turkey (Levinsohn, 1993), and Cote d'Ivoire (Harrison, 1994).
- ¹⁸ By "clean", what economists mean is that the policy change was unanticipated by firms, to reduce concerns over endogeneity between the policy change and the economic measures being examined. Nevertheless, in

- many of these country studies other important policy changes were occurring within the economy in addition to trade liberalization, which therefore weakens the ability to draw inference that changes in firm-level activity were caused by trade liberalization alone, or whether they also may be related to other simultaneous changes to domestic policies occurring as well.
- ¹⁹ The other two-thirds of the increase in Chilean industry productivity was associated with the change in relative firm size within the industry – i.e., the growth of firms that began with high-productivity and the shrinkage of low productivity firms – in the face of new competition introduced by liberalization.
- ²⁰ Tybout (2003) rationalizes the apparent contradiction in the findings that, in the presence of trade liberalization, both initially large firms tend to shrink and high-productivity firms tend to grow by suggesting that firm size is not a good proxy for firm productivity.
- ²¹ This particular work can be interpreted as motivated by the unknown implications of “de-industrialization,” or the decline in the share of manufacturing employment in total employment, more developed economies. Studies such as Rowthorn and Ramaswamy (1999) and Boulhol and Fontagné (2006) point to a small but positive role of trade in speeding the pace of de-industrialization, arguing that the more important domestic factors are changes in productivity and shifts in structural demand away from manufacturing toward services.
- ²² This point is broadly captured by the work of Wacziarg and Wallack (2004) using a cross-country sample of data. First they find that trade liberalization episodes are followed by a reduction in the extent of intersectoral labour shifts at the economy-wide 1-digit level of industry disaggregation. Then, even at the 3-digit level of disaggregation, they find that liberalization has only a weak and positive effect on labour adjustment, and this result is sensitive to minor changes in the definition of liberalization, the measures of sectoral shifts, and controls for the underlying domestic (labour market regulation) policy environment.
- ²³ Nevertheless, Goldberg and Pavcnik (2005) report that this result has been documented in a number of other studies as well in countries as diverse as Brazil, India, Mexico and Morocco.
- ²⁴ Furthermore, a decrease in formality on its own is not necessarily a sign of inferior quality, even from the worker’s perspective, provided that it is voluntary behaviour. For example, a worker may prefer the flexibility (number or timing of hours worked) that informal sector employment provides but that formal sector employment does not.
- ²⁵ In a related study, Currie and Harrison (1997) provide evidence that there is a positive link between the number of temporary workers hired by firms and the conclusion of a trade reform episode in Morocco.
- ²⁶ An interesting survey of labour adjustment costs across OECD markets and attempts to relate some of these dislocation measures to trade can be found in OECD (2005b).
- ²⁷ In reality there is no way to know for certain whether or not the underlying cause behind any individual displaced worker was increased competition from imports or some other factor (for example, labour-saving technological innovation), or more likely the degree to which any increase in competition from imports contributes to the dislocation of a worker. In recognition of this, Kletzer (2001) provides an empirically-based approach that sorts manufacturing workers in the survey based on the severity of import competition in the worker’s industry. The proxy used to sort workers is based on a measure of the worker’s industry’s import penetration ratio (and/or changes thereto) which is defined as the share of industry imports in the total domestic industry’s available supply (domestic shipments + imports – exports).
- ²⁸ For a recent survey of the US TAA program, see Baicker and Rehavi (2004).
- ²⁹ See again the survey of Bernard et al. (2007a).
- ³⁰ An example of another study that finds some evidence that there is learning by exporting, at least in the case of a sample of developing countries in sub-Saharan Africa, can be found in Van Biesebroeck (2005). See also the discussion in Sections C.3.d and C.4.b.
- ³¹ As one approach in this direction of research, Eaton et al. (2005) use disaggregated data from a sample of French firms to estimate destination-specific fixed costs of exporting.
- ³² For example, in their study of US firms, Bernard et al. (2007a) find that exporting firms tend to export multiple products and that nevertheless trade is extremely concentrated across firms. Earlier research by subsets of these authors also examines the question of “product-switching” and how firms change their mix of product offerings in response to the pressures of globalization. Furthermore, there is also evidence from US import data on within-product differentiation (Schott, 2004) that is consistent with a theory of within-product specialization in ways that may reflect differences in product quality, i.e. that rich countries export varieties with high unit values and lower income countries export varieties with lower unit values.
- ³³ The few studies which do examine the links between globalization and poverty typically use computable general equilibrium (CGE) models. Those studies thus generate predictions about the expected impact of trade on poverty and do not represent ex post evidence on the impact trade reform has actually had on poverty. See Hertel and Reimer (2005) for an overview of the relevant CGE literature.
- ³⁴ However, in a comment by Rodrik (2000a) the above-mentioned study is criticized in major points. For example, the selection criteria for the “globalizers”, tariff averages (policy measure) and the import share of GDP (outcome), are “conceptually inappropriate, as policy makers do not directly control the level of trade”. Rodrik applies the selection criteria in a more stringent way and finds that the countries under consideration did not do significantly better. This finding thus questions the relationship between trade and growth and as a consequence the potential of trade to reduce poverty through growth.
- ³⁵ A general equilibrium analysis is able to account for all the linkages between sectors of an economy, including the linkages between household expenditures and incomes.
- ³⁶ According to the standard version of Stolper-Samuelson model (the baseline two-factor, two-good and two country model), the usual benchmark for trade economists, openness in developing countries is pro-poor. In this framework, trade liberalization will lead countries to specialize in the production of goods that use intensively production factors that the country is relatively well endowed with. Returns for these factors will tend to rise while the returns for the relatively scarce production factors will tend to fall. Developing countries are typically well endowed with low-skilled labour relative to developed countries, thus they will specialize in the low-skill-intensive-sectors. Consequently, wage of low-skilled labour (the poor) are expected to increase.
- ³⁷ In Winters (2000) overcrowding occurs if the workers have a negative social product which is lowered if there are less workers in subsistence. On the other hand he calls a shortening of labour supply in the subsistence sector successful development.
- ³⁸ A CGE model is a general equilibrium model which uses the power of today’s computers to calculate numerically the effects of a particular change that is introduced to the model.

F POLICY IMPLICATIONS OF GLOBAL INTEGRATION AND THE WTO

1. INTRODUCTION

This section considers the policy implications of recent developments in trade theory and the challenges arising from more open trade. The discussion in Section C examined in detail much of the theoretical basis for the gains from trade. Subsequent discussions also identified a number of economic factors that have the potential to reduce those gains or to skew their distribution. While in traditional trade theories even unilateral liberalization is beneficial, the “new-new” trade theory stresses the attractiveness of reciprocal trade opening. This is because productivity improvements are driven by additional exports, and lower profit margins lead to the exit of low-productivity firms.

High trade costs can inhibit participation of more countries in international trade and reduce the potential volume of trade transactions. Beyond high trade costs, many poor countries face supply-side constraints that make it difficult to increase trade even when market access is not a constraint. There may be significant costs to adjusting to trade liberalization if, for example, factors of production are sector specific. Trade can create winners and losers in a country. Recent technological changes may make it more difficult to predict winners and losers from liberalization, which could add to anxieties about market opening. Some of the new trade theories also suggest that differences among countries have the potential to result in some countries losing at the same time as their partners gain from trade liberalization.

This section discusses the policies that will need to be crafted to cope with some of these challenges. Policy instruments beyond traditional border measures will need to be deployed. There is also a need for coherence in how these various policy instruments are used. While most measures have to be taken at the national level, there is a role for international cooperation and institutions like the WTO. It will not, however, be feasible to cover all the possible responses to the challenges identified in previous sections. Instead, the approach adopted here is to be selective and to deal with those that have been highlighted the most in previous sections.

2. ADDRESSING TRADE COSTS AND SUPPLY CONSTRAINTS

As discussed in Section D, falling trade costs marked the post-World War II era and played a large role in the global trade expansion of the period. But this general pattern of falling trade costs hides important differences between high-income and low-income countries. In practically all of the important components of trade costs discussed in Section D (tariffs, non-tariff measures, transport costs, telecommunications costs), these costs are at much higher levels for low-income countries than for high-income countries (see Table 12, Section D). Trade costs are on average higher in low-income countries because of the absence or poorly developed nature of their physical infrastructure, such as seaports, airports, railways, road networks and telecommunications, which are necessary to conduct international trade. The absence or poorly developed nature of infrastructure represents a major constraint to expanding domestic production.

There are many examples of how low-income countries suffer from infrastructure deficiencies. While high-income OECD countries had 42 kilometres of roads (per 100 square kilometres of area), low-income countries averaged less than 18 kilometres.¹ High-income OECD countries had three times more first-class airports than middle-income countries and seven times more than low-income countries.² In 2002 the international internet bandwidth per person was over 2 kilobits in high-income countries but only 20 bits in middle- and low-income countries (the average for the least developed countries (LDCs) was only half a bit per person).³ Mainline connections per 1,000 persons in 2005 averaged over 500 in high-income countries but did not even reach 135 in middle- and low-income countries. Even though mobile phone subscriptions have surged dramatically around the globe, there is still a big gap between high-income countries (with subscription rates of 83 per cent in 2005) and middle- and low-income countries (where the rate was 25 per cent in 2005).

Government policies and regulations that adversely affect the provision of infrastructure and the supply of its services exacerbate the situation. This observation, of course, can apply to high-, middle-

or low-income countries. There may be a designated public monopoly in the telecommunications sector. There could be significant restrictions on the rights of foreign ships in terms of transporting goods and passengers. Investment rules and regulations may limit the degree of foreign participation in the transport and telecommunication sectors.

Customs formalities may lead to long delays for obtaining clearance of imported goods. The data collected by Micco and Perez (2001) on the median number of days for customs clearance show a huge disparity among countries, with the least efficient taking 30 days to clear imports while the more efficient take one or two days. The absence of certain government measures may also contribute to higher trade costs and supply constraints. Without competition policy, for example, anti-competitive behaviour can flourish in those sectors that are crucial to the economy. Fink et al. (2002) found price-fixing agreements in liner transport which they argue have significantly increased transport prices.

(a) Measures at the national level

At the national level there are two broad types of actions that could be taken to expand the productive potential of the economy. The first would be the provision of public goods and this is an urgent need in low-income countries. There should be more public investment in physical infrastructure essential to carrying out production and trade or allowing traders cheaper access to international markets. A second and equally important action would be to make changes to policies or regulations that prevent efficient use of already existing infrastructure, deter private-sector investments to build infrastructure or act simply as “red tape”. As noted earlier, these policy or regulatory changes may be needed not only in low-income countries but even in high- or middle-income countries.

But directing more investments to infrastructure is more easily said than done because low income-countries are typically short on tax revenues. Thus governments in low-income countries will need to look beyond their own resources and tap other sources of financing for infrastructure. Sizeable funds for infrastructure may involve official development assistance or private-sector financing (both foreign and domestic). One of the most encouraging examples of how the private sector

can respond to economic opportunities available in infrastructure investments is the explosive growth of mobile telephony across the world, even in many low-income countries. Countries in sub-Saharan Africa, for example, saw the number of mobile phone subscribers soar from about 1 per 1,000 in 1995 to 125 per 1,000 in 2005.⁴

Beyond increasing public and private investments in infrastructure, countries will need to consider making changes to domestic policies and regulations. More domestic competition and liberalization of the transportation sector should increase efficiency in the provision of transport services. Government monopoly in telecommunications or lack of competition in the sector raises costs. But cheaper telecommunications services are an important ingredient for electronic commerce, participation in international trade and the development of successful centres of offshoring. Countries should also examine the scope for streamlining customs procedures and enhancing transparency in the administration of trade regulations. The adoption of international standards can make it easier for a country's exports to penetrate foreign markets. These measures and regulatory changes would enhance the efficient use of already existing infrastructure. They should also increase the incentives for private investments, whether local or foreign, to contribute to the provision of vital infrastructure.

(b) International cooperation

Beyond these national initiatives, there is a role for international action and international institutions. The international community can help draw attention to the problems faced by low-income countries and help mobilize or direct needed resources. As was noted earlier, governments in low-income countries may be unable to generate adequate resources from domestic taxes to finance all their infrastructure requirements. The international community can also provide the needed expertise through technical cooperation. Finally, some of the required changes in policy and regulations may well have an international dimension and need to be negotiated with foreign partners. International institutions can serve as fora for negotiations and as vehicles for implementing international accords. This sub-section will focus on the role that the WTO is playing in all of these areas.

The current negotiations in the WTO allow members the opportunity to bind current access and make new market-opening commitments in those areas that can contribute significantly to reducing trade costs and increasing the productive capacity of low-income countries. Among the most relevant services sectors are maritime transport, telecommunications and distribution. (While transport by air is becoming more and more important in international trade, the General Agreement on Trade in Services (GATS) unfortunately does not cover measures affecting the transport of passengers and freight by scheduled and non-scheduled services).

With the high growth of trade in time-sensitive goods, express delivery services are bound to prove important. At present, express delivery services are not explicitly covered by the Classification List generally used by WTO members for scheduling purposes under the GATS, which has led some members to propose the creation of such a sub-category under communication services. Since May 2005, 30 WTO members have tabled revised offers in services, although not all cover these sectors.⁵ There appears to be plenty of room for other WTO members to make additional offers.

The huge disparity in customs clearance times among countries underlines the large potential for improvements in the area of customs formalities. In July 2004, WTO members launched negotiations on trade facilitation. This has been part of the WTO's work programme since the Singapore Ministerial Conference in 1996, when Ministers mandated the start of exploratory and analytical work on the simplification of trade procedures. The objective of the current negotiations is to clarify and improve WTO rules so as to further expedite the movement, release and clearance of goods, including goods in transit.⁶ The WTO clearly recognizes the differing capacities of its membership to meet requirements in this area and so the negotiations also aim at enhancing technical assistance and support for capacity building in trade facilitation. It is important to note that the provision of technical assistance goes beyond the WTO, and other international organizations, such as the International Monetary Fund (IMF), the Organisation for Economic Cooperation and Development (OECD), the United Nations Conference on Trade and Development (UNCTAD), the World Customs Organization (WCO) and the World Bank, are collaborating with the WTO in this field.

There is a continuing work programme on electronic commerce which is intended to examine all trade-related issues connected to global electronic commerce. Given the potential that electronic commerce holds for developing countries, one important focus of the work programme is to respond to the economic, financial and development needs of developing countries in this area. With respect to product standards, technical regulations and sanitary and phytosanitary (SPS) measures, considerable opportunities exist for reducing trade costs through, for instance, the implementation of WTO agreements.

The Agreement on Technical Barriers to Trade encourages members to use relevant international standards as a basis for technical regulations. Although the effects of standards on the direction and size of trade flows tend to be complex, there is empirical work which documents how the adoption of international or common standards can have a positive and significant effect on trade.⁷ Moenius (1999), for example, estimates that a 10 per cent increase in the number of shared standards between trading partners enhances their trade by about 3 per cent. Given that food and agricultural products tend to be more prominent in the exports of developing countries, it is particularly important for them to be able to comply with SPS measures in export markets. Some of the case studies in the recent International Food Policy Research Institute study (2003) demonstrate the pitfalls faced by developing countries in failing to comply with such measures. They showed that developing countries whose access to export markets was denied due to SPS issues experienced substantial costs in terms of lost sales, reduced market share and additional investments required to re-enter export trade.

Since the beginning of the current round of Doha negotiations, there has been a massive expansion in the WTO's technical cooperation programme. Beginning in 2001, the programme has averaged several hundred technical assistance and capacity-building activities each year. Many of these activities are of course undertaken in collaboration with other partner organizations. WTO technical cooperation focuses on building institutional and human capacity to understand and implement WTO agreements and to participate in trade negotiations. As noted earlier, implementation of WTO agreements can enhance a country's market access opportunities. Thus, to take the example of SPS measures, the Standards and Trade Development Facility is

assisting developing countries to enhance their expertise and capacity to analyse and to implement international SPS standards, improve their human, animal and plant health, and therefore their ability to gain and maintain market access.

Beyond collaborating with other international organizations and donors on technical assistance in WTO-specific areas, the WTO participates in broader collaboration arrangements with multilateral institutions to address the supply-side constraints faced by developing countries. For example, the Integrated Framework (IF), which brings together the WTO, the IMF, the International Trade Centre (ITC), UNCTAD, the United Nations Development Programme (UNDP) and the World Bank, is intended to support LDC governments in trade capacity building and mainstreaming trade issues into their national development strategies. Through a diagnostic trade integration study, the IF helps developing countries identify the constraints faced by their traders and those sectors of greatest export potential together with a plan of action for integrating into the global trading system. The plan of action is subsequently integrated into the country's national development plans and becomes an important target area for development assistance or donor support.

(c) Aid for Trade

The Aid for Trade work programme was launched at the Hong Kong Ministerial Conference in December 2005. The initiative is intended "to help developing countries, particularly LDCs, to build the supply-side capacity and trade-related infrastructure that they need to assist them to implement and benefit from WTO agreements and more broadly to expand their trade."⁸

Aid for Trade includes technical assistance, infrastructure, the development or further improvement of productive capacity and adjustment assistance – helping with the costs associated with tariff reductions, preference erosion, or declining terms of trade. The infrastructure component of Aid for Trade has a direct impact on efforts to reduce trade costs and to expand productive capacity in low-income countries. As noted earlier, the implementation of some WTO agreements enhances the export prospects of WTO members. Technical assistance to help members implement such agreements can therefore be considered

part of the effort to reduce trade costs and to address supply-side constraints. The involvement of the WTO in these efforts arises from its role in creating opportunities for countries to benefit from participation in international trade. The WTO also has a mandate to seek to achieve coherence in global economic policy making. The initiative helps national and international agencies responsible for development understand the trade needs of WTO members, and assist them in developing adequate policies.

The Task Force on Aid for Trade established at the Hong Kong Ministerial Meeting in 2005 was assigned the responsibility of "operationalizing" Aid for Trade. In 2006 the Task Force came up with a set of recommendations on how this could be achieved. The recommendations aim to make it easier to identify the needs of individual countries, to determine the appropriate response from donors and to bridge the gap between donor response and a country's needs. It has also recommended that the WTO can play a monitoring role by undertaking a periodic global review of the initiative based on reports from a variety of stakeholders.

The monitoring would involve global tracking of financial flows, self assessments by partner and donor countries, three high-level regional meetings and a series of periodic reviews in the WTO's Committee on Trade and Development, a global Aid for Trade review and a debate in the General Council. The global review undertaken in November 2007 at the WTO showed that Aid for Trade has assumed growing importance in most donor programmes. The resources for Aid for Trade averaged \$21 billion over the 2002-05 period and now represent over 30 per cent of bilateral programmes (OECD, 2007a). The OECD report also expected that the high profile enjoyed by Aid for Trade was likely to be maintained, and possibly even expanded over the medium term.

The immediate goals for 2008 include improving monitoring, advancing implementation and strengthening ownership of the initiative by developing countries. In terms of monitoring, the most important improvement needs to be made in measuring the impact, rather than merely the flows of assistance, of Aid for Trade. The OECD, the World Bank and other institutions with expertise in this area are looking at performance indicators that could be used for this purpose.

To move implementation of the Aid for Trade initiative to the next level, a series of national and sub-regional Aid for Trade reviews in Africa, Latin America and the Caribbean, and Asia and the Pacific would be held in 2008. These reviews are intended to advance the implementation of national and sub-regional plans. As noted earlier, there is already an existing mechanism – the Integrated Framework (IF) – through which LDCs benefit from Aid for Trade. Finally, everything is being done to encourage developing countries to take a more active and direct role in the initiative. There is a growing list of countries that are in the process of holding Aid for Trade events as a way to mobilize both domestic and international support.

3. DEALING WITH THE SOCIAL CONSEQUENCES OF LIBERALIZATION

Some of the gains from trade liberalization come about from the reallocation of resources to those sectors of the economy where a country has comparative advantage. While such reallocations are necessary to reap the benefits of trade reform, they also often imply losses for some individual workers. They may, for instance, result in some workers losing their jobs. The consequences of temporary job losses can be harsh and in many countries policies are in place to assist those temporarily out of work. Those policies are often general in nature, in the sense that they target any individual affected by job loss independent of its cause. But examples also exist of policies that target explicitly those who have lost their jobs for trade-related reasons or specific regions or sectors affected by trade.

The discussion in previous sections has shown that for some the negative effects of trade reform may be permanent as they may face lower revenues in absolute or relative terms after trade liberalization. Given that the overall gains from trade are positive, it is in principle possible to redistribute those gains to make everybody better off. Whether such redistribution policies are introduced or not are decisions that have to be taken at the domestic level. Again the question arises as to whether equity concerns related to trade liberalization should be addressed by specific trade-related policies or whether they can be addressed by more general economy-wide redistribution policies.

(a) General policies to assist those negatively affected by trade

i) Facilitating transition

Two types of labour market policies regarding job loss can be distinguished: (passive) income support during periods of unemployment and so-called active labour market policies that attempt to facilitate re-employment.

Social protection systems

Modern economies need to constantly reallocate resources, including labour, from old to new products, from bad to good firms (Blanchard, 2005). At the same time, workers value security and insurance against job loss. In response to this, economies have used different tools to provide a buffer against the most negative consequences of job loss. These tools include job-security regulation that makes it harder for employers to lay off workers and unemployment benefits that provide workers with a certain level of income during periods of unemployment. However, both types of policies may negatively affect the reallocation process, i.e. the process of job loss inherent in the growth process and also the adjustment process following trade liberalization. The question therefore arises whether a trade-off between efficiency and insurance exists and how far this should go.

In this context, Blanchard (2005) argues that it is important to provide generous unemployment insurance, but that it ought to be conditional on the willingness of the unemployed to train for and accept jobs if available.⁹ He argues in favour of protecting workers, rather than jobs, thus indicating a preference for unemployment insurance (potentially co-financed by companies) rather than job-security regulation. Sapir (2006) illustrates that Nordic European countries (Denmark, Finland, the Netherlands plus Sweden) combine generous and comprehensive unemployment benefits with relatively “loose” job-security regulation. He argues that such a system provides insurance to workers and is at the same time “efficient” as these countries are characterized by high employment rates when compared to the OECD average.

Blanchard (2005) also suggests that the cost of low-skilled labour could be reduced through lower social contributions paid by firms at the low wage

end and that work could be made more attractive to low-skill workers through a negative income tax rather than a minimum wage.

Numerous industrialized countries, in particular in the European Union, are characterized by generous social protection systems that differ significantly when it comes to the detail (Sapir, 2006). An important challenge for these countries is to design systems whereby the unemployed continue to have incentives to look for jobs, ensuring that generous social protection systems do not introduce significant inefficiencies. Social protection in low-income countries is typically confined to the minority of workers who are part of the formal economy. This is because it is difficult to introduce systems of social insurance for workers in the informal economy and agricultural sector who are outside the fiscal system; levels of poverty are also high in these sectors.

A major challenge faced by low-income countries is therefore to devise and extend alternative means of providing social protection to workers in the informal economy (Jansen and Lee, 2007). In middle-income countries, where formal employment is more significant, there is often more scope for providing social protection to workers who are adversely affected by trade and related economic reforms. However, very few of these countries have systems of unemployment insurance even though such schemes are financially and organizationally feasible.

Active labour market policies

Active labour market policies are intended to facilitate the re-integration of the unemployed into the labour market as well as the reallocation of labour necessitated by structural change or geographical, occupational and skill mismatches. They include measures such as retraining schemes for the unemployed, job-search assistance, direct employment-creation programmes such as public works schemes, credit and training programmes to promote self-employment, and employment subsidies to promote the hiring of vulnerable groups such as low-skilled workers and new entrants to the labour force.

Active labour market policies are widely used in industrialized countries where they are increasingly being seen as a preferable alternative to passive income support to the unemployed.¹⁰ Coupled with measures to increase the incentive (and obligation) to seek work, such measures appear to have the potential to raise the employment rate (Sapir,

2006). Hybrid systems of income support and active labour policies have also been suggested. Heitger and Stehn (2003), for instance, propose the re-interpretation of the unemployment insurance system as an employability insurance system. Under such a system, an individual who is laid off could take his insurance entitlement and use it to finance the training needed to find another job.

While many developing countries implement elements of active labour market policies, such as public employment services, skill-development programmes and various direct employment creation schemes, the scale of these activities and the resources devoted to them are typically limited (Jansen and Lee, 2007).

ii) Redistribution policies

As in the case of social protection and labour market policies, redistributive policies fall in the domain of domestic policy making. Most industrialized countries have redistributive policies in place, but they differ significantly. Redistributive policies are, for instance, more extensive in Europe than in the United States even though pre-tax inequality is higher in the United States (Alesina and Angeletos, 2005). Alesina and Angeletos (2005) show that different beliefs about the fairness of social competition and what determines income inequality influence the redistributive policy chosen in a society.

A large body of economic literature has analyzed different redistribution policy options. The discussion in this Report focuses on the analysis of redistribution policies in the context of trade reform. In particular, two questions have been reviewed: are the efficiency losses introduced through redistribution policies smaller than the efficiency gains from trade and is it possible to redistribute from capital to labour if capital is more mobile at the global level than labour?

Traditional trade models have predicted that trade would lead to a rise in the wage premium in countries that are relatively well endowed with skilled labour and a rise of the capital-wage ratio in countries that are relatively well endowed with capital. It comes therefore as no surprise that economists have attempted to analyse the effect of redistribution policies within these models. Such policies tend to introduce two distortions into the economy.

The first distortion comes from the policy itself since it distorts incentives. The need to pay for the compensation scheme creates the second distortion. Using a traditional, full employment model of trade, Dixit and Norman (1980; 1986) have argued that it is possible to use commodity taxes to compensate the losers from trade liberalization without exhausting the benefits from freer trade. Brecher and Choudhri (1994) have raised concerns about this result by showing that in the presence of unemployment this scheme may not work. Instead, they show that in such a setting and under reasonable conditions, fully compensating the losers may eliminate all of the gains from trade. Feenstra and Lewis (1994) have also shown that when factors of production are imperfectly mobile, a compensation scheme on the basis of commodity taxes may neutralize the benefits from trade. Davidson and Matusz (2006) estimate that the total cost of compensation remains quite modest and never rises above 5 per cent of the net benefit from liberalization.

Another question that has received significant attention in the public finance literature in recent years concerns the incidence and optimality of taxes when factor markets become more integrated. One standard model is built on the assumption that capital becomes more and more mobile across countries or regions while labour is rather less mobile or even assumed to be immobile (Janeba, 2000).

Increasing mobility of capital has important consequences for tax policy because a higher elasticity of capital relative to labour would call for lower tax rates on capital on efficiency grounds. This has at least partly undesirable distributional consequences. In particular, it significantly restricts the possibilities for governments to redistribute from capital to labour, which may be a matter of concern if the inequality between capital and labour earnings increases, for instance, as a result of increased globalization. Several contributions to the literature have recommended international tax coordination or even tax harmonization in order to reduce the strong downward pressures on the taxation of capital income (Rodrik and van Ypersele, 2001; Razin and Sadka, 2004). International tax coordination would allow countries to reap the benefits of capital mobility, while compensating the losers of increased openness.

(b) Specific trade adjustment programmes for workers

i) Can specific trade adjustment programmes be justified?

Providing specific assistance to workers displaced by trade liberalization can be justified if these workers face worse job prospects than other unemployed individuals. Evidence on whether this is the case is scarce and is mainly based on US data on recipients of Trade Adjustment Assistance (TAA). The US TAA is one of the few programs explicitly targeting trade adjustment. As it has been around for several decades – it was introduced in 1962 – sufficient data are available to analyse differences between TAA recipients and recipients of “ordinary” unemployment benefits in the United States.¹¹

Decker and Corson (1995) find that during the 1980s, recipients of TAA in the United States were more likely than other unemployed individuals to have been laid off due to plant closures, to have experienced longer jobless spells, to have suffered a larger decline in wages and were less likely to be recalled to their old job.¹² They also find that TAA recipients were more highly paid before lay-off than other unemployed workers.¹³ In a more recent study, Kletzer (2001) does not find significant differences between those who lose their jobs because of trade liberalization and other unemployed workers in terms of levels of work experience before job loss, educational attainments, re-employment rates, re-employment wages and sectors in which they find re-employment.¹⁴

The latter may explain why, according to Aho and Bayard (1984), the political argument for government intervention is the best argument for specific programmes to supplement a more general, and less generous, job loss programme where such programmes are in place. The political argument is that certain interest groups have sufficient political power to block or delay socially beneficial changes unless they are generously compensated and otherwise assisted. According to Aho and Bayard (1984), the case for a special programme such as TAA for trade-displaced workers is that the alternative to TAA is increased trade barriers or greater difficulty in reducing existing trade restrictions because of the political power of the potential “losers”.

Numerous references in the economic literature suggest that political concerns may, indeed, have played a fundamental role in introducing and revising trade-adjustment assistance programmes in the United States. According to Feenstra and Lewis (1994), for instance, the introduction of TAA in 1962 was used to “compensate workers for tariff cuts under the Kennedy Round of multilateral negotiations”. Baicker and Rehavi (2004) point out that in 1993 Congress created the NAFTA Transitional Adjustment Assistance as part of the push to secure the passage of the Agreement. This programme explicitly targeted workers who lost their jobs as a result of trade with Canada or Mexico or through plant relocations to these countries. The same authors link the recent revision of US TAA, in the context of the so-called Trade Adjustment Reform Act 2002, to the US administration’s desire to obtain congressional renewal of the “trade promotion authority”.

Nevertheless, in countries that lack wide-ranging social protection systems, the introduction of adjustment programmes of limited duration, targeting those negatively affected by trade reform can be justified on the grounds of the above-mentioned equity concerns or on grounds of efficiency concerns. Efficiency concerns may, for instance, be related to problems of labour-market congestion that can occur if the local labour market is relatively small and workers are relatively immobile (Aho and Bayard, 1984).¹⁵ Efficiency concerns have also been invoked by Levy and van Wijnbergen (1995) in their analysis of agriculture liberalization in the context of NAFTA in Mexico. The authors argued in favour of gradual trade liberalization together with a well-targeted adjustment programme of investments in land improvements in order to transform a loser from trade reform (rain-fed land) into a winner from trade reform (irrigated land). They argued that gradual trade liberalization would make it possible to reap the combined benefits of transformation and trade without having to experience a period of losses.¹⁶ Such an adjustment programme would also have had the potential to reduce the level of migration from rural to urban areas that took place in certain parts of Mexico in the aftermath of NAFTA liberalization (Nadal, 2000).

ii) Designing specific trade-adjustment programmes: the example of retraining programmes

Training programmes often form part of the “active labour market policies” discussed above and have in

many cases had a positive impact on employment.¹⁷ In the context of targeted (trade) adjustment programmes for workers, however, the effects of retraining schemes have sometimes been considered disappointing. The following discussion illustrates that outcomes are likely to depend significantly on the design of such programmes.

With respect to the US TAA training component, Decker and Corson (1995) find that the training provided through trade-adjustment assistance does not seem to increase re-employment wages. While Marcal (2001) also fails to find evidence that training increased re-employment wages, she finds some evidence that trainees had higher employment rates relative to recipients not in training and to those who had exhausted unemployment insurance benefits. Matusz and Tarr (1999) cite similar evidence based on government-sponsored retraining programmes in Hungary and Mexico in the context of public sector downsizing. Evidence for Hungary suggests that workers who participated in the programme had a slightly higher chance of getting re-employed compared with those who did not. Furthermore, the wages of participants upon re-employment were slightly higher compared with those of non-participants in the programme who later became re-employed. The trainees also subsequently obtained jobs that had longer durations. In Mexico, the retraining programme seemed only to be effective in increasing the chance of finding a job or getting a higher wage for trainees who had previous work experience and for adult male participants, respectively.

Rama (1999) gives some hints as to the reasons for disappointing outcomes of retraining programmes. He analyzes a case of public-sector downsizing by Spain in the 1980s that had only limited success in relocating workers to alternative industries, in spite of extremely large retraining programmes. Rama (1999) argues that failure was partly due to retraining being focused on updating previous skills rather than on acquiring new ones.

In order to be successful, training courses may need to target specific skills demanded in expanding sectors. In the context of the privatization of Brazil’s Federal Railway, for instance, an attempt was made to adapt training courses to the particular needs of laid-off workers.¹⁸ For this purpose, regional labour markets were studied in detail by labour market specialists in an attempt to determine the nature and composition of the market, relative to supply and demand. This information was used

to help organize training and to determine what was necessary to achieve optimal results from the company's efforts to help participants of the incentive programme to re-enter the job market.¹⁹

iii) Targeting adjustment assistance

According to traditional trade theory, adjustment is expected to take place across sectors as production factors move from import-competing sectors to exporting sectors. Adjustment assistance, therefore, was often targeted at particular sectors or was conditional on the sectors being affected by import surges. Traditionally, eligibility for assistance under the US TAA was based on increases of imports of articles of the same nature or directly competitive with articles produced by sectors that subsequently experienced layoffs (Magee, 2001).

The 2002 reform of TAA broadened the definition of the eligible set of workers significantly (Baicker and Rehavi, 2004). It now includes workers laid off in plant relocations, reflecting the concern of offshoring. The new definition also reflects awareness of the fact that workers may be affected by trade even though their employer is not directly active in trade. Under the new definition, secondary workers employed by upstream suppliers or downstream customers of firms affected by trade liberalization may also be eligible for trade adjustment.

Recent trade literature, however, suggests that even such a broadened definition may fail to capture all workers affected by trade and that, more generally, it may prove to be impossible to identify all workers affected by trade liberalization. As discussed in previous sections, recent studies indicate that adjustment processes may not only be observed between sectors but that significant job reallocation may also take place within sectors. In particular, the traditional approach has been challenged by the so-called "new-new trade models". These studies predict that trade reform will trigger job creation and job loss across sectors as both net-exporting and net-importing sectors will have expanding high-productivity firms and low-productivity firms that shrink or close down (Bernard et al., 2007b). For policy-makers, this implies significant reshuffling of jobs within sectors.²⁰ This also implies that a wider range of jobs are at risk in all sectors.

While traditional trade models would suggest that policy-makers who wish to assist workers focus on

so-called comparative disadvantages sectors, i.e. those that can be identified as import-competing sectors, more recent research suggests that such targeted intervention is not justified. Instead, this research may explain why surveys in industrialized countries have revealed that workers in very different types of industries feel greater job insecurity as countries liberalize (Scheve and Slaughter, 2004). Baldwin (2006a) argues that it will be increasingly difficult for policy-makers to predict the direction and nature of employment changes.

(c) Helping workers to adjust: a role for international cooperation?

The possible role for international initiatives in helping to deal with the social consequences of trade reform have mostly been discussed in the context of adjustment problems. In particular, it has been argued that trade reform should be designed in such a way that adjustment is as painless as possible for workers, in particular the less privileged. Gradual liberalization would, for instance, give labour markets time to adjust and avoid temporary unemployment surges due to labour market congestion (Aho and Bayard, 1984). It has also been argued that it could be helpful for developing countries to receive international funding to deal with negative social aspects of the adjustment process following trade reform.

i) Multilateral trade agreements and adjustment

Multilateral trade liberalization is by its very nature a gradual process and in this respect leaves room for adjustment processes to take place smoothly. Many WTO agreements contain more or less explicit provisions that aim to facilitate their adoption. In particular, they often specify phased-in implementation periods, with developing and least-developed countries usually being granted longer implementation periods than industrialized countries.²¹

Multilaterally agreed trade rules also offer countries several safety valves that can be used to address adjustment problems.²² In particular, the so-called "safeguard" provisions in WTO agreements offer members the possibility to react subsequently to problems caused by unforeseen import surges. Bacchetta and Jansen (2003), however, argue that the safeguard provisions target adjustment problems

faced by firms rather than those faced by workers. In particular, the WTO Agreement on Safeguards seemingly wants to facilitate the restructuring of industries hurt by import competition rather than the reallocation of workers who consequently lost their jobs.

ii) Financing temporary trade-adjustment assistance in developing countries

The discussion above illustrates that most industrialized countries have more or less generous social protection systems in place, sometimes combined with trade-specific adjustment programmes. In many developing countries, in particular least-developed countries, both types of schemes are missing. In the absence of any social protection, unemployment – even for a short period – may cause considerable hardship in developing countries. Or, as Winters (2000) puts it, for the poorest “even switching from one unskilled informal sector job to another could cause severe hardship”.

To the extent that the introduction of wide-ranging social protection systems in middle- and low-income countries takes time, the introduction of targeted trade-adjustment assistance could be justified in countries lacking more general systems. The challenge is to design them in such a way that they are effective. The analysis of existing trade-adjustment assistance schemes in industrialized countries can provide some guidance on this. The question also arises as to whether there could be a role for the international community in contributing to the funding of such schemes.

4. DO ALL COUNTRIES GAIN FROM TRADE? THE ROLE OF TECHNOLOGY

From the discussion of major trade theories and associated empirical evidence in Section C, it seems reasonable to conclude that the gains from trade are universal – that is, shared among all countries participating in international trade. However, several studies have highlighted the possibility that, under certain circumstances, one country may gain less than its trading partner or even lose when trade is liberalized (although global gains always remain positive).²³ This may be of obvious concern to policy-makers trying to emphasize the benefits of trade opening. Two key aspects in the

distribution of gains from trade across countries appear to be countries’ relative size and level of technological development, and the relationship of these issues with other relevant factors. For instance, as described in Section C.1.b, differences in the availability of resources may influence the choice of technology. The latter may change rapidly in open economies and, therefore, alter the initial situation of gains from trade. Since the economic size of a country cannot easily be changed, at least in the short-term, technology appears to be an important factor shaping a country’s expectations of trade benefits. In Section C.3.d, it was noted that technological leadership can even make up for size disadvantages.

The theoretical literature examined in Section C.4.a emphasizes that while the general presumption is that trade liberalization enhances innovation and world growth, several counteracting effects may be at work. This implies that, at least in theory, it is possible to have varying effects on growth, whereby some countries benefit while others are negatively affected by a reduction in trade barriers. The evidence that is extensively reviewed in Section C.4.b points to the limited relevance of these counteracting effects. In particular, the evidence at the firm-level in both developed and developing countries for several trade liberalization episodes attests that trade reforms improve the growth of plant productivity and, hence, the overall growth of the economy (see also Sections C.3.a and C.3.c).

Nonetheless, policy-makers still believe that trade may lead to “incorrect” specialization. The notion of “incorrect” specialization is based on the assumption that the spread of technology across borders is limited while (as discussed in Section C.4.b) empirical literature finds that knowledge developed in one country has positive effects on other countries through trade. However, a possible counter-argument could be that while this form of technology transfer is present in general, not all countries may benefit from it.

From a policy perspective, the question remains as to whether a country should welcome the possibility to trade with technologically advanced partners or shun it, and what it can do to reduce technological differences. By the same token, it must be asked how trade itself can act as a mechanism for technology transfer and what policies may encourage such exchanges. These issues are discussed in turn.

(a) Technological differences and international trade

Traditional approaches, be they Ricardian models or variants of the Heckscher-Ohlin framework that include technological differences, have emphasized that the more “different” countries are from one another, the higher is the potential for mutual gains from trade opening. Smaller countries also prefer to trade with larger countries, as they reap more of the surplus if the terms of trade change in their favour, as is likely to happen. As far as dynamics are concerned, in Section C.4.a it was noted that a country that is large enough to influence world prices via the volumes it exports, i.e. even a “smaller” country supplying a highly specialized product, can see its terms of trade worsen if it experiences faster capital accumulation or productivity growth than the rest of the world. Hence, “export-biased” growth can hurt a country that is sufficiently large to influence its terms of trade.

Building on the idea of import- versus export-biased growth, Krugman (1990) has argued that catching-up by technologically backward countries may lead to welfare reductions in the advanced country, whereas technological progress in the leading country benefits all. In this model, technological progress is biased towards technology-intensive industries. In other words, progress in the technological leader is biased towards goods that other countries do not produce themselves (and, hence, they benefit from lower prices, while the leader’s terms of trade loss is outweighed by its productivity gains). By contrast, technological progress in the less advanced countries leads to competition with the leading country’s current exports, and while production of new exports in these countries also benefits the technologically advanced country (since they have become cheaper), the leader risks paying more for its traditional imports, i.e. technologically less sophisticated products, in view of real wage increases abroad. This line of thought has received renewed public attention, when Nobel-prize winner Paul Samuelson argued that the recent rise in outsourcing to developing countries could wipe out the gains from trade in the industrialized world (Samuelson, 2004).

While agreeing that productivity improvements in a low-wage country in relation to a previously imported good can hurt the former exporter, Bhagwati et al. (2004) maintain that the outsourced services

in question (before the arrival of the internet) used to be non-traded and did not constitute exports by advanced economies. Hence, the benefits from importing cheaper services arise in the usual manner for the outsourcing countries. Nevertheless, Krugman’s (1990) basic analysis is still valid if developing countries become better at producing the goods currently exported by advanced nations. Bhagwati et al. (2004) contend, however, that with both sides producing a range of products in the real world, consumption and production effects of growth tend to offset each other and leave the direction of terms of trade changes undetermined. With net effects being modest, the authors discount the possibility of significant terms of trade changes following productivity improvements and skill accumulation abroad.

The “new” trade theory and more recent advances mostly do not consider country differences and the consequences that these may entail.²⁴ Where certain approaches have allowed for such differences, the more advanced country usually realizes larger gains from international trade, in contrast to the scenarios discussed above. In the monopolistic competition model, owing to the presence of scale economies and transport costs, the gains from trade for countries that are similar in all respects apart from size may be different. The home market effect together with weak counteracting forces can lead to an agglomeration of industry in the larger trading partner. Technological superiority resulting in higher productivity could be expected to further promote the size advantage of a trading partner by raising its market potential.

In the heterogeneous firm model with country differences described in Section C.3.d, a higher level of technological development in the home country makes it harder for trading partners to enter that market. This is akin to a situation where the initial level of competition is already high (e.g. because the market is larger) and it is more difficult for foreign competitors to find their niche. At the same time, firms from a technologically advanced country also find it easier to compete in foreign markets, and the overall productivity effects from firm selection and share-shifting are amplified. Demidova (2006) notes that technology has to be understood broadly in this context to include, for instance, an inadequate trading infrastructure that affects the overall level of firm productivity in a country.

In short, each of the various trade theories presented in this Report is built on a specific, narrow set of assumptions and abstracts from different aspects of the situation in the real world. It is quite natural that the theories explaining the gains from trade do not offer a unified view of the implications of country differences. Reality is likely to be a complex overlay of the different factors that each framework identifies as an underlying rationale for trade and of the different terms of trade and real income changes that may follow. The degree to which differential gains are realized across countries also depends on the prevalence of other economic conditions, such as the flexibility or rigidity of labour markets, that are often simplified or not explicitly considered in such models.

However, especially from a firm-level perspective, it seems fair to say that policies fostering technological progress, be it in the narrow sense of research and development (R&D) promotion or in a broader sense that includes public services and infrastructure, strengthen a country's position in international trade.²⁵

What can policy-makers do to promote a country's technological advancement? The literature has shown that the rate of technological change is determined not only by domestic innovation but also by the international diffusion of technology, particularly in developing countries.

Many of the policies to foster innovation domestically are also conducive to encouraging the transfer of technology from abroad. These include improvements in a country's education system and support for R&D (including the interaction between basic research and its application to specific uses), the provision of a regulatory environment that allows inventors to appropriate the rewards of their work, notably patent protection, and the creation of a market structure that creates the incentives for entrepreneurs to innovate and constantly improve their competitive position.²⁶ Such policies seek to ensure that new knowledge can be absorbed domestically and that foreign providers are ready to do business in the first place. They matter to all of the different mechanisms through which technology may be transferred, be it trade, foreign direct investment (FDI) or partnerships. Broader policies also have an impact. For example, infrastructure investments may be particularly important to attract FDI, and labour market regulations and the efficiency of financial institutions may play a

key role in ensuring the widespread diffusion of technology within a country.²⁷

Most of these policies are implemented at the national level. However, in certain policy areas international cooperation and coordination may be beneficial. Within the WTO, a Working Group on Trade and Transfer of Technology has been established in order to consider possible recommendations that might be taken within the mandate of the WTO to increase flows of technology to developing countries. For example, some members expressed the view that a number of provisions in the Trade-related Aspects of Intellectual Property Rights (TRIPS) Agreement had an important role to play in technology transfer. The Aid for Trade initiative was also mentioned in the context of capacity building and the development of human capital.²⁸

Hoekman et al. (2004b) have raised the question as to what extent special and differential (S&D) treatment is needed, for instance in order to subsidize R&D efforts, but conclude that, in general, WTO rules do not constrain many of the policies commonly used to encourage the international transfer of technology. To the contrary, policies that reduce trade barriers and uncertainty in international trading relationships have the potential to increase the international transfer of technology. This has been demonstrated in a number of empirical studies finding that increased trade flows promote technology transmission not only via direct trade links between countries but also indirectly through the network of trade relations by partner countries (Keller, 2004; Lumenga-Neso et al., 2005). In the following sub-section, the channels through which trade fosters the spread of technology will be analyzed in more detail.

(b) International trade and technology transfer

The following sub-section reviews how the international flows of information that accompany trade imply that technical improvements in a sector developed in one country may improve productivity in other countries. This channel is independent of whether or not the receiving country is active in the same sector. However, while international trade increases exposure to foreign knowledge, not all countries are in an equal position to take advantage of it. This sub-section also examines the role of the world trading system (and of international

organizations more generally) in facilitating technology transfers. Unfortunately, technological innovations produced in advanced economies may not respond to the needs of developing countries.

Technological knowledge is embodied in products. Trade leads to the international spread of technology because: (a) technologically advanced intermediate goods become available for production; (b) the technological specifications of intermediate and final goods can be studied; and (c) it favours person-to-person communication.

There is an important difference between technology acquired via the use of advanced intermediate inputs and that acquired via the learning of the technology embodied in a product. In the former case, employing the foreign intermediate good involves the implicit usage of the design knowledge that was created with the R&D investment of the foreign inventor. The technological knowledge of the blueprint is embodied in the intermediate good, and the use of the technologically advanced intermediate good increases the importing country's productivity. As long as the intermediate good costs less than it would cost to produce domestically, which includes the R&D costs of product development, there will be a gain from having access to foreign intermediate goods. This gain is sometimes called "passive" technology spillover (Keller, 2002). Although an importing country has access to the results of foreign R&D activity, the technological knowledge embodied in the imported intermediate good as such is not available to domestic inventors, only the manufactured outcome of it is.

This contrasts with the situation when the importing country acquires the knowledge embodied in the imported good, whether intermediate or final. Knowledge is acquired by reverse engineering, copying, or communicating with the suppliers of the product. In this case, the knowledge obtained through communication and/or the copying of imported goods will probably not be lost even if communication or imports are interrupted. Once the technology has been acquired, the foreign technology remains in the country. This process of learning is likely to be less expensive than the original expenditure needed to create the knowledge, and therefore a gain is associated with it. This gain is commonly defined in economic literature as an "active" spillover, since it requires the active participation of the importer.

Notwithstanding the role of international trade in the spread of technology, in particular by increasing countries' exposure to advanced technologies, there are still important reasons for productivity differences across countries. Economic studies have emphasized several factors determining whether technology is successfully acquired by another country. These are associated with the notion of "absorptive capacity" – the idea that a firm or country needs to have certain types of skills and institutions in order to be able successfully to adopt foreign technological knowledge. As technical knowledge is generally needed to use more advanced technology, a certain level of domestic know-how (Caselli and Wilbur, 2001; Hanushek and Kimko, 2000) and domestic R&D (Cohen and Levinthal, 1989 and Griffith et al., 2000) is a prerequisite in order to benefit from technology transfers. Equally important are an effective business environment, macroeconomic stability and good governance since taking advantage of knowledge spillovers requires risky investments that depend on these factors (see Acemoglu et al., 2007 for a formal model on the role of contractual institutions and World Bank, 2008, for a general discussion).

Is there a role for international organizations in promoting the spread of technology? Recent studies have pointed out that there is often a mismatch between technologies developed at the world frontier (i.e. in the advanced economies that produce most innovations) and the needs of the adopting country.

The lack of effective enforcement of intellectual property rights and the inability to pay for innovation in less developed economies lead firms in the advanced economies to target the needs of their own domestic markets (Diwan and Rodrik, 1991, Acemoglu and Zilibotti, 2001, and Bonfiglioli and Gancia, 2007). As a result, technologies that travel through trade may not be appropriate for importing countries.

Inappropriate technologies limit the extent of technical development. Importantly, these problems cannot easily be solved by individual countries' policies. For instance, the enforcement of intellectual property rights may imply a prisoner's dilemma²⁹ whereby each developing country prefers other countries to enforce property rights in order to encourage producers in advanced economies to manufacture technologies more appropriate to their needs. This suggests an important role for

international organizations in coordinating the enforcement of property rights and in encouraging the production of technologies more appropriate to the needs of less-developed countries (Acemoglu and Zilibotti, 2001). As free-riding problems in patent policy are more severe the larger the number of independent countries involved in the global economy, the significance of an international patent agreement increases with the number of sovereign decision-makers (Grossman and Lai, 2004).

Several issues on the role of the multilateral trading system (and of international organizations in general) in promoting the international spread of technology are still open to discussion. These issues include the meticulous design of intellectual property rights agreements (e.g. differential rules for least developed countries, harmonization of criteria for patentability and novelty), the role of other policies (e.g. subsidies, temporary movement of people, monitoring), and the extent to which such policies should be embedded in a multilateral trade agreement. The discussions held over the past few years in the Working Group on Trade and Transfer of Technology have brought to the fore many of the complexities involved.³⁰

5. CONCLUSIONS

This section has examined a number of the problems that countries face in the light of today's increased level of economic integration and the forces that both economic theory and reality suggest will continue to pose new challenges. As noted in the introduction to this final section, the approach has been selective in regard to these challenges. The problems addressed here include continued high trade costs and deficiencies in production capacity that plague low-income countries, the social or re-distributional consequences of more open trade,

and the technology gap between rich and poor countries. It would be raising false hopes to say that all of these problems can be solved immediately or that policies exist to deal with all of them.

The aim of this section has been to identify what could be done both at the national and international levels in order to address some of the problems highlighted above. Most of the solutions require national actions. Countries need to increase public investments in infrastructure and consider changes in economic policies to increase the efficient utilization of existing infrastructure or to encourage more private domestic and foreign investments into those sectors. Beyond investments in physical infrastructure, countries can also do more to address social protection and to promote more flexible labour markets.

But there is also room for international action. International organizations can assist by coordinating the enforcement of property rights and by encouraging the production of technologies more appropriate to the needs of less developed countries. In the context of the WTO, countries could use the opportunities offered by the current Doha Round to lock in reforms or changes to economic policies. Simply implementing existing WTO agreements can also help to increase access to international markets. Finally, the Aid for Trade initiative shows how the WTO can create a coherent platform for directing the international community's resources in a targeted way to help poor countries participate more fully in the ongoing process of global economic integration. While the challenges that have been identified in this Report can seem formidable, they are not insurmountable with the appropriate domestic policy responses and with international cooperation.

Endnotes

- 1 Table IIB.6 in World Trade Report 2004, p. 118.
- 2 Table IIB.7 in World Trade Report 2004, p. 120.
- 3 All subsequent figures cited in this paragraph are taken from the World Bank's World Development Indicators 2007.
- 4 Data based on the World Bank's World Development Indicators 2007. Djiofack-Zebaze and Keck (2006) examined the impact of telecommunications liberalization on both sectoral performance and economic growth for a panel of Sub-Saharan African countries. The authors found that more competition and better regulation lowered prices and improved availability of telecommunications services both in the mobile and fixed-line segments. Finally, better performance of the African telecommunications sector, in turn, improved real GDP per capita.
- 5 Revised services offers have been submitted by: Australia; Bahrain; Brazil; Canada; Chile; China; Colombia; Egypt; European Communities and its member states; Honduras; Hong Kong, China; Iceland; India; Japan; Korea; Liechtenstein; Macao, China; Malaysia; Mexico; New Zealand; Norway; Peru; Singapore; Suriname; Switzerland; Chinese, Taipei; Thailand; Turkey; United States; and Uruguay.
- 6 The WTO rules explicitly referred to are GATT Article V (Freedom of Transit), Article VIII (Fees and Formalities connected with Importation and Exportation), and Article X (Publication and Administration of Trade Regulations).
- 7 See for example Deutsches Institut für Normung (2000) and Swann et al. (1996).
- 8 Paragraph 57 of the Hong Kong Ministerial Declaration.
- 9 OECD (2006a) uses the term "mutual obligation" in this context.
- 10 See, for instance, the discussion in chapter 5 of OECD (2007b).
- 11 The European Union established a so-called European Globalization Adjustment Fund in 2006.
- 12 In contrast, studies focusing on the 1970s found that workers receiving TAA were more likely to be recalled to their old job, less likely to switch industries and did not have longer unemployment spells than other displaced workers (Richardson, 1982).
- 13 Magee (2001) finds that unionized workers and those displaced by trade from less-developed countries were more likely to have their TAA petitions approved.
- 14 See also Irwin (2002) and the more extensive discussion of Kletzer (2001) in section E.2 above.
- 15 The finding by Scheve and Slaughter (2001) that home ownership with a manufacturing mix concentrated in comparative-disadvantage industries is correlated with support for trade barriers, indicates that "immobility" may be related to home ownership.
- 16 Storm (2003) makes a related call for policies to increase land productivity and gradual policy reform in the context of agricultural trade liberalization in India.
- 17 Chapter 4 of OECD (2005a) and chapter 3 of OECD (2006b) review international evaluation findings showing long-run positive effects of some training programmes.
- 18 See Estache et al. (2000).
- 19 There were significant problems with the design of the training program, as workers were paid allowances related to the training program, before the programs even started. This reduced the incentives for workers to participate in training courses. Also, some courses started so late that workers had already found new jobs.
- 20 Wacziarg and Wallack (2004) focus on the pattern of reallocation of labour following trade liberalization. They examine the impact of trade liberalization episodes on movements of labour across sectors for 25 countries, mainly developing and transition economies, and find weakly negative effects of liberalization on the extent of inter-sectoral labour shifts at the economy-wide 1-digit level of disaggregation. They find increased sectoral change after liberalization at the more disaggregated 3-digit level within manufacturing, although the estimated effects are statistically weak and small in magnitude. They also find that the effects of liberalization on labour shifts differ across individual countries, in a way related to the scope and depth of reforms.
- 21 Longer implementation periods for developing countries are just one form of special and differential treatment (S&D) contained in WTO Agreements. For a discussion of existing forms of S&D and debates on possible S&D reform as well as the underlying rationale for S&D in trade agreements see Keck and Low (2006) and World Trade Organization (WTO) (2007c).
- 22 The references to adjustment issues in the "aid for trade" debate have been discussed above.
- 23 Of course, the different rationales for international trade may also imply distributional concerns within each country, and policy questions arising in that regard are further discussed in Section E.3.
- 24 This is understandable, since initially these models were developed to explain trade between similar countries and in similar goods.
- 25 As was said before, comparative advantage-based theories of trade are built on the existence of country differences in either technology or resource endowments. From this perspective, it is therefore hardly possible to derive any conclusion as to whether e.g. technology transfer is desirable in order to close a technological gap. However, it is worth noting that, over time, comparative advantage certainly is not cast in stone. The pursuit of policies to foster technological progress and educational attainment may broaden or even shift the base of a country's comparative advantage, as witnessed, for example, by the evolution of Japan from being an exporter of labour-intensive goods to becoming successively an exporter of capital- and human capital-intensive products.
- 26 World Trade Organization (WTO) (2002b) examines in an in-depth fashion how new technologies are created, how they are transferred across countries and how they are diffused within a country.
- 27 World Trade Organization (WTO) (2002a) provides a comprehensive overview of government policies related to transfer of technology as well as a compilation of country experiences.
- 28 Among other things, it has also considered different indicators for an assessment of the cross-border flow of technology and reviewed country experiences with technology generation and its transfer via different mechanism. See, for example, World Trade Organization (WTO) (2007b).
- 29 In game theory, the prisoner's dilemma characterizes a situation where beneficial cooperation does not emerge. The game assumes that players (the prisoners) can either cooperate or not and that cooperation involves a higher joint welfare than non-cooperation. However, if the others choose to cooperate, each player acting individually is better off by deviating and choosing non-cooperation. As all players are trying to maximize their individual welfare, the only rational equilibrium implies the inferior situation of non-cooperation.
- 30 See, for example, the overview provided in Hoekman et al. (2004b) and the regular reports by the Working Group on Trade and Transfer of Technology, such as World Trade Organization (WTO) (2007b).

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TECHNICAL NOTES

Composition of geographical and other groups Regions

North America				
Bermuda	Canada*	Mexico*	United States of America*	
Other territories in the region not elsewhere specified				
South and Central America and the Caribbean				
Antigua and Barbuda*	Argentina*	Bahamas**	Barbados*	Belize*
Bolivarian Rep. of Venezuela*	Bolivia*	Brazil*	Chile*	Colombia*
Costa Rica*	Cuba*	Dominica*	Dominican Republic*	Ecuador*
El Salvador*	Grenada*	Guatemala*	Guyana*	Haiti*
Honduras*	Jamaica*	Netherlands Antilles	Nicaragua*	Panama*
Paraguay*	Peru*	Saint Kitts and Nevis*	Saint Lucia*	Saint Vincent and the Grenadines*
Suriname*	Trinidad and Tobago*	Uruguay*	Other territories in the region not elsewhere specified	
Europe				
Albania*	Andorra**	Austria*	Belgium*	Bosnia and Herzegovina**
Bulgaria*	Croatia*	Cyprus*	Czech Republic*	Denmark*
Estonia*	Finland*	France*	FYR Macedonia*	Germany*
Greece*	Hungary*	Iceland*	Ireland*	Italy*
Latvia*	Liechtenstein*	Lithuania*	Luxembourg*	Malta*
Netherlands*	Norway*	Poland*	Portugal*	Romania*
Montenegro**	Serbia**	Slovak Republic*	Slovenia*	Spain*
Sweden*	Switzerland*	Turkey*	United Kingdom*	
Other territories in the region not elsewhere specified				
Commonwealth of Independent States (CIS)				
Armenia*	Azerbaijan**	Belarus**	Georgia*	Kazakhstan**
Kyrgyz Republic*	Moldova*	Russian Federation**	Tajikistan**	Turkmenistan
Ukraine*	Uzbekistan**	Other territories in the region not elsewhere specified		
Africa				
Algeria**	Angola*	Benin*	Botswana*	Burkina Faso*
Burundi*	Cameroon*	Cape Verde**	Central African Republic*	Chad*
Comoros	Congo*	Congo, Dem. Rep. of*	Côte d'Ivoire*	Djibouti*
Egypt*	Equatorial Guinea**	Eritrea	Ethiopia**	Gabon*
Gambia*	Ghana*	Guinea*	Guinea-Bissau*	Kenya*
Lesotho*	Liberia**	Libyan Arab Jamahiriya**	Madagascar*	Malawi*
Mali*	Mauritania*	Mauritius*	Morocco*	Mozambique*
Namibia*	Niger*	Nigeria*	Rwanda*	Sao Tome and Principe**
Senegal*	Seychelles**	Sierra Leone*	Somalia	South Africa*
Sudan**	Swaziland*	Tanzania*	Togo*	Tunisia*
Uganda*	Zambia*	Zimbabwe*	Other territories in the region not elsewhere specified	
Middle East				
Bahrain, Kingdom of*	Iran, Islamic Rep. of**	Iraq**	Israel*	Jordan*
Kuwait*	Lebanon**	Oman*	Qatar*	Saudi Arabia*
Syrian Arab Republic	United Arab Emirates*	Yemen**	Other territories in the region not elsewhere specified	
Asia (including The Pacific and Oceania)				
Afghanistan**	Australia*	Bangladesh*	Bhutan**	Brunei Darussalam*
Cambodia*	China*	Fiji*	Hong Kong, China*	India*
Indonesia*	Japan*	Kiribati	Korea, Republic of*	Lao People's Dem. Rep.**
Macao, China*	Malaysia*	Maldives*	Mongolia*	Myanmar*
Nepal*	New Zealand*	Pakistan*	Palau	Papua New Guinea*
Philippines*	Samoa**	Singapore*	Solomon Islands*	Sri Lanka*
Taipei, Chinese*	Thailand*	Tonga*	Tuvalu	Vanuatu**
Viet Nam*	Other territories in the region not elsewhere specified			

* WTO members (As of 16 May 2008)

**Observer governments

Composition of geographical and other groups

Other groups

ACP (Africa, Caribbean and Pacific)				
Angola	Antigua and Barbuda	Bahamas	Barbados	Belize
Benin	Botswana	Burkina Faso	Burundi	Cameroon
Cape Verde	Central African Republic	Chad	Comoros	Congo
Dem. Rep. of the Congo	Cook Islands	Côte d'Ivoire	Cuba	Djibouti
Dominica	Dominican Republic	Equatorial Guinea	Eritrea	Ethiopia
Fiji	Gabon	Gambia	Ghana	Grenada
Guinea	Guinea-Bissau	Guyana	Haiti	Jamaica
Kenya	Kiribati	Lesotho	Liberia	Madagascar
Malawi	Mali	Marshall Islands	Mauritania	Mauritius
Micronesia	Mozambique	Namibia	Nauru	Niger
Nigeria	Niue	Palau	Papua New Guinea	Rwanda
Saint Kitts and Nevis	Saint Lucia	Saint Vincent and the Grenadines	Samoa	Sao Tome and Principe
Senegal	Seychelles	Sierra Leone	Solomon Islands	Somalia
South Africa	Sudan	Suriname	Swaziland	Tanzania
Timor Leste	Togo	Tonga	Trinidad and Tobago	Tuvalu
Uganda	Vanuatu	Zambia	Zimbabwe	
Africa				
North Africa				
Algeria	Egypt	Libyan Arab Jamahiriya	Morocco	Tunisia
Sub-Saharan Africa, comprising of:				
Western Africa				
Benin	Burkina Faso	Cape Verde	Côte d'Ivoire	Gambia
Ghana	Guinea	Guinea-Bissau	Liberia	Mali
Mauritania	Niger	Nigeria	Senegal	Sierra Leone
Togo				
Central Africa				
Burundi	Cameroon	Central African Republic	Chad	Congo
Dem. Rep. of the Congo	Equatorial Guinea	Gabon	Rwanda	Sao Tome and Principe
Eastern Africa				
Comoros	Djibouti	Eritrea	Ethiopia	Kenya
Madagascar	Mauritius	Seychelles	Somalia	Sudan
Tanzania	Uganda			
Southern Africa				
Angola	Botswana	Lesotho	Malawi	Mozambique
Namibia	South Africa	Swaziland	Zambia	Zimbabwe
Territories in Africa not elsewhere specified				
Asia				
West Asia				
Afghanistan	Bangladesh	Bhutan	India	Maldives
Nepal	Pakistan	Sri Lanka		
East Asia (including Oceania)				
Australia	Brunei Darussalam	Cambodia	China	Fiji
Hong Kong, China	Indonesia	Japan	Kiribati	Korea, Republic of
Lao People's Dem. Rep.	Macao, China	Malaysia	Mongolia	Myanmar
New Zealand	Papua New Guinea	Philippines	Samoa	Singapore
Solomon Islands	Taipei, Chinese	Thailand	Tonga	Tuvalu
Vanuatu	Viet Nam	Other countries and territories in Asia and the Pacific not elsewhere specified		
LDCs (Least-developed countries)				
Afghanistan	Angola	Bangladesh	Benin	Bhutan
Burkina Faso	Burundi	Cambodia	Cape Verde	Central African Republic
Chad	Comoros	Congo, Dem. Rep. of	Djibouti	Equatorial Guinea
Eritrea	Ethiopia	Gambia	Guinea	Guinea-Bissau
Haiti	Kiribati	Lao People's Dem. Rep.	Lesotho	Liberia
Madagascar	Malawi	Maldives	Mali	Mauritania
Mozambique	Myanmar	Nepal	Niger	Rwanda
Samoa	Sao Tome and Principe	Senegal	Sierra Leone	Solomon Islands
Somalia	Sudan	Tanzania	Timor Leste	Togo
Tuvalu	Uganda	Vanuatu	Yemen	Zambia
Six East Asian traders				
Hong Kong, China	Korea, Republic of	Malaysia	Singapore	Taipei, Chinese
Thailand				

Composition of geographical and other groups

Regional integration agreements

Andean Community				
Bolivia	Colombia	Ecuador	Peru	
ASEAN (Association of South East Asian Nations)/ AFTA (ASEAN Free Trade Area)				
Brunei Darussalam	Cambodia	Indonesia	Lao People's Dem. Rep.	Malaysia
Myanmar	Philippines	Singapore	Thailand	Viet Nam
CACM (Central American Common Market)				
Costa Rica	El Salvador	Guatemala	Honduras	Nicaragua
CARICOM (Caribbean Community and Common Market)				
Antigua and Barbuda	Bahamas	Barbados	Belize	Dominica
Grenada	Guyana	Haiti	Jamaica	Montserrat
Saint Kitts and Nevis	Saint Lucia	Saint Vincent and the Grenadines	Suriname	Trinidad and Tobago
CEMAC (Economic and Monetary Community of Central Africa)				
Cameroon	Central African Republic	Chad	Congo	Equatorial Guinea
COMESA (Common Market for Eastern and Southern Africa)				
Angola	Burundi	Comoros	Congo, Dem. Rep. of	Djibouti
Egypt	Eritrea	Ethiopia	Kenya	Libyan Arab Jamahiriya
Madagascar	Malawi	Mauritius	Namibia	Rwanda
Seychelles	Sudan	Swaziland	Uganda	Zambia
Zimbabwe				
ECCAS (Economic Community of Central African States)				
Angola	Burundi	Cameroon	Central African Republic	Chad
Congo	Congo, Dem. Rep. of	Equatorial Guinea	Gabon	Rwanda
Sao Tome and Principe				
ECOWAS (Economic Community of West African States)				
Benin	Burkina Faso	Cape Verde	Côte d'Ivoire	Gambia
Ghana	Guinea	Guinea-Bissau	Liberia	Mali
Niger	Nigeria	Senegal	Sierra Leone	Togo
EFTA (European Free Trade Association)				
Iceland	Liechtenstein	Norway	Switzerland	
European Union (27)				
Austria	Belgium	Bulgaria	Cyprus	Czech Republic
Denmark	Estonia	Finland	France	Germany
Greece	Hungary	Ireland	Italy	Latvia
Lithuania	Luxembourg	Malta	Netherlands	Poland
Portugal	Romania	Slovenia	Slovak Republic	Spain
Sweden	United Kingdom			
GCC (Gulf Cooperation Council)				
Bahrain	Kuwait	Oman	Qatar	Saudi Arabia
United Arab Emirates				
MERCOSUR (Southern Common Market)				
Argentina	Brazil	Paraguay	Uruguay	
NAFTA (North American Free Trade Agreement)				
Canada	Mexico	United States		
SAARC (South Asian Association for Regional Cooperation)/ SAPTA (South Asian Preferential Trade Arrangement)				
Bangladesh	Bhutan	India	Maldives	Nepal
Pakistan	Sri Lanka			
SADC (Southern African Development Community)				
Angola	Botswana	Lesotho	Malawi	Mauritius
Mozambique	Namibia	South Africa	Swaziland	Tanzania
Zambia	Zimbabwe			
WAEMU (West African Economic and Monetary Union)				
Benin	Burkina Faso	Côte d'Ivoire	Guinea-Bissau	Mali
Niger	Senegal	Togo		

