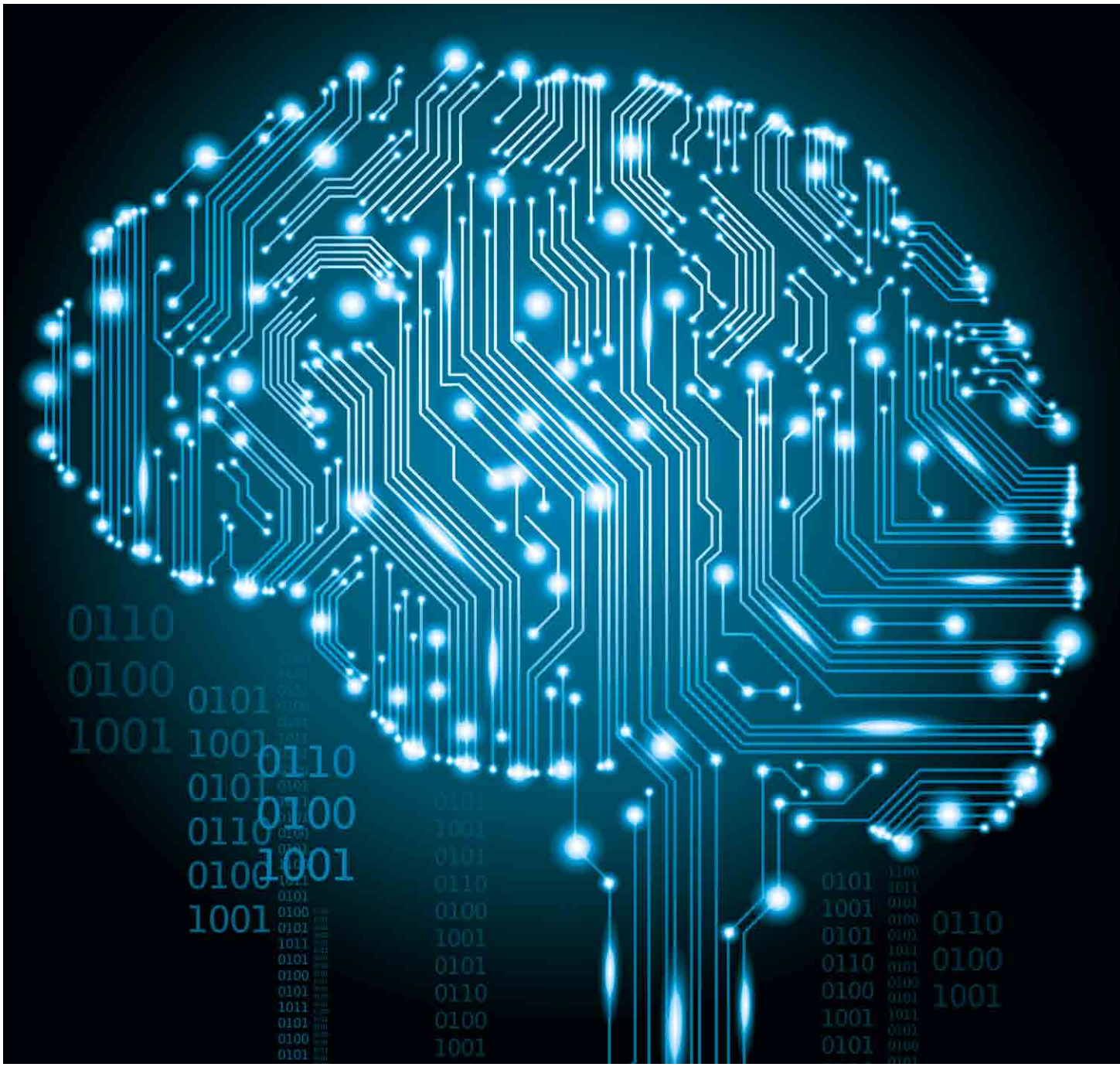
WORLD TRADE ORGANIZATION

15 Years of the Information Technology Agreement

Trade, innovation and global production networks



What is the Information Technology Agreement?

The ITA provides for participants to completely eliminate duties on information technology (IT) products covered by the Agreement. There are currently 74 participants – representing 97 per cent of world trade in IT products.

Using this publication

Each chapter starts with a highlights section, summarizing the main points. A full list of ITA participants and the date of joining the Agreement can be found at the back of the publication.

Find out more

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Foreword

Fifteen years ago, 28 WTO members and acceding members overcame numerous political and technical obstacles, and agreed to work together for the expansion of trade in information technology (IT) products through the Information Technology Agreement (ITA). This landmark agreement demonstrates not only that developed and developing countries can work together in a mutually beneficial manner, but also that the WTO could serve as an effective forum to promote trade opening beyond what was achieved during the Uruguay Round.

The 21st century is the era of information and communication technology, and the ITA has played a vital role in promoting affordable access to those technologies. This sector is crucial for the world economy – not only due to its considerable size, but also because it is an important driver of productivity, innovation and, ultimately, economic growth. Over the past 15 years, world exports of IT products have almost tripled in value since 1996, and reached an estimated US$ 1.4 trillion in 2010, accounting for 9.5 per cent of world merchandise trade. Together, ITA participants account for 96 per cent of world trade in IT products. And because they provide duty-free treatment to imports on a most-favoured-nation basis, they have created opportunities for exporters in all WTO members, including those in least-developed countries.

With the most recent participation of Colombia, the ITA has now grown to include 74 WTO members, and the majority of them are developing participants. Developing countries have consistently increased their participation in world trade of IT products since 1996, accounting for approximately 64 per cent of exports and 51 per cent of imports in 2010. While a growing share of the investment in both the production and use of these products is made by developed country IT industries, IT spending is increasing considerably in some emerging economies, such as China, India and countries of the Association of Southeast Asian Nations (ASEAN). These investments have been the catalyst that has allowed countries as diverse as China, Costa Rica and some ASEAN countries to develop their capacity for manufacturing IT products and become important players in global production

networks. In addition, other developing countries have used these IT products and technologies as tools to become key players in other areas. For example, access to affordable IT equipment was instrumental in enabling India to become a powerhouse in consulting services, software development and other services.

The ITA has also benefited its participants in ways that go far beyond its impact on trade in goods and services by "oiling" their economies. As general purpose technologies, IT products can increase not only the productivity in the traditional sectors of the economy, but they can also spur the creation of completely new business sectors, thereby generating economic growth and creating jobs. This is particularly true of information intensive and IT-enabled industries and services – such as e-commerce, on-line travel or hotel reservations, and financial, transport and professional services – many of which developed thanks to lower-cost communications networks and affordable IT equipment. IT products enable governments around the world to implement new information systems, which are used to expedite import procedures and facilitate trade. They have also simplified commerce in general by reducing some of the traditional obstacles for doing business, especially those involving time and distance. They have even changed the way in which production is organized around the world by allowing manufacturing processes to be

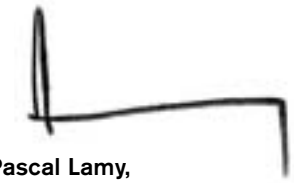
coordinated through global production networks, leading to a new paradigm where products are nowadays "Made in the World".

Even countries that have not joined the ITA have benefited indirectly by the trade opportunities created and the large economies of scale that have been generated by the global production networks, leading to better and more affordable products which have allowed the creation of new IT-enabled industries and services. One example is the creation of mobile phone applications for farming and fishing in many African and Asian countries. This development was based on access to cheap mobile phones, which has increased the overall economic efficiency of these countries and, perhaps more importantly, has empowered millions of people around the world.

Although the degree of trade opening achieved has truly been very impressive, and trade in the IT sector has grown much faster than in others, bound and applied tariffs on IT products remain relatively high (averaging between 33 per cent and 7 per cent respectively) in a number of medium-sized markets that have not joined the Agreement. The fact that these levels are comparable to those of ITA participants prior to joining suggests that they have the opportunity to follow the lead of others and progress in this dynamic sector. Moreover, there are many information and communication technology products that are not yet covered by the ITA, which highlights the importance of expanding its product coverage to further boost innovation and economic efficiency, as it was envisaged in 1996, but has since failed to achieve. In addition, other work programmes of the ITA Committee also need to be accelerated.

It is important to recall that many of these benefits did not accrue by accident. They were, in fact, expected by those who envisaged and negotiated the ITA. Those benefits are the result of policymakers who knew that the short-term costs necessary to implement the ITA would be small compared to the overall economic gains that could be achieved. They saw the elimination of tariffs on IT products as a stepping-stone in the creation of the necessary infrastructure for the "massification" of the internet and the creation of a new digital economy. In other words, a typical "win-win" trade opening agreement.

The WTO is proud to see that the ITA is celebrating its 15th anniversary and pleased to present this publication, which addresses a number of previously unexplored angles. These include, for example, a description of the obstacles that negotiators had to overcome, the issues that remain outstanding in the implementation of the Agreement, the link between the ITA and innovation, as well as the profound structural change that has been brought by the reliance on global production networks. I hope that the comprehensive manner in which the publication was developed will shed light on the larger picture and inspire those considering a possible review of the ITA to improve it and pursue further trade opening for the benefit of all.



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Throughout this publication, the Hong Kong Special Administrative Region of China, the Macao Special Administrative Region of China, and the Separate Customs Territory of Taiwan, Penghu, Kinmen and Matsu are referred to as Hong Kong (China), Macao (China), and Chinese Taipei, respectively. Before 30 November 2009, the European Union was known in the WTO as the European Communities. For consistency, however, the term European Union is used throughout this publication.

I The road to the Information Technology Agreement

Contents

Highlights

- The Information Technology Agreement (ITA) was a landmark trade deal signed by 14 WTO members and states or separate customs territories in the process of acceding to the WTO in December 1996. Not only was it the first sectoral agreement to be successfully negotiated among developed and developing countries, but it was also the first one to fully liberalize trade in a specific sector (with an estimated worth of US$ 500 billion a year) after the Uruguay Round.
- The main product categories covered by the ITA include: computers, semiconductors, semiconductor manufacturing equipment, telecommunication apparatus, instruments and apparatus, data-storage media and software, and parts and accessories.
- The ITA was initiated by the private sector, and political support at the highest level was crucial to overcoming challenges.
- The ITA was not the first attempt to liberalize trade in electronic products: negotiators benefited from experience gained in previous initiatives.
- The negotiation of the ITA was difficult and success was far from assured. However, participants were creative in finding solutions and managed to accommodate each other's concerns.

A. Introduction

Often hailed as the biggest tariff-busting deal since the Uruguay Round, the Ministerial Declaration on Trade in Information Technology Products – commonly known as the Information Technology Agreement (ITA) – is considered a landmark agreement for several reasons. It was the first time that a large group of developed and developing countries agreed to fully liberalize trade in a sector (worth US$ 500 billion annually at the time it was signed). It also proved that the World Trade Organization (WTO), which was established in 1995, could also serve as a forum to open markets without launching an official round of multilateral trade negotiations.

The success of the ITA is remarkable given the failed attempt to reach a similar agreement during the Uruguay Round and the initial reticence by some members to engage in further negotiations. Besides the significant experience gained by negotiators from previous sectoral initiatives, both failures and successes, much of the achievement of the Agreement can be attributed to the strong coalition of industry actors behind it, which developed specific recommendations and actively lobbied for opening trade in the sector.

Even with a cohesive push from the private sector, negotiators often struggled to find consensus and had to overcome a large number of stumbling blocks. These included, in particular, disagreements between the European Union[1] and the United States on the type of products that should be covered by the agreement and the renewal of a bilateral agreement between Japan and the United States on semiconductors. Negotiations even had to coexist with a dispute brought by the United States against the European Union concerning the correct classification and tariff treatment of certain information technology (IT) products. Convincing other WTO members to join the initiative under these circumstances, which required a particularly hard push from Asia-Pacific Economic Cooperation (APEC) leaders, also proved challenging. Although success was called into question on numerous occasions, strong political leadership at the highest level and creativity by those involved in the negotiations proved successful in the end.

The ITA Ministerial Declaration was endorsed by 14 WTO members and states or separate customs territories in the process of acceding to the WTO (counting the EU-15 as one)[2] at the WTO Ministerial Conference in Singapore, which took place in December 1996. However, it was only a stepping stone to securing a deal and significant work at the technical level at the beginning of 1997 was still required for its completion. This chapter describes the background against which the ITA negotiations took place, as well as the myriad difficulties that had to be tackled by negotiators in order to reach an agreement and implement it.

B. Sectoral initiatives in GATT history and the foundations of the ITA

The General Agreement on Tariffs and Trade (GATT) was adopted in 1947 to establish rules of general application that would regulate trade in all goods and, therefore, made few references to specific products or sectors.[3] Over time, however, GATT contracting parties developed rules to tackle problems facing individual products and sectors.[4] For example, the Kennedy[5] and Tokyo[6] Rounds resulted in a number of sector-specific agreements that aimed to regulate trade in certain products. Similarly, the results of the Uruguay Round included multilateral agreements on agriculture, and textiles and clothing, as well as plurilateral agreements on trade in civil aircraft, dairy and bovine meat.[7] Although their influence may not be self-evident, the experience gained in negotiating these sectoral initiatives provided the foundation on which the ITA was built (see Box 1.1).

The results of sectoral initiatives were usually "multilateralized" through binding the reduction commitments in the schedules of concessions of its participants. GATT Article XXVIII *bis* sets the broad guidelines for tariff negotiations and provides that they may be carried out on a

Box 1.1. Building blocks for an ITA

selective product-by-product basis or "by the application of such multilateral procedures as may be accepted by the contracting parties concerned".[8] The "sector specific" or "sectoral" negotiations were developed over time in order to allow a group of participants to negotiate specific duty levels (e.g. harmonization or "zero-for-zero")[9] or specific non-tariff barriers (NTBs) affecting a predefined group of products (e.g. "a sector").

GATT contracting parties envisaged that tariff reductions resulting from the Kennedy Round (1964-1967) would be made across-the-board based on a 50 per cent linear reduction formula. Nevertheless, bilateral and plurilateral negotiations in a number of sectors were eventually required to redress concerns raised by some contracting parties on issues such as tariff disparities, exceptions to the application of the formula, specific non-tariff problems, and the achievement of reciprocity in the negotiations.[10] Section 211(a) of the 1962 United States Trade Expansion Act gave the US president authority to reduce duties across the board by up to 50 per cent. In addition, the United States could agree to reduce tariffs further in any "category of goods", but only to the extent that the European Union and the United States accounted for 80 per cent of world exports. In other words, this so-called "dominant supplier formula" authorized US negotiators to go above a 50 per cent reduction in those sectors where the European Union and the United States were major suppliers of world trade in these products.[11] This idea eventually evolved into the "critical mass" requirement, which played a key role in broadening participation during the ITA negotiations.

The Tokyo Round (1973-1979) saw an increase in the importance of sectoral initiatives during the negotiations. A negotiating group called "Sectoral Approach" was established to explore, as a complementary technique, the possibility of coordinating the reduction or elimination of all barriers to trade in selected sectors.[12] These discussions took place based on sector-specific reports that were prepared by the GATT Secretariat. In 1975, the United States requested the preparation of studies on three sectors: chemicals, electrical machinery and electronics.[13] In its request, the United States noted that global trade in electronics had accounted for over US$ 25.2 billion in 1973 and was growing considerably. However, the United States considered that such growth was being threatened by an array of tariff and NTBs which included quantitative restrictions, voluntary export restraints, government involvement in trade and production, as well as discriminatory standards. As a result of the steep reductions resulting from the main tariff reduction technique that was used (i.e. the Swiss Formula), most sectoral discussions did not yield fruit (exceptions included agreement on certain commodities and the Agreement on Trade in Civil Aircraft).

Sectoral initiatives also played an important role during the Uruguay Round (1986-1994), where a large number of initiatives were negotiated. Most of these initiatives were proposed by the so-called "Quad", an informal group comprised of the four largest traders: Canada, the European Union, Japan and the United States. Participation in these initiatives was almost exclusively limited to Organisation for Economic Co-operation and Development (OECD) countries.[14] Twelve of these initiatives led to the incorporation of results into the schedules of their participants,[15] and approximately 15 failed to garner sufficient support.[16] One such failed proposal was a US initiative to have zero-for-zero on electronics, which sought full liberalization of trade in products such as automatic data processing equipment and parts; general electronic items; medical diagnostic and other medical equipment; scientific instruments; semiconductors; semiconductor manufacturing and testing equipment; and telecommunications equipment. Many of these initiatives were championed by the private sector through the Zero Tariff Coalition, which grouped a broad cross-section of the most competitive American industries and accounted for around 30 per cent of US merchandise trade.[17] While the European Union did not necessarily oppose many of those sectoral initiatives, it preferred to focus on the application of a tariff reducing formula of broad application. The European Union resisted taking part in the sectoral initiative on electronics mainly for two reasons: firstly because some of its domestic industries opposed it, in particular the semiconductor manufacturers; and secondly, since its duties were relatively higher for some of those products, the European Union considered that its main suppliers of electronic products, Japan and the United States, would have to offer more concessions in other areas.[18]

The "Pharmaceutical Understanding", or "Pharma", was one of the successful sectoral initiatives during the Uruguay Round. This initiative was unusual in at least three aspects that were subsequently mimicked by the ITA. Firstly, while the results of most sectoral initiatives were simply incorporated in the overall schedule of concessions based on informal product coverage lists, the Pharma was drafted as a formal agreement that was circulated for information to all GATT contracting parties.[19] Secondly, the liberalization of pharmaceutical products was not limited to the traditional "ordinary customs duties" that were bound in the schedules, but provided as well for the binding and elimination of all "other duties or charges", as defined by the second sentence of Article II:1(b) of the GATT.[20] Thirdly, while the product coverage is usually defined in terms of specific tariff lines, the Pharma envisaged the liberalization of specific substances defined in other ways. These included, for example, "active ingredients" bearing an "international non-proprietary name", or "INN", defined by the World Health Organization, as well as a number of intermediate products used in the manufacture of pharmaceuticals. Finally, Pharma concessions were incorporated to the schedules via a pharmaceutical appendix. This meant that the concessions would be actionable under Article II of the GATT. Although no formal link has been established between the ITA and the Pharma, they followed similar approaches.

Most OECD countries agreed to significant tariff reductions during the Uruguay Round, but the European Union and the United States still maintained some degree of tariff protection on some of these types of products.[21] As a result of the Uruguay Round, the European Union committed to reduce its tariffs on computers from 4.9 per cent to 2.5 per cent over five years, and on computer parts from 4 per cent to 2 per cent. In the case of semiconductors, however, the European Union maintained protection by reducing tariffs from an average of 14 per cent to an average of 10 per cent, but maintaining tariffs on a number of chips at the 14 per cent level. The United States agreed to reduce its tariff on computers from 3.9 per cent to 1.9 per cent.

C. Push by the private sector and other reasons to negotiate

Following the failure to eliminate duties on a number of electronic products during the Uruguay Round, US computer manufacturers regrouped in 1994 under the umbrella of the Information Technology Industry Council (ITI), which aimed at convincing its own government and industry groups in other countries of the need to pursue further liberalization. The ITI's ideas were reflected in the 1995 "Proposal for Tariff Elimination", which called for the negotiation of what they dubbed the "Information Technology Agreement" among as many economies as possible with a view to eliminating tariffs on computer hardware, semiconductors and integrated circuits, as well as computer software, by the year 2000.[22] The preparatory work for the first WTO Ministerial Conference, in Singapore in December 1996, was identified as one of the possible forums to pursue such an agreement. However, the proposal also considered other options to avoid "lengthy GATT-style negotiations", including the Quad and OECD discussions for the establishment of a "global information infrastructure".

ITI convinced the European Association of Manufacturers of Business Machines and Information Technology Industry (EUROBIT) and the Japanese Electronic Industry Development Association (JEIDA) to join its efforts. They were later joined by the Information Technology Association of Canada (ITAC). These industry groups called on the G-7 governments (Canada, France, Germany, Italy, Japan, the United Kingdom and the United States) to immediately remove all trade, investment and technical barriers to trade in the IT sector.[23] Support for the ITA from the private sector kept growing and it was eventually endorsed by EU and US business groups participating in the TransAtlantic Business Dialogue (TABD).[24]

The US Administration was initially reluctant about the proposal because it did not want to antagonize the European Union after it had refused to join a sectoral initiative on electronics only a few years earlier.[25] Industry successfully lobbied, and by the beginning of April 1995, the US Trade Representative, Mr Mickey Kantor, announced that the Clinton Administration would pursue the negotiation of an information technology agreement.[26] By 1995, both the governments of Canada and the US firmly supported the idea of negotiating an ITA. However, the initiative was initially resisted by the European Union and Japan, which considered that the results of the Uruguay Round were "big enough to digest".[27] This quickly changed. Fliess and Sauvé (1997) argue that policymakers had a strong interest in liberalizing trade in IT products for a number of reasons. Firstly, trade in these products had experienced an explosive growth during the first part of the 1990s, which significantly exceeded that of other industries and translated into a high commercial priority for liberalization. Secondly, there was a growing appreciation of the positive impact that IT products could have by increasing the overall competitiveness of an economy through improved business and manufacturing efficiency. The economic transformation towards a "global information society" required governments to promote affordable access to such technologies by, *inter alia*, liberalizing trade in these products. Moreover, removing obstacles to free trade in these products would ensure that the infrastructure required would be attained at the lowest possible cost.

Thirdly, the Quad was interested in achieving some kind of post-Uruguay Round liberalization momentum, which required finding a sector of mutual interest and relatively low sensitivity. From a political point of view, it was also necessary to find a sector within the parameters of the limited negotiating authority that the United States had under the Uruguay Round Implementation Act, which included electronics.[28] All these factors coalesced in the identification of the IT sector as one of the prime candidates for further liberalization in the goods area, as well as "basic telecommunications" in the services area. Industry's efforts paid off when the European Union and the United States formally endorsed the idea of an information technology agreement at the highest political level, at a summit between US President Bill Clinton, the president of the European Commission, Jacques Santer, and Spanish Prime Minister Felipe González, which took place on 3 December 1995.[29] Encouraged by this success, major US industry associations formed the Coalition for the ITA[30] in 1996, which later changed its name to the Information Technology Agreement Coalition. The private sector of most members involved in the negotiations played a pivotal role in pushing for the ITA.

D. A difficult first step: towards a Quad agreement

What type of agreement?

Representatives of Canada, the European Union, Japan and the United States began meeting in Geneva in February 1996 to develop the building blocks of a working agreement.[31] The idea was to build consensus based on concentric circles. Talks were kept at a very general level and no definitive lists of products were put on the table. This troubled the European Union because it saw it as a precondition for seeking a negotiating mandate, which they had yet to secure.[32] Fliess and Sauvé (1997) note that the European Union and the United States disagreed during these first discussions on whether to pursue such liberalization on a sectoral or broader basis. On the one hand, the European Union favoured a broader liberalization because it would be easier to address certain NTBs and sell a comprehensive package to its member states. The European Union was also concerned by the renewal of the US-Japan Semiconductor Arrangement, which was set to expire on 31 July 1996, and wanted to be part of it. On the other hand, Canada and the United States preferred a more targeted initiative that would focus exclusively on tariff elimination in the IT sector. Moreover, the United States was not interested in expanding its bilateral agreement with Japan to the European Union (see Box 1.2).[33]

Beyond the details of what would be negotiated, the European Union still lacked a negotiating mandate at the time the discussions began in 1996. In securing such a mandate, EU member states instructed the European Commission to pursue a number of issues, including "balancing measures", which went well beyond what the United States initially envisaged. During the Quad ministerial meeting that took place in Kobe on 19 April 1996, the European Union conditioned its support to the ITA on a list of conditions that included to: (1) be allowed to take part of the renewal of the US-Japan Semiconductor Agreement, which was being discussed bilaterally[34]; (2) negotiate a number of NTBs to IT products (e.g. government procurement, regulatory standards and intellectual property issues); and (3) receive compensation in other sectors. All these were considered controversial by the US negotiators. In spite of these disagreements, Quad ministers reaffirmed their strong support for the ITA and instructed negotiators to move forward.[35] A strong disagreement between the European Union and the United States ensued on exactly what should be negotiated, which eventually led to a suspension of the work. In parallel, Japan and the United States were also having a hard time agreeing on the extension of the semiconductor agreement.[36] Work on the ITA only resumed after an agreement concerning semiconductors was reached between Japan and the United States in August 1996 and, informally, between the European Union and the United States in September 1996.[37] Because it was envisaged that negotiating specific NTBs would take more time than negotiating tariffs, the Quad agreed to include this issue as part of the working programme that would implement the agreement.

Which products should be covered?

A key task was to define the products that would be liberalized through the ITA. Following an internal consultative process in early April 1996, the United States submitted to the other Quad countries a preliminary "landscape" list of products, which did not include references to the Harmonized System (HS) nomenclature.[38] Besides the technical difficulty behind identifying such broad categories of products, Japan and the United States were concerned at the time by what they considered a decision by the European Union to "reclassify" certain products (i.e. CD-ROMs and other optical reading devices that could be used as components of video equipment, computers with multimedia capability as television reception apparatus, and certain local area network (LAN) apparatus as telecommunication equipment), resulting in the application of higher duties. The US industry, in particular, considered this issue to be inextricably linked to the ITA at large and was keen to include "general interpretation rules" for the classification of these products in order to ensure that future iterations of IT products could continue to benefit from duty-free treatment.[39] The European Union considered that no reclassification had taken place and that its decision sought to harmonize the tariff treatment

Box 1.2. Main offensive and defensive interests of key players

United States

- Offensive interests: reduction of EU tariffs on semiconductors and other IT products; better access to Asian markets; in favour of a deal restricted to tariffs.
- Defensive interests: selected IT product categories; sensitive on fibre-optic cables and photocopiers.
- Outcome: agreed to include selected IT products where EU had an interest, but only partially on fibre optic cables; the agreement was mostly limited to tariffs.

Japan

- Offensive interests: better market access for IT products in Asian, EU and US markets; semiconductors and consumer electronics; in favour of a deal restricted to tariffs.
- Defensive interests: certain NTBs.
- Outcome: the agreement was mostly limited to tariffs; granted the EU access to the US-Japan Semiconductor Agreement.

European Union

- Offensive interests: source cheaper inputs; in favour of broader deal involving NTBs; gain access to US-Japan Semiconductor Agreement.
- Defensive interests: exclude consumer electronics; certain semiconductors.
- Outcome: access to US-Japan Semiconductor Agreement as compensation for opening domestic semiconductor market; compromises on software and cameras (only digital still-image cameras).

South East and East Asian Exporters

- Offensive interests: better market access to all major industrialized countries; lower EU tariffs; interest in including consumer electronics.
- Defensive interests: NTBs; linkages to products outside of the IT sector; to take account of the needs of developing countries.
- Outcome: failed to include key consumer electronic products; improved market access in products covered by the agreement; longer staging to implement reductions.

Source: Dreyer, I. and Hindley, B. (2008), "Trade in Information Technology Goods: Adapting the ITA to 21st Century Technological Change", ECIPE Working Paper No. 6.

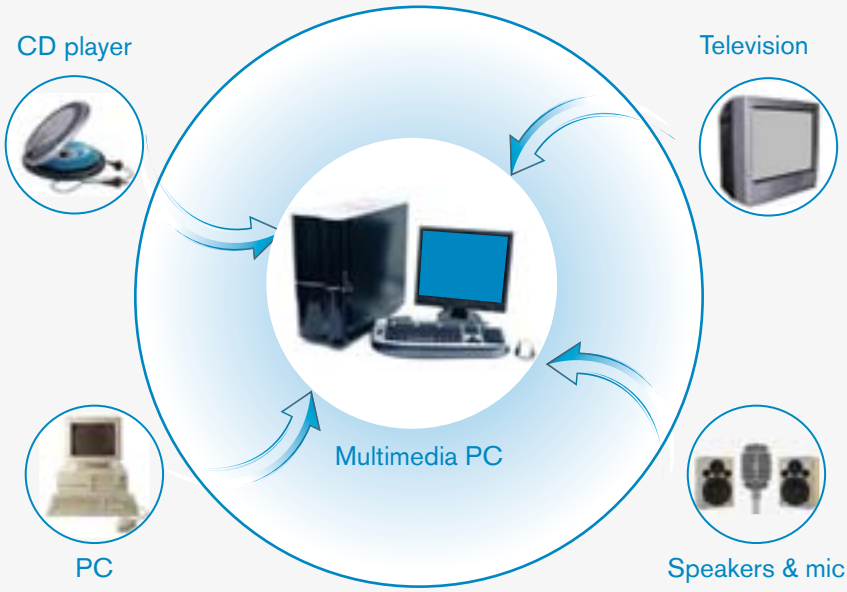
that different EU member states were giving to certain multimedia and telecommunication devices (i.e. not to IT products).[40]

The product coverage discussion intensified in October 1996, when new lists were exchanged. These consisted of broad categories of products to be included ("positive lists"), as well as lists of products to be excluded ("negative lists") from the scope of the agreement. The positive lists submitted by other Quad countries went beyond what the US industry originally envisaged. For example, the European Union proposed in its positive list to include telecommunications equipment, calculating machines, semiconductor manufacturing equipment and their parts, electronic resistors, capacitors, and certain types of software. Similarly, Japan sought to include digital duplicators, game machines, internet televisions, digital video cameras, and certain types of set-top boxes with multimedia capability. The negative lists reflected products where Quad countries wanted to retain tariff protection for their domestic production. The US wanted to exclude fibre-optic cables, photocopiers, monitors, resistors and capacitors.[41] The European Union sought the exclusion of "consumer products" in general, including products such as microphones and speakers, CD players, VCRs, computer games, set-top boxes, still-image video cameras, audio equipment, DVD players, satellite receivers and television sets.[42] The Quad agreed early on to exclude consumer electronics from the scope of the ITA, but profound disagreements followed thereafter on the specifics. These exclusions were a point of contention for major Asian exporters.

The European Union and the United States remained at odds on how to handle certain product categories, which was exacerbated by the early decision to exclude "consumer products" and the alleged "reclassification" by the European Union. Some of these problems were rooted in an increased technological convergence, where new "multifunctional" devices sat between consumer and IT products, and the dividing lines between both product categories had been blurred (see Box 1.3). Customs administrations often could not agree where to classify those new multifunctional products. A similar problem was faced with respect to "intermediate" components, which could be used both in the manufacture of IT products and consumer products, which were not meant to be covered by the ITA.[43] Finally, there was disagreement on where to classify certain semiconductor manufacturing equipment and their parts, in particular because some of these machines could have a "multiple use".

The traditional approach of negotiating based on common list of HS tariff lines proved agonizingly difficult and pushed negotiators into thinking out of the box. In October 1996, the European

Box 1.3. Technological convergence: multimedia PCs



Union proposed to define the product coverage in two separate sections.[44] The first one listed HS codes for those products with which there was no or limited disagreement, including a series of "ex-outs" that identify specific products within a specific HS subheading. The second section would contain a "positive list of products to be covered, wherever they were classified in the HS". This idea provided a platform on which to move forward and eventually gained the support of other Quad countries. Two additional ideas by the European Union to redress this problem were for participants to: 1) meet periodically to review product coverage in light of "technological developments, experience in applying the agreement or changes in the HS nomenclature"; and 2) work towards arriving at a common classification for products covered in the ITA and "where appropriate", participants would make joint suggestions to the World Customs Organization (WCO). Although no official link has been established, the fact that a first review of the Pharma took place in parallel suggests that EU negotiators were probably inspired by this model.

While a list of almost 150 products had been agreed by November 1996,[45] a number of issues had not been settled when the Singapore Ministerial Conference began in December, putting into question the viability of an agreement. Tensions peaked when the United States filed a dispute against the European Union, Ireland and the United Kingdom in November 1996, less than one month before the Conference. The United States alleged the reclassification for tariff purposes of: (1) LAN adapter equipment and (2) personal computers with multimedia capability.[46] While the European Union was willing to liberalize trade in computers and network equipment pursuant to the ITA, it wanted to ensure that including certain products would not undermine the idea of excluding consumer electronics.

Fliess and Sauvé (1997) note that negotiators were so intensely focused on the product coverage discussions that, by November 1996, they had hardly begun considering the procedural issue of how the tariff reductions would take place.[47]

E. A broader group was needed for a deal in Singapore

At the beginning of October 1996, and following the breakthrough concerning semiconductors and considerable legwork to conjure up support at the APEC forum, the United States submitted an official proposal to the WTO to negotiate an "Information Technology Agreement". It proposed that the ITA should be part of the Singapore Ministerial Conference to fully liberalize trade on IT products by 2000. The United States quoted a study by the World Bank which considered IT to be at the "cutting edge of the services revolution" and argued that tariffs had encumbered the development of the IT industry by acting as a "tax on the competitiveness and productivity of other industries that rely heavily on information technology".[48] According to the United States, those joining the ITA would enhance the competitiveness of their economies, whereas those that did not would end-up reducing it. Finally, the proposal emphasized that wide participation beyond the Quad was essential for the success of the ITA.

Participation of all Quad countries was a necessary, but not a sufficient, condition for the establishment of the ITA. Because tariff reductions would be bound in the WTO schedules of its participants, the reductions would have to apply on a most-favoured-nation basis. This meant that the benefits would inevitably accrue to all WTO members – irrespective of whether or not they joined the ITA, thereby creating a "free rider" problem.[49] Aware of this problem, the US frequently noted that those who had the most to gain from the ITA should join it.[50] Similarly, the European Union considered that participation should be "as broad as possible"[51] and include: Australia, Chile, China, Hong Kong (China), Indonesia, the Republic of Korea, Malaysia, Mexico, New Zealand, the Philippines, Chinese Taipei and Thailand.[52] The Quad also felt strongly that China should join the ITA as part of its accession to the WTO. This eventually led to the idea of having a "critical mass" requirement, whereby the ITA would only be implemented if participants accounting for at least 90 per cent of world trade in IT products joined the initiative. Evidently, this requirement alone was not enough and considerable groundwork was required to convince others that it was in their interest to join.

The focus moved to securing the participation of certain Asian countries that were rapidly becoming important players in the sector. Mindful of APEC's 1994 ambitious "Bogor goals", Canada, Japan and the United States believed APEC support key to securing a deal at Singapore. However, the notorious disagreement between the European Union and the United States, coupled with the lack of a precise product definition, translated into a "wait and see" attitude by many in APEC.[53] This lukewarm reception was reflected in APEC's Ministerial Declaration of Christchurch, New Zealand, of July 1996, which only called for "taking into consideration" the ITA during the Singapore Ministerial Conference.[54]

Certain APEC members, including Hong Kong (China), the Republic of Korea and Chinese Taipei believed that the ITA should be designed to take into account the needs of developing countries.[55] Other APEC members developed specific proposals, some of which sought the inclusion of consumer products in the product coverage.[56] Only after the personal intervention of various political leaders, such as US President Bill Clinton and Japanese Prime Minister Ryutaro Hashimoto, did APEC decisively endorse the ITA. The 1996 APEC Leaders' Declaration, of 25 November, called for the conclusion of the ITA by the Singapore Ministerial Conference in order to substantially eliminate tariffs by the year 2000. To take account of the views expressed by some developing countries in APEC, it also recognized the need for flexibility in the Geneva process.[57] By the end of November 1996, more than 30 WTO members and states or separate customs territories in the process of acceding to the WTO were involved in the discussions.[58]

However, the European Union and the United States had not solved their bilateral differences before the Singapore Ministerial Conference. Since the Conference was not exclusively about the ITA, the discussions eventually became part of a larger "package" that included, *inter alia*, parallel discussions on "basic telecommunications" services. After intensive bilateral sessions, the European Union and the United States finally reached a preliminary bilateral deal on 11 December 1996, which was quickly endorsed by the other two Quad members, Canada and Japan. On 13 December 1996, the final day of

the Conference, the Ministerial Declaration on Trade in Information Technology Products – the ITA – was signed by 14 WTO members and states or separate customs territories in the process of acceding to the WTO (counting the EU-15 member states as one).[59] The preamble of the ITA notes that signatories accounted for "well over 80 per cent of world trade" in IT products.[60] This meant that additional participants were still required to meet the 90 per cent "critical mass" threshold. Although they did not sign the Declaration at Singapore, seven WTO members signalled they were considering joining it: Brunei Darussalam, the Czech Republic, India, Malaysia, Mexico, the Philippines and Thailand.[61]

Far from reflecting a final deal, the ITA laid down the procedural steps that would be followed in reaching a final agreement by 1 April 1997 (see Box 1.4). From a practical point of view, the main issues were who else would join the Agreement, the manner in which each participant would reflect the ITA concessions in its WTO schedule, and the manner in which the tariff cuts would be implemented. Several contentious issues were kicked forward, including the exact phasing out of the tariff cuts by the European Union and the United States on specific IT products. The phasing out of tariffs on semiconductors by the European Union was particularly contentious.[62] Certain EU member states felt that some form of compensation was still required. While the United States initially resisted this idea, it eventually agreed and offered to eliminate duties on white distilled spirits and other concessions in the context of the negotiations on basic telecommunication services that would commence in February 1997.

At least seven WTO members were not satisfied with the product coverage that had been proposed in the ITA Ministerial Declaration because they felt that improved market access had been denied to products of their export interest.[63] Paragraph 3 of the Annex to the ITA provided that participants should meet periodically to discuss whether the product coverage should be modified to incorporate additional products in light of technological developments, experience in applying the tariff concessions, or changes to the HS nomenclature. While the Quad believed that such exercise should take place after the implementation phase, certain "non-Quad" members demanded that they take place before the 1 April 1997 deadline. This and other implementation issues are discussed in further detail in Chapter 2.

Box 1.4. Post-Singapore steps

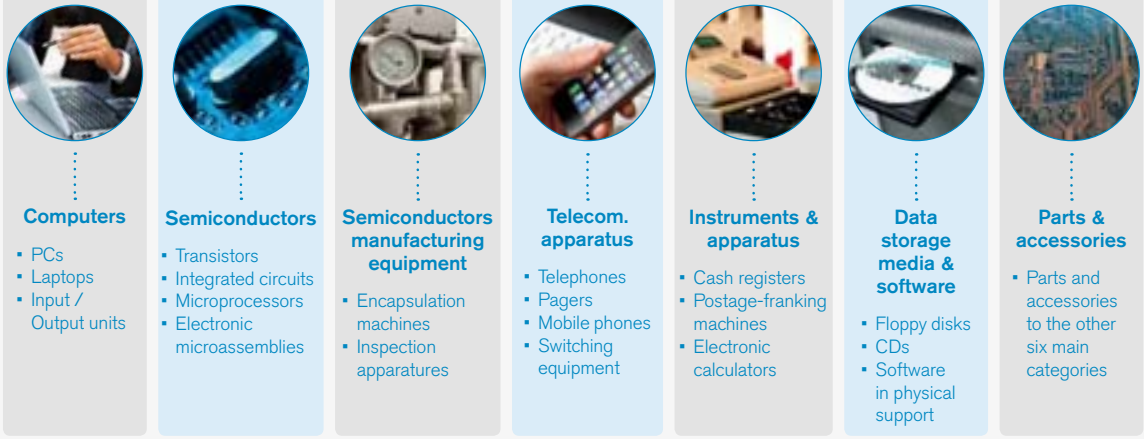
1. Finalization of plurilateral technical discussions by 31 January 1997 on, *inter alia*, extended staging of reduction and expansion of product coverage in limited circumstances.
2. Submission by participants of draft schedules of concessions no later than 1 March 1997.
3. Review and approval of schedules on a consensus basis no later than 1 April 1997.
4. Notification to the Director-General of acceptance of the annex on the modalities and product coverage.
5. Meeting of participants no later than 1 April 1997 to review the state of acceptances and the conclusions to be drawn therefrom.

Source: WTO document G/L/159/Rev.1.

F. Hanging by a thread: post-Singapore implementation

Some 50 WTO members and states or separate customs territories in the process of acceding to the WTO showed an interest in joining the ITA and attended the informal meetings that took place 17-31 January 1997.[64] These technical meetings were chaired by Mr Anwarul Hoda, WTO Deputy Director-General,[65] and aimed to discuss three issues: (1) product coverage; (2) the possibility of having extended staging; and (3) other technical issues required for the incorporation of ITA concessions into the schedule of concessions. An informal meeting was planned for 31 January 1997 to conclude the preparatory phase. Work subsequently continued during March and

Box 1.5. What products are covered by the ITA? Main product categories and examples



Computers
- PCs
- Laptops
- Input / Output units

Semiconductors
- Transistors
- Integrated circuits
- Microprocessors
- Electronic microassemblies

Semiconductors manufacturing equipment
- Encapsulation machines
- Inspection apparatures

Telecom. apparatus
- Telephones
- Pagers
- Mobile phones
- Switching equipment

Instruments & apparatus
- Cash registers
- Postage-franking machines
- Electronic calculators

Data storage media & software
- Floppy disks
- CDs
- Software in physical support

Parts & accessories
- Parts and accessories to the other six main categories

Source: Ministerial Declaration on Trade in Information Technology Products. See also Appendix 1.

April 1997 to operationalize the ITA and, in particular, to prepare the schedules. This section summarizes some of the main discussions that took place during this period. See Box 1.5 for a summary of the products covered by the ITA.

"Product coverage" review, January 1997

At least five WTO members made proposals to include additional products in the Attachments of the ITA: Australia, Malaysia, Norway, the Philippines and Switzerland.[66] For example, Australia wanted to include copper wire and optic fibres. Norway sought to include radar apparatus; radio navigational equipment; echo sounding instruments and ultra-sonic sounding or detecting equipment; simulator systems; and automatic regulating or controlling instruments or apparatus. Malaysia wanted to include consumer products such as video monitors and flat panel displays of all types; TV cameras, still-image cameras and video cameras of any kind; microphones of all kinds; cards incorporating a magnetic stripe; and magnetic discs, tapes or recording video of any kind. Switzerland proposed the inclusion of screen printers for manufacturing printed circuit boards and parts; co-axial cables and other conductors used solely in telecommunication applications; optic fibres; and automatic typewriters incorporating a ciphering device and other office machines incorporating ciphering devices.

An agreement to increase the product coverage of the ITA could not be reached mainly because the Quad feared upsetting the balance achieved amongst them at Singapore. Non-Quad members were "not happy at all" with this.[67] While discussing the products, which had been proposed for inclusion, many were of the view that some were already covered by the ITA and were, therefore, considered "classification" or "technical clarification" matters. Partly to bridge the gap between those participants who wanted to include additional products and those who opposed such inclusion, it was agreed that an expedited review of the product coverage would begin on 1 October 1997 and continue during 1998, to be implemented on 1 January 1999.

As a result of the technical and clarification discussions, participants agreed to modify the description of one of the Attachment B products. It was agreed that the description of the "flat panel displays" should be amended to read "flat panel display *devices* (including LCD, electro luminescence, plasma, *vacuum-fluorescence* and other technologies)" – the three words in italics were added. Finally, proposals for extended staging on certain products were received from developing-country participants, most of which were accepted. However, requests by India, Malaysia and Thailand to stage some tariff reductions beyond 2005 created controversy and were not considered favourably.[68]

Review of draft ITA schedules by the participants

As provided by paragraph 2 of the Annex to the ITA, most draft schedules were submitted on 1 March 1997. An intensive review process then began to verify draft schedules submitted by the 14 original Singapore signatories, plus those of

Box 1.6. ITA product coverage

1. What is covered by Attachment A?

This attachment lists 190 product items that correspond to 154 HS1996 subheadings (i.e. 6-digit codes) or parts thereof (see Box 1.5). This attachment is divided in two sections as follows:

Section 1: Major IT products	Section 2: Semiconductor manufacturing and testing equipment and parts thereof
This section is comprised of 112 product items that correspond to 110 HS1996 subheadings, 88 of which are fully included and 22 are only partially covered. These include products such as automatic data processing machines, line telephone handsets, facsimile machines, answering machines, electronic integrated circuits and microassemblies, printed circuits, etc.	This section is comprised of 78 product items that correspond to 45 HS1996 subheadings, 7 of which are fully included and 38 are only partially covered. These include products such as spin dryers for semiconductor wafer processing, die attach apparatus, tape automated bonders, and wire bonders for assembly of semiconductors, etc.

2. Where are the products "in" or "for" Attachment B and what are they?

Products "in" Attachment B	Products "for" Attachment B
Where are they?	
There are 13 narrative product descriptions that are listed in Attachment B to the Annex to the ITA, which are not identified in terms of HS codes.	There are 42 product items that are listed in Section 2 of Attachment A to the Annex to the ITA, but are identified in a special column as being "For Attachment B".
What type of products?	
Many of these items relate to products where technological convergence had made it difficult to differentiate them for classification purposes from other products not covered by the ITA. These include computers with multimedia capability., cathode ray tube (CRT) computer monitors, optical disc storage units for computers (e.g. CD and DVD units), network equipment, set-top boxes which have a communication function, and paging alert devices. There are, in addition, certain "intermediate" components, such as electric amplifiers and printed circuit assemblies, where the liberalization only takes place if they are "for" products falling within the ITA.	Twenty of these items relate to semiconductor manufacturing equipment, such as chemical vapour deposition apparatus, apparatus for stripping or cleaning semiconductor wafers, spinners for coating photographic emulsions on semiconductor wafers, apparatus for rapid heating of semiconductor wafers, etc. The other 22 items relate to parts of these semiconductor manufacturing equipment and quartz reactor tubes and holders used in the semiconductor wafers.

Source: WTO Secretariat based on the ITA.

12 additional participants[69] who had come on board by the time it concluded in March. This was the first time that draft schedules were submitted in electronic format, based on a template that was prepared by the WTO Secretariat. In addition, the Secretariat was asked to assist in the review process by making a preliminary, informal review of the draft schedules, including an assessment of whether all ITA items had been covered.[70]

While verifying the inclusion of the 148 ITA items for which the HS classification was agreed was a straightforward exercise, it was a considerably more difficult exercise for the 13 products listed "in" Attachment B, and the 42 items in Section 2 of Attachment A that were labelled "for Attachment B" (see Box 1.6). Besides the inherent difficulty of dealing with such divergences in classification, some of those product categories were meant to cover a large number of national tariff line codes. Pragmatic instruments were developed to verify the schedules. The first tool was the informal numbering of the 203 ITA items covered by the Agreement (items numbered from 1 to 190 are covered by Attachment A, and items numbered from 191 to 203 refer to products that are "in" Attachment B), which facilitate tracing items meant to be covered by the tariff lines listed in a draft schedule (see Box 1.7).[71] Though participants removed these references from the communications that formally introduced the changes in their WTO schedules, they are frequently found in the schedules that have been prepared thereafter.

Participants included a separate annex listing the 55 products "in" or "for" Attachment B, which identify the national tariff lines where they

Box 1.7. What does an "ITA schedule" look like?

The ITA provides that participants shall "bind and eliminate customs duties and other duties and charges of any kind" by incorporating them in their WTO schedules of concessions. In other words, although there are frequent references in the jargon to the "ITA schedules", concessions made pursuant to the ITA are part of the general WTO obligations of its participants. Because most ITA participants were already WTO members at the time the ITA was negotiated, they introduced the new concessions in their schedules through the 1980 "Procedures for Rectification and Modification of Schedules". On the other hand, the states and separate customs territories that have acceded to the WTO pursuant to the procedures set in Article XII of the Marrakesh Agreement Establishing the World Trade Organization and became ITA Participants did not have a schedule until they acceded. For this reason, ITA concessions in their case are part of their *Protocol of Accession*.[1]

Generally speaking, ITA schedules have three separate sections. The first one, sometimes labelled "Attachment A", lists the concessions in the traditional way, using HS codes. Although the modifications that are proposed by WTO members are listed together in a single document, the ITA concessions of those who have acceded to the WTO are combined with all other concessions in the schedule that is annexed to their Protocol of Accession.

Example of first section:

ex HS1996	Description	Base rate	Bound rate	Implementation	ODCs
3818.00.00	Chemical elements doped for use in electronics, in the form of discs, wafers or similar forms; chemical compounds doped for use in electronics	6.9	0.0	2000	0.0
7020.00	Other articles of glass				
7020.00.10	Quartz reactor tubes and holders designed for insertion into diffusion and oxidation furnaces for production of semiconductor wafers.	4.0	0.0	2000	0.0
(…)					

A second section, often labelled "Attachment B", normally reflects the headnote that was negotiated in 1997. In addition, it lists the 55 products that were identified "in" of "for" Attachment B to the Annex to the ITA plus the national tariff lines or HS codes that are associated to each of those products.[2]

Example of second section:

With respect to any product described in or for Attachment B to the Annex to the Ministerial Declaration on Trade in Information Technology Products (WT/MIN(96)/16), to the extent not specifically provided for in this Schedule, the customs duties on such product, as well as any other duties and charges of any kind (within the meaning of Article II:1(b) of the General Agreement on Tariffs and Trade 1994) shall be bound and eliminated as set forth in paragraph 2(a) of the Annex to the Declaration, wherever the product is classified.

Description	HS1996
Quartz reactor tubes and holders designed for insertion into diffusion and oxidation furnaces for production of semiconductor wafers	7020.00.10
Chemical vapour deposition apparatus for semiconductor production	8419.89.20
(…)	

A third section, sometimes labelled "staging matrix", has been used by some ITA participants to reflect the manner in which the phasing out of their tariffs will take place over time.

Example of third section:

ex	HS1996	Base rate	July 1997	1998	1999	2000
	3818.00.00	6.9	5.2	3.5	1.7	0.0
	7020.00.10	4.0	3.0	2.0	1.0	0.0
(…)						

Notes: [1]These include Albania, China, Croatia, Georgia, Kyrgyz Republic, Moldova, Oman, Saudi Arabia, Chinese Taipei, Ukraine and Viet Nam. Acceding members who subsequently joined the European Union are covered by the EU schedule. [2]Japan reflected these concessions in a different manner. See WTO document WT/Let/138.

classified them. More importantly, a common "headnote" was negotiated which provided that the participant committed to fully eliminate and bound at duty-free levels all customs duties and "other duties and charges" on all the products in or for Attachment B to the Annex to the ITA, wherever the product is classified.[72]

The last review session took place at the informal meeting on 25-26 March 1997, and participants approved by consensus 25 schedules representing 40 ITA participants.[73] The approval of draft schedules by Panama and Poland was delayed because it was not possible to conclude the negotiations in time.[74]

The European Union and the United States reached a common understanding on the phasing out of the different product categories,[75] and the European Union participated in the renewal of the US-Japan Semiconductor Agreement. However, the divergences in classification resurfaced. At the time the EU draft ITA schedule was reviewed, the United States introduced a reservation pending the finalization of an agreement on the tariff treatment of LAN products and personal computers with multimedia capabilities because they considered that the ITA had not settled the alleged reclassification by the European Union. The United States subsequently lifted its reservation by noting that it did not want to delay the implementation of the agreement.[76] Similarly, at the time the draft ITA schedule of the United States was reviewed, the European Union indicated that it was concerned by the eventual dual use of flat-panel display devices. However, the European Union felt that the headnote that had been included in the Attachment B section of the schedules had resolved this situation and that no problem of substance remained.[77]

Fulfilment of the 90 per cent "critical mass" threshold

Paragraph 4 of the Annex to the ITA provided that participants would meet no later than 1 April 1997 to decide whether they would implement the actions foreseen in the ITA, which hinged upon achieving a critical mass of 90 per cent of world trade in IT products. Twenty-one of such notifications of acceptance were received before, and four during, the informal meeting that took place on 26 March 1997.[78] The Secretariat figures showed that the 90 per cent threshold had been met and participants duly agreed to go ahead with the implementation of the decision.[79]

Introducing the ITA concessions in the WTO schedules of concessions

The final stage for implementing the ITA required participants to "bind" the liberalization in those products by including them in their WTO schedules of concessions. These modifications were introduced through the so-called 1980 "Procedures for the Modification and Rectification of Schedules of Tariff Concessions".[80] Although Japan was the first to submit such a formal request on 7 January 1997, others preferred to wait until a review phase had taken place and the draft ITA schedules had been verified. Following the decision taken on 26 March 1997 to implement the Agreement, participants started requesting the formal introduction of their ITA concessions in their schedules.[81] While six draft modifications[82] were submitted on 2 April 1997, the others took more time because they first had to complete domestic procedural requirements, including, in some cases, "ratification" procedures.[83] The modifications to the schedules of the other 13 participants were formally certified during the second half of 1997 and ten additional ones throughout 1998.

Endnotes

1 Before 30 November 2009, the European Union was known in the WTO as the European Communities. For consistency, however, the term European Union is used throughout this publication.

2 Australia, Canada, the EU-15, Hong Kong (China), Iceland, Indonesia, Japan, the Republic of Korea, Norway, Singapore, Switzerland (including Liechtenstein), Chinese Taipei, Turkey and the United States.

3 This section is largely based on WTO document TN/MA/S/13.

4 For example, GATT Articles IV (cinematograph films), XI:2 (foodstuffs, agricultural and fisheries products), XVI:4 (primary products), XX (gold and silver) and XXI (fissionable materials, arms, ammunition and implements of war).

5 These include: the Agreement Relating Principally to Chemicals (GATT BISD 15S/8) and the Memorandum of Agreement on Basic Elements for the Negotiations of a World Grains Arrangement (GATT BISD 15S/18).

6 These include: the Arrangement Regarding Bovine Meat (GATT BISD 26S/84); Agreement on Trade in Civil Aircraft (GATT BISD 26S/162); and the International Dairy Arrangement (GATT BISD 26S/91).

7 The agreements on dairy and bovine meat were terminated at the end of 1997.

8 GATT Article XXVIII *bis* was introduced during the Review Session of 1954-55 and entered into force on 7 October 1957.

9 "Harmonization" means that all participants agree to bind different product categories at agreed levels (e.g. certain products at 3 per cent and others at 5 per cent). "Zero-for-zero" means that participants agree to the complete elimination of import duties (i.e. binding them at duty-free levels).

10 GATT BISD 13S/109. Informal groups were established in five sectors: chemicals, cotton textiles, pulp and paper, iron and steel, and non-ferrous metals.

11 GATT document L/1754.

12 GATT document MTN/SEC/1.

13 The US definition of electronics included: radio, TV and photographic equipment, telephonic and telegraphic apparatus, telecommunications equipment and electronic components (BTN ex 85.01, 85.02-85.04, 85.10-85.18, ex 85.19, 83.20, 85.21., 85.23-85.28, 85.32). See GATT document MTN/SEC/W/6.

14 See GATT document MTN.TNC/W/113.

15 These included: agricultural equipment, beer, chemicals, construction equipment, distilled spirits (brown), furniture, medical equipment, paper, pharmaceuticals, steel and toys. In addition, participants to the Agreement on Trade in Civil Aircraft agreed to expand the product coverage.

16 Unsuccessful sectorals included: ceramics, cigars, electronics, fisheries, footwear and leather goods, glassware, musical instruments, non-ferrous metals, oilseeds, photographic film, rubber, scientific instruments, textiles and clothing, white spirits, and wood products.

17 Testimony of Mr Robert L. Donnelly, Representing the American Forest and Paper Association (AFPA) and the Zero Tariff Coalition before the US Senate Committee on Finance, 10 November 1993.

18 Barbara Fliess and Pierre Sauvé (1997), *Of Chips, Floppy Disks and Great Timing: Assessing the Information Technology Agreement*, Institut Français des Relations Internationales and the Tokyo Club Foundation of Global Studies, p. 13.

19 GATT document L/7430.

20 A similar provision is contained in Article 2.1.1 of the 1980 Agreement on Trade in Civil Aircraft, but there is no express provision requiring their binding in the schedules.

21 For more details, see Chapter 3.

22 Inside U.S. Trade, *Text: ITI Proposal for Tariff Elimination*, 3 March 1995. The ITI also wanted to ensure that General Interpretation Rules similar to those negotiated under the North American Free Trade Agreement were part of the agreement to ensure that future product generations, such as multimedia products, would be covered by the ITA. The proposal also sought to address issues relating to rules of origin and customs valuation of software products.

23 Fliess and Sauvé (1997), *op. cit.*, p. 15. See also Inside U.S. Trade, *G-7 Telecom, Computer Firms Draft Recommendations for GII*, 2 June 1995.

24 Inside U.S. Trade, *U.S., EU Industry Calls for Zero Tariffs for Information Technology*, 17 November 1995.

25 Inside U.S. Trade, *Computer Industry Proposing Sweeping Tariff Elimination by 2000*, 17 February 1995.

26 Inside U.S. Trade, *Kantor Calls for New Zero-For-Zero Initiative Among Quad Countries,* 7 April 1995.

27 Inside U.S. Trade, *EU, Japan Blocking US Initiative for New Tariff Negotiations*, 28 April 1995.

28 Fliess and Sauvé (1997), *op. cit.*, pp. 4, 9 and 14. The Statement of Administrative Action of the Uruguay Round implementing legislation gave the US president the authority to set duties at levels which had been proposed during the Round. Because the US had proposed to fully liberalize the electronics sector, ITA negotiations would be covered by such mandate.

29 Inside U.S. Trade, *US-EU Action Plan Includes Broad Agenda for Future WTO Talks*, 1 December 1995.

30 Inside U.S. Trade, *EU Pressing US for Proposal on Information Technology Agreement*, 9 February 1996.

31 Inside U.S. Trade, *US, EU to Begin Talks on Information Technology Pact Next Week*, 26 January 1996.

32 Inside U.S. Trade, *EU Pressing US for Proposal on Information Technology Agreement*, 9 February 1996.

33 Fliess and Sauvé (1997), *op. cit.*, p. 16. Inside U.S. Trade, *U S Makes Detailed Proposal for Information Technology Agreement*, 19 April 1996.

34 This agreement was negotiated with a view to establishing a boost to foreign access in Japan's chip market the European Union considered that the US-Japan deal was "de facto discrimination" against EU chip makers and called it "managed trade" because of a 20 per cent "foreign market share" clause included in the agreement. Inside U.S. Trade, *US, EU and Japan Plan to Meet on Semiconductors next month*, 16 February 1996; and *US Rebuffs EU Demands to Link ITA to European Role in New Chip Deal,* 26 April 1996.

35 Inside U.S. Trade, *Text: Kobe Quad Statement*, 26 April 1996.

36 Inside U.S. Trade, *Japan Rejects US Proposal on Semiconductors as ITA Work Stalls*, 21 June 1996.

37 Inside U.S. Trade, *Understanding on Semiconductors and ITA between the European Commission, Japan and the United States*, 1 October 1996, p. 5.

38 The list proposed to include: computers and computer parts, semiconductors and integrated circuits, telecommunications and networking equipment, opto-electronics (e.g. computer scanners), semiconductor manufacturing equipment and parts, electronic resistors (but not capacitors) and software media such as floppy discs and CD-ROMs. Inside U.S. Trade, *US Makes Detailed Proposal for Information Technology Agreement*, 19 April 1996.

39 Inside U.S. Trade, *US, European Firms Alarmed on Possible EU Tariff Change on CD-ROMs*, 29 September 1995; *EU to Reclassify CD-ROMs Despite Japanese Complaint in WCO*, 24 November 1995; and *Industry Pressing USTR to Include Classification Rules in ITA*, 1 March 1996.

40 Inside U.S. Trade, *Brittan Fends off US Charges that EU Undermines Market Access*, 29 March 1996.

41 Inside U.S. Trade, *EU Proposal Envisions Broad ITA Coverage, Including China*, 18 October 1996.

42 Inside U.S. Trade, *EU Offers Strong Proposal on ITA Products; US Sees Progress*, 11 October 1996; and Iana Deyer and Brian Hindley (2008), "Trade in Information Technology Goods: Adapting the ITA to 21st Century Technological Change", ECIPE Working Paper, No. 6, p. 8.

43 Fliess and Sauvé (1997), *op. cit.*, p. 28, citing Americo Beviglia Zampetti (1997), "Globalisation in the Consumer Electronics Industry", in OECD, *Globalisation of Industry*, Paris, p. 22.

44 U.S. Trade, *EU Proposal Envisions Broad ITA Coverage, Including China*, 18 October 1996.

45 See draft product coverage at the beginning of November 1996 in Inside U.S. Trade, *Text: Technical Working Document*, 8 November 1996.

46 The three disputes filed by the United States are*: European Communities – Customs Classification of Certain Computer Equipment*, WT/DS62 series; *United Kingdom – Customs Classification of Certain Computer Equipment*, WT/DS67 series; *Ireland – Customs Classification of Certain Computer Equipment*; WT/DS68 series.

47 Fliess and Sauvé (1997), *op. cit.*, p. 20, footnote 39.

48 WTO document G/MA/W/8. A reference to liberalizing trade on IT products was made by Canada in the meeting of the Council for Trade in Goods of 5 July 1996. See paragraph 6.4 of WTO document G/C/M/11.

49 Inside U.S. Trade, *U.S. Planning Formal Proposal on ITA at April Quad Meeting*, 29 March 1996.

50 WTO document G/C/M/15, paragraph 2.1.

51 Inside U.S. Trade, *US, EU to Begin Talks on Information Technology Pact Next Week*, 26 January 1996.

52 Inside U.S. Trade, *EU Commission Floats New ITA Proposal, Requests Formal Mandate,* 25 October 1996.

53 Inside U.S. Trade, *Lack of Political Commitment Threatens Information Technology Deal*, 24 May 1996; and *US-EU Split Stalls APEC Talks on Information Technology Agreement*, 20 September 1996.

54 Inside U.S. Trade, *U.S. Says APEC Backs ITA, Product Coverage to be Discussed Further,* 30 August 1996.

55 Fliess and Sauvé (1997), *op. cit.*, p. 19.

56 Inside U.S. Trade, *US Says APEC Backs ITA, Product Coverage to be Discussed Further,* 30 August 1996.

57 Inside U.S. Trade, *TEXT: APEC Leaders' Declaration*, paragraph 13, 29 November 1996. Canadian Press, *Trade talks pick away at barriers, Flexibility key to technology accord,* 26 November 1996.

58 Fliess and Sauvé (1997), *op. cit.,* p. 21.

59 Australia, Canada, EU-15, Hong Kong (China), Iceland, Indonesia, Japan, Republic of Korea, Norway, Chinese Taipei, Singapore, Switzerland (including Liechtenstein), Turkey and the United States.

60 Ministerial Declaration on Trade in Information Technology Products, 13 December 1996, Preamble.

61 Fliess and Sauvé (1997), *op. cit.,* p. 23. See also Inside U.S. Trade, *New Participants Foreshadow Good Prospects for Finalizing ITA*, 20 December 1996.

62 Inside U.S. Trade, *Major WTO Members Announce Plan to Finish ITA Talks Next Year*, 13 December 1996.

63 Inside U.S. Trade, *Quad Countries Facing Demands for Extensive Additions to ITA*, 24 January 1997; and Deyer and Hindley (2008), *op. cit.*

64 The description of events in this section is largely based on formal and informal records by the WTO Secretariat.

65 Mr Jean Saint Jacques of Canada, who was Chairman of the Market Access Committee, was also elected Chairman of the ITA process. However, during the first meeting, which took place on 17 January 1997, he stated that it would not seem prudent for a member participating in the negotiations to continue chairing the process. Moreover, the "non-Quad" members wanted a neutral entity (i.e. the Secretariat) to be more involved.

66 This section is largely based on WTO document G/L/159/Rev.1 and the informal record of the negotiations kept by the WTO Secretariat.

67 Inside U.S. Trade, *Quad Pushes Ahead on ITA Amid Renewed Controversy Over Product Coverage*, 7 February 1997.

68 Inside U.S. Trade, *ITA Finalized But US Warns on EU Tariff Classification Disputes*, 28 March 1997.

69 Costa Rica, the Czech Republic, Estonia, India, Israel, Macao (China), Malaysia, New Zealand, Norway, Romania, the Slovak Republic and Thailand.

70 The Statement by the Chairman of the Committee of Participants on the Expansion of Trade in Information Technology Products (ITA Committee) of 29 October 1997 outlined the "usual way" for verifying ITA schedules. First, the draft would be informally verified by the Secretariat. If discrepancies were found in the Secretariat's verification, they were communicated to the member concerned as well as to the participants. The member concerned could then correct these discrepancies and the schedule would contain a note to that effect. Alternatively, if the member concerned so desired, the schedule would be circulated as originally submitted with the discrepancies. Second, the schedule would then be circulated and objections could be raised by other participants. See paragraph 4.1.2 of WTO document G/IT/M/2.

71 This practice has been preserved to date, and items are often referred to by their number in the technical documentation considered by the Committee of Participants of the ITA. See, for example, WTO document G/IT/W/6/Rev.3.

72 It should be noted that not all ITA participants included this language as a "head note" (e.g. Japan).

73 WTO document G/L/159/Rev.1. The difference in the numbers is due to the single schedule for EU-15, as well as the joint schedule for Liechtenstein and Switzerland.

74 Footnote 2 to WTO document G/L/60.

75 The European Union agreed to cut its 7 per cent duties on semiconductors by 50 per cent by 1 July 1997 and by 25 per cent at the beginning of 1998 and 1999. In addition, the United States agreed to accelerate the duty elimination on a number of products (e.g. mostly those with a "nuisance" duty of 3 per cent or less) and to liberalize imports on distilled spirits (e.g. vodka, gin). See Inside U.S. Trade, *ITA Negotiators Meet March 1 Deadline, Surpass 90 Per cent Level*, 7 March 1997.

76 Inside U.S. Trade, *USTR Statement on Completion of Information Technology Agreement*, 27 March 1997.

77 Informal record kept by the WTO Secretariat.

78 WTO document G/L/159/Rev.1, p. 2.

79 The WTO Secretariat determined that 25 schedules for the 40 Participants accounted for more than 92 per cent of world trade in the sector. See WTO document G/L/159/Rev.1.

80 Decision of 26 March 1980, GATT document L/4962.

81 Draft modifications made to WTO schedules are circulated pursuant under the WTO document G/MA/TAR/RS series and members are given three months to raise reservations. In case no reservation is raised within that period, the Director-General "certifies" the modification of the schedule.

82 This first batch included the modifications by the European Union, India, Indonesia, Israel, Norway and Turkey.

83 WTO documents G/IT/1, G/IT/1/Rev.1, and paragraphs 2.1-2.13 of G/IT/M/1, minutes of the first formal meeting of the ITA Committee.

II The ITA Committee: 15 years of encouraging trade

Contents

Highlights

- The ITA Committee was established to oversee the implementation of the ITA, including to review the product coverage, consult on non-tariff barriers (NTBs), consider classification divergences and serve as a forum to work out disagreements between participants.
- The ITA Committee has played a pivotal role in furthering the objectives of the Agreement and ensuring that tariff eliminations are carried out as foreseen. It has also served as a forum to solve specific trade concerns arising from the implementation of the Agreement.
- While some progress has been made, outstanding issues remain in narrowing down the divergences in classification of "Attachment B" products.
- The review of product coverage (the so-called "ITA II negotiations") began almost immediately after the implementation of the ITA, but participants were not able to accommodate their differences.
- The on-going Work Programme on NTBs has so far resulted in guidelines on conformity assessment procedures on electromagnetic compatibility (EMC) and electromagnetic interference (EMI) of information technology (IT) products, which has increased transparency in the context of the ITA as far as these measures are concerned.
- Participation in the ITA Committee has successfully expanded from 28 original participants (representing 43 WTO members and states or separate customs territories in the process of acceding to the WTO) in May 1997 to 47 participants (representing 74 WTO members) by March 2012. It is envisaged that additional participants will join in 2012.

A. Introduction

On 26 March 1997, participants to the Information Technology Agreement (ITA) established a committee to carry out the provisions of paragraphs 3, 5, 6 and 7 of the Annex to the Agreement. The Committee of Participants on the Expansion of Trade in Information Technology Products (ITA Committee) is in charge of overseeing the functioning of these elements and serves as the forum for meetings required under its procedures and collective consultations among the participants. Participants agreed that "All decisions of the Committee shall be taken by consensus".[1] Over the past 15 years, the ITA Committee has contributed to the reduction and, in some cases, the elimination of barriers affecting trade in IT products, and has played a pivotal role in furthering the objectives of the Agreement and improving market access for IT products.

The first formal meeting of the ITA Committee took place on 29 September 1997 and was chaired by WTO Deputy Director-General Anwarul Hoda. Since then, the main tasks of the ITA Committee have stemmed from the Annex to the ITA and include: (1) the review of the status of implementation of the Agreement; (2) the review of product coverage; (3) consultations on non-tariff barriers (NTBs) to trade in IT products; (4) the consideration of divergences in classification of IT products; and (5) the encouragement of increased participation in the Agreement.

These tasks have been met with mixed success. For example, since 1997, the ITA Committee has successfully expanded its membership from 28 participants (representing 43 WTO members and states and separate customs territories in the process of acceding to the WTO) to 47 participants (representing 74 WTO members). Several countries are expected to join in 2012.[2] Similarly, the ITA Committee agreed, as part of its work programme on NTBs, on a set of guidelines for electromagnetic compatibility and electromagnetic interference conformity assessment procedures (EMC/EMI guidelines). In spite of the progress made in these areas, participants have faced a stalemate on other issues, including the expansion of the product coverage (also known as the ITA II), and on narrowing down the divergences in the classification of Attachment B products. This chapter summarizes the main developments since 1997.

B. Implementing the ITA

The ITA participants periodically review the status of ITA implementation. This serves two primary functions: firstly, to ensure that tariff reduction and elimination concessions have been carried out as foreseen in the Agreement, as provided by paragraphs 1 and 2 of the Annex to the ITA (see Box 2.1); and secondly, to serve as a forum for participants to discuss the undertakings set out in the Agreement, as detailed in paragraph 7 (see Box 2.2).

Box 2.1. Paragraphs 1 and 2 of the Annex to the ITA

Each participant shall incorporate the measures described in the paragraph 2 of the Declaration into its schedule to the General Agreement on Tariffs and Trade 1994 and, in addition, at either its own tariff line level or the Harmonized System (1996) ("HS") 6-digit level in either its official tariff or any other published versions of the tariff schedule, whichever is ordinarily used by importers and exporters.

Paragraph 1.

To this end, as early as possible and no later than 1 March 1997 each participant shall provide all other participants a document containing (a) the details concerning how the appropriate duty treatment will be provided in its WTO schedule of concessions, and (b) a list of the detailed HS headings involved for products specified in Attachment B. These documents will be reviewed and approved on a consensus basis […]

Paragraph 2.

Box 2.2. Paragraph 7 of the Annex to the ITA

Each participant shall afford sympathetic consideration to any request for consultation from any other participant concerning the undertakings set out above. Such consultations shall be without prejudice to rights and obligations under the WTO Agreement.

Paragraph 7.

Reviews are conducted regularly, based on a document prepared by the Secretariat (WTO document G/IT/1 and its revisions) which provides information on the level of implementation, including domestic ratification requirements and procedures followed for each participant's ITA schedule of concessions. It also indicates whether a participant's ITA schedule has been submitted as a modification to its WTO schedule, in accordance with the Decision of 26 March 1980 on Procedures for Modification and Rectification of Schedules of Tariff Concessions (BISD 27S/25). The main objective is to ensure that the implementation of all tariff concessions related to IT products has been carried out as foreseen in the Agreement.

The ITA Committee also serves as a forum for participants to hold consultations to help resolve their differences. There have been several instances where the ITA Committee's work has resulted in a positive resolution when specific trade concerns have been raised. For example, in 2000 several delegations, including the European Union and the United States, were concerned by Thailand's requirement to provide a "certificate of origin" for the importation of certain IT products. The European Union and the United States considered that this certificate was inconsistent with the ITA. Following formal and informal consultations, Thailand eventually rescinded this requirement.

Another example involved concerns by Japan in 2005 over Indonesia and Thailand levying duties on digital cameras with video recording capability. After several rounds of discussions in the ITA Committee, as well as many rounds of bilateral consultations, both Indonesia and Thailand agreed to eliminate duties on those products. In another instance, the United States consulted with Chinese Taipei in 2005 on the alleged reclassification of thermistors – a type of resistor whose resistance varies significantly with temperature. Following a ruling on the matter by the World Customs Organization (WCO), many rounds of bilateral negotiations and ITA Committee discussions, Chinese Taipei eventually recognized that this product was covered by the Agreement and provided it with duty-free treatment.[3]

However, the ITA Committee was not able to solve all specific trade concerns raised. The United States expressed a concern with what, in its opinion, was the danger of certain IT products "no longer receiving the tariff treatment provided by the ITA" in the European Union – in

Box 2.3. The ITA and the WTO's Dispute Settlement Understanding

The ITA is not itself a "covered agreement" of Appendix 1 to the Understanding on Rules and Procedures Governing the Settlement of Disputes (DSU). However, paragraph 2 of the ITA provides that:

Pursuant to the modalities set forth in the Annex to this Declaration, each party shall bind and eliminate customs duties and other duties and charges of any kind, within the meaning of Article II:1(b) of the General Agreement on Tariffs and Trade 1994, with respect to the following:

- *(a) all products classified (or classifiable) with Harmonized System (1996) ("HS") headings listed in Attachment A to the Annex to this Declaration; and*
- *(b) all products specified in Attachment B to the Annex to this Declaration, whether or not they are included in Attachment A;*

through equal rate reductions of customs duties beginning in 1997 and concluding in 2000, recognizing that extended staging of reductions and, before implementation, expansion of product coverage may be necessary in limited circumstances.

Paragraph 2 of the Annex provides that participant's WTO schedules of concessions should be amended following the Decision of 26 March 1980 on Procedures for Modification and Rectification of Schedules of Tariff Concessions (BISD 27S/25). Thus, commitments made by the ITA participants that are WTO members are part of the schedules that are annexed to the GATT. Therefore, the individual ITA concessions of each participant are enforceable under the WTO's DSU.

spite of being covered in Attachments A and B of the Agreement.[4] Subsequently, Japan, Chinese Taipei and the United States raised concerns in the ITA Committee over certain EU measures which they considered were limiting duty-free treatment for three categories of IT products. These participants were unable to bridge their differences and the discussions eventually led to a formal dispute under the WTO Dispute Settlement Understanding (DSU) (see Box 2.3 for information on the DSU and Box 2.4 for details on the dispute).

Box 2.4. EC – IT products[1] (DS375, 376, 377)

Parties		Agreement	Timeline of the dispute		Measure at issue	Products at issue
Compl.	Resp.	GATT Arts. II:1(a), II:1(b), X:1 and X:2	Est. of Panel	23/09/2008	Various EU measures pertaining to the tariff classification, and consequent tariff treatment, of certain IT products	**Flat-panel display devices (FPDs)**, including those with digital DVI connectors that are capable of connecting to computers and other equipment **Set-top boxes which have a communication function (STBCs)**, including those that access the internet and have recording capabilities **Multifunctional digital machines (MFMs)**, capable of printing, scanning, copying and faxing
			Circulation of Panel Report	16/08/2010		
Japan, Chinese Taipei, US	EU		Circulation of AB Report	NA		
			Adoption	21/09/2010		

Summary of key panel findings[2]

The ITA: The European Union had committed in its WTO schedule to provide duty-free treatment to certain IT products pursuant to the ITA. The products receiving duty-free treatment were indicated in the ITA in two ways: as HS1996 headings and in "narrative description" form.

FPDs: The panel found that the measures at issue were inconsistent with GATT Arts. II:1(a) and II:1(b) because they required EU member states to classify some FPDs under dutiable headings, although such products fell within the scope of the "narrative description" and/or within the scope of the CN code 8471 60 90 (which pertains to "input or output units" of "automatic data-processing machines" (ADP), both of which were duty-free in the EU WTO schedule pursuant to EU implementation of the ITA.[3]

STBCs: The panel found that the measures at issue were inconsistent with GATT Arts. II:1(a) and II:1(b) because they required EU member states to classify some STBCs under dutiable headings – although such products fell within the scope of the duty-free commitment in the "narrative description" included in the EU schedule pursuant to EU implementation of the ITA.[4]

MFMs: The panel found that the measures at issue were inconsistent with GATT Arts. II:1(a) and II:1(b) because they required EU member states to classify under dutiable headings certain MFMs that work with ADP machines and certain MFMs that do not work with ADP machines, although such products fell, respectively, within HS1996 subheadings 8471 60 (for "input or output units" of ADP machines) and 8517 21 (for "facsimiles"), both of which are duty-free in the EU WTO schedule pursuant to EU implementation of the ITA. The panel found that the type of technology MFMs use to make "copies" is not photocopying and, as such, the products could never fall within the dutiable heading under which the European Union was classifying these products (HS1996 subheadings 9009 12).

GATT Art. X: The panel found that the European Union failed to publish promptly the explanatory notes related to the classification of certain STBCs, so as to enable governments and traders to become acquainted with them, inconsistently with GATT Art. X:1.

GATT Art. X:2: The panel also found that the European Union had acted inconsistently with GATT Art. X:2 by enforcing the explanatory notes before its official publication.

Source: WTO, forthcoming, *WTO One-Page Case Summaries*, 2012 Edition.

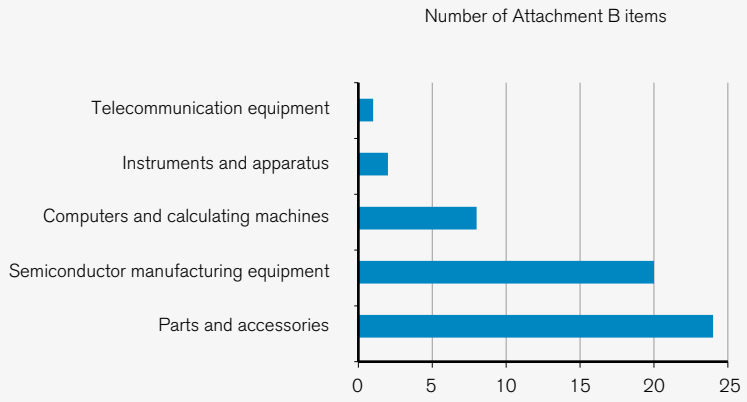
Notes: [1]*European Communities and its member States – Tariff Treatment of Certain Information Technology Products.* [2]Other issues addressed in this case include: co-complainants as third parties; acceptance of requests to be a third party after the panel composition; status of EC member States as respondents. [3]However, the Panel found that the measures were not inconsistent with Art. II:1 (b) in light of a duty suspension in place for certain LCD display devices. However, for those products falling within the scope of the two concessions that are not covered by the duty suspension, the Panel found that the duty suspension did not eliminate the inconsistency with Art. II:1 (b) and, therefore, this dutiable treatment that was extended to those products was considered inconsistent with Art. II:1 (b). [4]In particular, this includes set-top boxes incorporating a device performing a recording or reproducing function but retaining the essential character of a set-top box, and set-top boxes utilizing ISDN, WLAN or Ethernet technology. The panel found that the United States did not establish a prima facie case for its claim that the products at issue fell within the scope of concessions pursuant to certain tariff lines (8517 50 90, 8517 80 90, 8525 20 99 and 8528 12 91) listed in the EC schedule.

C. Divergences in classification

As described earlier, the WTO schedules of ITA participants diverged in the classification of 55 "Attachment B" items: 13 that were listed "in" Attachment B and 42 labelled "for Attachment B" in Section 2 of Attachment A of the ITA. Mindful of this situation, participants agreed that the ITA Committee would meet as often as necessary to agree on, where appropriate, a common classification for those products and, if necessary, to take appropriate action at the WCO. As required by paragraph 5 of the Annex to the ITA, the ITA Committee made considerable progress in narrowing down several classification divergences, but no formal decision has been taken to date (see Box 2.5). The bulk of the divergences in the classification of the Attachment B items relate to parts and accessories of semiconductor manufacturing equipment (44 per cent), semiconductor manufacturing equipment (36 per cent) and computers (15 per cent) (see Figure 2.1).

Participants began the technical work in 1997 based on a note by the Secretariat, which provided an overview of those divergences.[5] A group of participants' customs experts met informally between 1999 and 2000 to progress as much as possible at the technical level. This group produced a report identifying one or more possible HS classifications for each of the 55 Attachment B items,[6] and was subsequently used by the Secretariat in 2001 to prepare a report that divided the items into four lists, depending on the outcome of the technical discussions.[7] Progress was made until December 2004, when the last of such reports was prepared, classifying the items into five lists (see Figure 2.2). This included, for example, the identification of four relevant HS1996 subheadings concerning "computers" (see Box 2.6). The ITA Committee also agreed in 2004, on an *ad referendum* basis, to endorse lists I (A) and I (B).[8] However, a formal decision was not adopted in this respect.

Figure 2.1. Number of Attachment B items by product category



Source: WTO Secretariat.

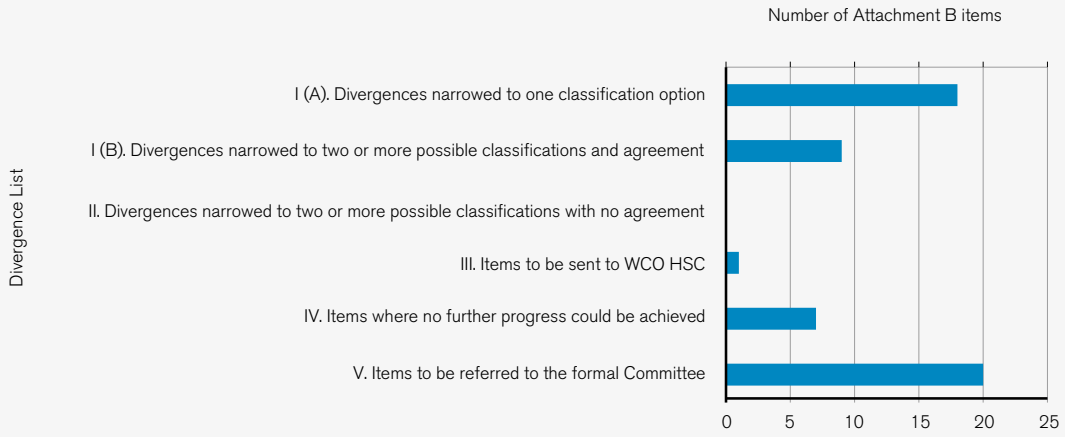
Notes: See Appendix 1. Most of the items relating to "parts and accessories" are parts and accessories of semiconductor manufacturing equipment.

Box 2.5. Paragraph 5 of the Annex to the ITA

Participants shall meet as often as necessary [...] to consider any divergence among them in classifying information technology products, beginning with the products specified in Attachment B. Participants agree on the common objective of achieving, where appropriate, a common classification for these products within existing HS nomenclature, giving consideration to interpretations and rulings of the Customs Co-operation Council (also known as the World Customs Organization or "WCO"). In any instance in which a divergence in classification remains, participants will consider whether a joint suggestion could be made to the WCO with regard to updating existing HS nomenclature or resolving divergence in interpretation of the HS nomenclature.

Paragraph 5.

Figure 2.2. Classification divergences as of 20 December 2004



Source: WTO Secretariat, based on WTO document G/IT/W/6/Rev.3.

Participants referred to the Harmonized System Committee (HSC) of the WCO for the classification of a number of products, including that of "set-top boxes which have a communication function". Customs experts of participants had identified four HS1996 subheadings that they considered relevant: 8517.50, 8525.10, 8525.20 and 8528.12. In September 2005, the HSC decided that these set-top boxes should be classified as a "reception apparatus for television" under HS1996 subheading 8528.12.[9] Shortly after, the HSC decided the same set-top boxes would be classifiable in HS2007 subheading 8528.71.[10]

In 2006, Japan submitted a proposal seeking progress on narrowing down the divergences of classification.[11] However, the European Union considered that the proposal was an "indirect expansion of the ITA" and reminded other participants that the ITA II "was not dead".[12]

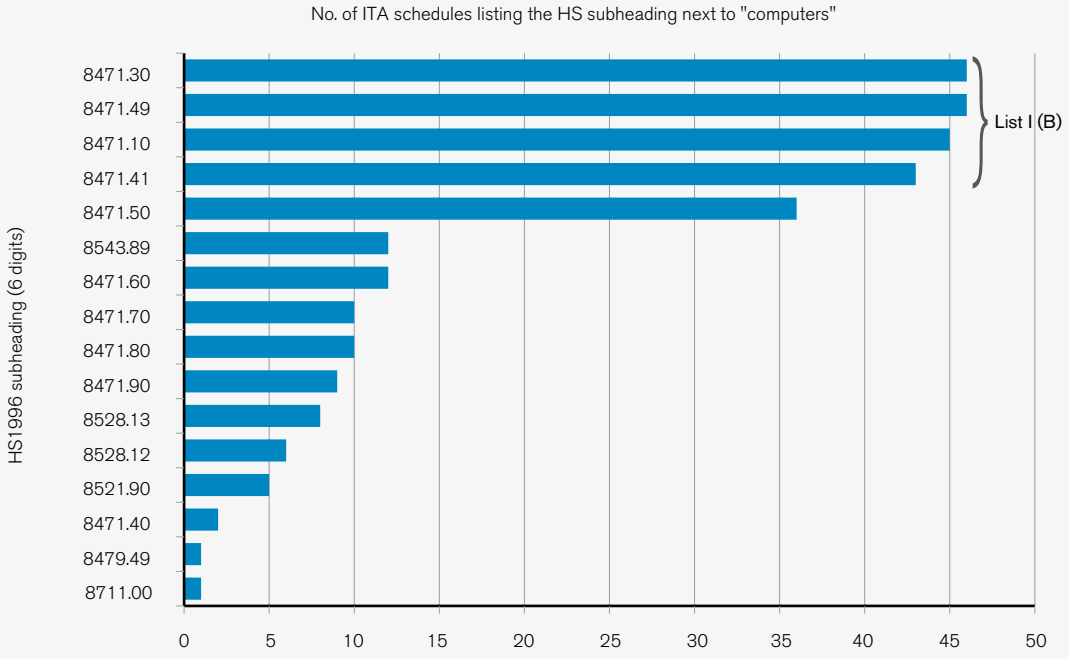
In February 2009, after several years of impasse, the chairman of the ITA Committee reignited the discussions by presenting a list of options on classification divergences. Participants agreed that the work should commence with the "easy items first", i.e. with list I (A) which included those items where divergences had been narrowed to one classification option. At the meeting on 30 October 2008, the ITA Committee agreed that the chairman would circulate an "options paper" asking participants who had not been involved in the previous technical discussions to confirm the classification options in list I (A).[13] On 11 October 2011, the chairman circulated a draft decision that would have the effect of formally endorsing the HS1996 classification of those 18 Attachment B items and requiring participants to amend their WTO schedules of concessions accordingly.[14] The adoption of the decision was complicated by the fact that 16 of the HS1996 subheadings involved were affected by the introduction of HS2007. A formal decision has yet to be taken.

Box 2.6. What is a computer and where should it be classified in the HS?

Computers are defined in Attachment B of the Annex to the ITA as "automatic data-processing machines" (ADPs) capable of performing certain specific functions. This definition is very similar, but not identical, to that used by HS1996 in Note 5(A) of Chapter 84 to define ADPs in general. The ITA definition covers ADPs able to receive and process telephony signals, television signals or other analogue or digitally processed audio or video signals. Certain ADPs are not covered, including machines that perform a specific function other than data processing (e.g. game consoles) or ADPs that are incorporated or work in conjunction with products not covered by the ITA.

ITA participants diverged considerably in how they classified some of these products, which is evident from the tariff codes listed in the Attachment B section of their WTO schedules. While there is near consensus on the relevance of HS1996 heading 84.71 (which relates to ADPs in general, its units, and other related machines), several other HS subheadings were listed by participants in their schedules. These include subheadings 8543.89 (other electrical machines and apparatus) and 8528.13 and 8528.12, where reception apparatus for televisions is classified. The ITA Committee narrowed down the classification options to four HS1996 subheadings (8471.10, 8471.30, 8471.41 and 8471.49), but a formal agreement has not been reached (see WTO document G/IT/W/6/Rev.3, List I (B)).

Questions have been raised with the arrival of new products to the market. For example, the HSC began discussing the classification of the machines commercially referred to as tablet computers in 2011. See WCO, *Agenda for the 48th Session of the Harmonized System Committee, 2011.*



Source: WTO Secretariat, based on 47 schedules of concessions of ITA participants. The EU-27 was counted as one, as well as Switzerland (including Liechtenstein).

D. Review of product coverage: ITA II

The beginning of the first sentence of paragraph 3 of the Annex to the ITA requires the participants to "meet periodically" to review the product coverage specified in the Agreement (see Box 2.7). This would allow the Agreement to adapt to an environment of intense technological development, which often led to "new" products where the HS classification was sometimes unclear.[15] In other words, it was envisaged as an indispensable tool to keep up with industry. Given that discussions began immediately after the implementation of the Agreement, it was not surprising that most of the problems that had complicated the original ITA negotiations quickly resurfaced.

In March 1997, at the same time they decided to implement the ITA, participants agreed on procedures for consultations and review of the product coverage. Participants were asked to submit "lists" of products between 1 October and 31 December 1997, to consult between 1 January and 31 March 1998, and to conclude by 30 June 1998. The main goal was to "establish a revised list of products with respect to which participants would bind and eliminate customs duties and other duties and charges", "replace Attachment A or B" in the ITA, and modify participants' WTO schedules accordingly.[16]

The discussions that ensued are often referred to as the ITA II negotiations. While some participants, such as Switzerland, re-submitted the proposals they had previously tabled during the technical discussions of January 1997, others consulted with their domestic industries to propose the inclusion of new products. For example, as part of its initiative on "e-commerce", the United States had an interest in ensuring that full coverage was provided for products and technologies used to access the internet. The ITA II negotiations began soon after the original negotiations and, not surprisingly, old issues, such as disagreements involving certain photocopiers, resurfaced. Both the European Union and Japan proposed the inclusion of "electrostatic photocopying apparatus, operating by reproducing the original image via intermediate onto the copy (indirect process)".[17] The European Union also proposed to include digital duplicating machines and parts thereof, as well as optical units for photocopying apparatus.

Fourteen product lists had been submitted by February 1998,[18] which were summarized, compiled and classified by the Secretariat into five categories: (1) Attachment A, Section 1 items; (2) Attachment A, Section 2 items; (3) Attachment B items; (4) Clarifications on classification; and (5) Other proposals or issues.[19] See Box 2.8 for a summary of the scope and types of products contained in these proposals. The ITA II negotiations took place mostly in informal sessions where proposals could be discussed in a more frank and candid environment. They began with technical issues, such as clarification of proposals that overlapped with the existing product coverage of the Agreement, the HS classification of particular items, and even the manner in which certain product descriptions should be drafted when included in the new version of the Agreement.[20]

By June 1998, the chairman of the ITA Committee, Mr Martin Harvey, of New Zealand, had a clearer picture of where sensitivities lay and where consensus was emerging. The main obstacles were not only technical elements, but also broad policy questions – such as what should be considered an IT product. Hong Kong (China), Malaysia and Singapore considered that consumer electronic products should be included in the ITA II and even established an informal group called the Friends of Consumer Electronics. Other participants, in particular the European Union, with the support of certain East European countries and India, opposed this idea. Finally, some participants had problems with some of the specific products being proposed

Box 2.7. Paragraph 3 of the Annex to the ITA: first part

Participants shall meet periodically under the auspices of the Council on Trade in Goods to review the product coverage specified in the Attachments, with a view to agreeing, by consensus, whether in the light of technological developments, experience in applying the tariff concessions, or changes to the HS nomenclature, the Attachments should be modified to incorporate additional products [...]

Paragraph 3.

Box 2.8. The ITA II proposals: a summary

The *scope* of proposals received was varied and comprised both general statements and proposals for the inclusion of specific products. While some participants proposed long lists of products, others only envisaged the inclusion of a few products. Some participants proposed to negotiate a number of other issues including, *inter alia*: achieving a faster elimination of tariffs for certain products currently covered by the ITA; the elimination of nuisance tariffs; the examination of certain divergences in classification; the review of ITA implementation; increasing participation in the Agreement; expansion to other high-tech sectors, such as medical equipment; NTBs; the inclusion of a more diverse set of products; and the staging of new cuts.

In terms of the *product coverage*, proposals were diverse and included products such as: (1) equipment for the manufacturing of: printed circuit/wiring boards, flat-panel display devices, and capacitors; (2) additional assembly and testing equipment; (3) additional manufacturing and testing equipment; (4) parts of products already included in the ITA, but which were not themselves covered by the Agreement; and (5) a variety of other miscellaneous products. The latter included products such as:

- aerials and aerial reflectors
- air-traffic systems
- banking and ticketing machines
- coaxial cables
- colour television receivers
- data/graphic display tubes
- digitizers
- duplicating machines
- electric amplifiers
- electric fuses
- electrical transformers
- forging machines
- headphones
- klystrons
- loudspeakers
- magnetrons
- metal milling or sawing machines
- microphones
- microtomes
- navigation positioning systems
- optical amplifiers
- optical fibres
- optical scanners
- oscilloscopes
- paging alert devices
- photocopying apparatus
- power supplies
- primary cells and primary batteries
- projection type FPDs
- radar apparatus
- radio-broadcast receivers
- radio cassette players
- receiver or amplifier valves
- record players
- recorded magnetic media
- relays
- simulator systems
- spacecraft
- tape recorders
- TV camera tubes
- TV picture tubes
- TV surveillance cameras
- vessel traffic systems
- video monitors
- video projectors
- video recorders

Source: WTO Secretariat, based on WTO documents G/IT/SPEC/1-14.

for liberalization under the ITA umbrella because they were considered "sensitive". Although significant differences of opinion remained in some of these areas, practically all participants were supportive of the ITA II process (see Box 2.9).[21]

In an effort to overcome the impasse generated by these issues, the chairman circulated a text that attempted to craft a package with products that, in his opinion, could reach consensus. However, the text did not achieve its goal. While some participants considered that the proposal did not contain the necessary products, others were not happy with the inclusion of products sensitive to them. Furthermore, some participants opposed the general approach of discussion based on a chairman's text.

Several issues prevented a consensus being reached in June 1998. Firstly, the European Union and the United States struggled to find consensus on several products, such as fibre optics and computer monitors but most notably photocopiers. The European Union wanted to include them as part of the core package, but the United States considered them extremely sensitive. The second issue involved Malaysia's demands for the inclusion of consumer electronics such as colour television picture tubes and DVDs. Without the inclusion of these products, Malaysia threatened to exclude printed circuit boards, which was of concern to some major players.[22] Thirdly, although the Friends of Consumer Electronics eventually lowered their demands, other participants – the European Union and India in particular – were not ready to accept the inclusion of what they considered a very large number of these products. Finally, the chairman noted that participants needed to think about ways to include extended phasing out sought by certain developing country participants – India – as opposed to the four equal cuts as originally proposed.[23]

Box 2.9. Timeline for ITA II negotiations, 1998	
Month	**Events**
February	Fourteen product lists submitted.
March	Formal and informal negotiations begin.
June	Chairman of the ITA Committee submits a "Chairman's text" but no consensus found.
June	Deadline missed and reset for November.
June-November	Negotiations continue with difficulties.
November	A package was proposed by the chairman, but it did not obtain consensus.
December	Of the 44 participants, 35 were willing to accept the proposed package. It was not formally adopted.

Box 2.10. Main obstacles for a deal in 1998	
The European Union and the United States struggled to find consensus on the inclusion of a number of products, notably photocopiers and fibre optics. (The European Union and the United States did agree to a proposed package of products in late 1998).	Malaysia sought the inclusion of certain consumer electronic products, such as DVDs. Without them, it opposed the inclusion of "printed circuit boards" which was of concern to major players.
The European Union, India and others were opposed to including consumer electronic items, which were being pushed by the Friends of Consumer Electronics coalition.	India opposed the inclusion of certain radar and navigation equipment to the package which was requested by major players.

Source: Inside U.S. Trade, *India and Malaysia Thwart Emerging Consensus in ITA II Negotiations*, 18 February 1998.

After missing the June 1998 deadline, participants continued to engage for an additional month, but without success.[24] Steps forward were continually met with new hurdles (see Box 2.10). For example, when the European Union and the United States announced a way forward on photocopiers, a new issue concerning products with "radar and navigation" capabilities arose, with major opposition from India.[25] Formal and informal consultations continued through late 1998, which led to a new package on 19 November 1998. After much discussion, this package included consensus between the European Union and United States on a list of products for expansion; although smaller than some had originally envisaged.[26] At the ITA Committee meeting of 11 December 1998, its then recently appointed chairman, Ambassador Ronald Saborío Soto of Costa Rica, noted that 35 of 44 participants were able to agree to the November package,[27] that India and Malaysia could not accept it as proposed, and that El Salvador and the Philippines required more time for consideration.[28] Other delegations not agreeing to the package did not state their reason.

The ITA Committee revisited the issue in February 1999, but disagreements had reached a point where no delegation took the floor on the matter. While informal discussions continued, profound differences arose with respect to the status of the ITA II. Since then, the chairman of the ITA Committee has encouraged participants to continue their efforts on the issue which, from a formal point of view, remains under consultation, but major steps forward have yet to be taken.[29]

It should be noted that the conditions for the ITA II were markedly different from its predecessor, in particular with respect to political realities and support by industry, which made striking a bargain more difficult.[30] The European Centre for International Political Economy (ECIPE) observes that successful plurilateral agreements delinked from trade rounds have been driven by the private sector. For example, progress has been made in the Pharmaceutical Understanding, where four product reviews were completed in essentially the same period of time, which may be a result of the degree of involvement and smaller number of private stakeholders.[31]

Although ITA II negotiations stalled at the end of 1998, the efforts to expand product coverage under the ITA have never stopped. In September 2008, the European Union proposed to conduct a review of the ITA and calling for negotiations on NTBs, product coverage, the establishment of mechanisms to keep the ITA up to date with technological development, and the enlargement of the ITA membership.[32] A number of delegations sought further clarifications on the scope and time-frame of the review, the linkage with the dispute settlement panel – which had then been established – on three IT products, and the relationship between the review and the Non-Agricultural Market Access sectorial negotiations on electronics. Singapore, on behalf of the Association of Southeast Asian Nations, circulated a list of questions on the proposal and requested the European Union to clarify them.[33] There was no discussion of this issue in the ITA Committee for two years due to the dispute between the European Union and Japan/Chinese Taipei/the United States, but the issue was once again under discussion in 2011.

On 6 May 2011, the United States Trade Representative (USTR) published a notice in the Federal Register inviting public comments on possible negotiations in the WTO to expand the ITA, including the enlargement of its product coverage. Twenty-one associations, councils and industry leaders representing a large portion of the global IT industry responded unanimously supporting the idea of expanding product coverage.[34]

In November 2011, at the 19th APEC Economic Leaders' Meeting, which took place in Honolulu, Hawaii, and was supported by over 40 IT industry associations from around the world, the leaders of the 21 APEC economies agreed to "play a leadership role in launching negotiations to expand the product coverage and membership of the WTO Information Technology Agreement, in order to build on the contribution this Agreement has made to promoting trade and investment and driving innovation in APEC economies."[35]

At the World Electronics Forum (WEF) in January 2012, members of the global high-tech industry and consumer associations called for the immediate expansion of the ITA's product coverage. They also considered that: "The ITA is one of the most commercially significant and successful trade agreements of the World Trade Organization (WTO)."[36] They also noted their strong support for the expansion of the Agreement and committed to working with their respective governments and the global information and communications technology (ICT) industry to achieve this goal.

On 23 February 2012, DIGITALEUROPE also called for an expansion of the Agreement: "the ITA needs to be expanded to keep pace with technological change and help eliminate uncertainty that arises as convergence in the ICT industry continues to advance. It is DIGITALEUROPE's firm belief that all ITA signatories should place a top priority on commencing negotiations to expand the ITA, which would contribute significantly towards stimulating the world economy."[37]

E. Programme for reducing NTBs on IT products

The end of the first sentence of paragraph 3 of the Annex to the ITA recognizes that tackling NTBs on IT products is also an important component of the Agreement (see Box 2.11). Indeed, because tariffs on IT products have been fully eliminated by participants, NTBs could constitute the most important barriers to trade in these products. The main challenge of the ITA Committee's work in this area is how to allow participants to achieve their legitimate public policy objectives, such as protecting their consumers and the environment, in a manner that it is not more trade restrictive than necessary and that facilitates trade in IT products. Pursuant to its mandate, the ITA

Box 2.11. Paragraph 3 of the Annex to the ITA: second part

Participants shall meet periodically […] to consult on non-tariff barriers to trade in information technology products.

Paragraph 3.

Box 2.12. Understanding EMI and EMC

Electromagnetic interference (EMI), also known as radio frequency inferences, is the disruption of a device's signal due to the crowding of signal space by other electromagnetic signals. Excess electromagnetic energy causes adverse effects for surrounding devices. The signal interference can range from simple (e.g. static noise emitted from speakers when a cell phone is too close) to severe when obstruction degrades the performance of an important circuit or when intentionally used as a type of electronic warfare (e.g. radio wave jamming).

Nearly every electrical device is subject to and causes EMI. Devices that transmit signals also tend to emit side bands of other wavelengths that may cause interference. Advances in technology such as spread spectrum techniques and ultra-wideband have led to the improvements of device selectivity of wavelengths reducing EMI, but interferences remain.

Electromagnetic compatibility (EMC) ensures that devices can operate simultaneously. It describes the ability of any electrical or electronic system or device to operate in a disturbing electromagnetic environment while itself not disturbing the operation of other devices.

EMC focuses on two issues: emission and susceptibility or immunity. It ensures that devices are equipped with enough "immunity" in order to avoid EMI from surrounding devices, meaning that emissions from a device must be at a level that does not seriously disturb neighbouring equipment. A device's emission level is determined by a variety of standard setting bodies. A device that does not emit intolerable levels of EMI and has relative "immunity" surrounding EMI producing devices is EMC.

Source: WTO Secretariat, adapted from WTO document G/IT/22; TÜV SÜD Product Service.

Committee continually searches for projects to eliminate and reduce NTBs. One of the most tangible results in this area was the adoption of the EMC/EMI guidelines on conformity assessment for IT products. This section explains the types of NTBs that have been discussed and – in particular – the manner in which the EMC/EMI guidelines were developed (see Box 2.12).

At the first formal meeting of the ITA Committee, in 1997, some participants noted that further information on a number of NTBs was necessary. For example, the United States wanted information on the application of two specific standards, the European Union wished to better understand the conformity assessment procedures used by participants and Canada considered that certain import-licensing procedures could pose a problem.[38] Most participants believed that NTBs could reduce the benefits of the ITA through delays, additional paperwork and costs, as well as other administrative hurdles.

Because most of the efforts in 1997 were devoted to the review of the product coverage, it was not until 1998 that the ITA Committee began to look more seriously at NTBs. The basic idea was to conduct a series of surveys in order to compile information on issues such as specific technical regulations, national safety standards, conformity assessment criteria, import licensing requirements, customs procedures and international standards that were applied to trade in IT products.[39] Twenty-five participants responded to the first survey,[40] which can be summarized as follows: (1) with respect to electromagnetic interference, 16 participants indicated they had mandatory requirements and 15 of them were harmonized with CISPR 22[41]; (2) with respect to electrical safety of IT equipment, 17 participants indicated they had mandatory requirements and 15 of them were harmonized with IEC 950[42]; and (3) responses to the question on conformity assessment were quite varied: about half of the participants indicated they had some type of supplier's declaration of conformity (SDoC) and the other half involved third-party certification.

In February 1999, the Australian delegation argued that the ITA offered a special opportunity to establish a set of disciplines covering non-tariff measures (NTMs), which would secure a genuinely liberalizing outcome and proposed a work programme. Australia believed that the ITA Committee was the appropriate body to develop a framework and a set of principles on which progress could be made in a range of international bodies.[43] This proposal led to the adoption in November 2000 of a three-phase work programme on NTMs.[44] The first phase involved the identification of NTMs affecting trade in IT products, as identified in the submissions by the participants. Phase two consisted of an analysis of those NTMs, including the economic impact of the specific ones identified. In phase three, the ITA Committee would draw conclusions and perhaps make decisions on the outcome of the NTM work programme. As part of the identification phase, at least 11 submissions were made, encompassing a range of NTMs.

Box 2.13. Types of conformity assessment on EMC/EMI notified to the ITA Committee

EMC type	Conformity assessment type	Number of participants that notified using the type	WTO members using the assessment type
A	**Certification by a regulator or delegated entity** – the equipment has to be submitted to the regulator or its delegated entity for certification.	4	Republic of Korea, Macao (China), Peru, Chinese Taipei
B	**Certification by a third party** – the equipment has to be submitted to certification bodies recognized (or approved) by the regulator for certification.	6	China, Costa Rica, Honduras, India, Mauritius, Singapore
C	**SDoC type 1** – the supplier or manufacturer declares the equipment meets requirements. A testing laboratory recognized by the regulator tests the equipment and the supplier registers this equipment with the regulator.	1	Jordan
D	**SDoC type 2** – the supplier or manufacturer declares the equipment meets requirements on the basis of test reports by a testing laboratory recognized by the regulator. No registration of the equipment with the regulator is required.	3	Japan, Switzerland, United States
E	**SDoC type 3** – the supplier or manufacturer declares the equipment meets requirements. The supplier registers the equipment with the regulator. Testing of the equipment by a recognized testing laboratory is not mandatory and additional laboratory testing choice rests with the supplier or manufacturer.	0	–
F	**SDoC type 4** – the supplier or manufacturer declares the equipment meets requirements. Registration with the regulator is not required and testing of the equipment by a recognized testing laboratory is not mandatory and additional laboratory testing choice rests with the supplier or manufacturer.	9	Australia, Canada, Croatia, Dominican Republic, El Salvador, European Union, New Zealand, Norway, Turkey
G	No mandatory assessment procedure.	4	Hong Kong (China), Malaysia, Philippines, Thailand

Source: WTO document G/IT/W/17/Rev.7.

Notes: SDoC stands for supplier's declaration of conformity.

Although the majority fell within the standards and the conformity assessment areas, others related to customs procedures, import licensing and other issues.[45]

In January 2002, Canada proposed to launch a "pilot project" on conformity assessment of EMC as part of the third phase of the work programme.[46] This proposal received considerable support from others, but India and others considered that the pilot project should also include conformity assessment of EMI (see Box 2.13). The ITA Committee eventually agreed to launch a pilot project on both of them, which included a new survey.[47]

In April 2003, a workshop was organized by the ITA Committee to better understand the trade policy aspects of EMC/EMI and to allow participants' regulators to analyse and determine collectively a set of optimum regulatory approaches to further facilitating market access for IT products. In February 2005, Canada proposed to move forward by developing a set of "guidelines".[48] The ITA Committee approved a modified version in the Guidelines for EMC/EMI Conformity Assessment Procedures,[49] which are voluntary. They apply to all IT products and components, except for wireless telecommunication equipment, and aim to make conformity assessment procedures more consistent, transparent and simple. Based on responses received from more than

26 participants, the secretariat prepared a draft list of six types of EMC/EMI conformity assessment procedures that were being used in practice by participants (see Box 2.13).[50]

Since the guidelines were adopted, participants have held conflicting views on which NTBs should be dealt with next. The European Union has proposed confronting issues such as non-recognition of international standards, lack of transparency and openness in domestic standardization processes, and unnecessarily burdensome and duplicative conformity assessment procedures.[51] Another aspect that influenced the ITA Committee were discussions in the Negotiating Group on Market Access for Non-Agricultural Products on proposals concerning electronic products discussed in the context of the Doha Development Agenda.[52] Additionally, in 2011, the European Union proposed that the ITA Committee examine a number of NTBs, including manufacturing services, IT consultancy and services, and telecom services.[53] While discussions on how to move forward are on-going, the ITA Committee has yet to decide on how to proceed.

F. Encouraging greater participation in the ITA

Paragraph 8 of the Annex to the ITA encourages greater participation in the Agreement (see Box 2.14). Efforts to attract more involvement resulted in participation increasing from the 28 original participants (representing 43 WTO members and states or separate customs territories in the process of acceding to the WTO) to 47 participants (representing 74 WTO members) by the end of March 2012 (counting EU-27 member states individually). At the time of publication, Colombia had just joined the Agreement, and Montenegro, the Russian Federation and Serbia were also expected to do so. What have been the drivers for such a considerable growth in the number of participants? Besides those WTO members that joined the ITA on their own initiative, this section explains the manner in which procedures to join the WTO, bilateral free-trade agreement negotiations by the United States and two EU enlargements have all contributed in this respect.[54]

WTO members that joined the ITA had to modify their WTO schedules of concessions accordingly. The ITA also provided that states or separate customs territories in the process of acceding to the WTO could become participants, even before joining the WTO as members. For example, Estonia and Chinese Taipei were original participants of the ITA before acceding to the WTO in 1999 and 2001, respectively. Besides these two members and those that have joined the European Union since 1997, ten participants have joined the ITA upon their accession to the WTO – including major players in the IT sector such as China and Viet Nam. This has been mostly the result of a process where participants have encouraged those in the process of acceding to join the ITA as a part of their accession package (see Table 2.1).

Some recently acceded members have also undertaken commitments akin to those contained in the ITA, but without formally joining the Agreement.[55] For example, the former Yugoslav Republic of Macedonia even has an "Attachment B" section in the schedule annexed to its Protocol of Accession. In addition, although Montenegro and the Russian Federation did not join the ITA as part of the accession package that was approved in December 2011, their schedules include references to it.[56]

Box 2.14. Paragraph 8 of the Annex to the ITA

Participants acting under the auspices of the Council for Trade in Goods shall inform other Members of the WTO and States or separate customs territories in the process of acceding to the WTO of these modalities and initiate consultations with a view to facilitate their participation in the expansion of trade in information technology products on the basis of the Declaration.

Paragraph 8.

Table 2.1. ITA participants as of 31 March 2012

Original participants		Joined in 1998 or after	
Australia	Macao (China)	Albania[3]	Kyrgyz Republic[3]
Canada	Malaysia	Bahrain	Mauritius
Costa Rica	New Zealand	China[3]	Moldova[3]
El Salvador[1]	Norway	Colombia	Morocco[4]
Hong Kong (China)	Philippines	Croatia[3]	Nicaragua
Iceland	Singapore	Dominican Republic	Oman[3]
India	Switzerland[2]	Egypt	Panama
Indonesia	Chinese Taipei[3]	Georgia[3]	Peru
Israel	Thailand	Guatemala	Peru
Japan	Turkey	Honduras	Saudi Arabia, Kingdom of[3]
Korea, Rep. of	United States	Jordan[3]	United Arab Emirates
		Kuwait	Viet Nam[3]
European Union member states and participation in the ITA			
Original participants		**Joined in 1998 or after**	
EU-15		Individually	Through enlargement
Austria	Portugal	Bulgaria (EU-27)	Hungary (EU-25)
Belgium	Spain	Cyprus (EU-25)	Malta (EU-25)
Denmark	Sweden	Latvia (EU-25)[3]	
Finland	United Kingdom	Lithuania (EU-25)[3]	
France		Slovenia (EU-25)	
Germany	**Individually**		
Greece	Czech Republic		
Ireland	Estonia[3]		
Italy	Poland		
Luxembourg	Romania		
Netherlands	Slovak Republic		

Source: WTO Secretariat, based on WTO document G/IT/1 and its revisions, and WTO document G/L/160 plus addenda.

Notes: [1]Modifications proposed in WTO document G/MA/TAR/RS/45 and Add. 1 have not been certified. [2]Switzerland joined on behalf of the customs union of Switzerland and Liechtenstein. [3]Member incorporated the ITA commitments in the schedule annexed to its Protocols of Accession. [4]Member has not yet begun procedures to modify its WTO schedule of concessions.

Several WTO members have also joined the ITA, which can partly explained by a US policy that has systematically encouraged partners negotiating a free-trade agreement with the United States to also join the ITA.[57] These include, for example, the Dominican Republic, Guatemala, Honduras, Nicaragua and Panama. Besides the 15 EU member states at the time the ITA was negotiated, five countries that subsequently became part of the European Union joined the ITA as original participants in 1997. Following two EU enlargements, in 2004 (ten new members) and 2007 (two new members), the WTO schedules of the individual member states were withdrawn and replaced by the concessions of the European Communities. By virtue of the Treaty of Lisbon, the European Union replaced and succeeded the European Communities in the WTO as of 1 December 2009.[58] While some new EU member states were also ITA participants, others became participants through enlargement (see Table 2.1).

Endnotes

1 See WTO document G/L/160, paragraph 3.

2 Colombia recently became a participant in March 2012. Montenegro, the Russian Federation and Serbia are expected to join the ITA in the near future.

3 WTO documents G/IT/M/23, p. 2; G/IT/M/22, p. 2; and G/IT/M/44, p. 3.

4 WTO documents G/IT/W/26.

5 WTO document G/IT/2.

6 WTO documents G/IT/14 and G/IT/14/Rev.1.

7 WTO document G/IT/W/6.

8 WTO documents G/IT/M/40 paragraph 1.6; and G/IT/M/41, paragraph 4.13.

9 The formal text of the Classification Opinion was agreed during the 37th Session of the HSC (Annex O/21 to WCO document NC10592b).

10 WTO document G/IT/26/Add.1.

11 WTO document G/IT/W/25.

12 WTO document G/IT/M/47.

13 WTO document G/IT/M/50, paragraph 5.20.

14 WTO document G/IT/W/34.

15 See Wasecha L. and Schlanenhof M. (1998), "Information Technology Agreement (ITA): towards a new era of sectorial market liberalization in the WTO", *Aussenwirtschaft*, 53(1): 116.

16 WTO document G/L/160, p. 5.

17 WTO documents G/IT/SPEC/3 and G/IT/SPEC/7.

18 The proponents included participants such as Australia, Canada, the European Union, Hong Kong (China), Israel, Japan, Malaysia, Norway, the Philippines, Singapore, Switzerland, Chinese Taipei, Turkey and the United States. See WTO documents G/IT/SPEC/1-14.

19 WTO document G/IT/SPEC/15, Annex 5.

20 WTO document G/IT/M/7, p. 2.

21 WTO document G/IT/M/8, pp. 2-3.

22 Inside U.S. Trade, *Possible ITA II Deal Depends on Soften Malaysia Electronics Stance*, 16 October 1998.

23 Inside U.S. Trade, *ITA Expansion Talks Stalled by Dispute over Consumer Electronics*, 3 July 1998.

24 WTO document G/IT/M/11.

25 Inside U.S. Trade, *IT Expansion Talks Suspend as New Disputes Prevent Final Deal*, 24 July 1998.

26 Inside U.S. Trade, *Possible ITA II Deal Depends on Soften Malaysia Electronics Stance*, 16 October 1998.

27 Inside U.S. Trade, *ITA II Talks Postponed until February*, 15 December 1998.

28 WTO document G/IT/M/15, paragraph 1.32.

29 WTO document G/IT/M/18.

30 ECIPE (2008), "Trade in information technology goods: adapting the ITA to 21st century technological change", ECIPE Working Paper No. 6.

31 ECIPE, (2011), "Future-proofing world trade in technology: turning the WTO IT Agreement (ITA) into the International Digital Economy Agreement (IDEA)", ECIPE Working Paper No. 4.

32 WTO documents G/IT/W/28 and TN/MA/W/107.

33 WTO document JOB(08)/16.

34 Inside U.S. Trade, *New ITA Talks Would Face Challenge Of Building "Critical Mass" Of Support*, 16 June 2011.

35 APEC, "The Honolulu Declaration: Toward a Seamless Regional Economy", 19th APEC Economic Leaders' Meeting, Honolulu, Hawaii, 12-13 November 2011.

36 For a full list of the group, see WEF joint publication (2012), *Members of the World Electronics Forum call for Swift, Tariff-Eliminating Expansion of the Information Technology Agreement*, 2012 International Consumer Electronics Show.

37 DIGITALEUROPE, (2012), *DIGITALEUROPE Statement on Information Technology Agreement Expansion.*

38 WTO document G/IT/M/1, p. 7.

39 The survey on "standards" was circulated in G/IT/4.

40 WTO document G/IT/SPEC/Q1/25.

41 CISPR 22 is a standard on electromagnetic interference set by the Special International Committee on Radio Interference (Comité International Spécial des Perturbations Radioélectriques).

42 IEC 950 is a standard on electrical safety by the International Electrotechnical Commission.

43 WTO document G/IT/M/16, p. 4.

44 WTO document G/IT/19.

45 WTO document G/IT/SPEC/Q2/11/Rev.1.

46 WTO document G/IT/M/29, p. 3.

47 WTO document G/IT/22.

48 WTO document G/IT/24 + Corr.1.

49 WTO document G/IT/25.

50 WTO document G/IT/W/17/Rev.7.

51 WTO documents G/IT/M/48 and G/IT/M/50.

52 WTO documents JOB(07)42/Rev.1 and TN/MA/W/105/Rev. 1.

53 G/IT/M/53, paragraph 3.2 onwards, JOB/IT/5.

54 Inside U.S. Trade, *U.S. Proposes Language That Would Require TPP Participants to Join ITA*. 16 March 2012.

55 For example, Cape Verde and the former Yugoslav Republic of Macedonia.

56 Montenegro's schedule provides that it "commits to bind at zero the customs duty rates for products covered by Attachments A and B of the Information Technology Agreement (ITA), beginning on the date of its accession to the WTO". Similarly, a note in schedule of the Russian Federation provides that it "is committed to reducing to zero, through equal annual reductions, the customs duty rates for products covered by the Information Technology Agreement (ITA) within three years after its accession to the WTO".

57 Inside U.S. Trade, *US Chamber, Council of the Americas Paper on FTAA*, 17 February 1998.

58 WTO document WT/L/779.

III The impact of the trade liberalization brought by the ITA

Contents

Highlights

- Participants in the Information Technology Agreement (ITA) significantly liberalized trade in information technology (IT) products by reducing the rates of both the bound (the maximum rate that a WTO member can legally levy on a certain product) and most-favoured nation applied tariffs (those applied in practice by governments).
- Bound and applied tariffs on IT products remain relatively high (averaging 33 per cent and 7 per cent respectively) in a number of medium-sized markets that have not joined the ITA. These levels are comparable to those of ITA participants prior to joining the Agreement.
- Exports of IT products reached an estimated US$ 1.4 trillion in 2010 – almost triple the 1996 value, and accounted for approximately 9.5 per cent of global merchandise exports.
- ITA participants accounted for 96 per cent of global exports and 90 per cent of global imports of IT products in 2010. As a result of the increased reliance on global production networks, the largest exporters of IT products are also the largest importers of these products.
- Trade patterns have changed considerably over the past 15 years in terms of main traders and products. Developing countries have consistently increased their participation in global trade of IT products, increasing from approximately 31 per cent of exports and 27 percent of imports in 1996 to approximately 64 per cent of exports and 51 per cent of imports in 2010.
- Semiconductors is the largest IT product category and accounted for 33 per cent of global exports of IT products in 2010. They are followed by parts and accessories of IT products (24 per cent), computers and calculating machines (22 per cent) and telecommunication equipment (16 per cent). Trade in IT products appears to be concentrating in fewer groups of products, as defined by the World Customs Organization's (WCO) Harmonized System (HS) nomenclature.

A. Introduction

The purpose of the Information Technology Agreement (ITA) was to liberalize trade in a specific group of products – information technology (IT) products – by the year 2000, a goal that was largely achieved. Trade in IT products, which in this chapter refers *only* to products covered by the ITA, has more than tripled over the past 15 years, and there is a high degree of correlation between this surge in trade volumes and the large-scale tariff elimination achieved by the Agreement. A number of indicators suggest that the sector has undergone a profound transformation during this period. This chapter describes the extent and nature of these changes by exploring the available data.

Section B examines the extent to which participants eliminated tariffs pursuant to the ITA and highlights the degree of tariff protection that remains in those countries that have not joined it. It concludes that the degree of liberalization was relatively high in some sectors while in others protection had already been unilaterally dismantled prior to the Agreement. The initial participants – 28 WTO members and states or separate customs territories in the process of acceding to the WTO – contributed to an increased reliance on global supply chains and a global specialization of tasks for the production of IT products. However, non-participants still account for an important amount of trade in IT products and maintain high levels of bound and applied tariffs.

Section C assesses the evolution of export and import patterns over the past 15 years. Not only have developing countries become the leading exporters of IT products, but the main type of IT products internationally traded has also changed considerably as a result of technological progress and consumer preferences (see Table 3.1, in Section C). This chapter dwells on the more traditional aspects of trade analysis. The role that the ITA has played in nurturing global supply chains between developed and developing countries is described later, in Chapter 5.

It should be noted from the outset that any statistical analysis of the ITA is inevitably influenced by a number of technical choices that can make it difficult to define the product coverage to be used in the calculations. The three most important ones are: (1) 95 out of 190 items listed in Attachment A of the ITA were defined as sub-categories of the World Customs Organization's (WCO) Harmonized System (HS) subheading (i.e. 6-digit) level, which are normally not identified by participants at the national level; (2) divergences in the classification of 55 items "in" and "for" Attachment B mean that participants listed slightly different HS subheadings in their respective schedules of concessions; and (3) the ITA was negotiated in the 1996 version of the HS (HS1996) and the data used in this study is affected by two amendments by the WCO that have since entered into force, i.e. HS2002 and HS2007. Appendix 1 offers an explanation of the most important assumptions that were made.

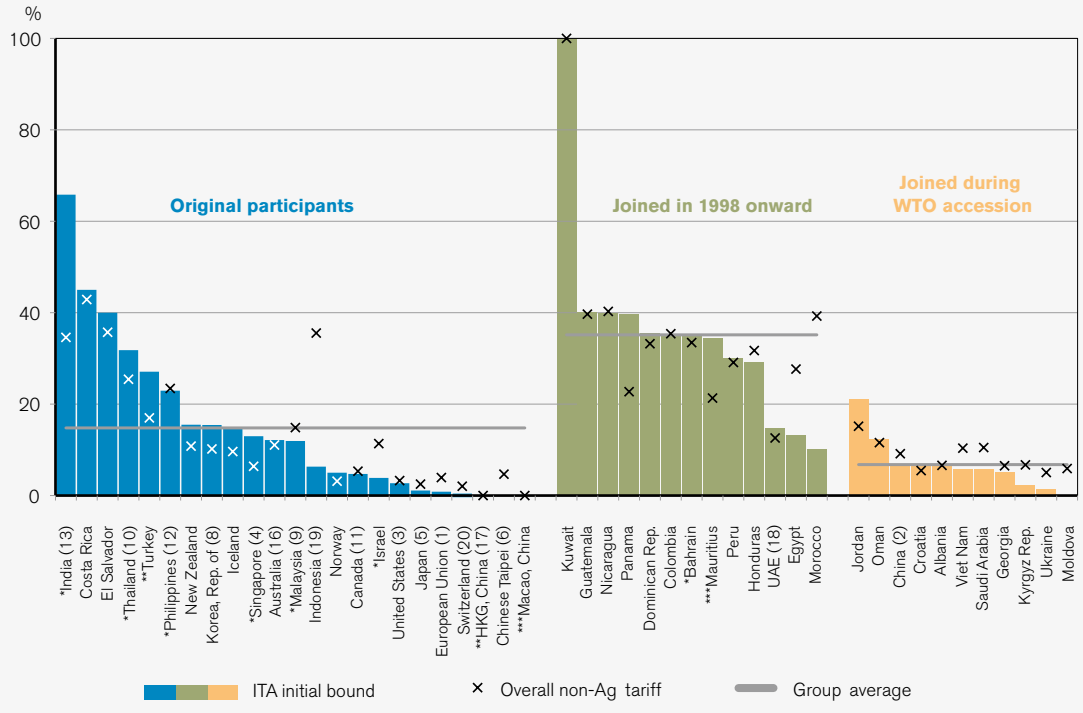
B. Slashing tariffs through the ITA

Reduction of bound and applied tariffs

The ITA provided that participants would modify their WTO schedules of concessions in order to grant duty-free treatment to IT products and most-favoured-nation (MFN) applied tariffs would also be reduced accordingly. Although various participants, and in particular some developed countries, had already committed to liberalizing trade in some of these products as part of the Uruguay Round, a significant number of bound tariffs (the maximum rate that can legally be set by WTO members) and MFN applied tariffs (those that are applied in practice) were significantly lowered by the ITA.

There are at least two benchmarks that can be used in assessing the magnitude of such reductions: the actual reduction of the bound and MFN applied duties. The first benchmark can be derived from the level from which participant's bound tariffs were cut. Although this would normally be calculated by averaging the bound tariffs in participants' WTO schedules

Figure 3.1. Overall average bound tariff on non-agricultural products and average initial bound tariff on IT products



Source: WTO Secretariat, based on WTO schedules of concessions, Consolidated Tariff Schedules (CTS) and *World Tariff Profiles 2011*.

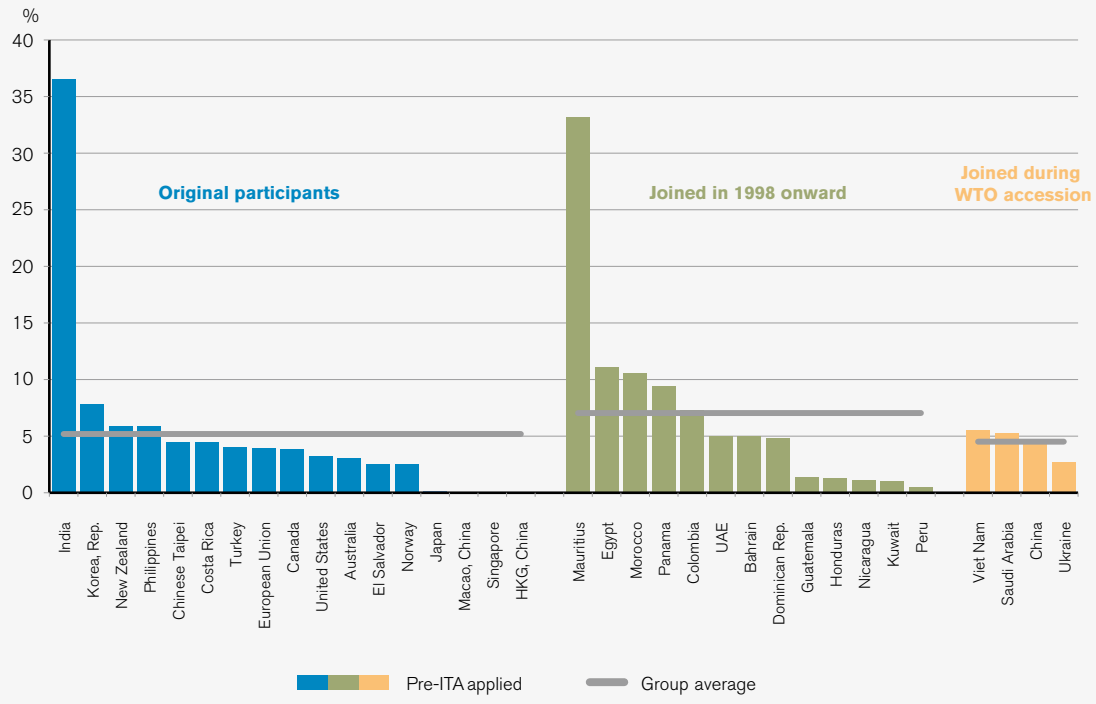
Notes: Rank as top 20 importer in 2010 in parentheses (see Table 3.2). The 27 EU member states are counted as one; calculation is based on the schedule submitted in 1997 by the EU-15. Asterisks indicate less than 85% binding coverage for non-agricultural products. ***<35%, **35≤60%, *60<85%.

prior to joining the Agreement ("initial" or "base" duties), several participants did not have any commitment in respect of some IT products (i.e. they were "unbound"). For example, Mauritius did not have a binding on any IT product prior to joining the Agreement, whereas HS heading 85.70 (calculating machines and pocket-size data recording) was unbound in India's Uruguay Round concessions. For this reason, the estimates below only present a partial overview of the actual effort made by some of the participants.

Figure 3.1 divides ITA participants in three categories: (1) original participants, which include the signatories of the ITA Ministerial Declaration (excluding individual EU member states) and those who agreed to join in 1997; (2) WTO members that joined in 1998 onward; and (3) participants that joined the Agreement at the time of their accession to the WTO. The estimates are in descending order of the average bound tariff that participants had on IT products prior to joining the ITA. Figure 3.1 shows that the original ITA participants had lower initial bound commitments for IT products compared with those that joined after 1997. The latter group also had the highest average of initial bound tariffs for IT and for non-agricultural products. Among the original participants, India had the highest average initial bound tariffs for IT products (66 per cent), but Kuwait, which joined in 2010, was even higher at 100 per cent. However, Hong Kong (China) and Macao (China) already had duty-free bindings on those products, so joining the Agreement did not require any further reduction. Similarly, the Quad countries (Canada, the European Union, Japan and the United States) were largely committed to very low, and even duty-free, concessions on most of those products.

Participants that joined as part of their WTO accession process generally had the lowest average initial bound tariff on IT products and, in general, on all non-agricultural products. Because their participation in the ITA was taken into account in their protocol of accession, these averages reflect the starting point from which they committed to liberalize and explain their low pre-ITA bound average.

Figure 3.2. Average applied tariffs on IT products prior to joining the ITA



Source: WTO Secretariat, based on Integrated Data Base (IDB) data.

Notes: EU member states are counted as one. Only includes participants with applied tariff data available for any year prior to their ITA participation.

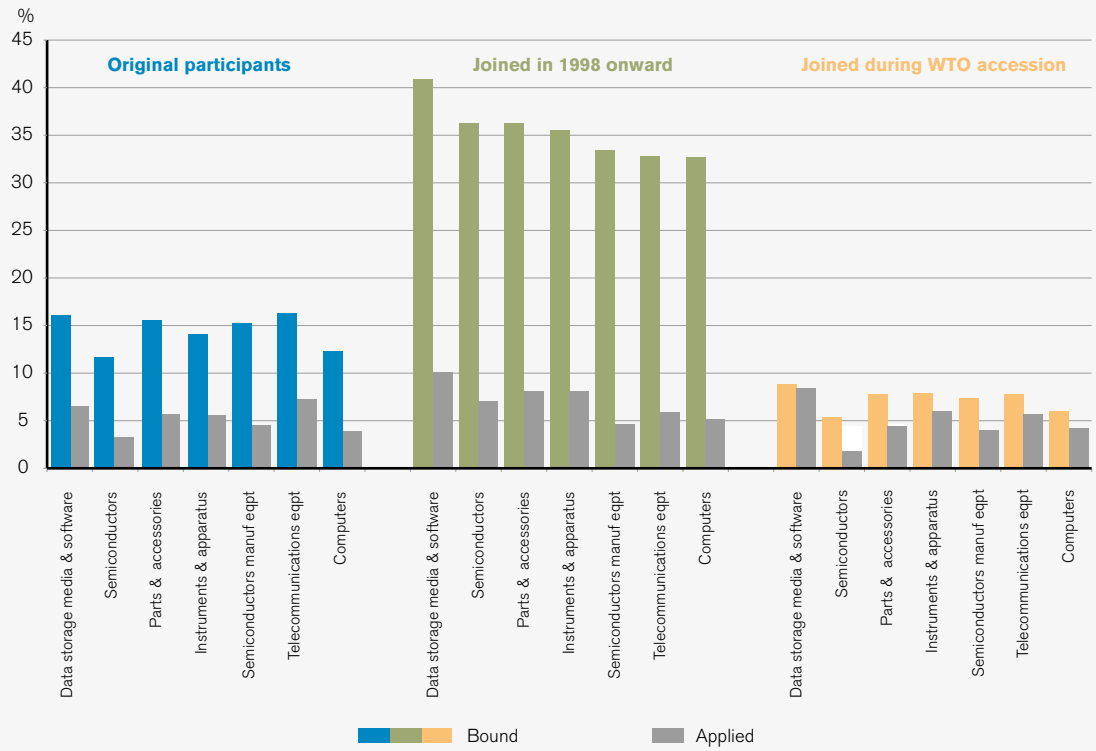
Sixteen of the top 20 importers of IT products in 2010 are ITA participants (see Table 3.2 in Section C). All of the developed countries in Table 3.2 joined the ITA as original participants; and the majority of the developing countries that joined the ITA in 1997 were from East and South-East Asia. China, which joined the ITA as part of its accession package to the WTO in 2001, was already the number two importer of IT products in 2010.

Countries usually apply lower MFN levels than their bound. The difference between the bound and applied is often referred to as "water" or "binding overhang". The existence of such a difference raises the question of whether the ITA really reduced applied tariffs or simply formalized *de facto* duty-free conditions in those products. Thus, the average applied tariff prior to joining the Agreement is a second benchmark that could be used to measure the degree to which participants opened their markets as a result of the ITA.

Figure 3.2 is similar to Figure 3.1, but shows the average applied tariff of each participant for the latest available year before it joined the ITA. In aggregate terms, and with notable exceptions, the ITA led to the elimination by participants of applied tariffs that were on average 6 per cent. India's average applied tariff on IT products was highest (36.5 per cent) prior to, with almost one-third of products subject to a 52 per cent tariff. Mauritius, which had the second-highest average pre-ITA applied tariff, imposed an 80 per cent per cent import duty on certain telecommunication equipment. By contrast, Hong Kong (China), Macao (China) and Singapore already had duty-free bindings on those products before joining the Agreement. Among developed countries, the European Union had the highest average applied tariff in 1996, at 4.1 per cent, while Japan had the lowest, at 0.1 per cent. Pre-ITA average applied tariffs of all the original participants are below 6 per cent, except for India and the Republic of Korea.

Closer examination of the reductions by the different participant categories reveals several interesting facts. Latin American countries that joined the ITA after 1997 tend to have higher average bound tariffs (see Figure 3.1), but lower pre-ITA applied tariffs than the other participants (see Figure 3.2). Members that joined the ITA as part of their accession to the WTO tend to have a lower binding overhang because most of their bound tariffs already reflected their

Figure 3.3. Pre-ITA average bound and applied tariffs of ITA participants



Source: WTO Secretariat, based on WTO schedules, CTS and IDB databases.

Notes: Only includes participants with applied tariff data available for any year prior to joining (see Figure 3.2 for a full list).

actual market-access conditions at the time they joined. For example, China's average applied tariff on IT products in 2000, one year before the country's formal accession to the WTO, was 4.5 per cent, compared with the average of its initial bound tariffs on IT products of 6.9 per cent. The other acceding members had an even lower binding overhang.

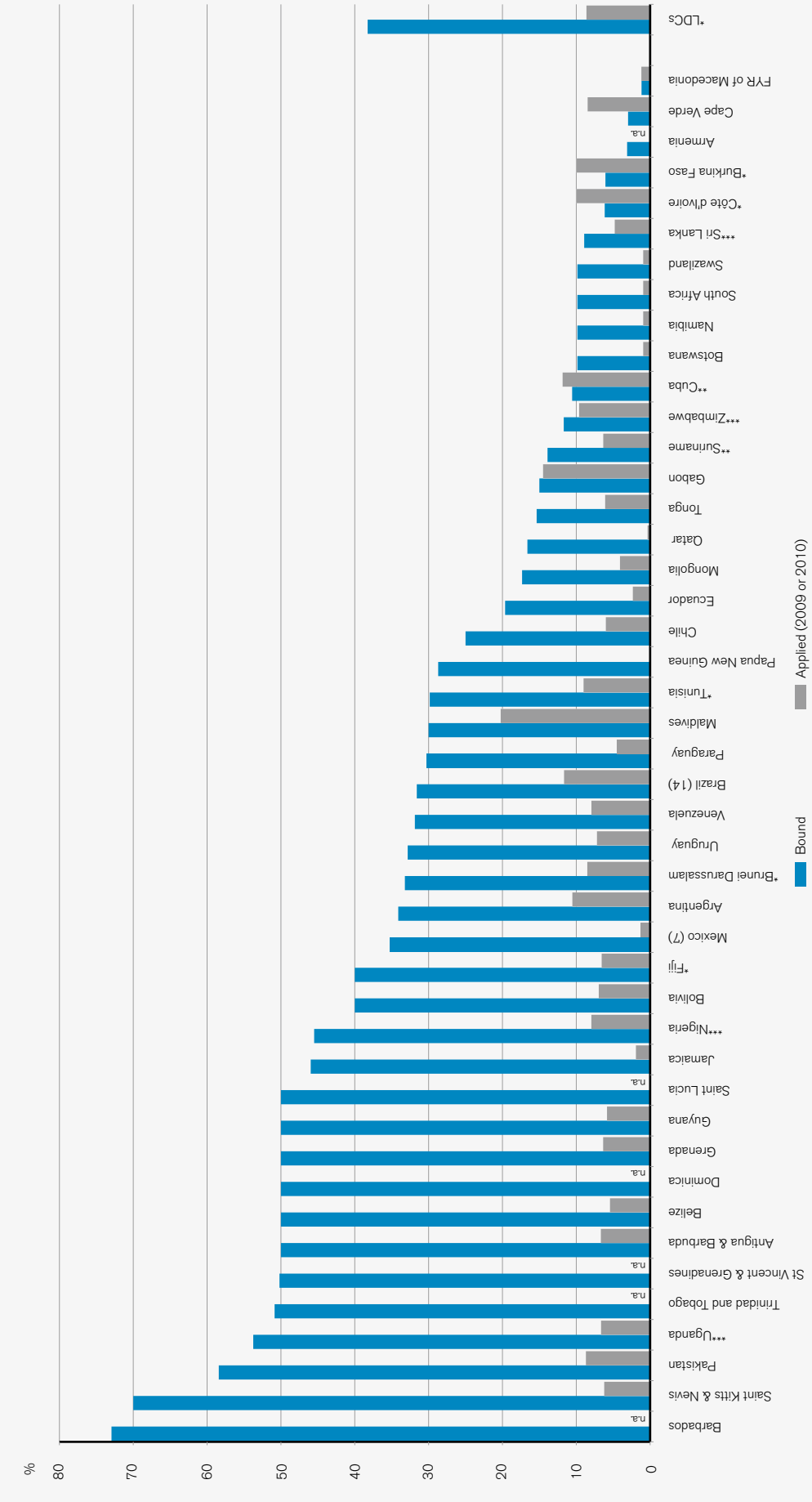
Duty levels by IT product category

The average bound and applied tariffs of the participants that have been discussed conceal the considerable variation in the tariff treatment that different individual products receive. As explained in Chapter 1, the product coverage of the ITA does not differentiate beyond Attachments A and B. These products can, however, be loosely classified into seven categories: (1) computers and calculating machines; (2) telecommunication equipment; (3) semiconductors; (4) semiconductor manufacturing equipment; (5) data storage media and software provided on physical media; (6) instruments and apparatus; and (7) parts and accessories. Appendix 1 provides more details on these categories.

Among ITA participants, the highest tariff reductions on both bound and applied tariffs are on "data storage media and software provided on physical media" category (see Figure 3.3). An additional element affecting trade in these products at the beginning of the 1980s and 1990s was whether the value of software contained in a carrier medium (at that time a floppy disk or tape) should be determined based on the value of the floppy disk or tape that contained the data or the value of the software itself plus the value of the carrier. The latter would normally lead to the payment of substantially higher import duties than the former.

On 12 May 1995, the WTO Committee on Customs Valuation adopted the "Decision on the Valuation of Carrier Media Bearing Software for Data Processing Equipment", which continued the General Agreement on Tariffs and Trade practice of allowing either method of valuation. In 1998, WTO members adopted a work programme on e-commerce that included a moratorium on the imposition of customs duties on electronic transmissions,[1] which was extended in December 2011 until 2013.[2] These actions allowed software exporters to avoid a peculiar situation in which importing a piece of software contained on a

Figure 3.4. Average bound and applied tariffs on IT products for WTO members not part of the ITA



Source: WTO Secretariat, based on WTO schedules, CTS and IDB databases.

Notes: Excluding members with fully unbound IT products. Asterisks indicate less than 90% binding coverage for non-agricultural products. ***<10%, **10≤50%, *50<90%.

carrier medium (e.g. a CD or DVD) would be subject to relatively high import duties, whereas downloading the same software from the internet would not.

Early participants, mainly developed countries and developing members from Asia, had the lowest bound and pre-ITA applied tariffs on semiconductors and computers. The same trend can be observed for those participants that joined the ITA during their accession to the WTO. For participants that joined after 1997, the lowest applied tariffs were for semiconductor manufacturing equipment.

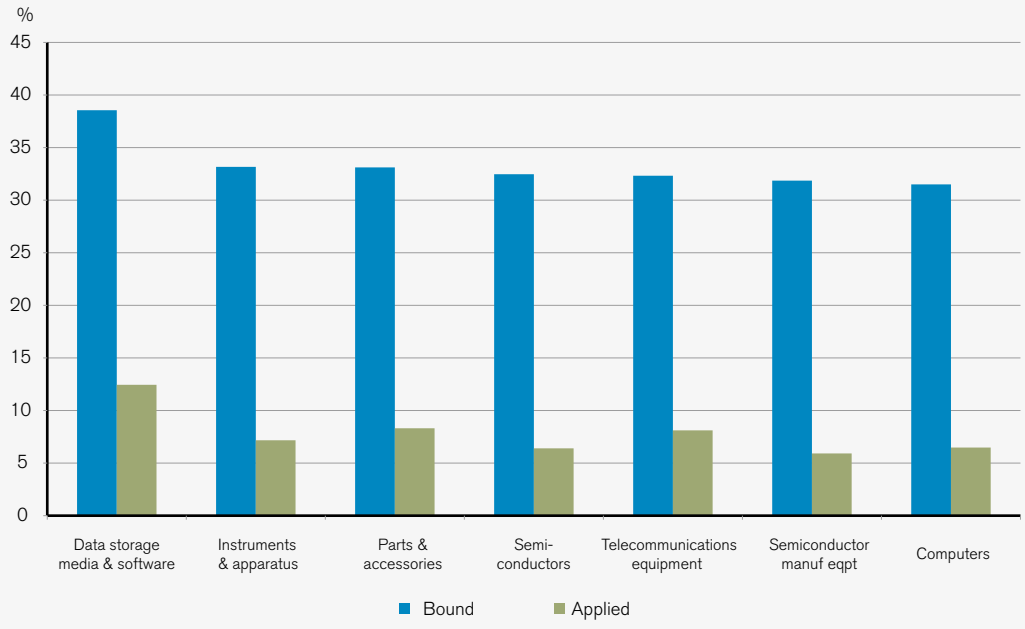
Import duties in countries outside the ITA

The average bound tariffs on IT products of countries that have not joined the ITA (hereafter "non-participants") vary widely, as shown in Figure 3.4. Among the non-participants, Brazil (14th) and Mexico (7th) were among the top 20 importers of IT products in 2010 (see Table 3.2, in Section C). Mexico's average bound tariff on IT products amounted to 35 per cent, while Brazil's was 32 per cent. Other members that have minimal binding coverage for IT products include four developing and eight least-developed country (LDC) WTO members which have no binding on any IT product. All 12 non-participants with no bindings on IT products are in Africa. No LDC has formally joined the ITA. As a group, they have an average binding coverage of 80 per cent, with an average bound tariff of 38 per cent. There are, in addition, six non-participants whose binding coverage for IT products is less than 10 per cent – i.e. 90 per cent of IT products in these countries are not subject to maximum import duty.

When China joined the WTO, its average applied tariff on IT products was 4.5 per cent. In comparison, the applied average in that same year was 14.5 per cent for Brazil and 12.5 per cent for Mexico, which are considerably higher than the pre-ITA applied tariffs of most participants – only India and Mauritius had higher averages before joining. It should, however, be noted that Mexico's 2010 applied tariff on IT products, at 1.3 per cent, is low and that its trade on IT products mostly takes place within free-trade areas – the North American Free Trade Agreement (NAFTA) in particular. This means that IT products originating in Canada and the United States probably benefit from duty-free treatment. However, the applied tariff on IT products of Brazil was 11.7 per cent in 2010, which is not much lower than it was in 2002. The Russian Federation, which is ranked 15th among the top 20 importers of IT products, had an applied tariff of 5.7 per cent in 2010.

A comparison of current applied tariffs of non-participants to the ITA with the pre-ITA tariffs of participants reveals similar numbers. Based on the latest available data, the average applied

Figure 3.5. Average bound and latest applied tariffs for non-participants



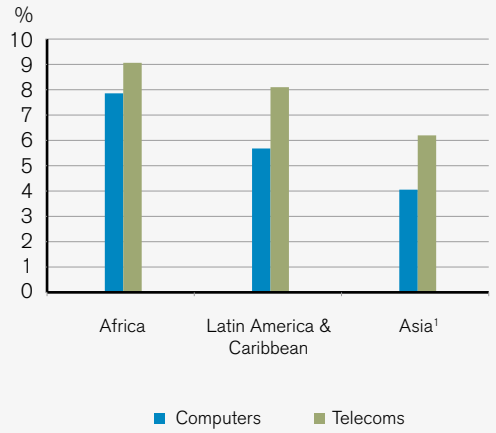
Source: WTO Secretariat, based on WTO schedules, CTS and IDB databases.

tariffs on IT products for all non-participants is 7 per cent, although this drops to a little above 6 per cent if LDCs are excluded. As a group, LDCs have an applied average of 9 per cent. These figures indicate that the degree of liberalization that would be required from non-participants to join the Agreement would be similar to that made by participants at the time they joined the ITA.

The overall averages reported are only part of the story. The average bound levels by product category shows that data storage media products and software provided on physical media has the highest bound tariff among non-participants – as was the case with ITA participants, (see Figure 3.5). Applied tariffs are also highest in this category. Another noteworthy observation is the amount of "water" that tariffs on IT products have. With a significant binding overhang, even a considerable reduction of bound tariffs would not significantly cut into the applied tariffs of most non-participants. With the exception of data storage media products and software on physical media, where the average applied tariff of non-participants ranges between 5 and 10 per cent, these are comparable to pre-ITA applied levels.

Bound and applied tariffs of non-participants vary considerably across regions. Figure 3.6 shows that non-participants in Asia generally apply lower tariffs on computers and telecommunications equipment compared to either their African or Latin American and Caribbean counterparts. Indeed, tariffs on these products in Asia are significantly lower compared with other regions – even for non-participants.

Figure 3.6. Latest available average applied tariffs on computers and telecommunications equipment of non-participants



Source: WTO Secretariat, based on WTO schedules, CTS and IDB databases.

Notes: [1]Including Pacific Islands.

C. Trade flows: an ever-increasing but changing landscape

Considerable increase in volume of trade

World exports of IT products almost tripled in value between 1996 and 2010 (see Figure 3.7), leading to a considerable transformation of the main traders and product categories. With an annual average growth rate of 7 per cent over this period, global exports of IT products reached US$ 1.4 trillion in 2010, becoming one of the most important product categories in world trade. Exports of IT products accounted for 9.5 per cent of global merchandise exports in 2010, exceeding the share of both agricultural (9.2 per cent) and automotive products (7.4 per cent).[3]

While global exports of IT products grew more rapidly than other manufactured products between 1996 and 2010, the share of IT products in the export of all manufactures was not stable (see Figure 3.8), rising from 10 per cent in 1996 to a peak of 19 per cent in 2000 and dropping to 12 per cent in 2010. These trade data need to be treated with caution, however, as they can be inflated by double counting where IT products are manufactured in global supply chains, with components sometimes crossing borders several times.[4]

Perhaps the most striking feature of these growth figures is that they took place against a considerable decrease in the price of some of the main IT product categories (see Figure 3.8), and an exponential increase in their performance. In the context of computers, the latter is often referred to as "Moore's law".[5] The US Bureau of Labor Statistics estimated the import price level of June 2011 for "Computers, peripherals and

semiconductors" to be around 65 per cent below the respective level of June 1996, while the average import prices for all commodities were 40 per cent above the level of 1996. Therefore, and as a result of significant price reductions and increased performance, consumers have benefited from an unprecedented reduction in the price paid for computational power. The cost of a gigaFLOPS,[6] a unit of computational power, fell to US$ 1.80 in March 2011 from US$ 30,000 in 1997 – 0.006 per cent of the initial cost.

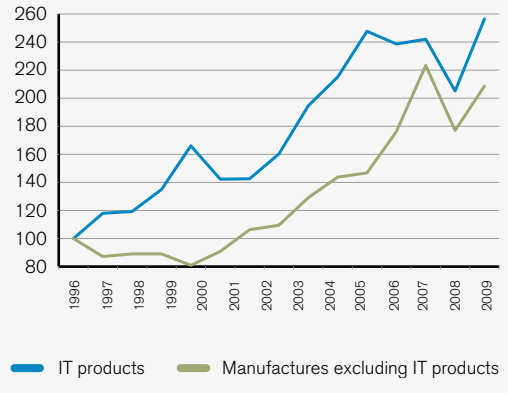
Exports of IT products, by region and leading exporters

The considerable growth of trade in IT products has been led by growth in developing countries' exports. Between 1996 and 2010, the share of developing economies in global exports of IT products has more than doubled – from 31 per cent to 64 per cent. Asia's share increased sharply in the period, rising from 44 per cent of global exports of IT products to 66 per cent (see Figure 3.9).

Figure 3.10 shows the top nine exporters of IT products for the years 1996, 2005 and 2010. While the European Union (EU-15 in 1996, EU-25 in 2005) was the top exporter of IT products in 1996 and 2005, it was overtaken by China in 2010. In that year, China accounted for 27 per cent of global exports of IT products, compared with 16 per cent in 2005 and 2 per cent in 1996 – the year the ITA was signed. In 1996, China was the eighth-largest exporter of IT products. The export share for the United States fell from 20 per cent in 1996 to 9 per cent in 2010. Taking the European Union as a single entity, six of the top nine exporters were Asian countries in all the years under consideration.

Within the European Union, the largest exporters in 1996 were the United Kingdom (representing 4.8 per cent of world exports of IT products),

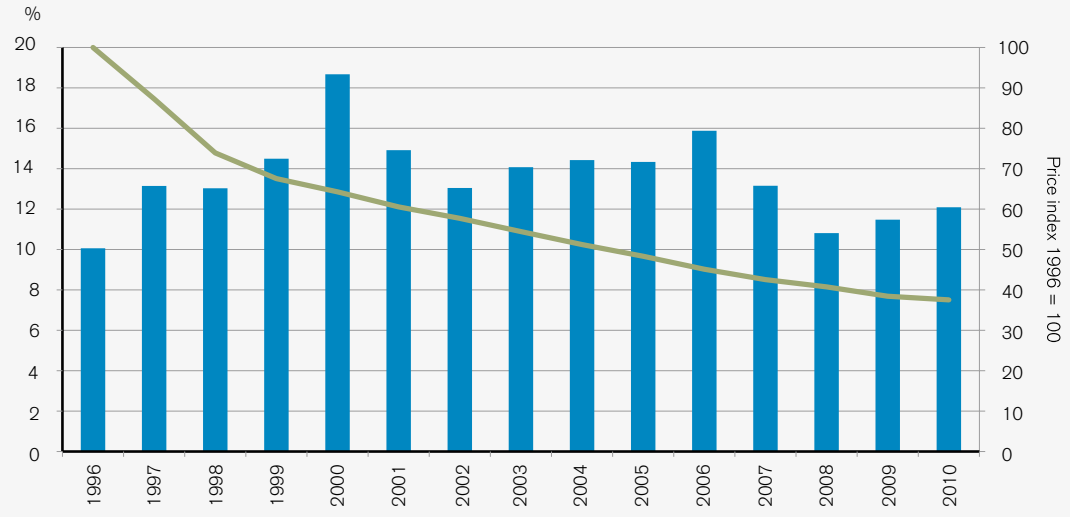
Figure 3.7. The expansion of global exports of IT products and other manufactures



Source: WTO Secretariat, based on UN Comtrade and WTO estimates.

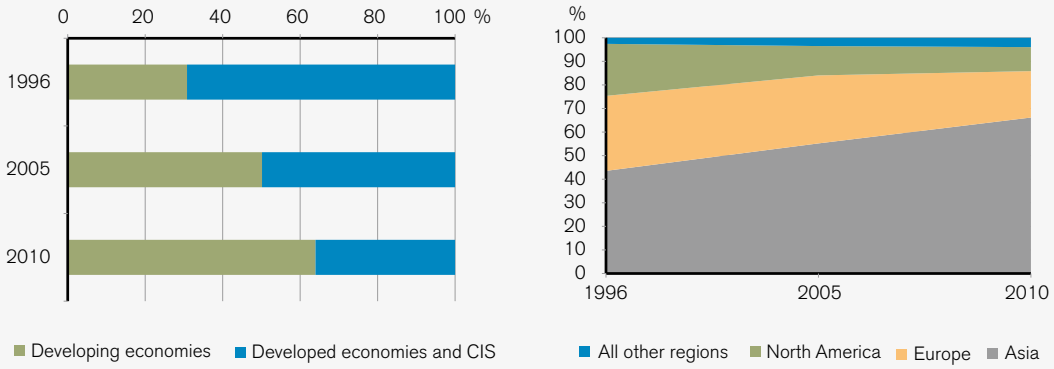
Notes: Value index 1996 = 100.

Figure 3.8. Share of IT products in exports of manufactures and price index of US imports of computers, peripherals and semiconductors



Source: WTO Secretariat, based on UN Comtrade, WTO estimates and US Bureau of Labor Statistics.

Figure 3.9. Exports of IT products by economic and geographic region



Source: WTO Secretariat, based on UN Comtrade and WTO estimates.

Notes: The Commonwealth of Independent States (CIS) is composed of the former Republics of the Union of Soviet Socialist Republics.

Germany (4.7 per cent) and the Netherlands (3.2 per cent). In 2005 and 2010, the European ranking was led by Germany, whose shares in world exports of IT products were 5.3 per cent and 3.9 per cent, respectively. It was followed by the Netherlands (3.6 per cent in 2005, 2.5 per cent in 2010) and the United Kingdom (2.6 per cent in 2005 and 1.6 per cent in 2010).

Within the top 30 exporters of IT products in 2010 (see Table 3.1), Viet Nam was the most dynamic, with the highest annual increase between 1996 and 2010 (45 per cent). Rising from a very low level in 1996 (US$ 30 million), Viet Nam's exports reached a value of US$ 1.2 billion in 2005 and increased to US$ 5 billion in 2010. Shortly after joining the ITA in 2006, Viet Nam became the 15th-largest ITA exporter. Within the top 30 exporters, the second-highest average annual growth was observed for China (up by 29 per cent). The United Arab Emirates also emerged as a major trader whose (mostly re-) exports increased by an annual average of 29 per cent in the same period. The distinct growth of China's ITA exports can be closely related to foreign direct investment inflows. Attracted by favourable conditions, many multinational enterprises increased their production capacities in China and assembled IT products using imported components – semiconductors in particular (see Figure 3.15).

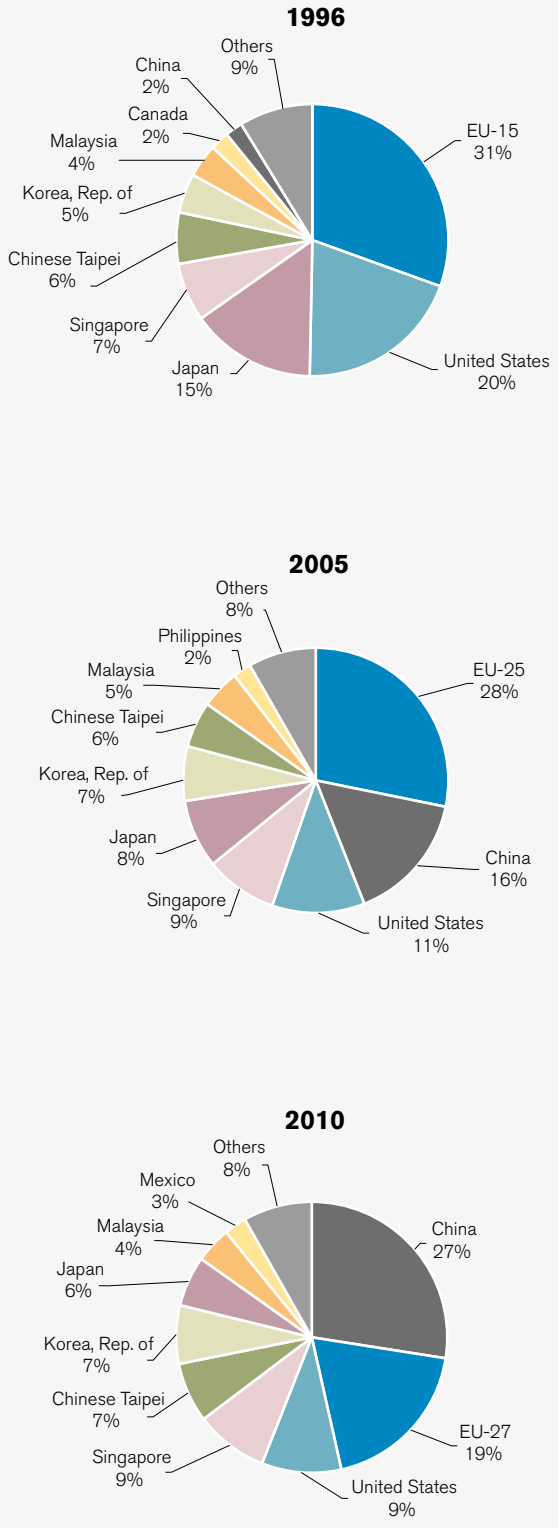
Other participants experiencing strong growth in their exports of IT products between 1996 and 2010 include India (17 per cent) and the Republic of Korea (10 per cent). Among the developing countries that do not participate in the ITA, Mexico, a member of NAFTA, is still the most important trader, with an export value of US$ 37.5 billion in 2010 (up by 10 per cent). Mexican exports of IT products are mainly destined for the US market.

The development of the share of ITA participants in global exports of IT products is shown in Figure 3.11. Between 1996 and 2002, there was a continuous decline, from 94.8 per cent in 1996 to 87.6 per cent in 2002. In 2003, with the subsequent participation of Bahrain, China, Egypt and Morocco in the ITA agreement, the share increased markedly and peaked at 97.3 per cent in 2007. In recent years, the share has again declined slightly. Nonetheless, with a share of 96.5 per cent in 2010, ITA participants still account for the majority of global exports of IT products.

Imports of IT products, by region and leading traders

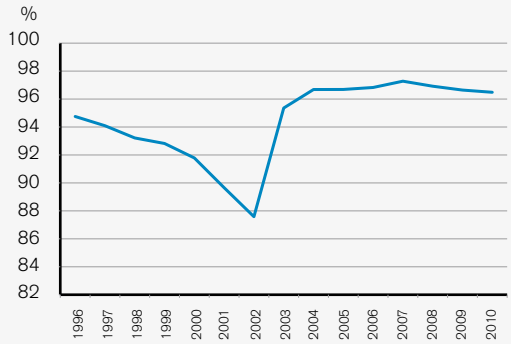
World imports of IT products increased from US$ 550 billion in 1996 to US$ 1.243 trillion in 2005 and US$ 1.54 trillion in 2010 (an average annual increase of 8 per cent). The largest importers of IT products generally tend to be the largest exporters. A significant part of the growth since 1996 can be attributed to higher demand by developing countries. While in 1996, developing countries accounted for 27 per cent of world imports of IT products, this share had increased to 51 per cent in 2010 (annual average percentage change of 13 per cent in terms of import value). This is largely explained by the specialization of tasks and reliance on global supply chains in the manufacture of IT products (see Chapter 5 for more details). The typical pattern in 2010 is one where semiconductors and certain capital-intensive components are imported by developing

Figure 3.10. Leading exporters of IT products: shares in world exports of IT products



Source: WTO Secretariat, based on UN Comtrade and WTO estimates.

Figure 3.11. Share of ITA participants in global exports of IT products



Source: WTO Secretariat, based on UN Comtrade and WTO estimates.

countries from developed countries, which are transformed into other intermediate and final products prior to global distribution.

In 2010, the EU-27 was the largest importer of IT products (a 25 per cent share of global imports of IT products), followed by China (18.8 per cent), the United States (14.3 per cent), Singapore (5.6 per cent) and Japan (4.5 per cent). In terms of growth, the highest annual percentage changes over the whole period were observed in China and Viet Nam (up by 25 per cent in both countries). Imports by developed-country markets have continued to grow, but at a slower rate compared with developing countries (see Table 3.2).

Of the countries outside the ITA, Mexico is the largest importer of IT products by value, followed by Brazil, the Russian Federation, South Africa, Argentina and Chile. Imports of IT products have also increased considerably in non-participants. This applies, in particular, to the Russian Federation (up by 15 per cent) and Mexico (12 per cent). Imports of IT products also rose steeply in LDCs: in 2010, they were around US$ 4.5 billion, a nine-fold increase compared with 1996.[7] The value of IT product imports to Africa rose from US$ 2.4 billion in 1996 to US$ 19.8 billion in 2010.[8]

Trade in IT products, by product category

As explained above, the ITA does not differentiate its product coverage beyond Attachment A (with two sections) and Attachment B. However, this chapter classifies them in seven categories: (1) computers and calculating

Table 3.1. The 30 leading exporters of IT products in 2010

Rank	Main exporters	Value (US$ bn)			Share (%)			Average annual change (%)	
		1996	2005	2010	1996	2005	2010	1996 -2010	2005 -2010
ITA participants									
1	China	11.3	186.8	386.5	2.1	15.8	27.5	29	16
2	EU-27	170.0	333.2	267.4	31.0	28.3	19.0	3	-4
	Extra-EU-27 exports	61.0	120.2	94.9	11.1	10.2	6.8	3	-5
	Intra-EU-27 exports	109.0	213.0	172.4	19.9	18.1	12.3	3	-4
3	United States	108.6	133.3	133.6	19.8	11.3	9.5	1	0
4	Singapore[1]	38.1	103.9	122.5	6.9	8.8	8.7	9	3
5	Chinese Taipei	33.4	66.0	100.6	6.1	5.6	7.2	8	9
6	Korea, Rep. of	25.6	78.3	97.9	4.7	6.6	7.0	10	5
7	Japan	81.9	98.7	84.5	14.9	8.4	6.0	0	-3
8	Malaysia	21.7	56.2	60.5	4.0	4.8	4.3	8	1
10	Thailand	8.9	21.9	31.3	1.6	1.9	2.2	9	7
11	Philippines	8.6	26.1	29.2	1.6	2.2	2.1	9	2
12	Canada	12.4	13.5	9.6	2.3	1.1	0.7	-2	-7
13	Israel	3.1	3.1	6.8	0.6	0.3	0.5	6	17
14	Switzerland	3.1	4.8	5.2	0.6	0.4	0.4	4	2
15	Viet Nam	0.0	1.2	5.0	0.0	0.1	0.4	45	32
16	India	0.5	1.0	4.3	0.1	0.1	0.3	17	35
17	Indonesia	1.6	4.7	3.9	0.3	0.4	0.3	7	-4
18	Norway	1.0	1.5	3.2	0.2	0.1	0.2	9	16
19	United Arab Emirates[1]	0.1	4.4	2.6	0.0	0.4	0.2	29	-10
20	Australia	2.1	1.7	1.9	0.4	0.1	0.1	-1	2
21	Hong Kong (China)	4.9	3.9	1.9	0.9	0.3	0.1	-7	-14
22	Costa Rica	0.1	1.6	1.9	0.0	0.1	0.1	26	3
24	Turkey	0.2	0.2	1.8	0.0	0.0	0.1	16	53
26	Morocco	0.4	0.7	0.7	0.1	0.1	0.0	5	0
29	New Zealand	0.2	0.3	0.6	0.0	0.0	0.0	9	12
30	Croatia	0.0	0.4	0.3	0.0	0.0	0.0	28	-4
ITA non-participants									
9	Mexico	9.5	25.0	37.5	1.7	2.1	2.7	10	8
23	Brazil	0.4	3.5	1.9	0.1	0.3	0.1	12	-12
25	Tunisia	0.0	0.2	0.7	0.0	0.0	0.1	25	25
27	Russian Federation[2]	0.1	0.5	0.7	0.0	0.0	0.0	-	8
28	South Africa	...	0.5	0.7	...	0.0	0.0	-	7
WORLD[3]		548.0	1,179.0	1,406.0	100	100	100	7	4

Source: WTO Secretariat, based on UN Comtrade.

Notes: Figures exclude those IT products that are grouped together with other non-IT products in tariff and trade classifications, with the exception of HS1996 "ex-" codes 8529.90 and 8456.10, which are completely included. The 2010 world trade value of these excluded IT products is estimated to be less than US$ 140 billion for each flow. [1]Includes significant re-exports. [2]Not an ITA participant at the time of publication. [3]World totals include intra-EU trade but exclude re-exports of Hong Kong (China). Estimates for missing reporters are based on mirror data.

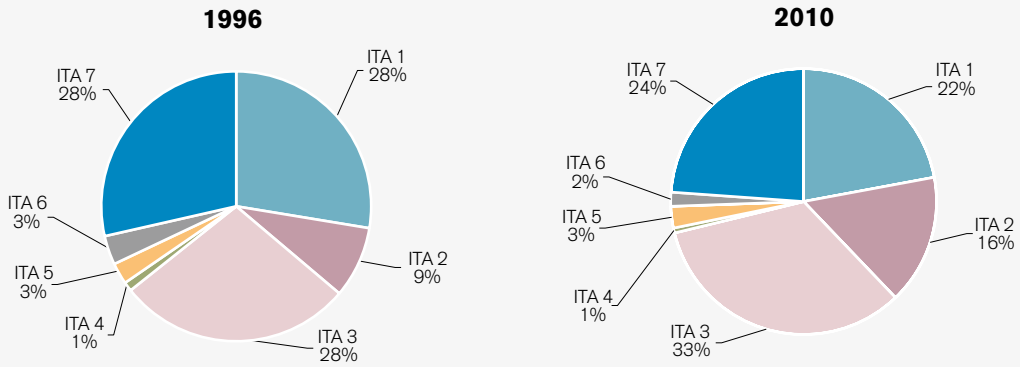
Table 3.2. The 30 leading importers of IT products in 2010

Rank	Main importers	Value (US$ bn)			Share (%)			Average annual change (%)	
		1996	2005	2010	1996	2005	2010	1996 -2010	2005 -2010
ITA participants									
1	EU-27	194.0	379.9	387.0	35.3	30.4	25.0	5	0
	Extra-EU27 imports	103.9	203.2	235.0	18.9	16.3	15.2	6	3
	Intra-EU27 imports	90.1	176.7	152.0	16.4	14.1	9.8	4	-3
2	China	12.9	169.3	291.7	2.3	13.6	18.8	25	11
3	United States	122.9	190.4	222.0	22.4	15.2	14.3	4	3
4	Singapore[1]	25.4	75.6	86.7	4.6	6.0	5.6	9	3
5	Japan	40.6	64.3	69.1	7.4	5.1	4.5	4	1
6	Chinese Taipei	14.3	46.3	56.5	2.6	3.7	3.6	10	4
8	Korea, Rep. of	19.7	45.1	54.5	3.6	3.6	3.5	8	4
9	Malaysia	14.2	44.3	50.2	2.6	3.5	3.2	9	3
10	Thailand	6.6	20.2	26.9	1.2	1.6	1.7	11	6
11	Canada	19.8	24.1	25.7	3.6	1.9	1.7	2	1
12	Philippines	7.7	22.9	18.8	1.4	1.8	1.2	7	-4
13	India	1.0	10.5	16.7	0.2	0.8	1.1	22	10
16	Australia	7.8	11.5	15.5	1.4	0.9	1.0	5	6
17	Hong Kong (China)	10.7	10.9	14.1	1.9	0.9	0.9	2	5
18	United Arab Emirates[1]	0.8	5.6	12.6	0.1	0.4	0.8	22	18
19	Indonesia	2.1	1.8	11.5	0.4	0.1	0.7	13	44
20	Switzerland	6.4	8.4	8.7	1.2	0.7	0.6	2	1
21	Turkey	1.8	6.5	8.6	0.3	0.5	0.6	12	6
22	Saudi Arabia	0.7	3.4	6.5	0.1	0.3	0.4	17	14
24	Viet Nam	0.3	2.1	6.3	0.1	0.2	0.4	25	24
25	Israel	3.2	4.3	4.9	0.6	0.3	0.3	3	3
26	Norway	2.7	4.1	4.5	0.5	0.3	0.3	4	2
29	Colombia	1.2	2.4	2.9	0.2	0.2	0.2	6	4
30	Costa Rica	0.1	2.1	2.4	0.0	0.2	0.2	22	2
ITA non-participants									
7	Mexico	10.7	36.1	54.5	1.9	2.9	3.5	12	9
14	Brazil	4.4	8.3	16.4	0.8	0.7	1.1	10	15
15	Russian Federation[2]	2.3	6.1	15.8	0.4	0.5	1.0	15	21
23	South Africa		5.6	6.5	...	0.4	0.4	-	3
27	Argentina	1.9	3.0	4.4	0.4	0.2	0.3	6	8
28	Chile	0.8	1.9	3.2	0.1	0.1	0.2	10	12
WORLD[3]		550.5	1,250.0	1,548.0	100	100	100	8	4

Source: WTO Secretariat, based on UN Comtrade.

Notes: Figures exclude those IT products that are grouped together with other non-IT products in tariff and trade classifications, with the exception of HS1996 "ex-" codes 8529.90 and 8456.10, which are completely included. The 2010 world trade value of these excluded IT products is estimated to be less than US$ 140 billion for each flow. [1]Includes significant re-exports. [2]Not an ITA participant at the time of publication. [3]World totals include intra-EU trade but exclude re-exports of Hong Kong (China). Estimates for missing reporters are based on mirror data.

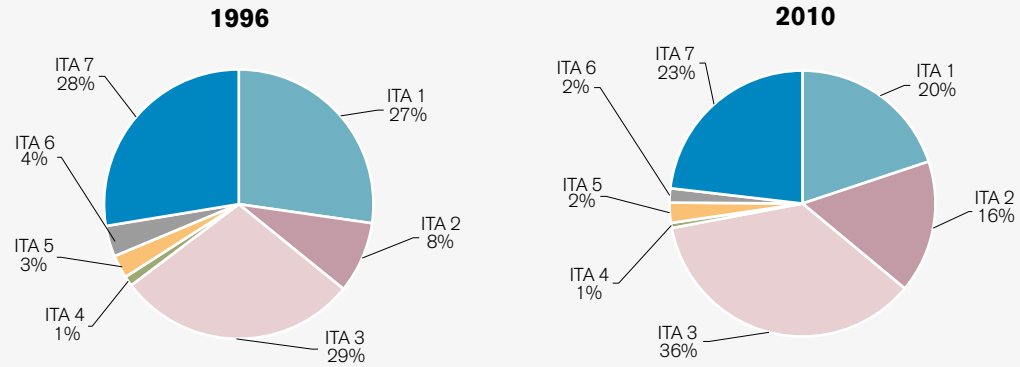
Figure 3.12. World exports of IT products, by product category



Source: WTO Secretariat, based on UN Comtrade and WTO estimates.

Notes: ITA 1 = computers and calculating machines; ITA 2 = telecommunication equipment; ITA 3 = semiconductors; ITA 4 = semiconductor manufacturing equipment; ITA 5 = data storage media and software provided on physical media; ITA 6 = instruments and apparatus; ITA 7 = parts and accessories.

Figure 3.13. World imports of IT product categories



Source: WTO Secretariat, based on UN Comtrade and WTO estimates.

Notes: ITA 1 = computers and calculating machines; ITA 2 = telecommunication equipment; ITA 3 = semiconductors; ITA 4 = semiconductor manufacturing equipment; ITA 5 = data storage media and software provided on physical media; ITA 6 = instruments and apparatus; ITA 7 = parts and accessories.

machines; (2) telecommunication equipment; (3) semiconductors; (4) semiconductor manufacturing equipment; (5) data storage media and software provided on physical media; (6) instruments and apparatus; and (7) parts and accessories. All categories increased in value terms between 1996 and 2010, both for exports and imports, with some of them growing faster than others.

Figures 3.12 and 3.13 chart the shares of the seven categories for 1996 and 2010. In 1996, the categories of computers and calculating machines, and semiconductors and parts and accessories each accounted for 28 per cent of all ITA exports. However, the situation had changed considerably by 2010. Semiconductors increased by five percentage points and became the major product group in exports of IT products. Computers and calculating machines lost six percentage points during the same period, and parts and accessories dropped four percentage points. The shares of both instruments and apparatus, and semiconductor manufacturing equipment remained roughly unchanged for the period (at 3 per cent and 1 per cent respectively). The greatest change was observed for exports of telecommunication equipment – with an increase of seven percentage points, which is largely explained by the increasing popularity of mobile phones, including smartphones.

A similar development occurred for imports. The share of telecommunication equipment doubled from 8 per cent in 1996 to 16 per cent in 2010, and semiconductors increased by seven percentage points. The shares of computers and

Table 3.3. World exports of IT products, by product category

ITA product category	Value (US$ bn)				Average annual change (%)		
	1996	2000	2005	2010	1996 -2010	1996 -2005	2005 -2010
ITA 1 Computers and calculating machines	151	195	265	310	5.3	6.4	3.3
ITA 2 Telecommunication equipment	47	111	183	222	11.7	16.3	3.9
ITA 3 Semiconductors	154	275	322	469	8.3	8.5	7.8
ITA 4 Semiconductor manufacturing equipment	6	14	17	8	2.0	12.0	-13.8
ITA 5 Data storage media and software provided on physical media	19	20	28	24	1.6	4.4	-3.1
ITA 6 Instruments and apparatus	14	16	26	37	7.2	7.3	7.0
ITA 7 Parts and accessories	157	279	338	336	5.6	8.9	-0.2
TOTAL	548.0	911.0	1,179.0	1,406.0	7.0	8.9	3.6

Source: WTO Secretariat, based on UN Comtrade and WTO estimates.

Table 3.4. World imports of IT products, by product category

ITA product category	Value (US$ bn)				Average annual change (%)		
	1996	2000	2005	2010	1996 -2010	1996 -2005	2005 -2010
ITA 1 Computers and calculating machines	150	216	279	308	5.3	7.1	2.0
ITA 2 Telecommunication equipment	47	111	181	250	12.7	16.1	6.7
ITA 3 Semiconductors	159	292	386	558	9.4	10.4	7.6
ITA 4 Semiconductor manufacturing equipment	7	15	17	10	2.6	10.8	-10.6
ITA 5 Data storage media and software provided on physical media	20	18	27	27	1.9	3.0	0.0
ITA 6 Instruments and apparatus	15	18	27	38	6.7	6.7	6.7
ITA 7 Parts and accessories	152	268	333	358	6.3	9.1	1.5
TOTAL	550.0	939.0	1,250.0	1,548.0	7.7	9.6	4.4

Source: WTO Secretariat, based on UN Comtrade and WTO estimates.

calculating machines, parts and accessories, and data storage media and software provided on physical media all decreased, while semiconductor manufacturing equipment remained stable.

Although the shares for several of these product categories diminished over the past 15 years, Tables 3.3 and 3.4 show that all product categories increased in value terms between 1996 and 2010, both for exports and imports. The greatest average annual rises were for telecommunication equipment (11.7 per cent for exports and 12.7 per cent for imports), followed by semiconductors (up by 8.3 per cent and 9.4 per cent respectively).

Table 3.5 shows the top five exporters and importers for each ITA product category, comparing 1996 with 2010. China was the largest exporter in 2010 for four of the seven

Table 3.5. Top ten exporters and importers of IT products, ranked by 2010 value

EXPORTS					IMPORTS				
Economy	Value (US$ bn)		Share (%)		Economy	Value (US$ bn)		Share (%)	
	1996	2010	1996	2010		1996	2010	1996	2010
ITA 1 Computers and calculating machines									
China	3.9	148.9	3	48	EU-27	64.6	102.1	43	33
EU-27	49.1	62.7	33	20	*EU-27 extra-trade*	*33.2*	*59.6*	*22*	*19*
EU-27 extra-trade	*9.3*	*15.3*	*6*	*5*	*EU-27 intra-trade*	*31.3*	*42.5*	*21*	*14*
EU-27 intra-trade	*39.8*	*47.4*	*26*	*15*	United States	40.2	76.4	27	25
United States	25.3	25.3	17	8	China	1.0	27.6	1	9
Mexico	2.7	13.7	2	4	Japan	12.5	15.3	8	5
Thailand	4.4	13.0	3	4	Canada	6.0	8.7	4	3
Malaysia	6.1	11.4	4	4	Mexico	1.3	7.1	1	2
Singapore	20.8	9.3	14	3	Australia	2.8	6.3	2	2
Philippines	1.9	8.2	1	3	Singapore	3.6	6.0	2	2
Korea, Rep. of	4.7	5.0	3	2	Korea, Rep. of	2.5	5.4	2	2
Japan	15.9	3.4	11	1	Russian Federation	0.6	5.0	0	2
ITA 2 Telecommunication equipment									
China	1.8	75.5	4	34	EU-27	17.6	77.0	37	31
EU-27	24.3	59.6	52	27	*EU-27 extra-trade*	*8.8*	*41.6*	*19*	*17*
EU-27 extra-trade	*12.3*	*23.4*	*26*	*11*	*EU-27 intra-trade*	*8.8*	*35.3*	*19*	*14*
EU-27 intra-trade	*11.9*	*36.2*	*25*	*16*	United States	7.1	66.3	15	27
United States	7.9	19.8	17	9	Japan	2.9	10.1	6	4
Korea, Rep. of	1.2	17.2	3	8	Mexico	0.8	7.8	2	3
Mexico	0.9	13.9	2	6	Singapore	0.9	7.4	2	3
Chinese Taipei	1.1	9.0	2	4	India	0.1	6.4	0	3
Singapore	0.6	5.8	1	3	Canada	1.6	6.2	3	2
Canada	1.5	3.1	3	1	Russian Federation	0.6	6.1	1	2
Viet Nam	0.0	2.2	0	1	China	1.5	5.6	3	2
Japan	3.2	2.0	7	1	Korea, Rep. of	1.1	3.1	2	1
ITA 3 Semiconductors									
Singapore	8.5	83.3	6	18	China	3.5	176.9	2	32
China	1.1	61.8	1	13	EU-27	37.6	95.1	24	17
Chinese Taipei	7.8	60.3	5	13	*EU-27 extra-trade*	*23.9*	*60.2*	*15*	*11*
EU-27	31.6	60.0	21	13	*EU-27 intra-trade*	*13.7*	*34.9*	*9*	*6*
EU-27 extra-trade	*15.3*	*20.6*	*10*	*4*	Singapore	12.2	56.8	8	10
EU-27 intra-trade	*16.3*	*39.4*	*11*	*8*	Chinese Taipei	7.6	36.1	5	6
United States	35.4	46.9	23	10	Malaysia	10.1	30.8	6	6
Japan	29.6	46.3	19	10	United States	36.9	29.6	23	5
Korea, Rep. of	15.0	42.7	10	9	Korea, Rep. of	9.8	28.7	6	5
Malaysia	10.3	28.7	7	6	Japan	12.8	24.1	8	4
Philippines	4.8	16.5	3	4	Hong Kong (China)	6.4	17.2	4	3
Thailand	1.9	9.3	1	2	Mexico	3.7	12.8	2	2
ITA 4 Semiconductor manufacturing equipment									
United States	2.2	2.6	36	33	Chinese Taipei	1.1	2.4	16	24
Japan	2.6	1.7	43	22	China	0.1	2.0	1	20
EU-27	1.0	1.4	16	18	Korea, Rep. of	1.3	1.3	18	13
EU-27 extra-trade	*0.7*	*0.9*	*12*	*11*	EU-27	1.6	1.1	22	11
EU-27 intra-trade	*0.3*	*0.5*	*4*	*7*	*EU-27 extra-trade*	*1.3*	*0.7*	*19*	*7*
Singapore	0.0	0.5	0	7	*EU-27 intra-trade*	*0.2*	*0.4*	*3*	*4*

EXPORTS					IMPORTS				
Economy	Value (US$ bn)		Share (%)		Economy	Value (US$ bn)		Share (%)	
	1996	2010	1996	2010		1996	2010	1996	2010
Switzerland	0.2	0.5	3	6	United States	1.1	0.8	16	8
China	0.0	0.4	0	5	Singapore	0.3	0.7	5	7
Korea, Rep. of	0.0	0.4	0	4	Japan	0.8	0.4	11	4
Chinese Taipei	0.0	0.3	0	3	Malaysia	0.1	0.2	1	2
Malaysia	0.0	0.2	0	3	Thailand	0.0	0.1	0	1
Israel	0.1	0.2	1	3	Brazil	0.0	0.1	0	1
ITA 5 Instruments and apparatus									
EU-27	6.8	16.2	49	44	EU-27	7.0	12.9	47	34
EU-27 extra-trade	*2.7*	*8.9*	*19*	*24*	*EU-27 extra-trade*	*3.2*	*7.2*	*21*	*19*
EU-27 intra-trade	*4.1*	*7.4*	*30*	*20*	*EU-27 intra-trade*	*3.8*	*5.7*	*25*	*15*
United States	3.5	9.0	25	24	United States	2.0	6.0	13	16
Japan	1.1	2.3	8	6	China	0.4	4.6	3	12
China	0.3	2.3	2	6	Japan	0.9	1.5	6	4
Singapore	0.3	1.5	2	4	Canada	0.5	1.4	3	4
Switzerland	0.6	1.4	4	4	Korea, Rep. of	0.7	1.2	5	3
Malaysia	0.1	0.9	1	2	Singapore	0.3	0.7	2	2
Canada	0.2	0.8	2	2	Mexico	0.3	0.7	2	2
Mexico	0.2	0.6	1	2	Brazil	0.2	0.6	1	2
Chinese Taipei	0.3	0.4	2	1	Australia	0.3	0.6	2	2
ITA 6 Data storage media and software provided on physical media									
China	0.4	5.0	2	21	EU-27	9.3	6.7	47	25
EU-27	8.8	4.5	46	19	*EU-27 extra-trade*	*3.2*	*3.5*	*16*	*13*
EU-27 extra-trade	*2.0*	*0.9*	*10*	*4*	*EU-27 intra-trade*	*6.1*	*3.2*	*31*	*12*
EU-27 intra-trade	*6.8*	*3.5*	*36*	*15*	China	0.2	3.7	1	14
Chinese Taipei	0.4	4.2	2	17	United States	2.6	2.4	13	9
Singapore	0.3	2.5	2	10	Korea, Rep. of	0.6	1.8	3	7
Japan	2.7	2.4	14	10	Chinese Taipei	0.2	1.8	1	7
Korea, Rep. of	1.1	1.5	6	6	Japan	1.0	1.7	5	6
Malaysia	0.1	1.3	1	5	Thailand	0.6	1.5	3	6
United States	4.1	1.2	21	5	Hong Kong (China)	0.1	1.3	0	5
Mexico	0.5	0.3	2	1	India	0.0	1.0	0	4
Thailand	0.1	0.3	1	1	Singapore	1.6	0.9	8	3
ITA 7 Parts and accessories									
China	3.9	92.6	2	28	EU-27	56.3	94.5	37	26
EU-27	48.5	62.9	31	19	*EU-27 extra-trade*	*30.2*	*62.1*	*20*	*17*
EU-27 extra-trade	*18.7*	*24.9*	*12*	*7*	*EU-27 intra-trade*	*26.2*	*32.4*	*17*	*9*
EU-27 intra-trade	*29.8*	*38.0*	*19*	*11*	China	6.2	71.3	4	20
Rep. of Korea	3.5	30.8	2	9	United States	33.0	40.5	22	11
United States	30.3	28.7	19	9	Mexico	4.1	25.4	3	7
Japan	26.8	26.3	17	8	Japan	9.8	16.1	6	4
Chinese Taipei	11.9	23.6	8	7	Singapore	6.5	14.3	4	4
Singapore	7.5	19.5	5	6	Malaysia	2.6	13.8	2	4
Malaysia	3.6	16.3	2	5	Korea, Rep. of	3.7	13.1	2	4
Thailand	1.7	7.4	1	2	Chinese Taipei	3.5	10.7	2	3
Mexico	3.6	6.8	2	2	Thailand	2.1	8.5	1	2

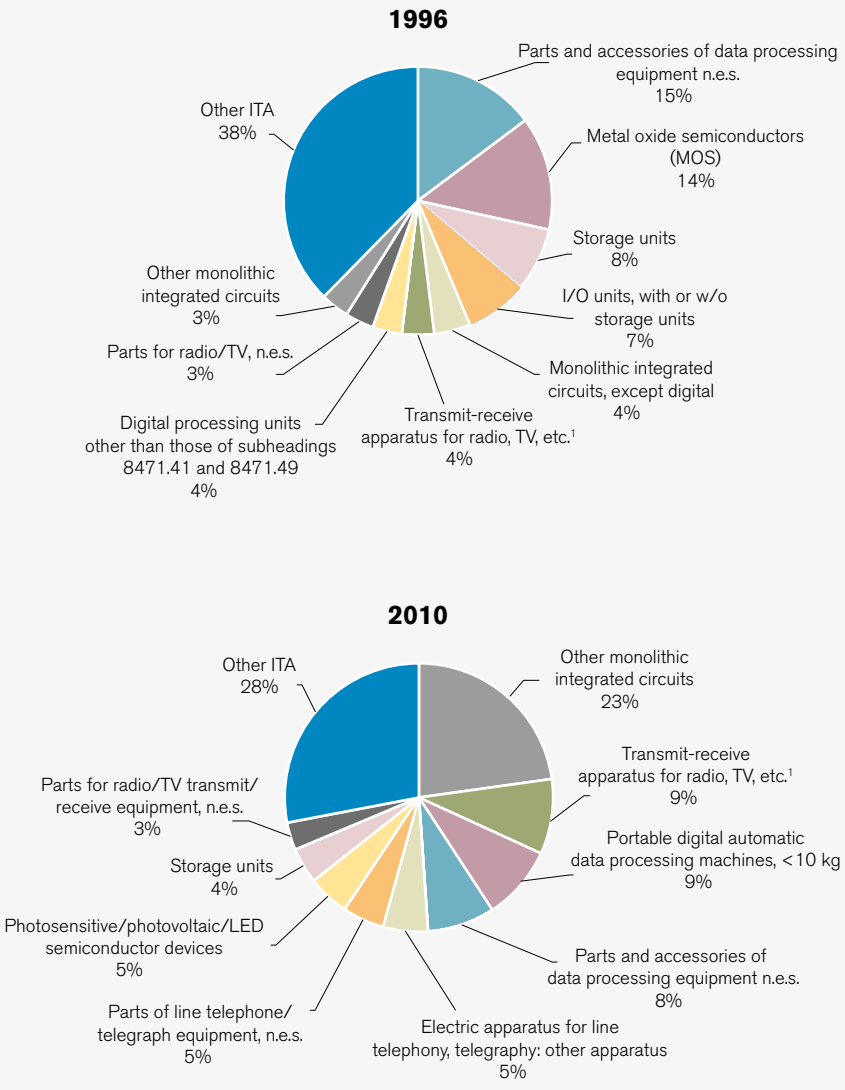
product categories and the second-largest exporter of semiconductors. Singapore's shipments of semiconductors tripled between 1996 and 2010 to reach 18 per cent of global exports, the highest market share in this category. Chinese Taipei (third position in 2010) also experienced remarkable growth in its exports of semiconductors, increasing its market share from 5 per cent to 13 per cent. China's shipments of computers and calculating machines and telecommunication equipment surged between 1996 and 2010 – the former increasing from a market share of just 3 per cent to 48 per cent in the period, while the European Union, Japan and the United States lost market share. Once again, these statistics should be treated with caution, as products assembled in China for export may have a high import component.

In 2010, the European Union was still the largest importer in five out of seven categories. Its market share of global imports has nonetheless declined since 1996, amid a notable rise in imports to developing countries across all categories. China was the leading importer of semiconductors in 2010, with Chinese Taipei the top importer of semiconductor manufacturing equipment.

Trade in IT products, by HS subheading

There have been profound changes in the type of IT products that are being traded, and the trend is to have a higher concentration in fewer categories of products as measured by the number of HS subheadings. While the top nine

Figure 3.14. World exports of IT products: top 10 HS subheadings



Source: WTO Secretariat, based on UN Comtrade and WTO estimates.

Notes: [1]Includes mobile phones, base stations, etc.

HS subheadings accounted for 62 per cent of exports of IT products in 1996, the equivalent figure for 2010 was more than 70 per cent. Interestingly, the nine most-exported IT products have changed markedly since 1996 (see Figure 3.14). Of the top nine HS subheadings in 1996, only five were in the top nine in 2010. At 15 per cent, parts and accessories of data processing equipment, n.e.s.[9] accounted for the greatest share of global exports of IT products in 1996, but declined to 8 per cent in 2010. Metal oxide semiconductors accounted for 14 per cent of exports in 1996 but just 0.2 per cent in 2010, and storage units slipped from an 8 per cent share to 4 per cent in the same period. In 2010, the top three products were other monolithic integrated circuits (23 per cent in 2010, 3 per cent in 1996), transmit-receive apparatus for radio, TV, etc. (9 per cent in 2010, 4 per cent in 1996) and portable digital automatic data processing machines (9 per cent versus 2 per cent). The new categories within the top nine exports in 2010 were electric apparatus for line telephony, telegraphy: other apparatus (5 per cent), parts of line telephone/telegraph equipment, n.e.s. (5 per cent) and photosensitive/photovoltaic/LED semiconductor devices (5 per cent).

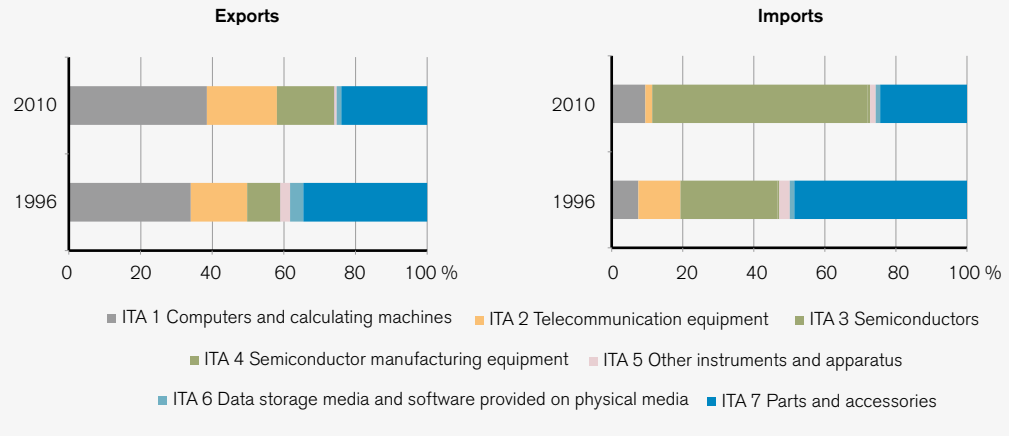
While this is partially explained by the different structure of HS1996 and HS2010, and in particular aggregation of certain product categories under HS2007 (see the Appendix), other factors may include technological innovation, consumer preferences and price developments. Metal oxide semiconductors (MOS technology), HS1996 subheading 8542.13, provides an example of change in technological developments. It accounted for a large share of 1996 and 2005 imports (14 per cent and 13 per cent respectively), but trade in these products had almost ceased by 2010. However, monolithic integrated circuits, classified under HS1996 subheading 8542.30, amounted to 23 per cent of global exports of IT products in 2010, up from just 3 per cent in 1996 (see Table A.1 in the Appendix).

Changes resulting from technological innovation, in particular machines capable of performing two or more previously separated functions, and variations in consumer preferences are often intertwined. For example, portable computers (HS1996 subheading 8471.30) accounted for 9 per cent of global exports of IT products in 2010, up from just 2 per cent in 1996. This had been driven by both by technical progress in terms of the miniaturization of electronic components and a growing preference for the flexibility of laptops and netbooks over traditional desktop computers. The surge in the popularity of smartphones provides another example (see Table A.1 in the Appendix).

Trade in IT products, by selected traders and product category

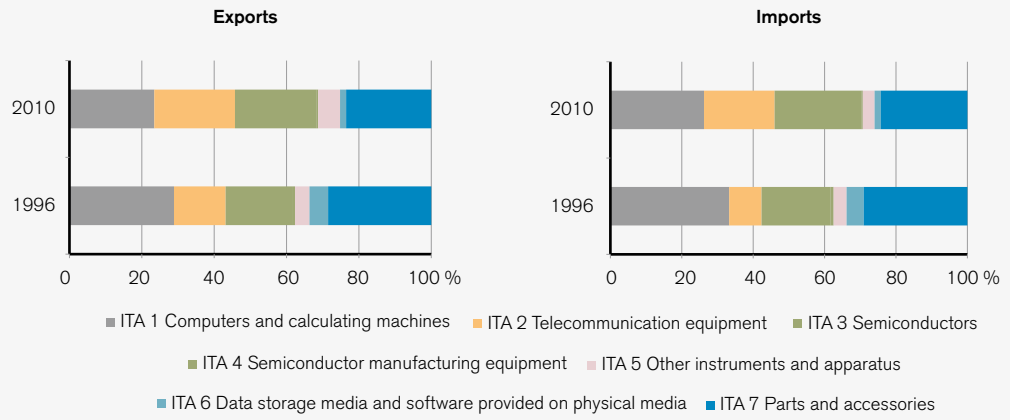
The scale of the evolution in the composition of IT product categories is even more apparent at the country level. For example, while the share of computers and calculating machines in the export of IT products decreased significantly for Japan, in particular, and the United States between 1996 and 2010, it increased markedly for China (see Figure 3.15). The share of parts and accessories in China's imports decreased in the same period, while the share of semiconductors more than doubled (from 27 per cent to 61 per cent), underlining China's growing

Figure 3.15. China: structure of trade by IT product category



Source: WTO Secretariat, based on UN Comtrade and WTO estimates.

Figure 3.16. EU-27: structure of trade by IT product category



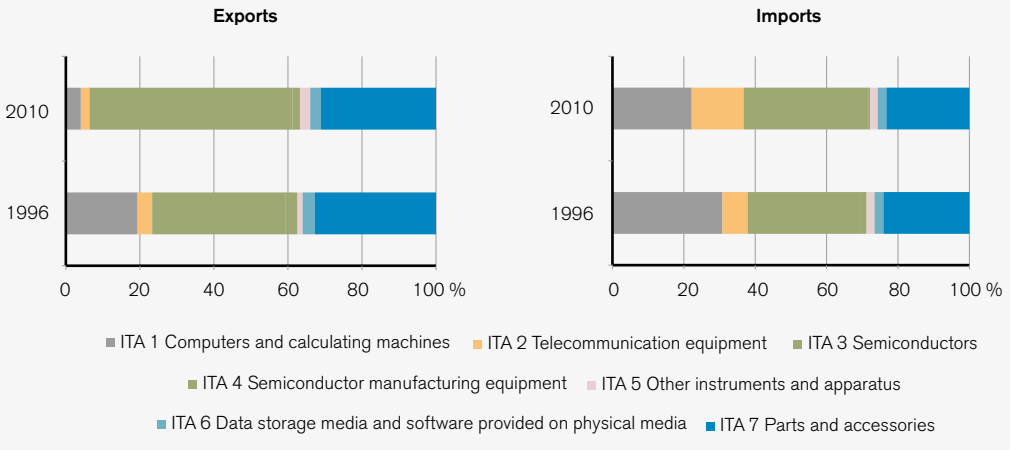
Source: WTO Secretariat, based on UN Comtrade and WTO estimates.

role as a location for assembling IT products. This section examines in greater detail the changes experienced in product composition in four major trading areas: China, the European Union, Japan and the United States.

When the ITA was being negotiated in 1996, China was mostly an exporter of parts and accessories (accounting for 35 per cent of IT product shipments) and computers and calculating machines (34 per cent). In terms of imports, the most important categories were parts and accessories (49 per cent) and semiconductors (27 per cent). However, the value of China's exports of IT products grew exponentially, surging from US$ 11.3 billion in 1996 to US$ 386.5 billion in 2010. The composition of its trade has also changed considerably. China now exports vastly more computers and calculating machines (in pure value terms almost 39 times more than in 1996) and telecommunications equipment (42 times more) than ever before. Their manufacture depends on semiconductors, many of which are imported – the value of inbound shipments rose by a factor of 50 between 1996 and 2010. Chapter 5 discusses in more detail the evidence of an increased reliance in global supply chains in the production of IT products.

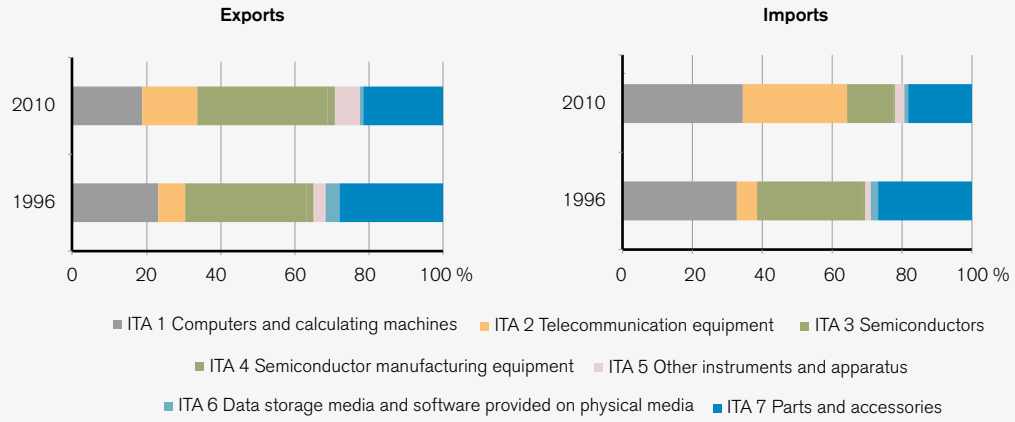
With regard to trade in IT products in the European Union between 1996 and 2010, only three categories of exports experienced an increase (see Figure 3.16): telecommunication equipment (its share rising from 14 per cent to 22 per cent), semiconductors (19 per cent to 22 per cent), and other instruments and apparatus (4 per cent to 6 per cent). Imports of telecommunication equipment to the European Union rose sharply in the period, from 9 per cent to 20 per cent, while the share of semiconductors

Figure 3.17. Japan: structure of trade by IT product category



Source: WTO Secretariat, based on UN Comtrade and WTO estimates.

Figure 3.18. United States: Structure of trade by IT product category



Source: WTO Secretariat, based on UN Comtrade and WTO estimates.

showed a comparably slight increase (from 19 per cent to 24 per cent). The other product categories decreased in terms of shares.

The structure of Japan's IT imports did not change as much as those of China between 1996 and 2010 (see Figure 3.17). While the share of Japan's exports of telecommunication equipment dropped from 4 per cent to 2 per cent in the 14-year period, shipments of semiconductors expanded from 36 per cent to 55 per cent. The share of computers and calculating machines also declined from 19 per cent to 4 per cent (and fell in absolute value terms), but this may be related to the price effect discussed above (i.e. the volume of trade has grown despite the fact that the price of those products has declined). The United States shows the same structural tendency observed in Japan but to a greater magnitude (see Figure 3.18). While the share in exports of IT products of computers and calculating machines, and parts and accessories decreased by 2010, exports of semiconductors and telecommunication equipment increased to 35 per cent and 15 per cent respectively. While the share of the imports of parts and accessories, and semiconductors diminished, the share of telecommunication equipment grew considerably. This largely reflects the decision by several companies to transfer the assembly of final products to other countries.

Endnotes

1 WTO document WT/MIN(98)/DEC/2.

2 WTO document WT/L/843.

3 In this chapter, the standard regional definitions used in the *WTO International Trade Statistics* apply. This implies that intra-EU trade is included and that the re-exports of Hong Kong (China) are excluded from the world total.

4 WTO and IDE-JETRO (2011), *Trade Patterns and Global Value Chains in East Asia: From Trade in Goods to Trade in Tasks*, Geneva: WTO. See Chapter 5 for a detailed explanation.

5 This "law" is in fact an observation that was formulated in 1965 by Intel co-founder Gordon E. Moore, who described a long-term trend in the history of computing hardware whereby the number of transistors that can be placed inexpensively on an integrated circuit doubles approximately every two years.

6 A gigaFLOPS is a billion FLOPS (floating point operations per second) and is used as a measure of a computer's performance.

7 Source: WTO Secretariat. Angola, Chad, Comoros, the Democratic Republic of the Congo, the Republic of Equatorial Guinea, Haiti, the Lao People's Democratic Republic, Liberia, Sierra Leone, Solomon Islands and Somalia are excluded, as figures and estimates are not available.

8 Source: WTO Secretariat. Angola, Congo, the Democratic Republic of the Congo, the Republic of Equatorial Guinea, Liberia, Libya, Chad, Comoros, the Gambia, Ghana and Sierra Leone are excluded as figures and estimates are not available.

9 The abbreviation "n.e.s." stands for "not elsewhere specified".

IV The ITA and innovation

Contents

Highlights

- The general-purpose nature of information technology (IT) means that its widespread use in other economic sectors helps induce organizational and technological innovation throughout the economy. Innovation in IT itself has a magnified effect on economic productivity.
- Demand for IT products is highly responsive to changes in both income and price, which means that diffusion and use of these products accelerates with the growth and price effects associated with opening trade and reducing tariffs. Technological innovation in the core ITA areas (i.e. semiconductors, computer technology and telecommunications) has grown faster than other sectors since 1997.
- Patents on important technologies in the IT sector are still predominantly held in developed countries participating in the ITA. However, patenting activity in IT-related fields has increased disproportionately compared to other domestic industry sectors in both developed and developing top-trading ITA participants.
- The long-term impact of outsourcing and offshoring, as well as an increasingly strategic use of the patent system may pose challenges for the pace of innovation in the IT sector.

A. Introduction

The conclusion of the Information Technology Agreement (ITA) in 1996 was largely driven by WTO members' realization that trade in information technology (IT) products played a key role in the development and dynamic expansion of the world economy. Mindful, therefore, of the "positive contribution information technology makes to global economic growth and welfare", the stated objectives of the ITA were to achieve "maximum freedom of world trade in information technology products" in order to "encourage the continued technological development of the information technology industry on a world-wide basis."[1] These programmatic statements reflect the founding participants' realization that the development, use and diffusion of these technologies play a central role in spurring innovation and hence providing one of the central ingredients for much-needed sustained economic growth. This chapter explores different aspects of IT innovation and reviews available patent data from the top-trading ITA participants.

While the rapid technological development that characterizes this sector poses a challenge for regulatory frameworks that attempt to cover it comprehensively, it is precisely this transformative characteristic of IT which lends its exceptional quality as a transmission mechanism of innovation throughout different industry sectors. Section B explores the role IT plays in an economy and highlights the challenges for measuring IT-related innovation.

The fundamental tenets of the ITA preamble remain true after 15 years – with the IT industry growing as one of the most dynamic sectors of the world economy and with exports of IT products representing US$ 1.4 trillion in 2010.[2] The rise in demand for IT products and the simultaneous technology-led development of decentralized, and highly integrated global production networks (GPNs), has led to the growing importance of developing countries. They are increasingly the source of essential inputs or intermediate parts, such as semiconductors for highly developed technology products, and provide sites for manufacturing and assembly in GPNs. While this phenomenon is most evident in the evolution of the trade figures reviewed in Chapter 3, the evidence in Section C below suggests that participation in GPNs of IT products is also affecting the *innovation* efforts of ITA participants by developing or deepening an innovation focus in IT-related technology fields. Section D explores future challenges for innovation in the context of the ITA.

It should be noted that in view of the manner in which the ITA's product coverage was defined, and because of limitations in the available data concerning patents, any analysis is limited to examining broadly matching product categories to establish general trends and tendencies, rather than establishing correlations or causal relationships.

B. Innovation in IT: what is it and how do we measure it?

While the concept of innovation is intuitively associated with new technologies or improvements in the functionality of individual products, innovations that improve factor productivity in economic terms – and thereby significantly affect economic growth – are of a much broader range and are not always as tangible as new fibre-optic communication, a smartphone or tablet PC. In product development, many, if not most, technological innovations are incremental and accumulative improvements in manufacturing processes, rather than game-changing leaps of progress. Organizational innovations, which are often sparked by technological innovation, can be even more significant in terms of affecting economic behaviour and can sometimes transform entire business sectors. These may be new services or novel ways of information sharing among collaborators, or may feed back into improvements in the manufacture, commercialization or implementation of technological advances.

Taking account of this wide spectrum of innovative activities, the Organisation for Economic Co-operation and Development (OECD) has adopted a definition of innovation as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations".[3] This definition has the advantage of going beyond mere process and product innovation to also capture organizational approaches and marketing methods, as well as aspects of adoption, absorption and adaptation of existing technologies in new contexts.[4]

IT as a general-purpose technology enables innovation throughout the economy

The recognition that innovation is not only bringing to market new products, but also what we do with them, is particularly appropriate in view of the economic impact of information technology as a *general purpose* or *platform* technology. These are technologies, like electricity or the steam engine, that are characterized by their potential use in a wide range of applications throughout the economy, rapid development and improvement in their own right, and a particular ability to facilitate further technological improvements in downstream sectors – a phenomenon referred to as "innovational complementarity".[5] The effect of general-purpose technologies on the rest of the economy is therefore twofold.

Firstly, the widespread use of IT in sectors as diverse as retail distribution and financial services can bring efficiency gains through novel business models or distribution methods, thus enabling organizational innovation throughout different sectors of the economy. The establishment of decentralized GPNs that now characterize the manufacture of electronic products is itself an organizational innovation of substantial magnitude. It has ultimately been made possible by improvements in communication and transport, which have, in turn, been enabled by advances in IT.

Secondly, innovational complementarity means that, in addition, the rapid technological improvement in the general-purpose technology itself increases the return on research and development (R&D) in downstream sectors. For example, dramatic improvements in semiconductor technology have facilitated ground-breaking technological innovations in downstream sectors, such as the computed tomography scanner in the health sector, the barcode scanner for the retail sector, or – more recently – 3D-printing.

The innovation and consequent productivity gains associated with the use and development of IT go far beyond the technological advances in the IT sector itself. Any comprehensive measurement of innovation would have to include the organizational improvements that IT enables in downstream sectors of the economy, as well the technological innovations in those sectors that would otherwise not have been possible. The ability of adopting IT, and thus realizing the potential benefits from its use, may vary across downstream sectors, depending on the rigidity of their organizational structures. Mann (2006) identifies health care and construction as the sectors with the longest delay in benefiting from IT-related productivity gains in the United States.[6]

Because of the multiplying effects described above, researchers associate the use of information and communication technology with significant economic benefits at the micro- and macroeconomic level, both in developed and developing countries.[7] Firms using IT display significantly higher factor productivity than others, industries that adopt IT are associated with higher labour productivity, and IT capital has a higher return at the aggregate level than other types of capital.[8] As a consequence, the use of IT is deemed to be responsible for a significant part of total productivity growth in economies around the globe. For the United States, Mann (2006) estimates that "more than half of the gain in productivity growth from the mid-1990s to the recent 2000s has come from the use of IT".[9] Brynjolfsson and Saunders (2010)[10] estimate the impact of IT as high as 75 per cent of productivity growth in 1995-2002 and 44 per cent in 2000-2006. For China, the use of IT is estimated to be responsible for 38 per cent of total factor productivity growth,[11] and in Japan, IT contributed 34 per cent of annual economic growth in 2005-2010.[12]

Demand behaviour for IT multiplies positive trade effects

The functional linkages of IT with other sectors of the economy are further reflected in the dynamic behaviour of demand for such products as the economy develops. Research suggests[13] that demand for IT products is both *price* and *income* elastic. This means that a 1 per cent increase in income or 1 per cent decrease in price leads to an increase greater than 1 per cent in the

demand for IT products.[14] In other words, demand for IT products grows disproportionately when the economy grows and when prices for such products fall. As an economy grows, demand for IT diffuses through different economic sectors in the manner described above. As prices of IT products fall, IT becomes more easily available, including for additional sectors of the economy eager to realize the productivity gains associated with its use.

This demand behaviour is arguably independent of the level of gross domestic product (GDP) or level of development of the economy. Disproportionate growth rates of IT spending compared with GDP growth have been observed in countries as diverse as China, India, Ireland, the Republic of Korea, Malaysia, Poland and Singapore.[15] Similarly, the widespread adoption of IT in low-income sectors of developing countries once it had become affordable is well documented.[16]

These two qualities – the general-purpose nature of IT and the elasticity of demand for IT products – are particularly significant in the context of the ITA, as the growth and price effects associated with trade opening and tariff reduction accelerate the diffusion of IT, thus multiplying its effect on productivity growth. It is hard to underestimate the impact that the ITA has had in the world economy, as the explosion in IT trade has facilitated this transmission mechanism for international technology diffusion, thus enabling associated innovation in downstream sectors across the economy.

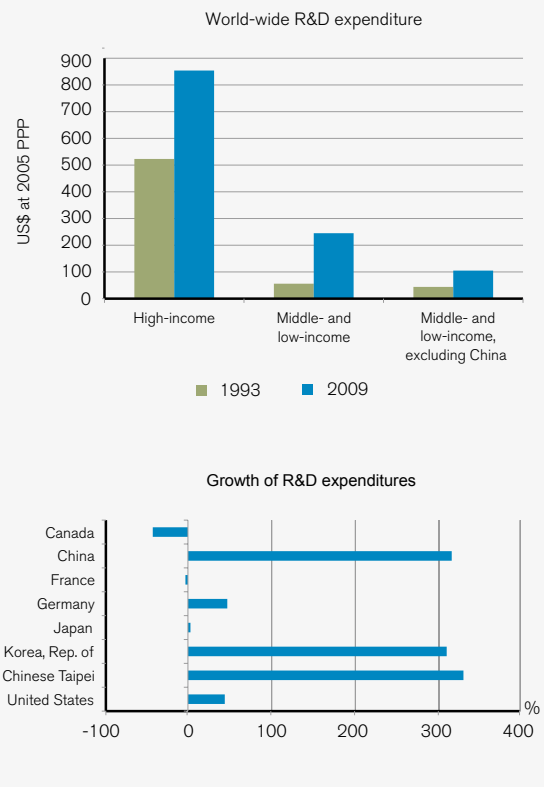
Innovation remains difficult to measure

While the body of theoretical and conceptual work on how innovation influences economic development increases steadily, innovation itself remains notoriously difficult to quantify and measure. The is particularly the case in IT, where the multifaceted nature of innovation and a lack of sufficiently detailed and disaggregated data mean that measuring at the macro- and microeconomic level is difficult. Reflecting a growing appreciation of the complexity of the conditions that encourage or inhibit innovation, recent ambitious initiatives to measure innovation have been examining a broad set of economic, social and geographical indicators and encouraging improvements in data collection in previously neglected areas.[17]

For lack of alternatives, researchers have long used R&D spending or investment in education as a proxy for measuring innovation, even if these are arguably an input into innovation rather than the output to be measured. Figure 4.1 shows that while R&D spending generally remains highest in developed countries, IT firms in developing countries which are ITA participants, are rapidly increasing their R&D spending – reflecting policy efforts to create pro-innovation environments for technologies that are already contributing strongly to the economy.

There is currently intensive research on the factors that influence the propensity of R&D and education spending to actually translate into innovation. New approaches to measurement and data collection are likely to bring an improved understanding of the complex system necessary for innovation to flourish and to produce tangible results in a particular economy. The following section reviews evidence of innovation output in the top-trading ITA participants by examining their use of the intellectual property system before and since the ITA was implemented in 1997.

Figure 4.1. R&D expenditure



Source: WIPO estimates, based on data from UNESCO, Eurostat and OECD. OECD (2008), *OECD Information Technology Outlook*, Paris.

Notes: In the top figure, R&D data refer to gross domestic expenditure on R&D. The high-income group includes 39 countries, and the middle- and low-income group includes 40. In the bottom figure, growth is based on the expenditures of top ICT firms from 2000-2006.

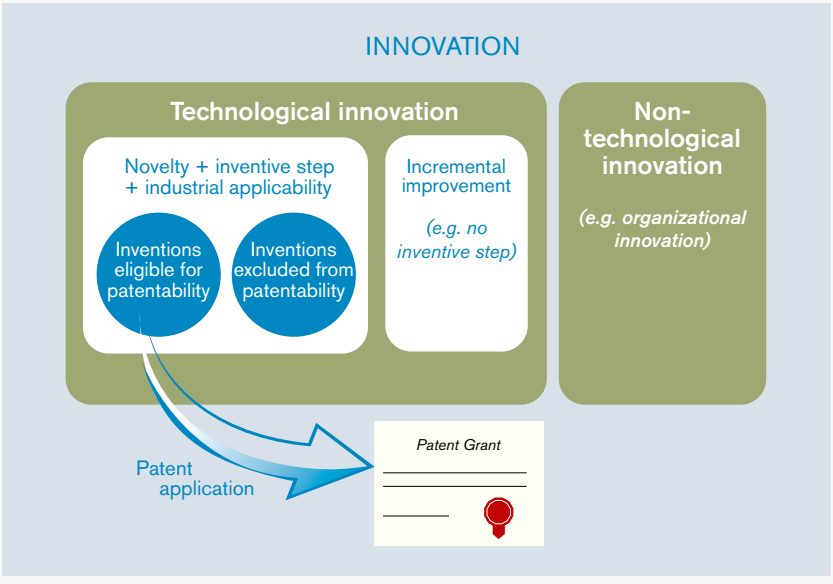
C. Evidence from intellectual property indicators

The multifaceted role of intellectual property rights

Patent statistics are closely related to concrete innovation outputs and have been used widely as indicators for innovation since the 1960s, both at the micro and macro level.[18] A patent provides the owner with an exclusive right to exclude others from making, using, selling or marketing an invention, thus providing a reward for successful innovation and thereby incentivizing inventive activity. This has the effect of mobilizing market forces to guide R&D investment in a decentralized fashion.[19] Although there are variations in the interpretation of the patentability criteria of "novelty" and "inventive step" across countries, patent examinations have the role of ensuring that patents are granted for inventions that are new and provide a substantial improvement to the body of prior art in a particular technology sector. Patents are, therefore, one output of innovative activity according to criteria that are comparatively standardized on a global level, which explains the popularity of using patent data for statistical analysis. The requirement to publish the patented invention seeks to ensure that patent information can be used as an input for further innovation by others that improve and build upon the published patented invention.

Although patents can be an indicator of *technological* innovation of a certain level of quality, they do not capture non-technological improvements or incremental innovations that do not qualify as an inventive step[20] (see Figure 4.2), nor are they representative of the organizational or technological innovations that IT may trigger in downstream sectors of the economy. The correlation between patents and applied innovation in the market place is also not direct, as not all registered patents are actually commercialized in products or processes that reach the market, and if they are, individual patents do not correspond to individual products. Modern IT products usually require the use of large numbers of patented inventions. Furthermore, the propensity to patent may vary across different activities and industries – with process improvements being generally patented much less than product inventions – and strategic patenting and litigation behaviour may further distort the correlation between patents and innovation. Despite these important caveats,[21] patent statistics remain a highly useful indicator of a particular type of innovation, in particular when examining individual fields of technology that are relatively homogenous. Moreover, the availability of increasingly detailed

Figure 4.2. Patent grants are only a fraction of all innovation



Source: WTO Secretariat.

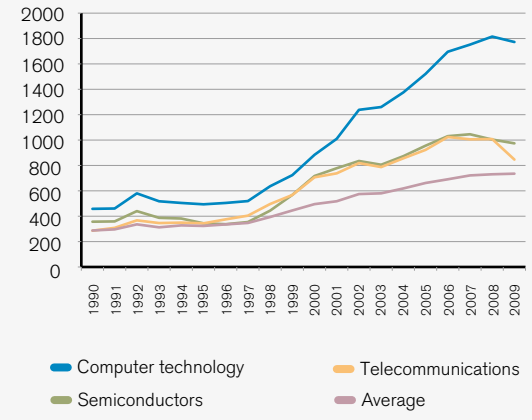
and disaggregated patent statistics at a global level permits a detailed analysis and comparison across most countries.

Patent data of ITA participants in different fields of IT technology

Examining patent statistics in the areas of computer technology, telecommunications and semiconductors – areas which cover the bulk of product categories covered by the ITA[22] – gives an indication of innovative activity and focus in these sectors across the world. Since 1996, worldwide patent applications in these three sectors have increased significantly, reflecting the dynamic nature and economic importance of the IT sector. This development is particularly pronounced among developed ITA participants – which are traditionally more active in technological innovation – but it also occurs in developing countries. Figure 4.3 shows that the average number of patent applications in the three technology fields has risen disproportionately compared to the average applications per industry among ITA participants.

Most patents in the IT sector, particularly those on the most important technologies within that sector globally, are held in developed countries. The so-called triadic patent families – groups of patent applications or grants that protect the same technology at the three patent offices of Europe, Japan and the United States[23] – are an approximation of strategically important technologies protected in the three major consumer markets of the world. Such patent families not only represent the business decision to invest in the often costly and time-intensive patent protection in the main markets, but are also indicative of a certain quality of an invention, as low-quality patents are significantly screened out.

Figure 4.3. ITA participants' average published patent applications



Source: WTO Secretariat, based on WIPO Statistics Database and EPO PATSTAT Data.

Table 4.1 shows that the large majority of triadic patent families in the area of IT technologies are held by nationals of OECD countries, with a particular concentration in Japan, the most advanced EU member states and the United States. While numbers of triadic patent families held by residents of countries give a good static picture of the distribution of ownership of important technologies, their long-term trends are more ambiguous because of the extensive time lag in establishing patent protection for a technology across the markets. But even with this important caveat, it is clear that the share of triadic patent families owned by applicants from developing countries that are top traders in ITA products is rising. For example, IT-sector triadic patent families held by applicants from the Republic of Korea have more than tripled between 1999 and 2003, while those held by applicants from China and Singapore have also expanded significantly, albeit at a much lower level.

Developed ITA participants

While indications of shifts in the *status quo* of technology ownership at the aggregate level of triadic patent families are tentative, examining the data of worldwide patent applications by residents of the top-trading ITA participants in the relevant sectors of IT-related industries gives a more detailed picture of national trends in innovation over time.

Looking at applications by residents rather than nationals, ensures a relatively high probability that the corresponding invention has been made locally and that the data can give an indication of innovative activity in that country. This is regardless of whether the applying inventor is employed by, or the applying enterprise is owned by, a foreign multinational. However, examining *worldwide* applications has the disadvantage of including filings abroad which are mostly, but not exclusively, the re-filings of already patented inventions to obtain protection in other countries – and are therefore less indicative of actual innovation. This is less problematic when looking at the domestic distribution of applications between different industry sectors, which is the focus of the examination below. It should, however, be borne in mind when comparing countries whose share or growth of abroad filings may differ considerably.

Table 4.1. Number of triadic patent families in the IT sector by applicant's country of residence, OECD countries and other selected economies

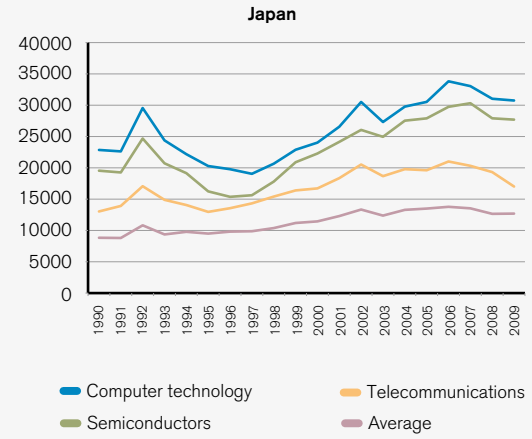
Member	1999	2000	2001	2002	2003	2004	2005
Australia	63.1	124.1	83.9	83.7	43.5	37	23
Austria	25.4	33.5	23.8	32.1	24.9	23.2	15
Belgium	62.2	57.9	65.8	67.9	53.8	54.4	32.3
Canada	136.2	155	132.8	128.7	111.3	101.8	84.3
Denmark	30.8	40.8	35.5	40.7	33.2	26.3	13
Finland	259.8	248.5	187.8	138.6	130	115.5	95
France	836.1	753	721.5	668.4	578.6	425.4	328.9
Germany	1374.4	1531.8	1270.1	1042.6	787.1	648.5	481.5
Ireland	19.2	11	11.4	9.6	13.1	8.6	12
Israel	70.7	81.3	71.7	66.3	60.3	42.8	51.5
Italy	115.7	92.9	93.4	87.2	66.5	52.8	41.5
Japan	6307.7	7228.1	6614.8	6467.6	6233	5401.4	3716.7
Korea, Rep. of	298.4	390.8	497.5	751.9	978.5	946.5	699.5
Netherlands	777.8	1139.7	1373.8	1012.7	856.3	580.6	341.2
Norway	23.3	45.5	31.5	25.3	34.2	22	11
Sweden	418.7	220.1	213	206.2	244.5	182.5	189
Switzerland	197.2	241.9	221.4	198.7	187.3	185.1	140.2
United Kingdom	344	409.8	346.5	300	253.4	158.6	135.9
United States	6273.5	6576.3	5894.4	5577.2	5161.4	4659.2	3764.7
EU-27	4283.4	4573.6	4371.7	3644.5	3068.7	2301.5	1707
OECD	17661.1	19419	17931.7	16950.3	15878.4	13699.4	10197.9
World	**17797**	**19585**	**18128**	**17207**	**16123**	**13912**	**10412**
China	11.6	17.2	19.8	41.5	51.5	33	33.5
India	1	4.8	3	7	2.3	4.5	3.5
Russian Federation	6	9.7	5.7	8	1.7	3.5	2.2
Singapore	22.6	23	43.3	41	48.3	61.6	31.8
South Africa	7	7.1	1	0	3	1	1

Source: WTO Secretariat, based on OECD Stat Extracts (27 Feb 2012).

Notes: For the methodology see Dernis, H. and Khan M. (2004), "Triadic Patent Families Methodology", OECD Science, Technology and Industry Working Papers 2004/02.

The data suggest that innovation efforts in the top trading ITA participants have shifted disproportionately into IT-related industry fields since the implementation of the ITA in 1997 and the application of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) in developing countries in 2000.[24] A comparison of the number of patent applications in the fields of computer technology, semiconductors, and telecommunications compared with the average number of applications per industry sector[25] suggests that the domestic focus of innovative activity has shifted significantly since 1996, both in developed and developing country ITA participants.

Figure 4.4. Worldwide published patent applications by Japanese residents



Source: WTO Secretariat, based on WIPO Statistics Database and EPO PATSTAT Database, 2011.

Japan's residents have traditionally been the strongest contributors to patenting activity across the three sectors of computer technology, semiconductors and telecommunications. The early specialization of the Japanese economy in the IT sector is reflected in the disproportionate number of patent applications in those sectors compared with average patenting activity across the economy. Figure 4.4 illustrates that the focus of Japanese innovative activity in these three sectors has continued to deepen since 1997, with the shift into innovation in semiconductors and computer technology becoming particularly pronounced. Japan continues to be the source of the highest number of patent applications in semiconductors and telecommunications – overtaken recently only by the United States in the area of computer technology – and Japanese residents own more than a third of the triadic patent families in the IT sector. This picture of a continuously high output of successful technological innovations is consistent with Japan's well-established and dynamic IT industry, which rose to prominence in the 1980s and has maintained its position among the leading traders and innovators in IT products.

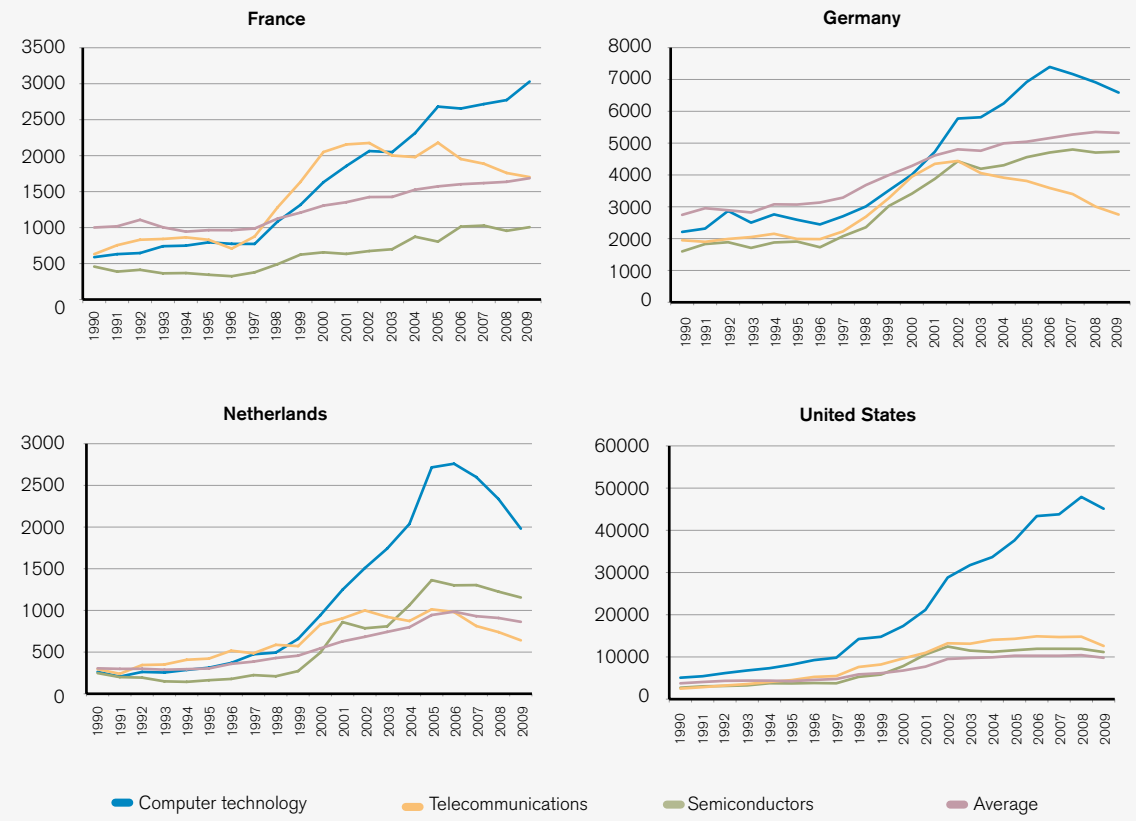
The early focus on innovation across a number of ITA-related sectors and the significant level of patenting in absolute numbers in these areas are unique to the Japanese economy. Other developed ITA participants and top traders of IT products also contribute high absolute numbers of patent applications in these sectors, but have only developed a focus on innovation in these areas since the ITA was implemented. Figure 4.5 shows that in France, Germany, the Netherlands and the United States – whose residents own about half of triadic patent families in the global IT sector – significant shifts of patenting activity into ITA-related technology fields only took place in the late 1990s. In the United States, innovation in the area of computer technology had been above average cross-industry patenting efforts since early on, but its meteoric rise to more than four times the average level only began towards the end of the 1990s. Similarly, while the general upward trend in patenting occurred in all four of these economies, the disproportionate rise of patent applications in the three ITA-related fields coincided with the expansion of trade in IT products after 1997.

Since then, innovation efforts in these countries have risen considerably in the area of computer technology, compared to the average across all technology fields, or even compared to other ITA areas such as semiconductors and telecommunications. Semiconductors are an "above average" innovation focus only in the Netherlands and the United States. An increasing degree of strategic patenting – motivated by market strategy rather than the protection of innovation – and different propensities to apply for patents in these three sectors may have to be taken into account when examining the significance of this difference. However, the relative rise of computer technology patenting *vis-à-vis* semiconductors and telecommunications may represent early signs of a relative specialization of innovation efforts of these countries as a result of increased competition following trade expansion and liberalization.

The emphasis on patenting in the US computer technology sector is exceptional, both in relative and absolute terms, with almost 13 per cent of all US patents filed in this field in 2008. This may partly be explained by the more permissive US approach to the controversial patenting of software and business methods, which contrasts with a more restrictive practice in other countries, including EU member states. Studies suggest that, following the introduction of such patents in the United States, the number of US software patents grew fourfold between 1990 and 2000, and accounted for 15 per cent of all US patents granted in 2000.[26]

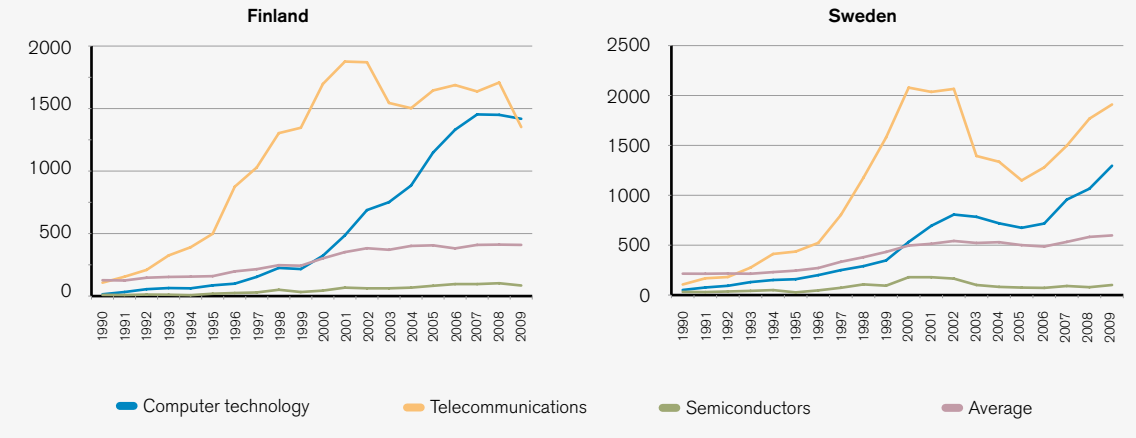
The degree of relative innovation focus on computer technology (and telecommunications in the case of France) in the European countries in Figure 4.5 is less extreme. Patent applications in those fields did not rise beyond twice the average, suggesting a more diversified innovation landscape across the respective

Figure 4.5. Worldwide published patent applications by country resident



Source: WTO Secretariat, based on WIPO Statistics Database and EPO PATSTAT Database, 2011.

Figure 4.6. Worldwide published patent applications by country residents



Source: WTO Secretariat, based on WIPO Statistics Database and EPO PATSTAT Database, 2011.

national economies. Exceptions to this more homogenous European picture can be seen in Finland and Sweden (Figure 4.6), where an early and strong specialization in telecommunications innovation reached its peak in the years 2000 and 2001. At this point, the application rate in Finland reached about eight times the cross-industry average and more than 15 per cent of all Finnish and 12 per cent of all Swedish patent applications were filed in this field alone. As trade in IT expanded and the industry diversified, the innovation focus in these countries expanded to include computer technology, where patenting activity rose above the cross-industry average after 2000.

Developing ITA participants

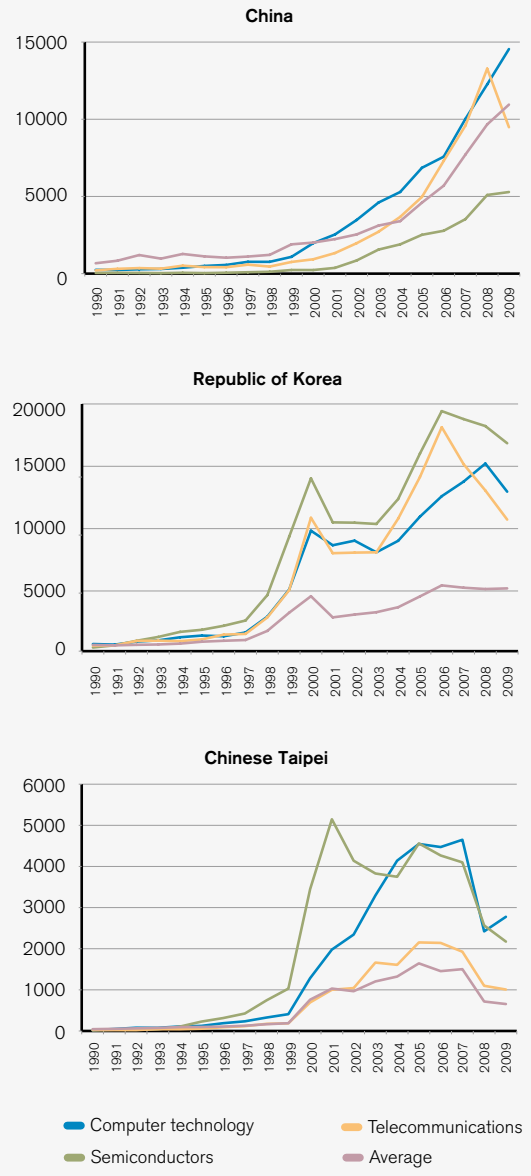
Among developing ITA participants, the rise of China, the Republic of Korea and Chinese Taipei as the top traders in the GPNs of IT products is mirrored by a profound shift of relative innovation efforts into ITA-related industry fields in these economies (see Figure 4.7). Patenting activity among residents of the Republic of Korea concentrated disproportionately in the three ITA-related fields of computer technology, telecommunications, and semiconductors after 1996, surpassing European countries in nominal terms and almost reaching Japanese dimensions in absolute numbers by 2006. In 2009, more than 22 per cent of all patent applications by residents of the Republic of Korea were filed in these three fields.

Patenting activity among applicants from China shifted disproportionately into computer technology and telecommunications after 2000, rising dramatically to nominal levels similar to that of the Republic of Korea by 2009. The trend in increased semiconductor patenting was less pronounced and remained below the rapidly rising average patenting activity across technology fields, but nevertheless reaching European levels in nominal terms by 2009.

The patenting pattern in China is unique. As a result of its rapid economic development and a policy of actively incentivizing the use of the patent system – most recently through the National Patent Development Strategy (2011-2020) – there has been an exponential rise in patenting efforts across all industries, which has made China one of the leading filers of patents in the world in 2011 – together with Japan and the United States.[27] This means that the high numbers of IT-related filings represent a strong relative focus of domestic innovation in the Republic of Korea, whereas in China they are part of an economy-wide surge of patenting in all areas. Furthermore, while an increase in filings abroad – usually re-filings of domestic patent applications and therefore less representative of innovation – is a general feature of the overall increase in patent applications,[28] it is particularly strong in China, where filings abroad have grown by 30 per cent a year since 1996, compared with 10 per cent annual expansion in the Republic of Korea.[29]

Moreover, although residents of China and the Republic of Korea apply for similar total amounts of patents in the computer technology and telecommunication sectors, this results in starkly different levels of international protection in the IT field. Residents of the Republic of Korea own 4-5 per cent of all triadic patent families in the IT field, while residents of China hold less than 0.5 per cent. This may partly be explained by the Republic of Korea's focus on innovation in these fields starting earlier than in China, giving more of the lead time necessary to establish protection for their technologies across the big markets. However, there is also evidence that the success rate – the ratio of grants to applications – of patent applications from the Republic of Korea has been significantly higher than the equivalent measure for China,[30] which may indicate more robust applications in substance.

Figure 4.7. Worldwide published patent applications by country residents



Source: WTO Secretariat, based on WIPO Statistics Database (not for Chinese Taipei) and EPO PATSTAT Database, 2011.

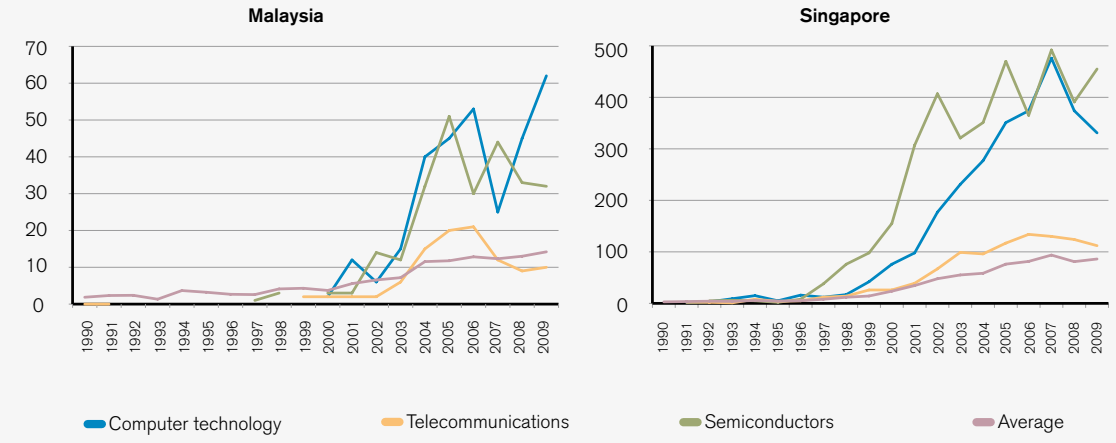
Because ITA participants are integrated into GPNs, disproportional innovation efforts in these areas are not confined to a few large economies. These can also be observed in the smaller developing countries that are strong traders in IT products. Figure 4.8 shows that the innovation efforts of Singapore – starting from very low levels of patenting in general – focused disproportionately in semiconductors and computer technology after 1996. A first indication of the same trend, albeit at a much lower level in nominal terms, can also be observed in Malaysia, which has long hosted semiconductor manufacturing plants of multinationals on Penang, the "Silicon Valley of the East", and which has recently developed into a global outsourcing hub. To appreciate the significance of this trend in lower middle-income countries such as Malaysia, it is worth recalling that technology patents represent an advanced output of innovation that is difficult and costly to obtain. They are usually the result of a much wider, more incremental and less well-defined innovation environment, which may escape precise recording, but of which a patent application in a high-technology area such as computer technology, semiconductors or telecommunications is indicative.

ITA non-participants

The data suggest that economies that participate intensely in GPNs of IT products have experienced a significant increase in innovation efforts in the IT-related sectors in their domestic economy. This is consistent with a notable absence of such trends in economies that remain outside the ITA or do not figure prominently in GPNs of IT products. Figure 4.9 illustrates that the relative innovation efforts in IT-related industry fields in the largest ITA non-participants – Brazil, Mexico and the Russian Federation – remain significantly below their cross-industry average. Patent applications in these areas have been growing at a slower rate than the industry average in those economies. The example of Mexico, whose membership in NAFTA may partly explain its high share in trade of IT products which rivals those of the top ten ITA-participants, shows that increased trade alone does not automatically translate into a boost of manufacture-related technological innovation that shows up in patent applications by resident inventors or firms.

To the extent that patent applications by residents can serve as an indicator for innovative activity in that economy, they indicate that innovation in ITA-related fields has increased disproportionately among most of the top-trading ITA participants since 1997. This coincides with the implementation of the ITA. Among the developed countries in that group, specializations on innovation in IT-related technology fields have either developed or have become more pronounced during that period. Among the top-trading ITA participants that are developing countries, the steady rise in their share of trade in IT products is accompanied with a disproportional increase in innovative activity in the ITA-related technologies among residents of these countries – particularly since the application of the TRIPS Agreement in developing countries. This is not confined to large economies, such as China and the Republic of Korea, but also occurs in relatively smaller traders such as Malaysia and Singapore. While the data focus on technological innovation

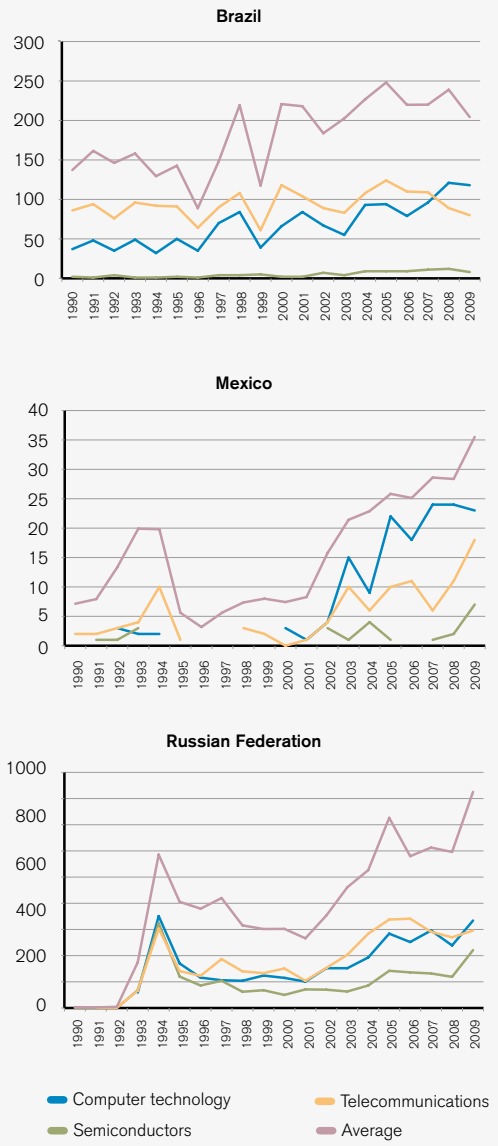
Figure 4.8. Worldwide published patent applications by country residents



Source: WIPO Statistics Database and EPO PATSTAT Database, 2011.

Notes: Gaps due to missing or unreported data.

Figure 4.9. Worldwide published patent applications by country residents



Source: WIPO Statistics Database and EPO PATSTAT Database, 2011.

Notes: Gaps due to missing or unreported data.

associated with IT production, they do not cover the potentially much larger scope of organizational or technological innovation that is triggered in downstream sectors by the mere use of IT, which would also be expected to occur in countries not directly involved in IT manufacturing.

Although more detailed data and research are needed in this area, current figures illustrate the close relationship between intensive trade and manufacturing in certain products and the use of the intellectual property system for related innovations. The increased involvement of certain developing countries in GPNs of IT products correlates with a disproportionate increase in innovative activity in these technology fields, compared to the average industry innovation in these countries. This seems to confirm that trade and intermediate manufacturing steps can indeed have the technology spillover effects and induce further innovation that economic theory suggests. The picture is also consistent with the view that there may be limits to the separation of manufacturing and innovation in globalized manufacturing networks, which indicates that at least some types of innovations and improvements may require direct involvement in the production process.

D. Challenges for innovation in the IT sector

The success of IT as a general-purpose technology in permeating other industry sectors and spurring productivity growth across the economy is largely driven by the rapid rate of innovation in the IT sector itself. Full understanding of the complex web of factors that make up the conditions that are conducive to innovation in a particular industry will require continued research and study. This section briefly summarizes recent discussions on two current issues. The first is how decisions concerning the location of design and manufacturing may affect

innovation. The second regards concerns that strategic use of the patent system, in particular in the IT sector, may undermine the underlying policy objectives of the system.

The impact of outsourcing and offshoring on innovation

Outsourcing and offshoring are essential ingredients of modern GPNs and are particularly advanced in the manufacture of IT products. They were initially limited to goods – and the delegation of steps of production under contract manufacturing remains the predominant form of offshoring.[31] In the IT sector, this practise has further advanced into globalized software development and the offshoring of services.

Many studies have associated outsourcing and offshoring with increased productivity through cost reduction, which improves competitiveness and enables firms to expand their market share, profits and capital spending.[32] Contract manufacturing is believed to increase the rate of innovation by original equipment manufacturers (OEMs) by reducing the cost of production capacity and allowing them to focus their financial and managerial resources on product development and marketing. The underlying assumption is that different steps of product development are mostly separate functions that can be delegated and sourced as "packaged services" without detriment to the overall process.[33] In this framework, strong and reliable intellectual property rights are seen as central to maintaining ownership and control of technologies.

Some other studies, however, have indicated that outsourcing and offshoring in areas where product design is highly integrated with manufacturing may in fact have a detrimental impact on an OEM's ability to innovate by removing this important feedback loop. The industry structure, and who owns the production facilities, may further influence incentives to invest in innovation and capacity, thus moving control away from the OEMs to contract manufacturers.[34] The expertise of company engineers related to systems and components design can erode sharply in the course of few years after the relevant activities have been outsourced, leading to a long-term loss of technical competence and of the ability to innovate.[35] Strong intellectual property rights enable control over innovative technology for a specified period, but do not in themselves ensure that companies maintain their ability to innovate. Whether the impact of outsourcing on an OEM's ability to innovate will be positive or negative may depend on two things: the ability of R&D and manufacturing to operate independently of each other and on the maturity of the manufacturing technology.[36]

Another factor affecting decisions concerning the location of both manufacturing and R&D operations is that the proximity of product development to manufacturing helps a company take full advantage of its innovative capacity, with the consequent responsiveness to the needs of local customers and the ability to offer tailored solutions. This is a powerful competitive advantage. A company's competitiveness may also depend on a local infrastructure that is supportive of innovation.

Such industries require the establishment and maintenance of an "industrial commons"[37] (the collective R&D, engineering and manufacturing capabilities that sustain innovation), which are increasingly springing up in developing countries that are the outsourcing-hubs of the GPNs of IT products. The data presented in this section indicate that the increased involvement of these new industrial clusters in the GPNs has coincided with a significant increase in their contribution to the global innovative effort. Managers and policymakers will need to consider such broader factors in designing successful innovation strategies for their companies and economies.

Strategic use of the patent system: thickets and trolls

The traditional function of the patent system to incentivize innovation by rewarding qualified technological inventions with a temporary exclusive right of exploitation is seen under threat from the increasingly strategic use of patenting.

The mounting complexity of technologies, particularly in dynamic areas such as IT, has led to individual technologies being covered by dense webs of potentially overlapping patents belonging to a multitude of owners – *patent thickets* – which become even more impenetrable if they consist of imprecisely drafted patents with unclear scope. To protect themselves against the resulting high risk of costly patent litigation, competitors in complex technology areas have developed different strategic approaches. In the 1970s and 1980s, rather than patenting all possible inventions, some companies consciously focused resources on seeking only those patents that provided the best opportunity for cross-licensing with competitors, thus providing an incentive to avoid or settle suits of alleged infringements.[38]

Such a strategy of "mutual non-aggression" is further institutionalized in *patent-pools*, where technology owners pool the patents necessary for a particular technology (e.g. TV, DVD, MPEG, WiMAX, etc.) and provide cross-licences to all participants. A single standardized licence on all essential patents for the technology is often provided to interested outsiders.

More recently, strategies have increasingly turned to more aggressive litigation and cross-licensing efforts. Companies have moved from pitching individual patents against those of competitors to the strategic building or acquisition of entire patent portfolios at vast expense. The availability of far-reaching legal sanctions that can potentially disrupt entire business operations – sometimes simply on the basis of suspected infringement – further incentivizes the creation of patent thickets, which is further encouraged if patent standards are low.[39] The soaring litigation among competitors of complex technology in certain areas is a symptom of this development. The recent auction of the Nortel patent portfolio of around 6,000 patents for US$ 4.5 billion is exemplary of the race among competitors to acquire strategic patent portfolios, which has led to high prices for patents whose strength and reliability are difficult to establish. By some estimates, only 3 per cent of in-force patents in any portfolio are truly valuable.[40]

The trend of increased patent litigation is potentially exacerbated by the phenomenon of non-practising entities (NPEs), or *patent trolls.* These entities focus on the acquisition and enforcement of strategic patent portfolios without themselves producing related products. While certain types of NPEs such as patent brokers and technology clearing-houses have often been important in facilitating technology markets in the past,[41] the more recent wave of litigation by NPEs has been associated with pure rent-seeking behaviour that has caused a significant loss of wealth without leading to efficiency gain or increased incentives to inventors. NPEs predominantly enforce patents that are used in multiple technologies, thus affecting multiple defendants. They enforce patents usually after the corresponding technology has been brought to market, thereby maximizing the economic threat to the defendant's business that may already be heavily invested in the technology. Most NPE-related patent litigation takes place in the field of software, where patents are particularly numerous and have a reputation for unclear scope – in other words, where the patent-thicket is greatest – hence particularly favouring rent-seeking behaviour. Some argue that NPEs still perform efficient market functions. However, others associate the significant increase of NPE-related litigation – estimated as 16 per cent of all patent litigation in 2009 – with approximately US$ 80 billion of lost wealth per year and no corresponding gains by inventors or increased incentives to innovate.[42]

Strategic use of the patent system can therefore discourage innovation by blocking competition and innovation in areas where technology ownership is too difficult or costly to establish, or the risk of litigation is too high. The competitive race for acquiring strategic patent portfolios involves considerable capital which diverts investment away from research and innovation, and instead generates an incentive for the acquisition and creation of large numbers of vague, low-quality patents. Increasingly, rent-seeking patent-litigation and cross-licensing can further overshadow normal technology licensing, thus leading to sub-optimal research decisions and discouraging innovation and new product development. Given that these phenomena are particularly evident in the IT sector, tackling these challenges will be of particular relevance for the continuing pace of innovation in this important sector.

Endnotes

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20 Some of these lesser innovations can be protected through the intellectual property right of utility models, which are, however, much less documented at the international level.

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22 See Tables 3.3 and 3.4.

23 The OECD Triadic Patent family database is based on the priority date of international patent applications to the European Patent Office (EPO) and the Japan Patent Office (JPO), and patent grants at the United States Patent and Trademark Office (USPTO) that share one or more priority applications.

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V Global production networks, electronic products and developing countries

Contents

Highlights

- Many manufactured goods are now produced with components sourced from several places around the world, using international supply chains within global production networks (GPNs). This is particularly the case for most finished electronic products, which are not “made in” a single country any more, but are rather “made in the world”.
- Global manufacturing has greatly changed international trade patterns and opened new opportunities for developing countries, while lowering costs for consumers worldwide.
- Production is segmented into many different steps that take place in different countries. Keeping the cost of international transactions as low as possible is key in determining industrial competitiveness. This makes the elimination of tariffs and other barriers to trade ever more important. Trade facilitation and good infrastructure services should become a priority for developing countries wishing to participate in these GPNs.
- This closer inter-industry complementarity increases efficiency and leads to an intense trade in value added. However, where partners tend to specialize in the tasks in which they have comparative advantages, this model also becomes a source of closer interdependency. This means that macroeconomic crisis or natural disasters in one country can rapidly affect factories located far away. Similarly, protectionist policies and unilateral changes in regulatory frameworks can disrupt these supply chains. Greater interdependence makes such individual policies counterproductive and calls for a strengthened global governance of the multilateral trading system.

A. Introduction

As a result of globalization, many products are not manufactured entirely in a single country, but are rather assembled using components made by other companies throughout the world. In other words, goods are rarely "made in" one country anymore, but are increasingly "Made in the World".[1] Although not a new phenomenon, global manufacturing has intensified the fragmentation of production within and across countries. Low transportation costs, cheap communication, the liberalization of trade in services, and open market policies have all contributed to blurring traditional boundaries between nations and reducing the distances for doing business. Supply chains have turned global, and a paradigm shift from "trade in goods" to "trade in tasks" has changed international trade patterns.

In 2010, trade in intermediate goods (i.e. goods used as inputs in the production of other goods) accounted for more than 54 per cent of non-fuel, world merchandise exports, which is higher than the combined global trade of consumer and capital goods. This share, for example, is higher in East Asia where production sharing is most active. A large share of global merchandise trade takes place in global production networks (GPNs) and most of the electronic products covered by the Information Technology Agreement (ITA) are an important component of this development.

Section B describes the importance of GPNs in the manufacture of electronic products and explains the reason why traditional trade statistics are insufficient to study them. Section C uses two case studies on smartphones to illustrate this point. Section D discusses how measuring the degree of vertical specialization can shed light on the impact of GPNs on competitiveness, obtaining a better measurement of trade balances and lubricating the economy at large. Section E concludes with the impact that GPNs can have on developing countries.

B. Evidence of global production networks in electronic products

GPNs are characteristic for the production of electronic products, which was highlighted in a WTO/IDE-JETRO joint analysis of East Asian trade and supply chains.[2] GPNs in electronic products criss-cross the planet and the production of smart phones is a prominent example of this phenomenon. Many of the intermediate goods required to produce them, and indeed many of the final electronic products bought by consumers, fall within the scope of the ITA (see Box 5.1 and Figures 5.1-5.3).

The developing country share in world exports of information technology (IT) products grew considerably from 1996 to 2010 – increasing from 31 per cent to 64 per cent. With 66 per cent of world exports in 2010, Asia is at the heart of GPNs and is frequently dubbed the world's factory. Is this characterization accurate? What has been the impact of this new paradigm for developing countries participating in GPNs? And does an environment of "trade in tasks" call for a new way of measuring and analysing trade statistics?

Companies in industrialised countries have increasingly outsourced less specialized tasks of their production process in order to concentrate on their core businesses and to benefit from more cost-efficient locations. Nowadays, parts and components in final electronic consumer products are manufactured around the globe and often in establishments belonging to the same company, such as multinational corporations. Final products are progressively produced along those international supply chains within GPNs, with each partner contributing additional parts or manufacturing services before moving the product to the next step. This type of trade is called "trade in tasks" because countries compete according to their comparative advantages in performing certain functions such as research and development, manufacturing and assembly, business services, and logistics.

Measuring the actual contribution of each country participating in these GPNs poses a considerable statistical challenge, in particular

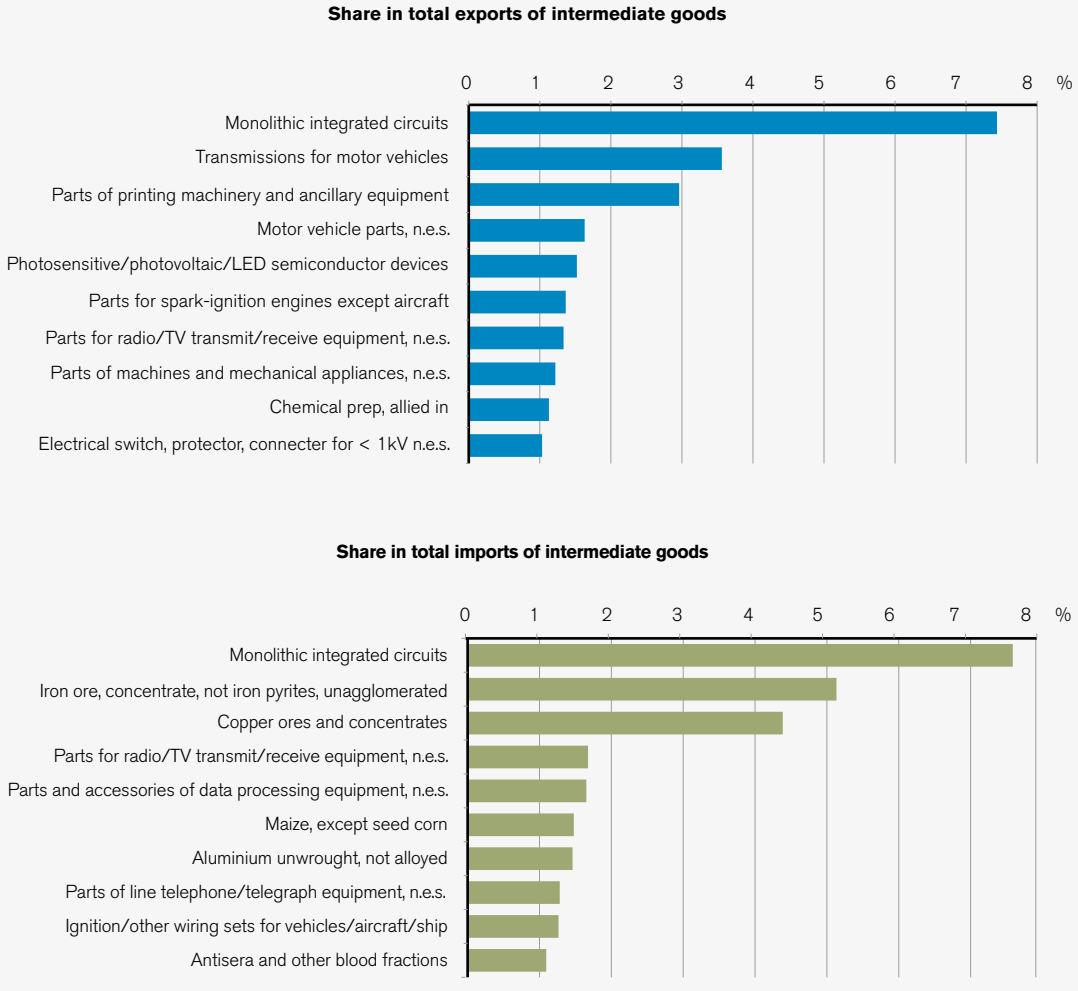
Box 5.1. What is trade in intermediate goods?

Intermediate goods are defined as those produced for being incorporated at a later stage in the production of a final good, which is classified either as a consumption or investment good. Transistors and electronic circuits used in smartphones are examples of intermediate goods. The distinction between intermediate and final goods is not always straightforward, as some goods can be used as final goods by households, but can also be purchased by industries for intermediate consumption.

Based on the United Nations Classification by Broad Economic Categories, intermediate goods in this chapter include all parts and accessories (BEC codes 42 and 53) as well as industrial primary and processed intermediate goods (BEC codes 111, 121, 21 and 22). Fuels and lubricants are excluded.

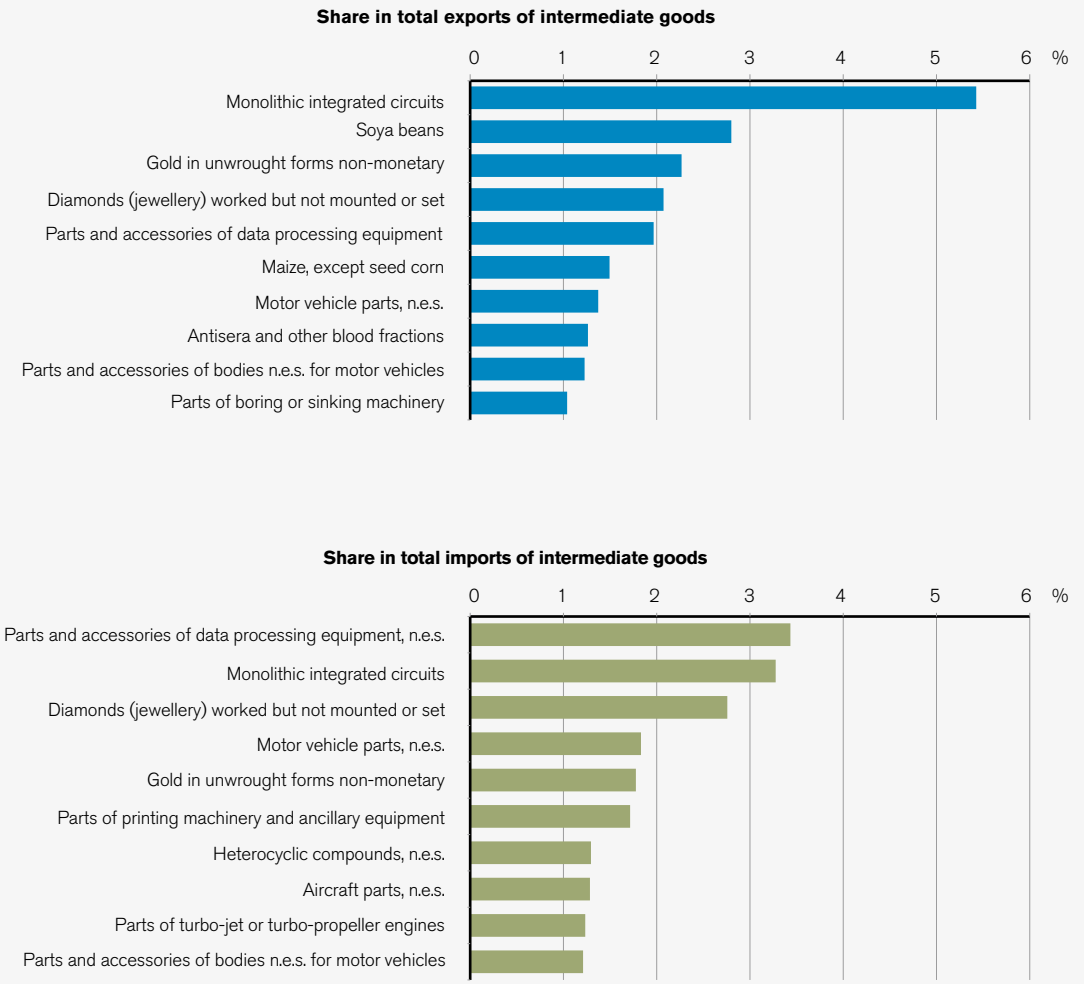
because "traditional" trade statistics record an international transaction each time a good crosses a border. This means that traditional trade statistics will count the value of those intermediate goods as many times as they cross the border, thus, as semi-finished products pass through several different countries before they are assembled into final products, their value is being counted multiple times. In addition, traditional import statistics normally record as the "country of origin" the last country in the production chain where a substantial transformation has taken place or where the good changes tariff codes, which fails to reflect the geographical fragmentation of the manufacturing process. Hence, the transaction value assigned to this last country cannot be used as an indication of the value it added

Figure 5.1. Top 10 intermediate goods traded: Japan, 2010



Source: UN Comtrade Database.

Figure 5.2. Top 10 intermediate goods traded: United States, 2010



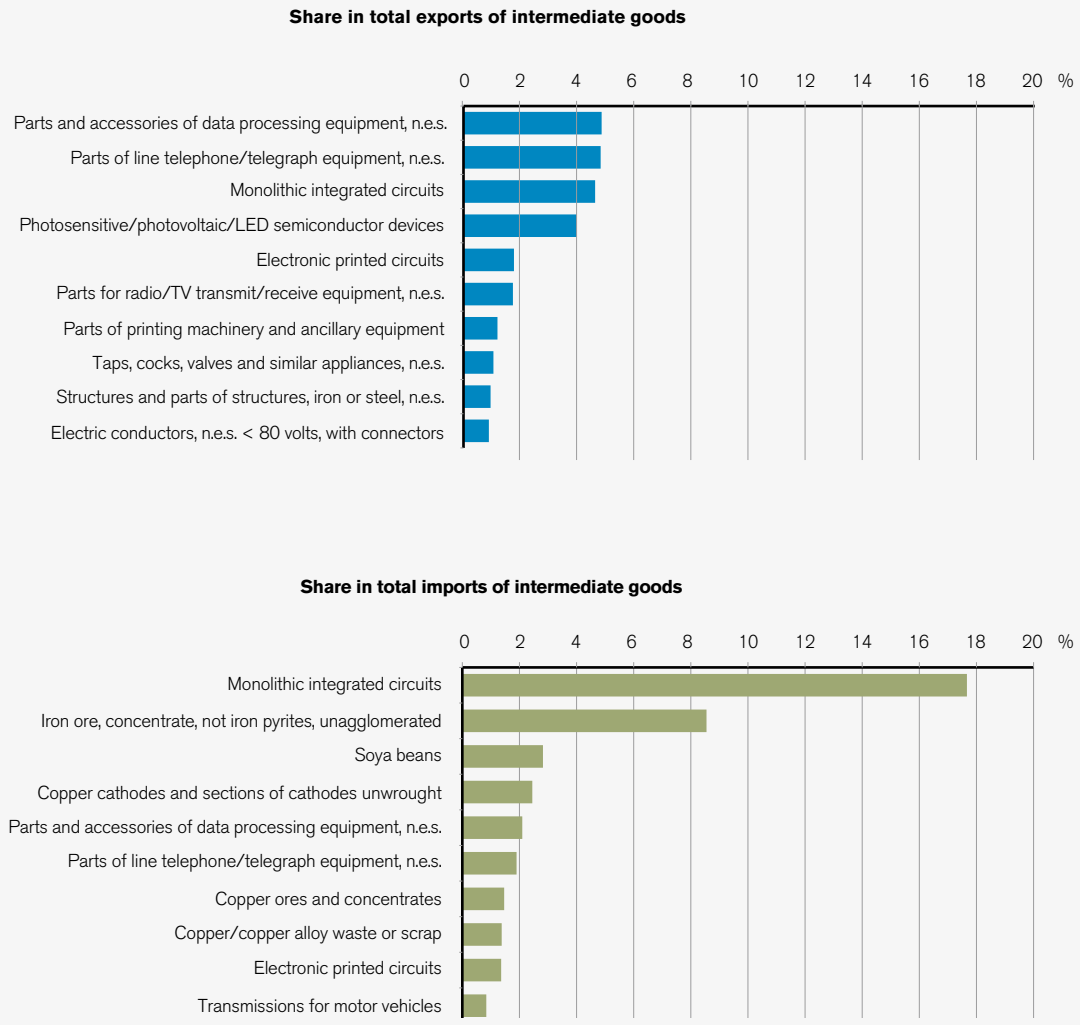
Source: UN Comtrade Database.

because it ignores the contribution made by the other countries which manufactured the intermediate goods it incorporates.

The degree of overestimation due to multiple counting can be seen in the analysis of top products in exports and imports of intermediate products. Electronic products are important for both developed and developing countries and Figures 5.1-5.3 show that multiple counting is clearly present with major global manufactures such as China, Japan and the United States. Several of the most traded electronic parts and components – among them monolithic integrated circuits or parts and accessories of data processing equipment n.e.s.[3] – are both exported and imported by all three countries, which confirms the high interconnectedness within the electronics industry. This is very true for Japan, which in 2010 had very similar shares of integrated circuits (7.5 per cent) in both its total exports and imports of intermediate goods (see Figure 5.1). Japan exported US$ 31 billion of integrated circuits in 2010 and is a key player in the Asian region for the supply of advanced technology parts and components. With US$ 57.4 billion traded (exports and imports) in 2010 the United States is also a major producer and trader of semiconductors. Integrated circuits represented 5.4 per cent of total US exports in intermediate goods in 2010 (see Figure 5.2). This is by far the main intermediate product exported by the United States, which is predominantly destined for production chains in Mexico and South East Asia.

Parts of Japanese and US exports of intermediate goods will be eventually re-imported by these countries as final consumer or investment goods (such as personal computers and communication equipment) after their processing and assembly in a low-cost Asian country such as China, Malaysia,

Figure 5.3. Top 10 intermediate goods traded: China, 2010



Source: UN Comtrade Database.

Thailand or Viet Nam. It is estimated that the gross total of US imports include up to 8 per cent domestically produced value added in 2004.[4] For China, the six most important intermediate goods exported are electronic components which fall under the ITA (see Figure 5.3). The high share of monolithic integrated circuits in China's total imports of intermediate goods – 17.7 per cent in 2010 – emphasizes China's predominant role as an assembler of electronic consumer goods. These intermediate exports and re-imports inflate trade figures, as the full cost of the final product will be assigned to the last country in the supply chain, irrespective of its real contribution to the entire value of the product.

To summarize, non-traditional statistical measurements are required to: (1) circumvent bias in conventional trade statistics; (2) better evaluate the actual contribution of foreign trade to an economy and, therefore, its impact on economic development; (3) take into account the interconnection of national economies within GPNs; and (4) better assess the impact of the services sector on trade.

In addition, a better understanding of the various business functions involved and traded within GPNs provide important information to policy makers on the impact of tariff policy and trade facilitation for shaping international competitiveness of each trade partner. A 2011 report on these emerging trend patterns in East Asia shows that the successful integration of the developing countries was based on an important effort in improving infrastructure services and the trade and investment climate.[5]

C. Case studies: smartphones

The Nokia N95 smartphone illustrates the large number of individual components and other elements that are necessary to produce it and their individual cost (see Table 5.1).

This case study identified the various parts that make up this smartphone and their respective contribution to its retail price: 33 per cent of the cost relate to intermediate goods, 4 per cent account for licences (intellectual property), 31 per cent are Nokia's own value added which relates to services, 16 per cent are Nokia's operating surplus, and only 2 per cent assembly. Distribution and retailing account for 15 per cent of the phone's price. That is, approximately a third of the value is made up of intermediate goods in the form of electronic products which may pass through several countries before being assembled into the final phone.

Another example is Apple's iPhone 4. Table 5.2 shows the component suppliers of the iPhone 4 that is assembled in China. Official statistics reported by a country importing iPhones from China will attribute the entire value of the final product to the country of origin, whereas a value added approach would attribute this value to each country participating in the value chain according to their contribution. Clearly, the resulting decomposition of trade statistics would show a very different situation, as indicated in Figure 5.4 for an earlier version of the iPhone.

Table 5.1. Nokia N95: cost breakdown, 2007

Individual components	Cost (€)	Share (%)
Processors	34	6
Memories	15	3
Integrated circuits	32	6
Display	22	4
Camera (5mp)	17	3
Other parts	59	11
Licences	21	4
Value added[1]	169	31
Nokia's operating profit	89	16
Final assembly	11	2
Distribution	19	4
Retailing	60	11

Source: Ali-Yrkkö, J., Rouvinen, P., Seppälä, T., Ylä-Anttila, P. (2011). "Who Captures Value in Global Supply Chains? Case Nokia N95 Smartphone", *Journal of Industry, Competition and Trade*, 11(3): 263-278.

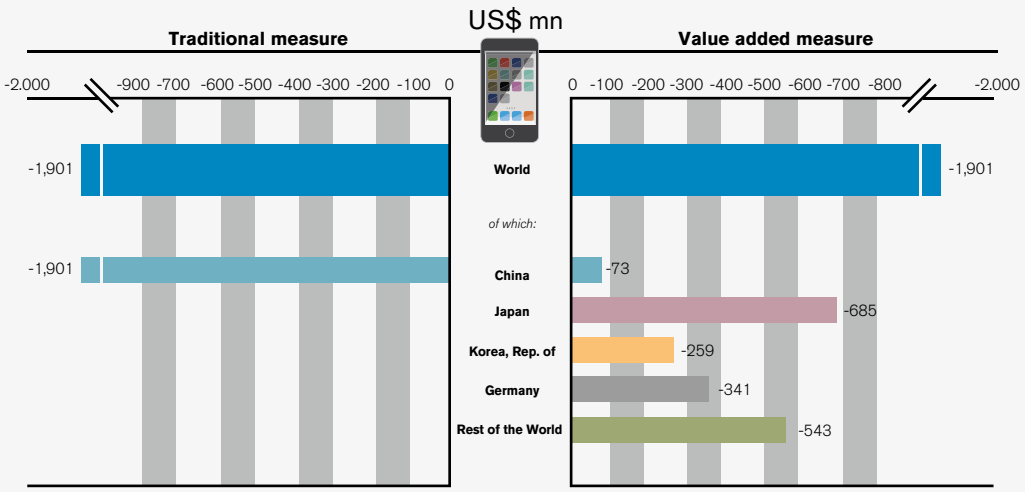
Notes: [1]Value added in Nokia's internal support function, excluding operating profits and assembly listed in the table.

Table 5.2. Apple's iPhone 4, country of manufacture and price of individual components

Country	Components	Manufacturers	Costs (US$)	Countries' shares (%)
Chinese Taipei	Touch screen, camera	Largan Precision, Wintek	20.75	11.1
Germany	Baseband, power management, transceiver	Dialog, Infineon	16.08	8.6
Korea, Republic of	Applications processor, display, DRAM memory	LG, Samsung	80.05	42.7
United States	Audio codec, connectivity, GPS, memory, touchscreen controller	Broadcom, Cirrus Logic, Intel, Skyworks, Texas Instruments, TriQuint	22.88	12.2
Other	Other	Misc.	47.75	25.4
		Total	187.51	100

Source: OECD/WTO (2012), "Trade in Value-Added: Concepts, Methodologies and Challenges", *Joint OECD-WTO Note*.

Figure 5.4. US trade balance in iPhones, 2009



Source: WTO/IDE-JETRO (2011), *Trade Patterns and Global Value Chains in East Asia: From Trade in Goods to Trade in Tasks*, Geneva: WTO.

These case studies examined the components and disentangled their origin, as measured by the value of inputs used. Albeit illustrative, they are not representative of all industries or applicable to all countries. Other statistical tools such as the combination of inter-country input-output tables and bilateral trade flows allow researchers to derive worldwide estimates, albeit at a much higher aggregation level, as shown in the next section.

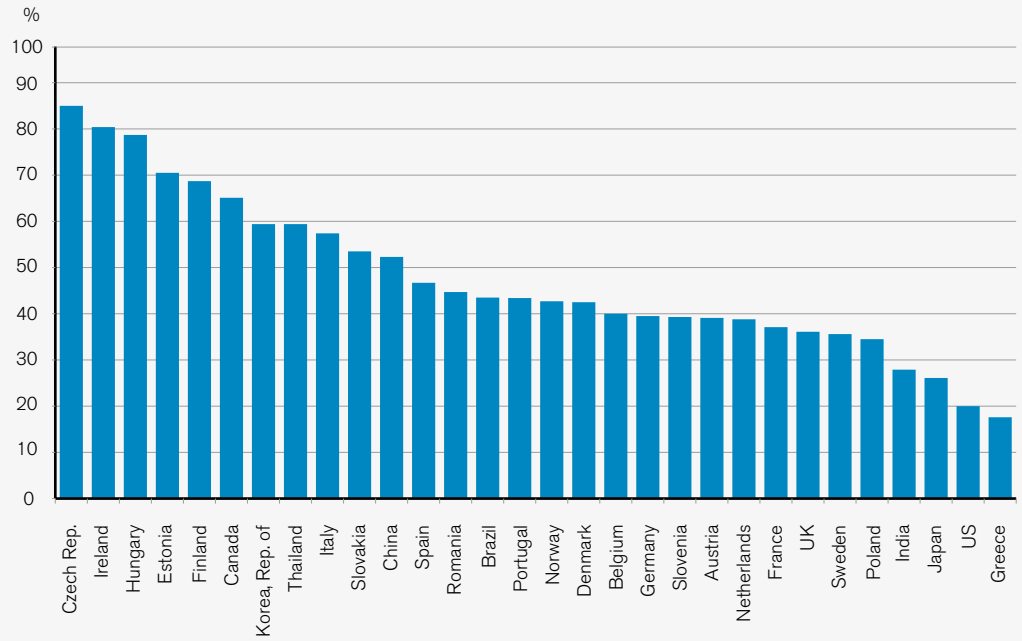
D. Vertical specialization: a way of estimating the impact of GPNs on trade

The estimation of trade in value added terms leads to the decomposition of exports into their domestic and foreign content. Such estimation is based on international input-output tables, which gather national accounts and bilateral trade data on goods and services into a consistent statistical framework. The notion of vertical specialization (VS) aims at measuring the foreign content of exports, and it is computed as the percentage value of imports directly and indirectly embedded in the exports of a country.[6] This indicator, derived from the input-output matrices, provides information at the level of sectors of activity (industries) rather than individual products. When dealing with manufacturing products – including IT and electronic products – a high VS rate outlines its dependency vis-à-vis input providers and suggests a close integration in GPNs. This section illustrates the basic concept of VS and examines how GPNs can increase competitiveness, and lubricate the economy at large.

The VS estimates shown below have been calculated based on OECD input-output tables. Although they are not an exact match, the two product groups used in these studies (based on ISIC Rev.3) are relevant to IT products: office, accounting and computing machinery (see Figure 5.5); and radio, television and communication equipment (see Figure 5.6).

The average share of VS for all sectors among OECD members was 23 per cent in 2005. The figures above show that the VS rates for the two sectors relevant to the ITA are much higher than this average, which may be explained by the complexity of electronic products and the fact that they usually involve a high number of components and production steps. The resulting geographical breakdown of the production stages, within supply chains, leads to intensive exchanges of intermediate goods and inevitably to high VS rates for those sectors.

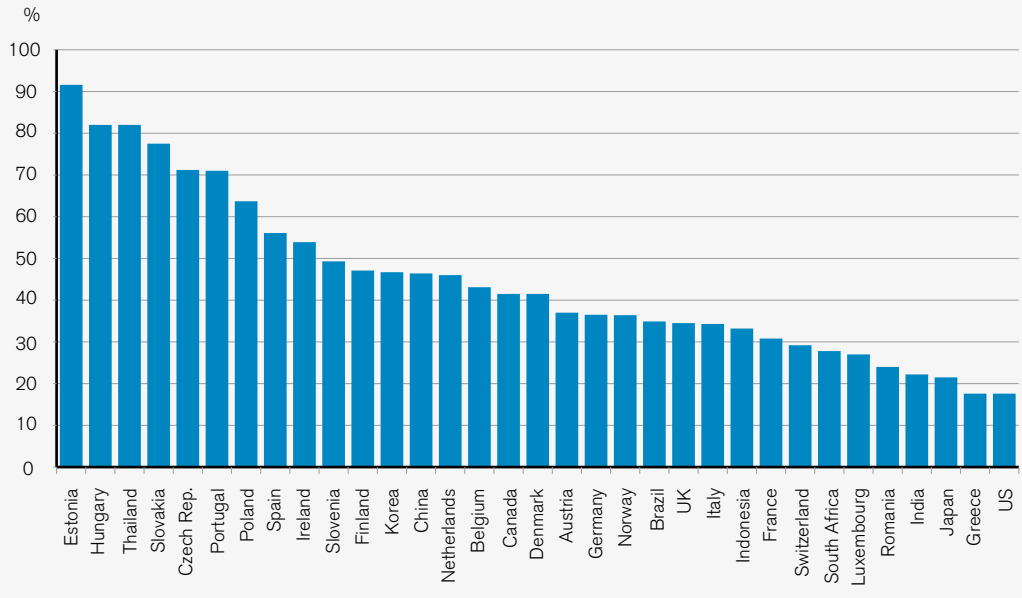
Figure 5.5. Share of VS in office, accounting and computing machinery, 2005



Source: WTO estimates, based on OECD 2005 input-output tables.

Notes: For India, 2003-04 fiscal year.

Figure 5.6. Share of VS in radio, television and communication equipment, 2005



Source: WTO estimates, based on OECD 2005 input-output tables.

Notes: For India, 2003-04 fiscal year; For Switzerland, based on 2001.

Interestingly, recent EU member states such as the Czech Republic, Estonia and Hungary show high VS rates. That is, enterprises from Central and Eastern Europe, and notably small and medium-sized enterprises (SMEs),[7] have relatively more opportunities to offer their services within European IT production networks. For example, part of the production of Hewlett-Packard desktop computers is manufactured in the Czech Republic. Indeed, joining supply chains was one of the factors that fostered a rapid integration of Eastern European countries with Western Europe, following the fall of the Berlin Wall in 1989.

Ireland established a favourable business environment, including tax incentives and a qualified workforce, in order to attract foreign direct investment and global companies. It hosts numerous subsidiaries of foreign multinationals, and during the first decade of the 21st century, became an important link within European supply chains, specializing in computer and component assembly operations. In 2005, 80 per cent of imported inputs were used in its exports of office machines and computers. These business-friendly policies contributed greatly to rapid economic growth until the global crisis of 2008-2009.

Similar changes took place in Asia. For example, with the development of adequate infrastructure and pro-investment policies since the 1980s, Thailand has become a production and export platform. Its exports are mainly bound for the rest of Asia and the United States. Western Digital Corporation, one of the world's largest manufacturers of hard disks, established one of its main factories in Thailand, which produces around 60 per cent of its hard disk production. Thai companies have also benefited from the multilateral liberalization brought by the ITA and additional regional liberalization resulting from the Association of Southeast Asian Nations (ASEAN) free trade area. Liberalization has enabled business in Thailand to develop close partnerships and production networks with companies in other ASEAN countries, including Indonesia, Malaysia and the Philippines. The high VS shares observed for Thailand for the two IT-related product groups (see Figures 5.5 and 5.6) outline its depth of integration in Asian production networks. The import content of Thai exports in office, accounting and computing machinery was 59 per cent in 2005, and for radio, television and communication equipment, it was 82 per cent.

Major economies, such as Japan and the United States, have relatively low shares of imported inputs in their exports of office, accounting and computing machinery, accounting for 26 per cent and 20 per cent respectively. Such low VS rates may be explained by the size of these economies (i.e. they can produce a large proportion of parts and components domestically). One can also assume that a significant part of the imported inputs relies on intra-firm trade taking place between the subsidiaries of Japanese or US multinational corporations.

Imports of intermediate inputs can play a key role in a strategy of helping domestic producers to remain globally competitive. International competitiveness not only depends on the businesses' own productivity or the inputs from other domestic sectors, but also on having adequate access to imported inputs, which is closely linked to tariff reduction, as well as transport and communication costs. Cheap imports of electronic products are particularly important to the organization of production networks across countries and the survival of SMEs. Furthermore, because a country's exports often contain imported inputs, the introduction of protectionist measures (e.g. tariff increases, anti-dumping measures and "buy national" engagements) may yield counter-productive effects on their own economies and the enterprises they are supposed to be protecting.

E. The impact of global production networks on developing countries

Several developing countries have played an active role in GPNs and benefited from the transfer of production capacity which accompanied the flow of foreign direct investment (FDI) and transfer of industrial know-how. The conventional view is that core competencies such as research and development, innovation, engineering and marketing are high value-added activities, while assembly and manufacturing represent lower value-added activities of a GPN. According to this notion, assembling final goods would not bring much value added to developing countries or promote innovation. However, this has been challenged by surveys and studies which suggest that innovation follows process-oriented activities.[8] Some of these studies argue that because innovation takes place at the location of the process, manufacturing has a higher value added than previously thought. Similarly, Sturgeon (2001)[9] explains that both explicit and embedded knowledge can flow through collaborative initiatives and be internalized by partner firms. New entrants from developing countries can acquire knowledge in areas such as market information,

design concepts, technical specifications, quality standards and process parameters by working with partners of greater competence.

GPNs are heavily fragmented and require a complicated network of services to function properly. This creates opportunities for SMEs operating in countries integrated in GPNs, which can export their goods and services through them and create jobs domestically. Hence, GPNs are beneficial for developing countries to the extent that their domestic business can integrate into them.

GPNs can bring benefits

The expansion of GPNs, with the respective increase of trade in intermediate goods and the delocalization of production, has considerably increased trade flows between developed and developing countries. The involvement of developing countries in such global production is often taking place through export processing zones (EPZs). China and Mexico are prominent examples of this.

Another example is Costa Rica, which, since the beginning of the 1990s, had a strategy of entering GPNs by attracting various industries, including the electronics sector. Most of these industries have established in EPZs. One such company is Intel Corporation, which, in 1996, established a US$ 300 million semiconductor assembly and test plant and quickly became the largest exporter in Costa Rica. By 2005, Intel had invested a total of US$ 770 million and generated 2900 direct jobs and almost 2000 indirect ones. With annual revenues of more than US$ 20 billion, Intel's total gross sales in 2006 were nearly twice the gross domestic product of Costa Rica.[10]

GPNs and international supply chains tend to be organized around lead companies, which are mainly located in advanced economies. Such multinational companies outsource some of their productive activities, such as processing or assembling, more often to developing economies. These countries not only provide significant comparative advantages for such labour-intensive tasks, notably through low labour cost, but they also promote trade and investment by creating EPZs with attractive administrative and regulatory status for foreign enterprises. EPZs have become core links within GPNs and represent a major source of development for emerging economies.

Economies such as the Republic of Korea or Chinese Taipei have benefited from such EPZs. However, when wages in these countries increased, other economies – beginning with Indonesia, Malaysia, the Philippines and Thailand, then followed by China – entered the market by participating in the GPNs. A significant proportion of electronic products is nowadays produced or assembled in EPZs and industrial zones of these Asian economies.

Keys to success: infrastructure services and trade facilitation

GPNs require a large number of services to function properly, but in particular transport and telecommunications. The adequate provision of these services has spill-over effects that go beyond the companies directly involved in the networks, and they have an overall positive effect on the economy. However, mere availability is not enough. For example, the transport of intermediate and final goods across borders requires not only adequate infrastructure, but also that it is efficiently managed and that port-related services are provided. In 2009, eight out of the ten ports with the greatest container traffic were located in Asia, five of which were in China and the other three in Hong Kong (China), the Republic of Korea and Singapore. The two ports outside Asia were in Dubai and Rotterdam.[11] Effective telecommunications also promotes cross-border trade, as they provide low-cost and instant access to information for the various stakeholders along the production chain. Information sharing, decision-making, logistics management and e-commerce now entirely depend on the availability and performance of such telecommunication networks.

The efficiency and simplification of border processes are key determinants for the integration of an economy in GPNs. Automated systems which simplify customs procedures and modernize customs operations are one of the most important tools for facilitating trade.[12] New computerized systems became possible with the proliferation of IT products in the 1980s and the 1990s. Through their use, governments have been able to replace manual operations with electronic ones, increase transparency and provide new services, such as the publication of laws, regulations and forms on the internet, electronic submission of customs and declarations, and the automated payment of duties and charges. In other words, governments have been able to become more efficient and increase administrative and operational capacity. Similarly, faster and more effective customs clearance procedures have saved time and reduced costs for private operators. SMEs may have benefited the most from the improved access to information, as

Box 5.2. Customs procedures and application of information technology

The World Customs Organization (WCO) established a series of obligations concerning the application of information technology to customs procedures through Chapter 7 of the revised Kyoto Convention on the Simplification and Harmonization of Customs Procedures, also known as the revised WCO Kyoto Convention, which came into force in 2006.

7.1. Standard

The Customs shall apply information technology to support Customs operations, where it is cost-effective and efficient for the Customs and for the trade. The Customs shall specify the conditions for its application.

7.2. Standard

When introducing computer applications, the Customs shall use relevant internationally accepted standards.

7.3. Standard

The introduction of information technology shall be carried out in consultation with all relevant parties directly affected, to the greatest extent possible.

7.4. Standard

New or revised national legislation shall provide for:

- electronic commerce methods as an alternative to paper-based documentary requirements;
- electronic as well as paper-based authentication methods;
- the right of the Customs to retain information for their own use and, as appropriate, to exchange such information with other Customs administrations and all other legally approved parties by means of electronic commerce techniques.

Source: The revised Kyoto Convention on the Simplification and Harmonization of Customs Procedures.

they usually do not have international representation and cannot as easily absorb the costs caused by delays encountered in the import process.

The positive role of technology in reducing the cost and time of cross-border trade was recognized in the revised Kyoto Convention on the Simplification and Harmonization of Customs Procedures, which includes standards and comprehensive implementation guidelines for the application of information and communication technologies in customs (see Box 5.2).

A concrete example of such efforts is the electronic data interchange (EDI) system which has been introduced by a number of customs administrations to replace paper-based procedures.[13] Besides expediting and facilitating collaboration between the government and private sector, EDI systems provide better service to the trade community. Not only is there more effective tax collection and selective – and more efficient – customs control, but there is also uniform implementation of customs legislation, improved human resources management, and more reliable and faster production of foreign-trade statistics.

IT is also being used to introduce risk management systems that allow customs administrations to focus compliance efforts in selected areas and avoid a full-scale transactional compliance approach (where every shipment has to be inspected at the border). The shift to selected inspection based on risk management encourages a better allocation of resources and provides incentives for traders to comply voluntarily.

Turkey reported in the context of the Negotiations on Trade Facilitation that it had automated 18 regional directorates and 68 customs offices within the Customs Modernization Project.[14] Approximately 99.5 per cent of customs entries are now processed electronically via the computerized import, export and national transit entry-processing system. Declarations can be processed electronically through EDI in either kiosks at customs offices or from company offices. Turkey estimates that, in 2004, the use of EDI in customs declaration averaged 65 per cent of all declarations.

Productivity, competitiveness and job creation in developed and developing countries

The growth in GPNs and IT products has been particularly important in explaining the evolution of global economy. Depending on the size of the domestic industries that directly or indirectly participate in GPNs, domestic job creation can be stimulated. However, it is very difficult to measure their relative contributions to employment and productivity separately. The expansion of GPNs

Box 5.3. Are developed country jobs relocating to developing countries?

The question of the net impact of GPNs on employment has gained importance in industrialized countries since the 2008-2009 crisis, which saw a significant rise in unemployment. Because the crisis affected developed economies more than developing countries, the resulting rise in unemployment brought back the debate about de-industrialization and its impact on employment. The drop in manufacturing jobs in developed countries has often been understood as a result of outsourcing, while the effects of productivity gains on labour demand are less visible.

However, some studies have found that this phenomenon, particularly the loss of unskilled jobs in industrialized countries, can be largely attributed to productivity gains and shifts in household demand from goods to services as income increases. Demand for manufactured goods rose less than total consumption, while increases in labour productivity in the electronic sectors meant that fewer jobs were required to produce the same amount of output.

The table below compares the evolution of employment and productivity in the electronics sector with those of financial and insurance activities (another emblematic sector of the 1990s and 2000s) for the EU-15, Japan and the United States. The slight reduction in employment observed in the electronics segment is explained by the huge gains in productivity in this sector.

Employment and labour productivity: average annual growth rates, 1975-2007 (%)

	Employment	Value added	Hours worked	Labour productivity
Electronic, electrical and optical products				
EU-15	-0.2	5.5	-0.4	5.9
Japan	-0.1	10.6	-0.3	11.0
United States	-0.8	11.3	-0.6	11.9
Financial and insurance activities				
EU-15	2.1	4.7	1.7	2.9
Japan	0.8	4.5	0.6	4.1
United States	1.9	3.7	2.0	1.7

Source: R. Stehrer and T. Ward (2012), «Study on 'Monitoring of Sectoral Employment», *Final Report*, European Commission, Table 3.2.2.

Similar results are observed in the case studies on the global value chains of a specific product. Using Apple's iPod as an example of global manufacturing, Linden, Dedrick and Kraemer (2008)[1] estimate that this product and its components accounted for about 41,000 jobs created worldwide in 2006, of which around 27,000 were outside the United States and 14,000 within (including retail). The jobs located outside the United States involved mostly low-wage manufacturing, while the employment generated within was more evenly distributed between high-wage engineers and managers (over 6,000 professional and engineering jobs) and low-wage retails and non-professional workers (close to 8,000 jobs). Most of them were created in related services (retail and after-sale services) that were not dependent on the cross-national organization of the supply chains.

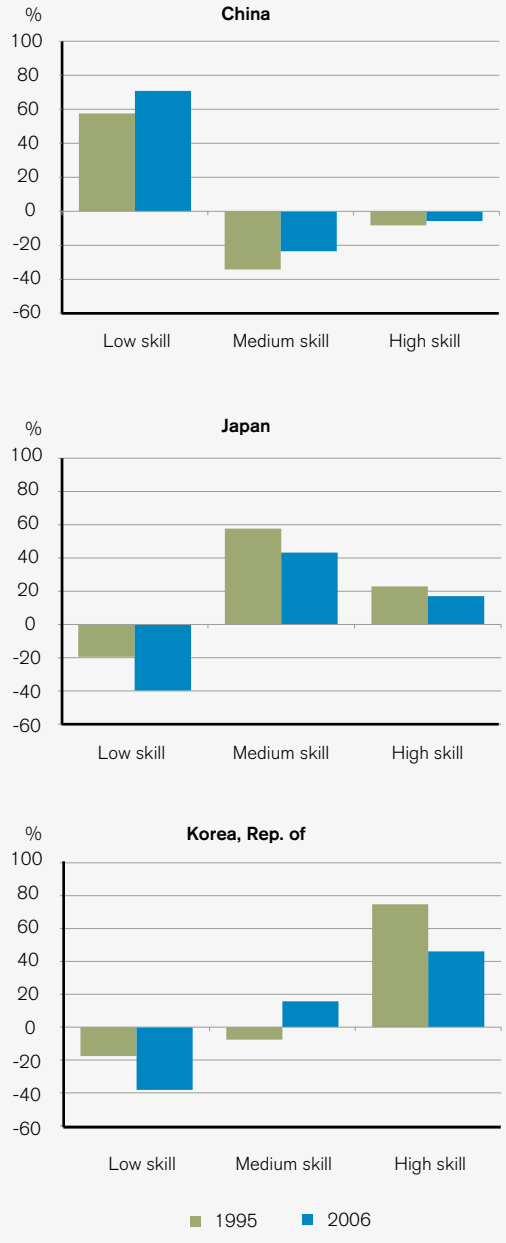
Notes: [1]Linden, G., Dedrick, J. and Kraemer, K.L. (2009), "Innovation and Job Creation in a Global Economy: The Case of Apple's iPod", Personal Computing Industry Center.

has only been made possible by the progress made in IT products and communications services. The effect of productivity gains on employment is particularly complex, as it also depends on demand. If demand remains unchanged, productivity gains tend to destroy jobs. On the other hand, gains in productivity reduce prices and raise income, thus stimulating demand.

The question is especially relevant in industrialized countries (see Box 5.3), where the loss of jobs in manufacture is often understood as a result of outsourcing, while productivity gains are less visible. For developing economies, the net effect is generally positive, as outsourcing from industrialized countries and the related flows of FDI create new job opportunities and foster the transfer of technology.

The results presented in Figure 5.7 contrast the composition of net trade from three East Asian countries (China, Japan and the Republic of Korea) at different stages of economic development. When considering all industrial sectors together, China specializes in low-skilled jobs, which has intensified since 1995, reflecting the particular role of the economy in East Asian

Figure 5.7. Value of the labour content of net trade by skill levels, China, Japan and the Republic Korea, 1995-2006

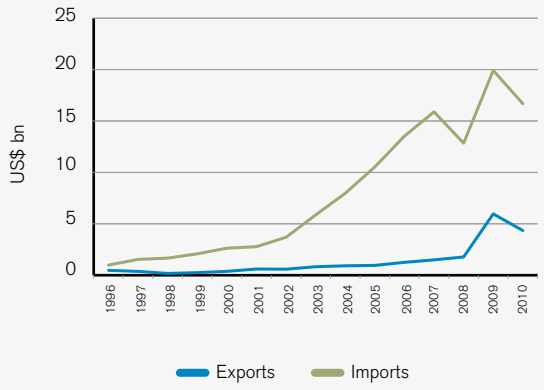


Source: WTO/IDE-JETRO (2011), *Trade Patterns and Global Value Chains in East Asia: From Trade in Goods to Trade in Tasks*, Geneva.

Notes: Percentage of the total value of the domestic labour cost embedded in traded products. Net trade is exports minus imports..

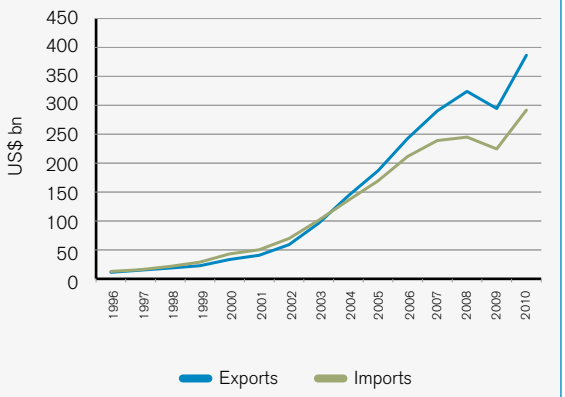
supply chains (as well as increasing wages paid to unskilled factory workers). In contrast, Japan has specialized in export activities intensive in medium- and high-skilled labour, while importing goods produced by low-skilled workers. The Republic of Korea is adopting a middle-of-the ground position, yet has moved closer in 2006 to the pattern in Japan.

Figure 5.8. India: trade of IT products



Source: UN Comtrade database

Figure 5.9. China: trade of IT products



Source: UN Comtrade database

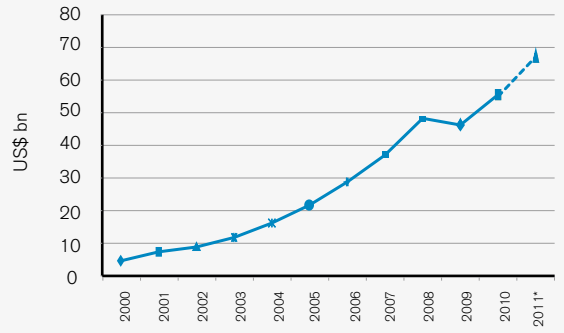
IT, competitiveness and trade

The creation of an electronics sector or the availability of cheap IT products in developing countries also help to increase the competitiveness of all other sectors. Thus, the IT-associated systemic gains in competitiveness may not materialize in exports of IT manufactures but in exports of high value-added services. For example, India's imports of IT products grew much faster than its exports (Figure 5.8), while China's trade was much more balanced between imports and exports (Figure 5.9).

While China's balance of trade in electronic products reflects its role as an industrial assembler, India's balance of trade shows that it is more an importer of electronic goods, which are used by some of its national industries to improve

productivity.[15] Electronic products have been in great demand by Indian firms to increase their competitiveness, also improving their comparative advantage in IT-related businesses such as call centres and software development. This has helped India to develop a particular comparative advantage in certain services-related industries. For example, its software services exports have increased nearly 11-fold since 2000 (see Figure 5.10). In addition, such a leading position may constitute in the future a major advantage for India to join GPNs.

Figure 5.10. India: software services exports



Source: Reserve Bank of India.

Notes: *WTO estimates; software services cover computer services (IT services and software development), IT-enabled services and business process outsourcing.

Increased interdependence calls for strengthened global trade governance

As in the case of Ireland, trade in tasks organized in GPNs was instrumental in boosting domestic activity. However, it also increased the interdependency of economies involved in them, which means that world production has become more vulnerable to supply chain disruptions. The 2008-2009 economic crisis was remarkable not only for the depth of the recession in developed economies, but also for the speed and synchronization of the transmission of the crisis to other economies. The role of GPNs in explaining this unexpected collapse of international trade has often been attributed to this increased interdependence of firms.[16] More

Table 5.3. Sectoral transmission of a supply-driven shock emanating from Japanese industrial sectors, 2008

From Japan[1] to:	China	Indonesia	Korea, Rep. of	Malaysia	Philippines	Chinese Taipei	Thailand	United States	Average (exported shock)[2]
Chemical products	0.7	0.3	2.2	2.1	1.0	3.2	1.0	0.3	1.4
Petroleum and petro products	0.1	0.0	0.0	0.7	0.3	0.1	0.0	0.1	0.3
Rubber products	0.6	0.6	1.7	1.1	1.2	2.6	1.3	0.4	1.3
Non-metallic mineral products	0.5	0.4	0.8	1.3	0.7	1.2	1.2	0.2	0.9
Metals and metal products	1.0	1.4	2.8	4.5	2.2	3.6	2.7	0.4	2.4
Industrial machinery	1.4	4.9	2.9	3.1	2.3	5.0	7.5	0.6	3.5
Computers and electronic equipment	3.6	1.5	3.0	4.3	7.4	5.6	5.7	0.8	3.9
Other electrical equipment	2.3	1.4	3.0	4.3	1.9	5.2	6.3	0.6	3.2
Transport equipment	1.4	1.6	2.9	3.8	2.1	3.4	5.8	1.0	2.8
Other manufacturing products	0.9	1.0	2.7	2.4	1.2	4.2	1.7	0.4	1.8
Average (imported shock)[2]	1.2	1.3	2.2	2.8	2.0	3.4	3.3	0.5	2.2

Source: Escaith, H. and Gonguet, F. (2011), "International trade and real transmission channels of financial shocks in global production networks: an Asian-USA perspective", in Inomata, S. (ed.), *Asia Beyond the Global Economic Crisis: The Transmission Mechanism of Financial Shocks*, Cheltenham: Edward Elgar Publishing.

Notes: Results higher than 2% are highlighted. [1]Percentage increase in sectoral domestic production costs resulting from a 30 per cent raise in the price of intermediate inputs imported from Japan. For example, a 30 per cent increase in the price of Japanese inputs would lead to a 7.4 per cent increase of production costs in the Philippine's computers and electronic equipment. [2]Simple average.

recently, the earthquake and tsunami in Japan in 2011 disrupted entire production lines around the world, including those relating to automobile and electronic products.

Table 5.3 reveals that industries such as computers and electronic equipment or other electrical equipment were highly affected by the tsunami that hit Japan in 2011. The impact was especially strong on other Asian economies such as Malaysia, the Philippines, Chinese Taipei and Thailand. This is probably because these economies are tightly embedded in regional and GPNs, and the fact that they are relatively small. Larger developing countries such as China and Indonesia were affected to a lesser degree overall, even if some of their industries showed high vulnerability. The United States was the least affected economy in this study, which is probably due to the large size of its economy and the predominance of the domestic market as a source of intermediate consumption in industrial inputs. These results should, however, be interpreted with caution because the average picture conceals the fact that, at the micro-level, some individual firms are highly dependent on Asian supply chains. Therefore, some of them may be more severely affected by external shocks or disruptions than others.

Confronted by an increased vulnerability to these external shocks, some countries have tried to reduce their exposure to risks by raising applied tariffs or, increasingly, adopting discriminatory non-tariff barriers, such as calls to "buy local". These "beggar-thy-neighbour" tactics not only harm trade partners and domestic consumers, but because trade is driven by GPNs, they also backfire against the national firms even more rapidly than before. An exporter's competitiveness is largely determined by its capacity to competitively import inputs. This is particularly true for IT products, where not only key inputs as parts and components are usually imported, but also the main vector of improved productivity, such as investment goods in machinery and office equipment.

The ITA was fundamental in improving access of both developed and developing countries to cheap and diversified sources of IT products. However, the global benefits remain vulnerable to individual protectionist actions that may spread through tit-for-tat retaliations. As both game theory and the practice of trade negotiation suggest, the only satisfactory way to deal with global issues is to deal with them through a multilateral perspective. In this way, preserving and strengthening the multilateral trade system – and the ITA in particular – is a source of benefit for all.

Endnotes

1 For further information, see the WTO Made in the World Initiative at www.wto.org.

2 WTO/IDE-JETRO (2011), *Trade Patterns and Global Value Chains in East Asia: From Trade in Goods to Trade in Tasks*, Geneva: WTO.

3 The abbreviation "n.e.s." stands for "not elsewhere specified".

4 R. Koopman, Powers, W., Wang, Z. and Wei, S.-J. (2010), "Give credit where credit is due: tracing value added in global production systems", Working Paper 16426, National Bureau of Economic Research.

5 WTO/IDE-JETRO (2011), *op. cit.*

6 Hummels, D., Ishii, J. and Yi, K-M. (2001), "The nature and growth of vertical specialization in world trade", *Journal of International Economics* 54(1): 75-96.

7 See Danish Commerce and Companies Agency (2008), *Small Suppliers in Global Supply Chains*.

8 UNIDO (2005), "Inserting local industries into global value chains and global production networks", UNIDO Working Papers. For further discussion, see Chapter 4 "The ITA and Innovation".

9 Sturgeon, T. (2001), "How do we define value chains and production networks?", *IDS Bulletin* 32(3):9-18.

10 World Bank Group/MIGA (2006), *The Impact of Intel in Costa Rica: Nine Years after the Decision to Invest*, Washington DC: World Bank Group/MIGA, p. 7.

11 Data from the International Transport Forum.

12 For further information, see: UNCTAD (2006), "The electronic submission of trade documentation, Technical Note No. 16; and UNCTAD (2008), "Use of customs automation systems", Technical Note No. 3.

13 See Angeles R., et al. (2001), "Success factors for domestic and international electronic data interchange (EDI) implementation for US firms", International Journal of Information Management 25(5): 329-347.

14 WTO document TN/TF/W/45.

15 Joseph, K.J. and Abraham, V. (2007), "Information technology and productivity: evidence from India's manufacturing sector", Working Paper No. 389.

16 Escaith, H., Lindenberg N. and Miroudot, S. (2010), "International supply chains and trade elasticity in times of global crisis", WTO Staff Working Paper ERSD-2010-08.

Appendix: Methodological challenges and assumptions

Contents

As explained in the introduction to Chapter 3, a number of technical assumptions need to be made for the analysis of trade and tariff data of IT products. This appendix provides more detailed explanation of the challenges and assumptions made in this publication, which are largely based on a background note and model lists prepared by the WTO Secretariat in 2007.[1]

A. Attachment B items

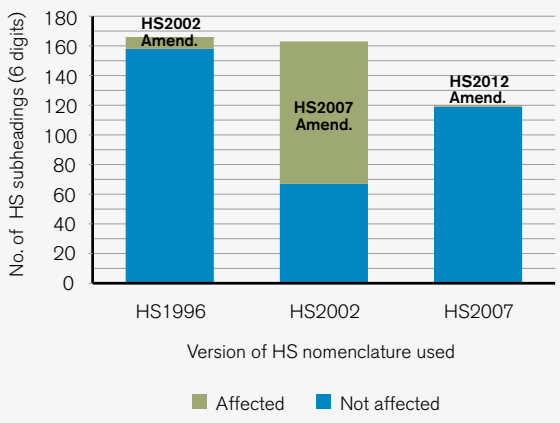
The first problem that complicates a trade and tariff analysis of IT products is the divergence in classification resulting from the 55 ITA items listed "in" or "for" Attachment B of the Annex to the ITA. As explained in Chapters 1 and 2, this means that participants often listed different HS1996 subheadings in order to liberalize trade in the same products. Of those 55 items, participants' customs experts made progress in narrowing down the classification of 28, including a clarification by the Harmonized System Committee of the World Customs Organization (WCO) on the classification of another item.[2] However, large divergences remain with respect to other 27 items,[3] which comprise as many as 80 different HS1996 subheadings. The majority of these relate to parts and accessories of IT products (36 subheadings), most of which include semiconductor manufacturing equipment and parts (25 subheadings).

One possible approach to deal with this situation is to examine the individual commitments made in each of the relevant WTO schedules of concessions and the national tariff schedules involved. While this approach was used in this publication to calculate the exact average bound tariffs, it was considered a cumbersome approach with respect to most-favoured-nation (MFN) applied tariffs and trade figures, mainly because it would have involved preparing detailed correlation tables from HS1996 and HS2002 into HS2007 for the schedule of each ITA participant. For this reason a "first model list" was developed with a total of 166 subheadings in the HS1996 nomenclature – 95 of which are fully covered and 71 have partial coverage.

Similar to the methodology used in a previous study by the WTO Secretariat,[4] the first model list includes all HS1996 subheadings listed in I (A) and I (B) of G/IT/W/6/Rev.3, as well as the subheading stated by the WCO in G/IT/26/Add.1. However, instead of including all the possible classification options for items in lists IV and V, the Secretariat this time only took into account HS subheadings listed by a substantial number of participants in their actual schedules of concessions and where trade figures were significant. For example, of the 11 HS1996 subheadings being considered as classification options for item 193 (flat panel display devices …), only six were included in the first model list: 8471.60, 8473.30, 8531.20, 8531.90, 9013.80 and 9013.90.

While the use of a model list in HS1996 considerably simplified the analysis, the approach may well lead to apparently inconsistent results when comparing the information in the WTO schedules and the applied tariffs. For example, there are cases where an HS subheading is covered by the first model list, but the ITA participant shows dutiable rates for all national tariff lines breakdown within the subheading. Whether or not the participant is in breach of the relevant concession depends, *inter alia*, on whether or not that subheading was included in the participant's schedule of concessions and if so, the manner in which it was reflected therein. Such comparison is further complicated by the lack of official WTO schedules of concession in HS2007, which was the nomenclature used in the 2010 applied tariff and the corresponding trade figures.

Figure A.1. Effect of HS amendments on the ITA first model list



Source: WTO Secretariat.

B. Amendments to the HS

The product coverage of the ITA is largely based on HS1996. However, the WCO introduced sets of amendments that entered into force on 1 January 2002 (HS2002) and 1 January 2007 (HS2007), both of which involved HS subheadings covered by the ITA. The latest amendments entered into force on 1 January 2012, but were not taken into account in this publication.

Because national and regional nomenclatures are adjusted by customs administrations to take account of amendments to the HS that are included by the WCO, it becomes difficult to compare the concessions in the WTO schedules of concession and the first model list, with respect to the MFN duties and trade figures from 2002 onwards. For this reason, and based in the previous work by the Secretariat in JOB(07)/96, the model list in HS1996 was transposed into HS2002 and HS2007.

Not all HS amendments affected the model to the same degree. Figure A.1 shows that while HS2002 amendments only affected a handful of HS1996 subheadings, the introduction of HS2007 amendments affected 96 of the 163 HS2002 subheadings. More than half of the subheadings affected relate to semiconductor manufacturing equipment (29 subheadings) and parts and accessories (28 subheadings). Based on the indicative correlation tables by the WCO,[5] it would appear that HS2012 will only have a marginal impact on the model list expressed in the HS2007 nomenclature.

In spite of the creation of new HS2007 headings and subheadings for certain product categories, such as computers and calculating machines, the total number of subheadings covered by the first model list was reduced to a total of 120 HS2007 subheadings. This was primarily due to the introduction of HS2007 heading 84.86, where a large number of semiconductor manufacturing machines, as well as their parts and accessories, were grouped.

C. Partial coverage of HS subheadings

The product coverage of Attachment A of the Annex to the ITA is defined based on the 1996 version of the HS, and 95 of these 190 items were defined beyond the HS subheading (i.e. 6-digit) level.[6] The use of specific subcategories within a subheading was identified by adding an "ex" next to the relevant code – the so-called "ex-outs". Of the 155 distinct HS1996 subheadings listed, 60 provide for one or more ex-outs (e.g. nine different ITA items are listed as ex-outs of HS1996 subheading 8479.89).

Contracting parties to the HS can, but are not obliged to, create subdivisions of HS subheadings in their national or regional nomenclatures (i.e. at the 8-digit level or higher). Reasons for introducing national subdivisions vary widely and include imposing different tariffs. Cognizant of this fact, paragraph two of the Annex to the ITA provides that "each participant shall promptly modify its *national tariff schedule* to reflect the modifications it has proposed [to its WTO schedule], as soon as they have entered into effect" (emphasis added). This does not mean, however, that all participants identified *all* ITA items at the national or regional level – a situation that considerably complicates a cross-country comparison and analysis of trade and MFN applied tariffs. To make matters worse, some participants tend to use the same tariff code with a different product description over the years, making cross-year comparisons a labour-intensive affair.

Another particularly difficult, but common, situation faced in the analysis of the data was how to treat situations where an ITA item encompasses one or two different product subcategories within an HS subheading, including products not covered by the Agreement, but the participant does not differentiate them in their national nomenclature. One possible approach that was used in the previous study by the WTO Secretariat[7] is to include the entire HS subheading in the analysis, i.e. considering 166 subheadings in HS1996 and 120 in HS2007 as fully covered. This would, however, lead to a

considerable overestimation of the import and export figures covered by the Agreement, as well as the introduction of "noise" in the calculation of tariff averages. In terms of trade, the Secretariat estimates that the degree of overestimation would be almost 100 per cent for both exports and imports.

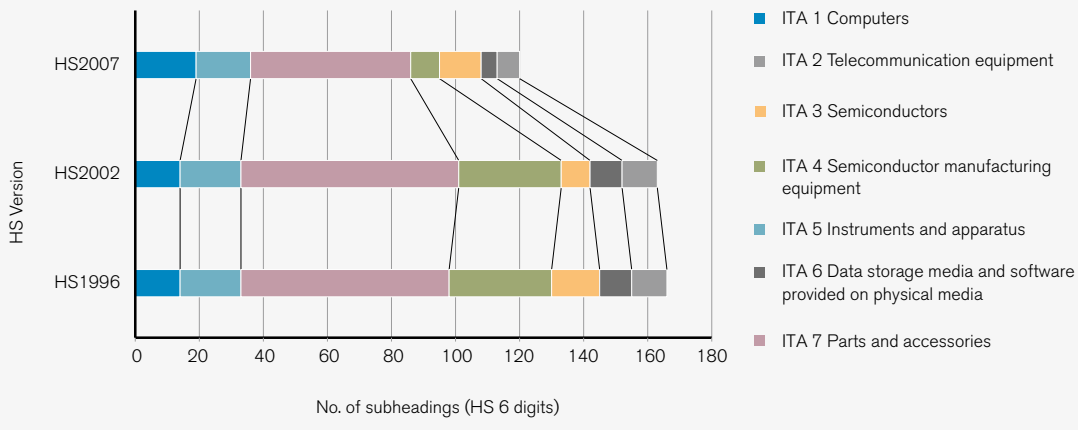
An alternative approach is to ignore the subheadings having ex-outs and to focus exclusively on the HS1996 subheadings that are fully covered by the ITA. The Secretariat implemented a mixed approach whereby it defined a "second model list" of 97 HS1996 subheadings that includes all the fully covered subheadings plus some of those with ex-outs. The relevant subheadings are listed in Table A.1. The same approach was used to define a "third model list" of 98 HS2007 subheadings. The Secretariat estimates that this approach leads to an underestimation of less than US$ 140 billion for each flow in 2010 (i.e. approximately 9 per cent for exports and 8 per cent for imports). Thus, while the approach chosen for this study is certainly not perfect, it yields a considerably more accurate picture of world trade in IT products.

D. Definition of product categories

The ITA does not differentiate products in its coverage beyond Attachment A (with two sections) and Attachment B. Although there are many ways in which these products could be classified for analytical purposes, the Secretariat used the following seven categories: (1) computers and calculating machines; (2) telecommunication equipment; (3) semiconductors; (4) semiconductor manufacturing equipment; (5) instruments and apparatus; (6) data storage media and software provided on physical media; and (7) parts and accessories. It should be noted that the last category includes *all* parts and accessories of *all* products falling within the ITA – including parts and accessories of semiconductor manufacturing equipment. Grouping IT products into categories is not an exact science, so the figures presented in the study should be interpreted with caution.

Finally, as noted above, the different amendments to the HS impacted each of these categories differently. While the number of relevant HS2007 subheadings that correspond to the first model list increased for two of the categories (computers and calculating machines, and telecommunication equipment), it significantly decreased for the others. As explained before, this largely reflects dedicated categories that have been created by the Harmonized System Committee of the WCO (see Figure A.2).

Figure A.2. Effect of HS amendments on the number of HS subheadings covered by the first model list



Source: WTO Secretariat.

Table A.1. World exports of IT products, by HS1996 6-digit-code, 1996, 2005 and 2010 (ranked by 2010 value)

HS 1996 code	ITA group*	Code change in HS2002/2007	Commodity description	1996		2005		2010	
				Value (US$ bn)	Share (%)	Value (US$ bn)	Share (%)	Value (US$ bn)	Share (%)
854230	ITA 3	No	Other monolithic integrated circuits	18.7	3.4	74.4	6.3	320.4	22.8
852520	ITA 2	Yes	Transmit-receive apparatus for radio/TV, etc. (includes mobile phones, base stations, etc.).	21.3	3.9	144.7	12.3	127.1	9.0
847130	ITA 1	Yes	Portable digital automatic data processing machines, weighing not more than 10 kg, consisting of at least a central processing unit, a keyboard and a display	13.1	2.4	55.8	4.7	125.9	9.0
847330	ITA 7	Yes	Parts and accessories of data processing equipment, n.e.s.	81.0	14.8	160.8	13.6	114.3	8.1
851780	ITA 2	Yes	Electric apparatus for line telephony, telegraphy: other apparatus	3.1	0.6	1.7	0.1	75.9	5.4
851790	ITA 7	Yes	Parts of line telephone/ telegraph equipment, n.e.s.	17.4	3.2	24.1	2.0	70.6	5.0
854140	ITA 3	No	Photosensitive/ photovoltaic/LED semiconductor devices	3.6	0.7	14.7	1.2	70.6	5.0
847170	ITA 1	No	Storage units	42.4	7.7	53.3	4.5	60.6	4.3
852990	ITA 7	Yes	Parts for radio/ TV transmit/receive equipment, n.e.s.	19.0	3.5	68.0	5.8	46.8	3.3
847150	ITA 1	Yes	Digital processing units other than those of sub-headings 8471.41 and 8471.49, whether or not containing in the same housing one or two of the following types of units: storage units, input units, output units	19.4	3.5	30.9	2.6	33.8	2.4
847160	ITA 1	Yes	Input or output units, whether or not containing storage units in the same housing	41.0	7.5	71.7	6.1	32.9	2.3
853400	ITA 7	No	Electronic printed circuits	9.7	1.8	26.2	2.2	32.5	2.3
847149	ITA 1	Yes	Other digital automatic data processing machines :-- Other, presented in the form of systems	15.0	2.7	9.2	0.8	19.4	1.4

HS 1996 code	ITA group*	Code change in HS2002/2007	Commodity description	1996		2005		2010	
				Value (US$ bn)	Share (%)	Value (US$ bn)	Share (%)	Value (US$ bn)	Share (%)
854290	ITA 3	Yes	Parts of electronic integrated circuits etc.	4.2	0.8	10.7	0.9	18.9	1.3
847180	ITA 1	Yes	Units of auto data processing	8.5	1.6	25.3	2.1	18.8	1.3
852390	ITA 6	Yes	Unrecorded sound recording media except photo/magnetic	1.0	0.2	12.1	1.0	16.2	1.2
381800	ITA 7	No	Chemical element/ compound wafers doped for electronics	3.4	0.6	7.1	0.6	14.7	1.0
854129	ITA 3	No	Transistors, except photosensitive, > 1 watt	3.7	0.7	13.0	1.1	14.2	1.0
847141	ITA 1	Yes	Other digital automatic data processing machines :-- Comprising in the same housing at least a central processing unit and an input and output unit, whether or not combined	6.0	1.1	9.9	0.8	12.5	0.9
851750	ITA 2	Yes	Other apparatus, for carrier-current line systems or for digital line systems	8.0	1.5	19.9	1.7	12.4	0.9
853120	ITA 7	No	Indicator panels incorporating electronic displays	1.7	0.3	12.3	1.0	10.9	0.8
854250	ITA 3	No	Electronic microassemblies	1.4	0.3	8.4	0.7	9.6	0.7
854110	ITA 3	No	Diodes, except photosensitive and light emitting	4.3	0.8	5.9	0.5	8.8	0.6
853224	ITA 7	No	Electric capacitors, fixed, ceramic, multilayer	2.0	0.4	5.8	0.5	8.7	0.6
902780	ITA 5	Yes	Equipment for physical or chemical analysis, n.e.s.	2.6	0.5	5.5	0.5	8.2	0.6
852320	ITA 6	Yes	Unrecorded magnetic discs	4.1	0.8	3.6	0.3	7.7	0.5
854150	ITA 3	No	Semiconductor devices, not light sensitive or emitting	0.8	0.1	4.7	0.4	7.5	0.5
854190	ITA 7	No	Parts of semiconductor devices and similar devices	1.4	0.3	3.3	0.3	7.5	0.5
847190	ITA 1	No	Automatic data processing, other	4.7	0.9	6.4	0.5	6.2	0.4
902750	ITA 5	No	Instruments n.e.s. using optical radiations	1.2	0.2	3.2	0.3	5.6	0.4

HS 1996 code	ITA group*	Code change in HS2002/2007	Commodity description	1996		2005		2010	
				Value (US$ bn)	Share (%)	Value (US$ bn)	Share (%)	Value (US$ bn)	Share (%)
902620	ITA 5	No	Equipment to measure or check pressure	1.2	0.2	3.2	0.3	5.6	0.4
854160	ITA 3	No	Mounted piezo-electric crystals	2.5	0.5	3.7	0.3	5.3	0.4
854212	ITA 3	No	Monolithic digital integrated circuits :-- Cards incorporating an electronic integrated circuit (“smart” cards)	1.4	0.3	5.7	0.5	4.6	0.3
854121	ITA 3	No	Transistors, except photosensitive, < 1 watt	2.6	0.5	4.3	0.4	4.4	0.3
853222	ITA 7	No	Electric capacitors, fixed, aluminium electrolytic n.e.s.	1.9	0.4	2.8	0.2	4.3	0.3
902610	ITA 5	No	Equipment to measure or check liquid flow or level	1.4	0.3	2.5	0.2	4.0	0.3
854470	ITA 7	No	Optical fibres and cables	1.7	0.3	2.0	0.2	3.7	0.3
851719	ITA 2	Yes	Telephone sets, n.e.s.	2.7	0.5	4.2	0.4	3.7	0.3
902690	ITA 7	No	Parts of equipment to measure or check fluid variables	1.3	0.2	2.5	0.2	3.5	0.2
903040	ITA 5	No	Gain/distortion and crosstalk meters, etc.	1.4	0.3	3.1	0.3	3.4	0.2
903082	ITA 4	No	Instruments and apparatus :-- For measuring or checking semiconductor wafers or devices	0.7	0.1	2.8	0.2	3.3	0.2
902730	ITA 5	No	Spectrometers, spectrophotometers, etc. using light	1.2	0.2	1.9	0.2	3.0	0.2
854213	ITA 3	No	Monolithic digital integrated circuits :-- Metal oxide semiconductors (MOS technology)	75.1	13.7	154.3	13.1	3.0	0.2
853321	ITA 7	No	Electrical resistors fixed, power capacity < 20 watt	1.3	0.2	2.0	0.2	2.8	0.2
851711	ITA 2	No	Line telephone sets with cordless handsets	2.9	0.5	4.0	0.3	2.6	0.2
845610	ITA 4	Yes	Laser, light and photon beam process machine tools operated by laser or other light or photon beam processes	0.7	0.1	2.4	0.2	2.6	0.2

HS 1996 code	ITA group*	Code change in HS2002/2007	Commodity description	1996		2005		2010	
				Value (US$ bn)	Share (%)	Value (US$ bn)	Share (%)	Value (US$ bn)	Share (%)
853340	ITA 7	No	Variable resistors, rheostats and potentiometers, n.e.s.	1.2	0.2	2.0	0.2	2.5	0.2
903141	ITA 4	No	Optical instruments and appliances for inspecting semiconductor wafers	0.6	0.1	1.7	0.1	2.5	0.2
902680	ITA 5	No	Equipment to measure, check gas/liquid properties n.e.s.	1.0	0.2	1.8	0.2	2.3	0.2
853221	ITA 7	No	Electric capacitors, fixed, tantalum, n.e.s.	0.9	0.2	2.1	0.2	2.2	0.2
847050	ITA 5	No	Cash registers	0.9	0.2	1.2	0.1	1.8	0.1
847350	ITA 7	Yes	Parts and accessories equally suitable for use with machines of two or more of the headings Nos. 84.69 to 84.72	0.9	0.2	2.6	0.2	1.8	0.1
902720	ITA 5	No	Chromatographs, electrophoresis instruments	0.7	0.1	1.2	0.1	1.7	0.1
853229	ITA 7	No	Electric capacitors, fixed, n.e.s.	0.7	0.1	1.5	0.1	1.5	0.1
853225	ITA 7	No	Electric capacitors, fixed, paper/plastic dielectric	0.9	0.2	1.0	0.1	1.4	0.1
854130	ITA 3	No	Thyristors/diacs/triacs, except photosensitive devices	0.6	0.1	1.0	0.1	1.3	0.1
847329	ITA 7	No	Parts and accessories of accounting machines, n.e.s.	1.1	0.2	0.9	0.1	1.0	0.1
853329	ITA 7	No	Electrical resistors, fixed, except heating, > 20 watt	0.3	0.1	0.9	0.1	0.9	0.1
847010	ITA 5	No	Electronic calculators operable with internal power	1.0	0.2	1.3	0.1	0.9	0.1
853290	ITA 7	No	Parts of electrical capacitors	0.8	0.2	0.8	0.1	0.8	0.1
853210	ITA 7	No	Fixed power capacitors (50/60 Hz circuits)	0.3	0.1	0.6	0.0	0.8	0.1
853223	ITA 7	No	Electric capacitors, fixed, ceramic, single layer	0.9	0.2	0.6	0.0	0.6	0.0
853390	ITA 7	No	Parts of electrical resistors, rheostats, etc.	0.3	0.1	0.4	0.0	0.5	0.0
854219	ITA 3	No	Monolithic integrated circuits, except digital	24.0	4.4	3.6	0.3	0.5	0.0

HS 1996 code	ITA group*	Code change in HS2002/2007	Commodity description	1996		2005		2010	
				Value (US$ bn)	Share (%)	Value (US$ bn)	Share (%)	Value (US$ bn)	Share (%)
847090	ITA 5	Yes	Postage franking, ticket-issuing machines, etc.	0.4	0.1	0.4	0.0	0.5	0.0
853310	ITA 7	No	Electrical resistors, fixed carbon	0.4	0.1	0.3	0.0	0.4	0.0
847321	ITA 7	No	Parts and accessories of electronic calculators	0.4	0.1	0.9	0.1	0.3	0.0
853230	ITA 7	No	Electric capacitors, variable or adjustable (pre-set)	0.3	0.0	0.3	0.0	0.3	0.0
847021	ITA 1	No	Electronic calculators, printing, external power	0.2	0.0	0.1	0.0	0.1	0.0
853339	ITA 7	No	Wirewound variable resistors, rheostats, etc. > 20 watt	0.2	0.0	0.1	0.0	0.1	0.0
847029	ITA 1	No	Electronic calculators, non-printing, external power	0.1	0.0	0.1	0.0	0.1	0.0
900990	ITA 7	No	Parts and accessories for photo-copying apparatus	6.1	1.1	5.9	0.5	0.1	0.0
853331	ITA 7	No	Wirewound variable resistors, rheostats, etc. < 20 watt	0.1	0.0	0.1	0.0	0.1	0.0
900911	ITA 5	Yes	Electrostatic photocopiers, direct process	0.2	0.0	0.5	0.0	0.0	0.0
852431	ITA 6	Yes	Recorded discs for laser reading systems :-- For reproducing phenomena other than sound or image	0.9	0.2	5.1	0.4	0.0	0.0
847030	ITA 1	No	Calculating machines, non-electric	0.1	0.0	0.0	0.0	0.0	0.0
852020	ITA 2	Yes	Telephone answering machines	0.6	0.1	0.1	0.0	0.0	0.0
852311	ITA 6	Yes	Unrecorded magnetic tapes, width < 4 mm	1.5	0.3	0.5	0.0	0.0	0.0
847110	ITA 1	Yes	Analogue or hybrid computers	1.6	0.3	1.6	0.1	0.0	0.0
851721	ITA 2	Yes	Facsimiles machines	3.1	0.6	2.1	0.2	0.0	0.0
854240	ITA 3	No	Hybrid integrated circuits	3.6	0.7	18.0	1.5	0.0	0.0
900921	ITA 5	Yes	Photo-copying equipment with an optical system, n.e.s.	1.0	0.2	0.5	0.0	0.0	0.0
851730	ITA 2	Yes	Telephonic or telegraphic switching apparatus	5.7	1.0	6.1	0.5	0.0	0.0
851722	ITA 2	Yes	Teleprinters	0.0	0.0	0.0	0.0	0.0	0.0

HS 1996 code	ITA group*	Code change in HS2002/2007	Commodity description	1996		2005		2010	
				Value (US$ bn)	Share (%)	Value (US$ bn)	Share (%)	Value (US$ bn)	Share (%)
852313	ITA 6	Yes	Unrecorded magnetic tapes, width > 6.5 mm	4.5	0.8	2.9	0.2	0.0	0.0
852491	ITA 6	Yes	Recorded media for other than sound or image	6.2	1.1	2.9	0.2	0.0	0.0
846911	ITA 1	Yes	Word-processing machines	0.2	0.0	0.1	0.0	0.0	0.0
852312	ITA 6	Yes	Unrecorded magnetic tapes, width 4-6.5 mm	0.4	0.1	0.6	0.0	0.0	0.0
854381	ITA 7	Yes	Proximity cards and tags	0.1	0.0	0.4	0.0	0.0	0.0
901042	ITA 4	Yes	Step and repeat aligners	1.6	0.3	4.6	0.4	0.0	0.0
847040	ITA 1	Yes	Accounting machines	0.0	0.0	0.0	0.0	0.0	0.0
852440	ITA 6	Yes	Magnetic tapes for reproducing phenomena other than sound or image	0.7	0.1	0.2	0.0	0.0	0.0
845691	ITA 4	Yes	Machine-tools for dry-etching patterns on semiconductor materials	1.3	0.2	2.7	0.2	0.0	0.0
901049	ITA 4	Yes	Apparatus for projection	0.5	0.1	1.8	0.2	0.0	0.0
854214	ITA 3	No	Circuits obtained by bip	4.8	0.9	0.0	0.0	0.0	0.0
854311	ITA 4	Yes	Ion implanters for dopin	0.5	0.1	0.7	0.1	0.0	0.0
901041	ITA 4	Yes	Apparatus for the projection or drawing of circuit patterns on sensitised semiconductor materials :-- Direct write-on-wafer apparatus	0.2	0.0	0.1	0.0	0.0	0.0
			Total ITA products	548.4	100.0	1179.3	100.0	1406.0	100.0

Source: UN Comtrade and WTO estimates.

Notes: *ITA 1 = computers and calculating machines; ITA 2 = telecommunication equipment; ITA 3 = semiconductors; ITA 4 = semiconductor manufacturing equipment; ITA 5 = other instruments and apparatus; ITA 6 = data storage media and software provided on physical media; ITA 7 = parts and accessories. The abbreviation "n.e.s." stands for "not elsewhere specified".

Endnotes

1 WTO internal document JOB(07)/96.

2 See Chapter 2 and WTO documents G/IT/W/6/Rev.3, lists I (A) and I (B); and G/IT/26/Add.1.

3 See WTO document G/IT/W/6/Rev.3, lists IV and V.

4 See WTO internal document JOB(07)/96.

5 See WTO document G/MA/W/105.

6 Box 1.6 provides a summary of the number of HS1996 subheadings covered by each section of Attachment A.

7 Bora, B. (2004), "The Information Technology Agreement and world trade", WTO Working Paper.

ITA: List of participants

The ITA currently has 47 participants representing 74 WTO members: the EU-27 is counted as one, and Switzerland represents Liechtenstein.

Participant	Date of participation
Albania	28 September 1999
Australia	26 March 1997
Bahrain, Kingdom of	16 July 2003
Canada	26 March 1997
China	24 April 2003
Colombia	27 March 2012
Costa Rica	26 March 1997
Croatia	28 September 1999
Dominican Republic	7 July 2006
Egypt	24 April 2003
El Salvador	20 May 1997
European Union[1]	26 March 1997
Austria	*26 March 1997*
Belgium	*26 March 1997*
Bulgaria	*1 January 2007*
Cyprus	*3 October 2000*
Czech Republic	*26 March 1997*
Denmark	*26 March 1997*
Estonia	*26 March 1997*
Finland	*26 March 1997*
France	*26 March 1997*
Germany	*26 March 1997*
Greece	*26 March 1997*
Hungary	*1 May 2004*
Ireland	*26 March 1997*
Italy	*26 March 1997*
Latvia	*24 February 1999*
Lithuania	*6 July 1999*
Luxembourg	*26 March 1997*
Malta	*1 May 2004*
Netherlands	*26 March 1997*
Poland	*26 March 1997*
Portugal	*26 March 1997*
Romania	*26 March 1997*
Slovak Republic	*26 March 1997*
Slovenia	*14 June 2000*
Spain	*26 March 1997*
Sweden	*26 March 1997*
United Kingdom	*26 March 1997*
Georgia	28 September 1999
Guatemala	22 December 2005
Honduras	20 October 2005
Hong Kong (China)	26 March 1997
Iceland	26 March 1997
India	26 March 1997
Indonesia	26 March 1997
Israel	26 March 1997
Japan	26 March 1997
Jordan	17 December 1999
Korea, Republic of	26 March 1997
Kuwait, State of	13 September 2010
Kyrgyz Republic	24 February 1999
Macao (China)	26 March 1997
Malaysia	26 March 1997
Mauritius	6 July 1999
Moldova, Republic of	29 November 2001
Morocco	14 November 2003
New Zealand	26 March 1997
Nicaragua	20 October 2005
Norway	26 March 1997
Oman	22 November 2000
Panama	23 June 1998
Peru	13 November 2008
Philippines	25 April 1997
Saudi Arabia, Kingdom of	20 October 2005
Singapore	26 March 1997
Switzerland	26 March 1997
Liechtenstein	26 March 1997
Chinese Taipei	26 March 1997
Thailand	26 March 1997
Turkey	26 March 1997
Ukraine	24 January 2008
United Arab Emirates	10 March 2007
United States of America	26 March 1997
Viet Nam	6 September 2006

Notes: [1]In 1997, when the European Union became an ITA participant, it had 15 member states: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and United Kingdom. Others joined the ITA individually in 1997: Czech Republic, Estonia, Poland, Romania and Slovak Republic. Bulgaria, Cyprus, Latvia, Lithuania and Slovenia joined in 1998 or after. Hungary and Malta joined through EU enlargement in 2004.

Abbreviations

ADP	automatic data processing
APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
CTS	Consolidated Tariff Schedule
DSU	Dispute Settlement Understanding
EC	European Communities
ECIPE	European Centre for International Political Economy
EDI	electronic data interchange
EMC	electromagnetic compatibility
EMI	electromagnetic interference
EPO	European Patent Organisation
EPZ	export processing zone
EU	European Union
FDI	foreign direct investment
GATT	General Agreement on Tariffs and Trade
GDP	gross domestic product
GPN	global production network
HS	Harmonized System
HSC	Harmonized System Committee
IDB	Integrated Data Base
INN	international non-proprietary name
ICT	information and communications technology
ISIC	International Standard Industrial Classification
IT	information technology
ITA	Information Technology Agreement
ITI	Information Technology Industry Council
IT products	only IT products covered by the ITA
LAN	local area network
LDC	least-developed country
MFN	most-favoured nation
MOS	metal oxide semiconductors
NAFTA	North American Free Trade Agreement
n.e.s.	not elsewhere specified
NPE	non-practising entity
NTB	non-tariff barrier
NTM	non-tariff measure
OECD	Organisation for Economic Co-operation and Development
OEM	original equipment manufacture
PATSTAT	EPO Worldwide Patent Statistical Database
R&D	research and development
SDoC	suppliers declaration of conformity
SMEs	small and medium-sized enterprises
TRIPS	Trade-Related Aspects of Intellectual Property Rights
US	United States
USTR	United States Trade Representative
UN	United Nations
VS	vertical specialization
WCO	World Customs Organization
WEF	World Electronics Forum
WIPO	World Intellectual Property Organization
WTO	World Trade Organization

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15 Years of the Information Technology Agreement

The Information and Technology Agreement (ITA) was finalized at the first WTO Ministerial Conference, in Singapore, in 1996, committing its participants to completely eliminate duties on certain information technology products. In its 15 years, the ITA has promoted affordable access to a wide range of technologies, encouraging closer cooperation between developed and developing countries. As production networks become increasingly global, the ITA will continue to facilitate the shift from products made in a specific country to "made in the world".

To mark the 15th anniversary of the ITA, this publication charts the political and technical obstacles which were overcome during the creation of the Agreement and the issues which still need to be resolved. It details the establishment of the ITA Committee and how the Agreement is implemented, and investigates the impact the ITA has had on trade liberalization and innovation. The publication also examines the effect information technology has had on global production networks and what this means for developing countries and the ITA.

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