

# AID FOR TRADE AND VALUE CHAINS IN INFORMATION AND COMMUNICATION TECHNOLOGY



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## Acronyms

ACP	African Caribbean and Pacific group of states
AFD	Agence Française de Développement
AfDB	African Development Bank
B2B	Business-to-Business
B2C	Business-to-Consumer
B2G	Business-to-Government
BASIS	Bangladesh Association of Software & Information Services
CDN	Content Delivery Network
CRS	Creditor Reporting System
CSME	Caribbean Single Market and Economy
CTS	Consolidated Tariff Schedules
CTU	Caribbean Telecommunications Union
DAC	Development Assistance Committee
DCCI	Dhaka Chamber of Commerce and Industry
EASSy	Eastern Africa Submarine Cable System
EIB	European Investment Bank
EMS	Electronics Manufacturing Services
EU	European Union
FDI	Foreign Direct Investment
GATS	General Agreement on Trade in Services
GDP	Gross Domestic Product
GNI	Gross National Income
GSMA	Global Money Adoption Survey
GVC	Global Value Chain
HIPCAR	Harmonization of ICT Policies, Legislation and Regulatory Procedures
HIPSSA	Harmonization of the ICT Policies in Sub-Saharan Africa

HS	Harmonized System
ICB4PAC	Capacity Building and ICT Policy, Regulatory and Legislative Frameworks Support for Pacific Island Countries
ICT	Information and Communication Technologies
IDB	Integrated Data Base
IDI	ICT Development Index (composite index produced by ITU)
IFC	International Finance Corporation
IP	Intellectual Property
IP	Internet Protocol
IT	Information Technology
ITA	Information and Technology Agreement
ITES	Information Technology Enabled Services sector in Bangladesh
ITU	International Telecommunications Union
IXP	Internet Exchange Point
KfW	KfW Bankengruppe
LCC	Least Connected Country
LDCs	Least Developed Countries
LMICs	Low- And Middle-Income Countries
MDG	Millennium Development Goal
MFN	Most Favoured Nation
NTFII	Netherlands Trust Fund II
NTMs	Non-Tariff Measures
ODA	Official Development Assistance
ODA	Official Development Assistance
ODM	Original Design Manufacturer
OECD	Organisation of Economic Co-operation and Development
OOF	Other Official Flows
PIDA	Programme for Infrastructure Development in Africa
PPP	Public-Private-Partnership
RCA	Revealed Comparative Advantage
SDSL	Structured Data Systems Ltd
TNC	Transnational Corporation
UMICs	Upper Middle Income Countries

UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIDO	United Nations Industrial Development Organization
WEF	World Economic Forum
WIOCC	West Indian Ocean Cable Company
WTO	World Trade Organization



## Executive summary

Information and communication technologies (ICT) value chains cover a wide array of activities carried out by both manufacturing and services firms. While the majority of top ICT firms are still located in OECD countries, major transnational corporations have emerged in developing countries. Asian countries are now home to some of the world's largest electronic manufacturers, while multinational telecommunications operators can also be found in emerging economies outside of Asia, such as Mexico and South Africa.

Due to technical standards and standardized design and interfaces, ICT manufacturing value chains are modular in nature where suppliers produce components following the design of lead firms. As a result of this modularity, ICT manufacturing is among the industries where the production process is the most fragmented internationally, relying on a high share of imported inputs.

ICT manufacturing is exemplary for the emergence of "Factory Asia". China, Japan and Korea are the largest producers of ICT goods and other Asian economies, such as Malaysia, Singapore, Thailand or Philippines, have also become major ICT manufacturers. China is the largest exporter of ICT goods accounting for 37% of world exports. However, gross export flows do not accurately reflect how much value a country captures in value chains. In particular, China tends to conduct lower value added activities in the later stages of the ICT value chain, such as the final assembly of intermediate components, while countries like Japan and the United States tend to conduct more high value added activities such as specialized component production, marketing services or engineering services.

Least-developed countries (LDCs) and low- and middle-income countries (LMICs) are of marginal importance for production and trade in ICT manufacturing chains – with the exceptions of India, Indonesia and the Philippines. The potential for a developing country to successfully integrate into ICT manufacturing value chains depends on, among other things, its closeness to a big market or to regional production networks, for instance "Factory Asia".

The emergence of international ICT value chains has been fostered by relatively low tariffs, which are below the average tariff rate of non-agricultural products for all income groups except LDCs. In particular, the highest tariffs on ICT goods are in African countries and the LDCs, with average rates of about 12%. The lowest tariffs exist in OECD countries, with average rates of less than 2%. Low tariff rates are the result of the WTO Information and Technology Agreement (ITA), in which 75 participants have fully liberalized trade on a MFN basis for 190 IT products covering more than 60% of ICT trade.

The increasing interdependence of economies, fostered by value chains, requires a trade policy that reaches beyond pure market access. Trade reform in the fields of non-tariff measures (NTMs) and trade facilitation promises the greatest benefits as lead firms

organize production across many countries. For instance, trade in intermediate goods is particularly sensitive to time.

In many developing countries activities in ICT services, such as telecommunications and computer services, generate significantly more value added than ICT manufacturing. Furthermore, ICT services constitute vital inputs to the activities of manufacturing and other services sectors. Since ICT services offer also a myriad of possibilities to entrepreneurs, they might be of a higher priority to developing countries compared to ICT manufacturing.

India represents the most prominent success story of a developing country successfully integrating into ICT value chains by developing export-oriented software services industry. India accounts for 60% of the global market for IT services offshoring and about 20% of world exports in computer services. However, other developing countries, such as the Philippines and the Latin American countries – Argentina and Costa Rica – have also successfully built up comparative advantages in computer services exports.

Telecommunication regulation plays an important role for the productivity of firms and for economic development by promoting universal access and ensuring competition. Since the mid-1990s, developing countries have privatized state-owned incumbent operators, established independent regulators, and facilitated competition in the market. Most countries in the Americas have introduced full competition in their telecommunications markets, while Africa and the Arab States still experience the existence of some monopolies or limited competition. In particular, more efforts are needed to increase competition in markets for international gateways, which connect domestic networks to undersea cables and are crucial for the affordability of broadband access.

Similar to developed countries, developing countries face regulatory challenges such as spectrum management or IP interconnection. While developing countries have made significant progress in liberalizing their telecommunications market, a few countries still apply foreign ownership restrictions or maintain discretion regarding the licensing, and entry, of foreign firms.

ICT infrastructure access and usage are necessary conditions for economic development and can be an important catalyst to the achievement of the Millennium Development Goals (MDGs). Developing countries have made significant progress in ICT infrastructure development since 2005. Mobile phone penetration in LDCs increased from 7% in 2005 to 52% in 2012. Despite these positive developments, a large digital divide still exists between OECD countries and developing countries, particularly LDCs. Only 8% of LDC inhabitants use the internet, while fixed broadband penetration is below 1%. However, optimism exists from the rapid growth in mobile broadband access in Africa, where subscriptions are expected to increase from 6% in 2012 to 11% by the end of 2013.

Following the diffusion of mobile phones, developing countries face the challenge of ensuring the proliferation of broadband access, which can bring high speed internet to individuals and businesses, thereby fostering economic growth and development. While infrastructure investments in undersea cables are, to a large extent private sector driven, development finance and public-private partnership can incentivize and leverage such investments. Besides facilitating infrastructure investments, policy makers and regulators

face challenges to increase competition for the access to undersea cables. In doing so, lower access prices will accelerate the proliferation of broadband.

ICT is an enabler of economic and social development for firms and households using them. Internet and mobile phones have allowed the rise of e-commerce. E-commerce provides entrepreneurs with improved access to domestic and foreign markets and allows for innovative types of services such as mobile money. However, developing countries still face significant challenges regarding e-commerce, such as the lack of internet access, insecure payments systems, lack of digital literacy, or inadequate distribution networks and customs procedures for the shipping of goods sold online. ICT furthermore, enables and catalyzes social development in areas such as health, education and women's empowerment towards the achievement of the Millennium Development Goals.

The analysis of the responses from 80 developing country suppliers and 44 lead firms to the OECD-WTO private sector questionnaire provides insights concerning the main difficulties developing country firms face when trying to enter, establish and/or move up ICT value chains. Access to trade finance and customs procedures are the most often mentioned trade-related difficulties by suppliers, which are also emphasized by lead companies. Lead companies additionally consider informal payment requests as a typical trade problem when dealing with developing country suppliers.

Access to finance and a lack of ICT labour force skills are the main national supply-side constraints for suppliers from developing countries. The absence of a sound business environment and transparency in the regulatory environment are the most typical obstacles for lead companies when establishing a commercial presence in developing countries. Regarding physical infrastructure, power supply problems are considered by both suppliers and lead firms as the main constraint, ranking higher than telecommunications and transport infrastructure.

Hence, in many instances, ICT firms face similar problems to suppliers in other value chains and would benefit from aid-for-trade interventions targeted at significant horizontal constraints, such as access to finance (trade finance), the business and regulatory environment, as well as customs procedures and delays.

Aid-for-trade donors and partners both consider ICT services as a priority. More than 55% of partners have identified communication services, including computer and information services, as sources of growth in their development strategies. The majority of donors are currently engaged in public-private partnerships that have ICT as a sectoral focus. On the other hand, manufacturing of office and telecoms equipment is only mentioned by 12% of partners in their development strategies.

ICT-related aid-for-trade projects can have different objectives and create linkages to other sectors. They may support firms in the ICT sector, help firms or governments to use ICT, assist telecommunication regulators or support and facilitate investments in ICT infrastructure. Aid-for-trade disbursements on ICT projects amounted to USD 418 million in 2011, accounting for only 1.2% of total aid-for-trade. This is significantly lower than for other categories of aid-for-trade disbursements – transport and storage secured 30% of all disbursements in 2011, while 21% was disbursed to energy generation and supply. The marginal importance of ICT-related aid for trade reflects the fact that investments into ICT infrastructure tend to be less capital intensive and more private sector driven than in the case of transport and energy infrastructure. Consequently, aid for trade to ICT constitutes only a small fraction of private sector investment and capital expenditure in most developing countries.



However, the digital divide between developing and developed countries still exists and is widening in the case of LDCs. Furthermore, the share of ICT projects in total aid for trade is below the average of partner countries for the majority of the 39 least connected countries (LCCs). Hence, there might be a more prominent role for aid for trade in some LDCs and LCCs to support ICT development and to facilitate private investments.

There are ICT-related aid-for-trade interventions cheaper than infrastructure development that can still bring significant benefits to developing countries. In particular, projects can aim at increasing the ICT skills of the workforce, which is a major constraint highlighted by suppliers in developing countries.

Furthermore, aid for trade can achieve significant development outcomes by supporting the capacity-building and the policy-making of telecommunications regulators. For instance, existing aid-for-trade projects support regulators to harmonize telecommunications legislation, including regulation at a regional level, with the objective to foster regional integration and competitiveness. Importantly, in addition to fostering competition and lower prices, a sound regulatory environment can facilitate private investment in ICT infrastructure.

## 1. Introduction

Major advances in information and communication technology (ICT) have fundamentally changed the way people live and communicate and how companies conduct business. In addition to being an enabling technology for social and economic development, ICT has played a crucial role in facilitating the fragmentation of production and the rise of global value chains (GVCs) by reducing trade costs in services and by allowing a multitude of tasks to be traded online.

The prime goal of this report is to describe value chains in the ICT sector, including the policy environment surrounding it by identifying the barriers developing country firms face when trying to enter, establish or move up ICT value chains. The report also assesses the important role of aid for trade in overcoming these barriers.

To identify the barriers that developing country firms face in integrating into ICT value chains and possible support measures, the report analyses the results of a joint OECD-WTO private sector questionnaire. The OECD-WTO questionnaire was conducted in collaboration with the International Telecommunications Union (ITU) as part of the fourth Global Review of Aid for Trade on "Connecting to Value Chains" and covers 80 developing country suppliers and 44 lead firms in ICT value chains in 55 countries.

While the focus of the report is on firms within ICT value chains, the report also examines developments and challenges regarding ICT infrastructure and accessibility, which is recognized as an important catalyst to the achievement of the Millennium Development Goals (MDGs) (ITU, 2011). Furthermore, the report illustrates the role of ICT as an enabler for economic and social development.

The report uses the OECD DAC list of official development assistance (ODA) recipients to group countries by income and region (Annex A). ODA recipients are referred to as "developing" countries in the report and their respective income and regional aggregates are benchmarked against OECD Members.

The structure of the report is as follows: Section B describes production and trade patterns of both ICT manufacturing and services value chains and their respective regulatory and trade policy environment; Section C assesses the advances in ICT infrastructure and access of developing countries with a particular focus on broadband; Section D describes how ICT enables firms to engage in e-commerce and its importance for social development.

Section E uses the results of the OECD-WTO private sector questionnaire to highlight the main barriers ICT firms in developing countries face when integrating into value chains. Section F describes the priorities of Aid for Trade partners and donors and analyses aid-for-trade disbursements on ICT projects. Section G describes support initiatives that can help suppliers to overcome the barriers to value chain integration. Section H provides a concluding discussion of the role of aid for trade for ICT development and the integration of developing country firms into ICT value chains.



## 2. ICT value chains: Manufacturing and services

### Definition of the ICT sector

The ICT sector is very diverse covering both manufacturing and services firms. According to the OECD ICT sector definition (see Table 1), ICT manufacturing covers the manufacture of electronic components, computer and peripheral equipment, communication equipment, consumer electronics and magnetic and optical media. ICT services activities cover software publishing, telecommunications, computer programming and consultancy, data services and web portals, as well as the repair of computers and communication equipment.

**Table 1 OECD definition of the ICT sector - based on ISIC Rev. 4**

ICT manufacturing industries	
2610	Electronic components and boards
2620	Computers and peripheral equipment
2630	Communication equipment
2640	Consumer electronics
2680	Magnetic and optical media
ICT trade industries (wholesale)	
4651	Computers, computer peripheral equipment and software
4652	Electronic and telecommunications equipment and parts
ICT services industries	
5820	Software publishing
61	Telecommunications
620	Computer programming, consultancy and related activities
631	Data processing, hosting and related activities; web portals
951	Repair of computers and communication equipment

Source: OECD (2011).

### Top ICT firms

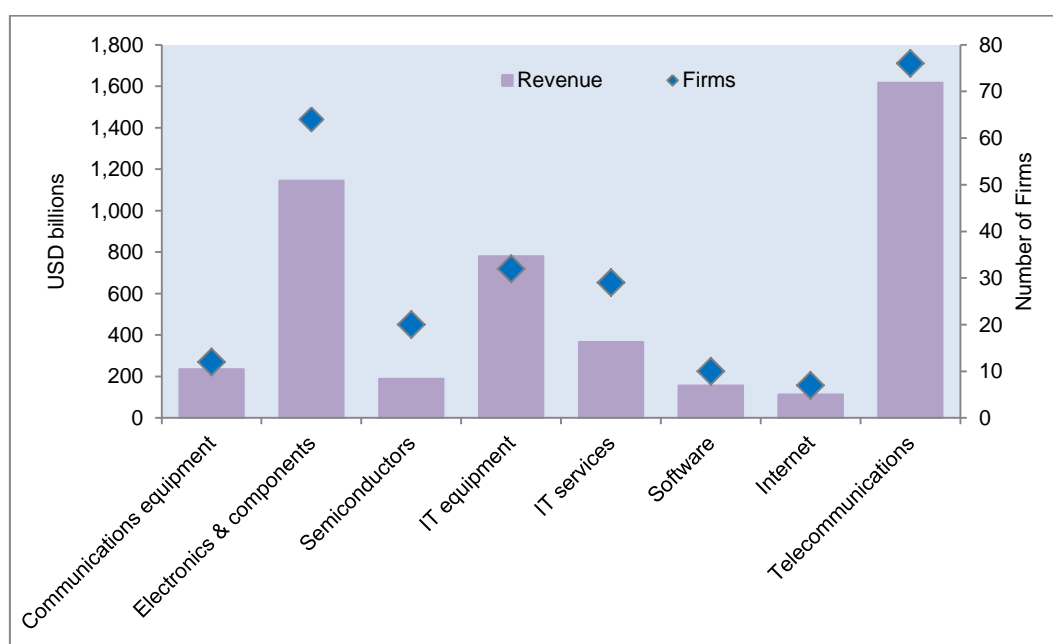
The OECD Internet Economy Outlook 2012 (OECD, 2012) provides data on the Top 250 ICT firms classified into the four manufacturing sectors communication equipment, electronics & components, semiconductors and IT equipment, and the four services sectors IT services, software, internet and telecommunications. Out of the Top 250 firms, 128 are manufacturing firms with revenues of USD 1,294 billion and accounting for 59% of the Top 250 revenue, while 122 are services firms with revenues of USD 915 billion and accounting for 41% of the Top 250 revenue. 201 firms are registered in OECD countries, 82 of which in the United States and 49 in Japan. Only 3 of the Top 250 are registered on mainland China, 4 are registered in Hong Kong and 18 in Chinese Taipei.

Other "emerging economies" that host one or more of the Top 250 ICT firm are Egypt (1), India (4), Indonesia (1), Mexico (1), Morocco (1), Russia (1), Philippines (1) and South Africa (3).

Telecommunications and electronics & components firms are predominant in terms of number and revenue (Figure 1). The 76 telecommunications firms and the 64 electronics & components firms have respective revenues of 1,617bn and 1,145bn constituting 60% of the revenues of all Top 250 ICT firms.

In terms of revenues, services firms have grown faster over the last decade than manufacturing firms increasing their revenue share among the Top 250 ICT firms from 41% in 2000 to 49% in 2011. In particular, the top internet firms grew 31% per year compared to about 10% for software and telecommunications firms.

**Figure 1 Revenue and number of the Top 250 ICT firms by sector in 2011**



Source: OECD Internet Economy Outlook 2012 (OECD, 2012).

Almost a third of the top 100 non-financial transnational corporations (TNCs) from developing and transition economies shown in Table 2 are ICT firms or have ICT as a main activity. The majority of these ICT TNCs are manufacturers headquartered in Asia and include industrial conglomerates such as Hutchison Whampoa (Hong Kong, China) and Samsung (Korea), the world's largest electronics manufacturing services (EMS) provider Hon Hai Precision Industries (Foxconn, Chinese Taipei), and the world's largest original design manufacturer (ODM) of notebooks Quanta Computer (Chinese Taipei).

While ICT manufacturing is concentrated in Asia, telecommunications TNCs can be found also in developing and transition countries from other regions. For instance, América Móvil from Mexico, operates in 18 countries in Latin America, and the MTN Group from South Africa operates in 21 countries.

Table 2 ICT companies among the top 100 non-financial transnational corporations from developing and transition economies, 2010

Ranking by:					Assets		Sales		Employment		TNI(%)
Foreign assets	TNI <sup>b</sup>	Corporation	Home economy	Industry <sup>c</sup>	Foreign	Total	Foreign	Total	Foreign <sup>d</sup>	Total	
1	15	Hutchison Whampoa Limited	Hong Kong, China	Diversified	75,447	92,762	21,053	26,924	198,707	240,000	80.8
8	26	Singapore Telecommunications Ltd	Singapore	Telecommunications	25,877	31,134	8,759	13,563	10,417	23,000	64.3
10	54	América Móvil SAB de CV	Mexico	Telecommunications	22,300	70,947	27,281	48,105	77,141	148,058	46.7
11	44	Hon Hai Precision Industries	Chinese Taipei	Electrical & electronic equipment	19,465	47,327	32,739	102,574	789,051	935,000	52.5
13	18	Qatar Telecom	Qatar	Telecommunications	18,882	27,857	6,011	7,467	1,495	1,900	75.7
14	49	Samsung Electronics Co., Ltd.	Korea, Republic of	Electrical & electronic equipment	18,075	118,337	111,394	133,756	94,802	190,464	49.4
21	24	MTN Group Ltd	South Africa	Telecommunications	15,352	23,341	9,845	15,665	23,253	34,588	65.3
25	12	Zain	Kuwait	Telecommunications	12,210	13,221	3,513	4,716	5,541	6,000	86.4
29	4	Flextronics International Ltd	Singapore	Electrical & electronic equipment	11,539	11,633	28,102	28,680	171,901	176,000	98.3
32	2	First Pacific Company Ltd	Hong Kong, China	Electrical & electronic equipment	10,639	10,914	4,640	4,640	70,083	70,121	99.1
35	20	Axiata Group Bhd	Malaysia	Telecommunications	10,205	12,356	2,741	4,849	21,250	25,000	74.7
41	57	Quanta Computer Inc	Chinese Taipei	Electrical & electronic equipment	9,006	17,552	5,780	38,492	50,485	68,720	46.6
43	27	Naspers Ltd	South Africa	Other consumer services	8,342	10,284	1,399	4,598	12,924	15,932	64.2
47	32	Orascom Telecom Holding SAE	Egypt	Telecommunications	7,458	9,980	3,432	3,825	3,319	14,839	62.3
50	81	VimpelCom Ltd	Russian Federation	Telecommunications	7,123	19,928	2,398	10,513	9,966	42,025	27.4
53	96	Sistema JSFC	Russian Federation	Telecommunications	6,151	44,109	2,983	28,098	18,563	135,000	12.8
60	61	Lenovo Group Ltd	China	Electrical & electronic equipment	5,436	10,706	11,579	21,594	6,247	27,039	42.5
62	17	Acer Inc	Chinese Taipei	Electrical & electronic equipment	5,231	9,616	20,119	21,528	6,546	7,757	77.4
65	38	Tata Consultancy Services	India	Other services	5,058	7,335	7,368	8,192	10,475	160,429	55.1
72	40	Advanced Semic. Engineering Inc	Chinese Taipei	Electrical & electronic equipment	4,113	7,135	3,241	6,459	26,520	48,901	54.0
73	84	Taiwan Semic.Manufacturing Co Ltd	Chinese Taipei	Electrical & electronic equipment	4,100	24,646	7,599	14,358	3,342	33,232	26.5
75	35	Wistron Corp	Chinese Taipei	Other equipments goods	3,888	7,462	15,113	21,054	28,475	50,733	60.0
78	33	ASUSTeK Computer Inc	Chinese Taipei	Electrical & electronic equipment	3,673	6,956	10,995	14,709	6,035	10,318	62.0
80	83	Compal Electronics Inc	Chinese Taipei	Other consumer goods	3,360	11,424	864	30,356	31,292	63,251	27.2
81	77	ZTE Corp	China	Other consumer goods	3,189	12,911	5,623	10,378	20,000	85,232	34.1
83	91	Mobile TeleSystems OJSC	Russian Federation	Telecommunications	3,120	14,478	1,906	11,293	6,385	39,911	18.1
86	88	Reliance Communications Ltd	India	Telecommunications	3,000	21,214	1,674	4,923	3,968	28,065	20.8
87	34	TPV Technology Limited	Hong Kong, China	Wholesale trade	2,985	5,127	8,043	11,632	21,815	37,473	61.9
89	87	Turkcell İletisim Hizmetleri AS	Turkey	Telecommunications	2,952	9,794	460	5,991	3,371	11,183	22.7
91	60	United Microelectronics Corp	Chinese Taipei	Electrical & electronic equipment	2,734	9,629	2,704	4,327	5,044	13,671	42.6
95	11	Skyworth Digital Holdings Ltd	Hong Kong, China	Electrical & electronic equipment	2,396	2,399	3,045	3,130	14,763	23,300	86.8

Source: World Investment Report 2012 (UNCTAD, 2012a).

<sup>a</sup> All data are based on the companies' annual reports unless otherwise stated; corresponds to the financial year from 1 April 2010 to 31 March 2011. <sup>b</sup> TNI, the Transnationality Index, is calculated as the average of the following three ratios: foreign assets to total assets, foreign sales to total sales and foreign employment to total employment.

<sup>c</sup> Industry classification for companies follows the United States Standard Industrial Classification as used by the United States Securities and Exchange Commission (SEC).

<sup>d</sup> In a number of cases foreign employment data were calculated by applying the share of foreign employment in total employment of the previous year to total employment of 2010.

<sup>e</sup> In lieu of 2010 figures, 2009 data have been used.

## ICT manufacturing

### *Production and trade patterns in ICT manufacturing chains*

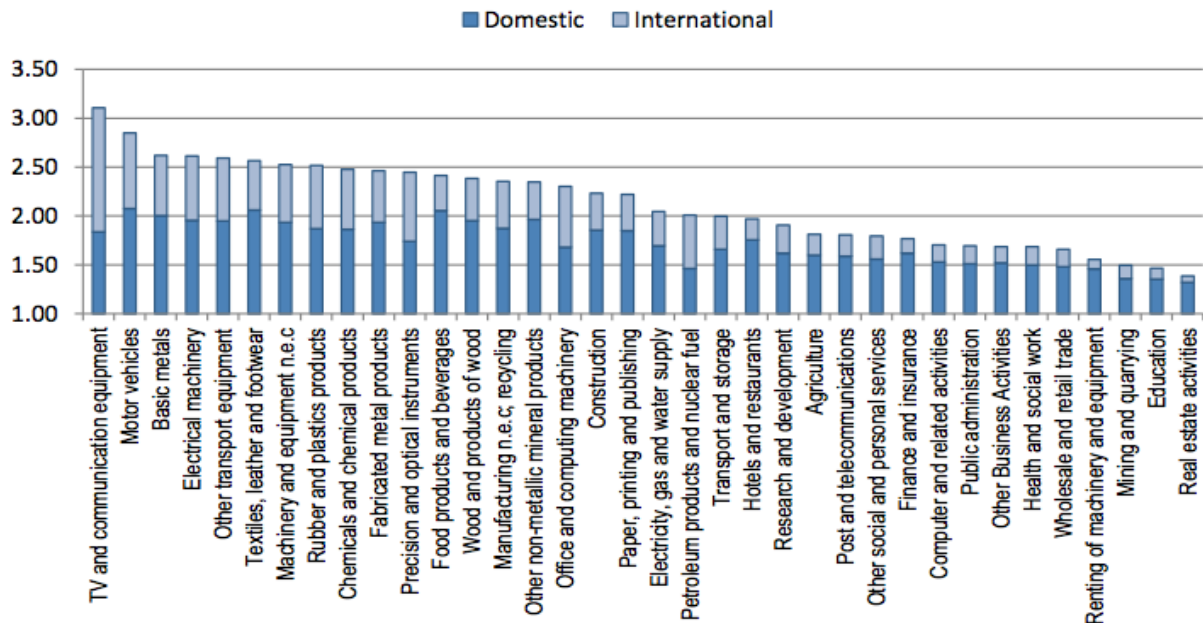
Most ICT products, such as smartphones, consist of different components which can be easily connected, owing heavily to technical standards, as well as standardized design and interfaces. This modularity allows a division between the design and manufacturing activities resulting in modular value chains where suppliers manufacture products following the design of lead firms (Gereffi *et al.*, 2005).

Sturgeon and Kawakami (2010) identify three principal types of companies in the electronics industry, *i.e.* lead firms, contract manufacturers and platform leaders. Lead firms, such as Apple or Samsung design the product, place orders with their suppliers and sell the final product to the consumer. Lead firms are characterized by a strong brand name and technological leadership and are able to capture a large portion of the value added through their design, marketing and distribution activities. Contract manufacturers can be further divided into providers of original design manufacturing (ODM) which conduct both manufacturing and design activities, and providers of electronics manufacturing services (EMS) which carry out only manufacturing activities. Contract manufacturers typically produce generic parts or assemble the final product and are hence substitutable with low market power against lead firms. The third type of actor in electronics value chains are platform leaders, such as Intel, which provide the technology platform that is used by products of other companies.

As a result of its modular nature, ICT manufacturing is among the industries where the production process is the most fragmented internationally. Figure 2 shows an indicator measuring the length, or "fragmentation" of industries, derived from the use of domestic and foreign inputs in the production process. The ICT industry "TV and communication equipment" is the most fragmented and the large contribution of international inputs highlights the international dimension of the chain. The other two ICT industries, "Precision and optical instruments" and "Office and computing machinery", have a shorter length overall. However, the length of the value chain which is due to traded intermediate inputs is still larger than for most other industries.

Since the indicator on the length of value chains is capturing backward linkages, it is not surprising that the ICT services industries of "Post and telecommunications" and "Computer and related services" have shorter lengths. As other services industries, telecommunications and computer services tend to have more forward linkages, that is, they constitute essential inputs for manufacturing or other services industries.

Figure 2 Length of value chains by industry in 2008



Source: De Backer and Miroudot (2013).

Note: The minimum value of the index is 1 when no intermediate inputs are used to produce a final good or service.

Table 3 highlights the fact that ICT manufacturing value chains are concentrated in East Asian economies. The "triangle" of China, Japan and Korea are the first, second and fourth largest producers of ICT goods. Furthermore, Malaysia, Singapore, Thailand and the Philippines are also among the most important countries in ICT manufacturing. Hence, the term "Factory Asia" matches well the production pattern in ICT value chains. While for many developing countries, and LDCs in particular, no data is available for the ICT sector. Available data suggests that these countries do not play a significant role in the production of ICT goods.

Besides accounting for a large share of world production, East Asian economies also tend to be specialized in ICT manufacturing relative to other manufacturing sectors. For instance, in China, the ICT sector accounts for 13% of manufacturing output and for 11% of manufacturing employment. In comparison, in the US, ICT manufacturing constitutes 6% of manufacturing output and 7% of manufacturing employment. Other East Asian developing economies are even more specialized in ICT manufacturing than China. In particular, the share of the ICT sector in manufacturing output and employment are respectively 23% and 14% in Malaysia, 29% and 22% in Singapore, and 28% and 23% in the Philippines.

The comparison of output and value added already provides some evidence regarding the high production fragmentation in ICT manufacturing and the position of countries in the value chain. For instance, while China is the largest ICT producer in terms of output, the United States is the largest producer in terms of value added. Furthermore, the level of value added is closer to the level of output in Japan, the US and Korea than in China indicating that the former are engaged in higher value added activities and are positioned more at intermediate stages of production while China tends to conduct more lower value added activities such as final assembly of intermediate components.



Table 3 Output, value added and employment in the ICT sector by country in 2008

Country	Output		Value added		Employment	
	Million USD	Share in manuf. (%)	Million USD	Share in manuf. (%)	Number in Thousands	Share in manuf. (%)
<b>China (2008/2007/2008)</b>	851,393.0	12.8	143,515.7	11.1	8,607.0	10.6
<b>Japan (2005)</b>	360,113.6	13.4	115,752.4	12.3	827.4	11.0
<b>United States of America</b>	347,259.3	6.3	201,164.5	9.2	910.8	7.1
<b>Republic of Korea (2006)</b>	174,855.0	18.3	77,773.0	22.7	451.9	16.3
<b>Germany</b>	119,348.2	4.8	37,070.3	5.6	348.9	5.1
<b>France</b>	58,292.7	4.7	19,155.5	6.1	187.7	5.9
<b>Malaysia</b>	56,465.5	23.0	9,676.2	20.5	349.6	13.6
<b>Singapore</b>	53,648.2	28.8	10,409.4	31.2	96.9	22.3
<b>Italy</b>	43,736.8	3.1	11,564.8	3.6	134.3	3.5
<b>United Kingdom (2008/2008/2007)</b>	38,599.8	4.2	16,010.2	5.5	154.8	5.2
<b>Finland</b>	34,175.9	19.2	9,187.4	19.0	42.6	9.9
<b>Thailand (2006)</b>	27,787.4	14.4	7,581.9	16.3	354.8	9.3
<b>Sweden</b>	26,652.3	9.6	7,315.2	9.7	47.4	6.9
<b>Hungary</b>	25,097.7	19.5	2,859.6	9.9	70.2	9.5
<b>India (2007)</b>	20,999.6	3.3	3,888.0	3.0	244.9	2.4
<b>Philippines (2006)</b>	16,628.3	28.1	3,454.1	26.3	226.7	22.9
<b>Spain</b>	16,151.2	2.1	3,944.8	2.1	44.8	1.9
<b>Poland</b>	14,451.0	4.2	3,111.8	3.5	85.0	3.5
<b>Netherlands</b>	10,195.2	2.4	2,742.2	3.0	30.7	4.1
<b>Belgium</b>	9,336.8	2.5	2,951.6	4.0	20.2	3.6
<b>Slovakia</b>	8,774.9	12.1	1,021.1	8.9	31.7	7.1
<b>Austria</b>	7,987.7	3.5	2,898.9	4.2	25.9	4.1
<b>Norway</b>	6,579.3	5.1	2,195.2	5.9	12.6	4.6
<b>Portugal</b>	5,806.6	5.0	1,166.0	4.1	16.7	2.2
<b>Indonesia</b>	5,645.8	2.9	1,940.9	2.8	139.8	3.1
<b>Denmark</b>	4,476.7	3.2	1,643.9	3.7	15.4	4.0
<b>Romania (2008/2007/2008)</b>	3,713.3	3.8	702.4	3.7	31.6	2.2
<b>Ukraine</b>	1,867.9	1.5	n.a.	n.a.	75.2	3.1
<b>Iran</b>	1,825.8	1.6	522.1	1.3	24.9	2.2
<b>Greece (2007)</b>	1,782.0	2.3	496.8	2.2	6.0	1.9
<b>Malta (2008/2008/2007)</b>	1,351.5	36.6	161.8	14.0	3.2	13.4
<b>Slovenia (2007)</b>	1,027.9	3.2	334.0	3.5	9.1	4.0
<b>Egypt (2006/2005/2006)</b>	804.3	2.3	208.0	2.5	18.3	1.8
<b>Bulgaria (2007)</b>	603.9	2.0	158.1	2.5	11.0	1.7
<b>Peru (2007)</b>	475.0	0.9	143.9	0.9	n.a.	n.a.
<b>Lithuania</b>	468.4	1.9	124.3	3.0	5.0	2.2
<b>Jordan</b>	410.4	3.0	86.2	2.1	2.6	1.6
<b>Oman (2006)</b>	296.9	3.8	15.3	0.5	0.5	1.2
<b>Kazakhstan (2007)</b>	210.7	0.9	n.a.	n.a.	n.a.	n.a.
<b>Ecuador</b>	125.5	0.6	21.8	0.3	0.6	0.4
<b>FYR Macedonia</b>	92.0	1.7	36.7	2.2	1.6	1.4
<b>Sri Lanka (2006)</b>	54.4	0.2	23.6	0.2	5.4	0.4
<b>Republic of Moldova (2007)</b>	33.3	1.9	n.a.	n.a.	n.a.	n.a.
<b>Azerbaijan</b>	32.0	0.5	13.1	0.6	2.4	2.1
<b>Armenia</b>	20.7	1.2	n.a.	n.a.	n.a.	n.a.
<b>Kyrgyzstan</b>	6.1	0.3	3.1	0.4	0.7	1.2
<b>Lebanon (2007)</b>	1.7	0.0	0.5	0.0	0.0	0.0

Source: WTO Secretariat, based on the UNIDO Industrial Statistics database (INDSTAT4).

Notes: Data in INDSTAT4 are available at the 4-digit level of the ISIC Rev. 3.1 classification. Table B.1 in Annex B shows the OECD ICT sector definition for ISIC 3.1 used in the calculation for this Table.

Upper-middle income countries (UMICs) experienced a vertiginous increase in ICT goods exports of 10% per year since 2005 reaching USD 662 billion in 2011 (Table 4). UMICs have overtaken developed OECD countries as the biggest exporters, accounting for 50% of world ICT exports. Table B.2 in Annex B shows that it has been predominantly China which was responsible for the strong performance of UMICs. In particular, China's ICT exports grew at an annual rate of 13% between 2005 and 2011 amounting to USD 492 billion or 37% of world exports. Other UMICs have also successfully integrated into ICT value chains. The leading four UMICs exporters China, Malaysia, Mexico and Thailand have developed a comparative advantage (see RCA column in Table B.2) in ICT exports as their share in world ICT exports is larger than their share in total world exports. While also ICT imports grew faster in developing countries than in OECD countries, OECD markets still attract a higher level of OECD imports accounting for 63% of World ICT imports.

LDCs and LMICs are of marginal importance for ICT exports with the exceptions of the India, Indonesia and the Philippines. The Philippines is the most successful LMIC in ICT value chains, as it is the largest LMI exporter and has managed to build a comparative advantage in the sector (Table B.2 in Annex B).

Table 4 also reflects the fact that China is positioned at the final stages of the value chain which involves the assembly of imported intermediates into the final product. For UMICs the share of intermediate inputs in imports is 74% and the share of intermediates in exports only 37%. In contrast, for developed OECD economies the share of intermediate ICT goods in imports is 35% while it is 50% for exports.

**Table 4 Exports and imports of ICT goods by income grouping**

	Exports					
	Value (in million USD)		Growth p.a. (%)	% of WLD	% Intern. in cou.	RCA
	2005	2011	2005-2011	ICT exports	ICT exports	
<b>LDCs</b>	40.1	249.3	35.6	0.0	5	0.07
<b>LMICs</b>	1,343.9	6,788.0	31.0	0.5	31	0.18
<b>UMICs</b>	370,246.1	662,469.5	10.2	50.0	37	1.81
<b>OECD</b>	690,508.4	656,159.4	-0.8	49.5	50	0.72
	Imports					
	Value (in million USD)		Growth p.a. (%)	% of WLD	% Intern. in cou.	RCA
	2005	2011	2005-2011	ICT imports	ICT imports	
<b>LDCs</b>	1,324.5	2,223.1	9.0	0.1	23	0.32
<b>LMICs</b>	15,857.3	35,841.5	14.6	2.4	33	0.54
<b>UMICs</b>	311,812.4	522,230.5	9.0	34.6	74	1.33
<b>OECD</b>	825,853.6	949,319.2	2.3	62.9	35	0.84

Source: WTO Secretariat – based on UN Comtrade database.

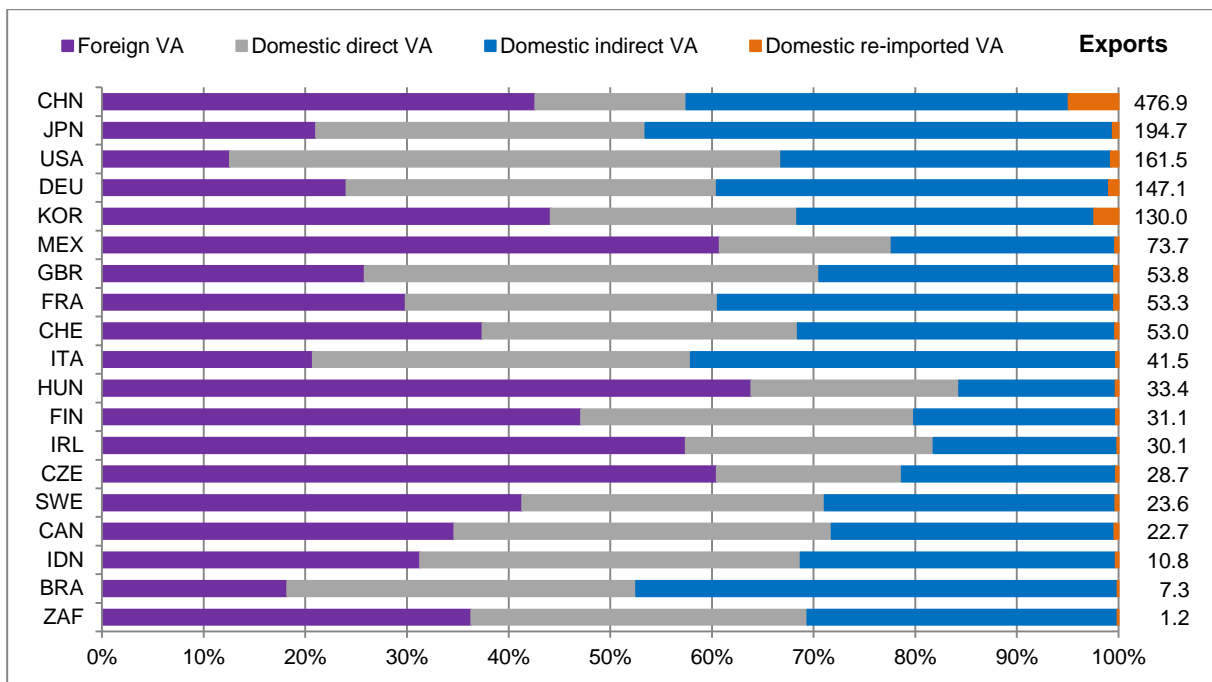
Notes: Aggregates by income group are based on 92 countries for which data are available in both 2005 and 2011. Income groups have the following number of countries: LDCs (15), LMICs (17), UMICs (29), and OECD (31). The Philippines and Indonesia were the largest LMICs exporters of ICT goods in 2011 but have not been included due to missing data in 2005. Aggregate exports for LMICs are hence underestimated compared to other income groups.

Figure 3 illustrates further the structure of ICT manufacturing value chains and to what extent countries are able to actually capture value by providing a decomposition of the value added content of exports into foreign value added and domestic value added components. As noted above, China is by far the biggest exporter of ICT goods in gross terms (see labels on the right hand side). However, Chinese exports contain more than

40% of foreign value stemming from imported goods and services that have been used as inputs in the production process.

In contrast to China, Japan adds significantly more domestic value added to its ICT exports. In particular, in Japan domestic value added accounts for almost 80% of ICT exports, of which more than 30% stems from the ICT industry itself (domestic direct VA), about 45% is value added provided through inputs of other Japanese industries (domestic indirect VA) and a small fraction represents domestic value added that had already been exported but has been re-imported in the form of intermediate inputs (domestic re-imported VA).

**Figure 3 Foreign and domestic value added shares content of ICT exports**



Source: OECD-WTO Trade in Value Added (TiVA) database.

Notes: The data used represent the ISIC Rev. 3.1 industries 30 to 33, labelled as "Electrical and optical equipment" in the TiVA database. These industries cover all ICT manufacturing (see Table B.1 in Annex B) but also few additional activities.

### Trade Policy

The increasing interdependence and integration of economies fostered by value chains requires a trade policy that reaches beyond pure market access policies. Many regional trade agreements already reflect this new reality covering issues such as services, non-tariff measures, competition policy or intellectual property (IP).

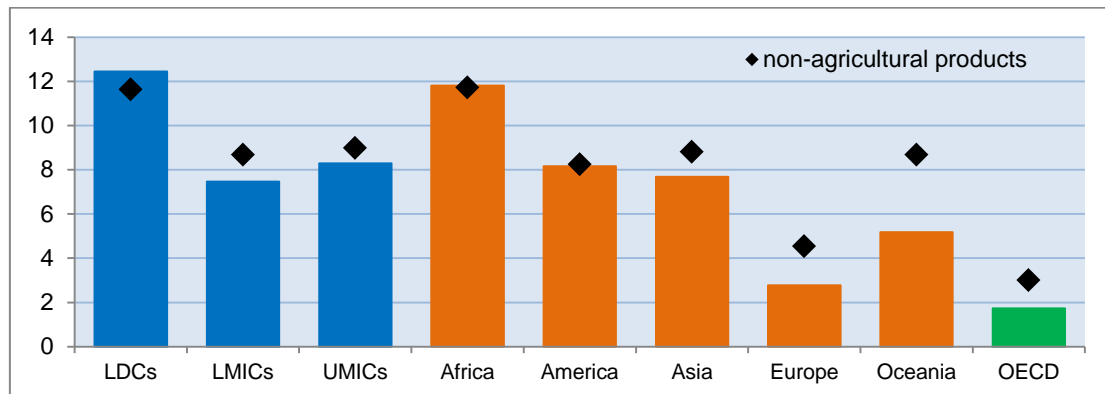
Nevertheless, trade costs and tariffs still have an important role to play. Since in value chains intermediate goods cross borders several times before the final good reaches the consumer, tariffs have a compounding effect so that changes in tariffs lead to a magnified response of trade flows (Yi, 2003).

### Tariffs on ICT products

Figure 4 shows average applied MFN tariffs for the overall ICT sector and for non-agricultural products by income group and region. Tariffs on ICT goods are the highest in

LDCs and in Africa with about 12% each. On the other hand, OECD countries have slashed their tariffs on ICT goods below 2%, also thanks to the WTO Information Technology Agreement (ITA), which is described in Box 1. Tariffs on ICT products are on average lower than tariffs on non-agricultural products for all income groups but LDCs. Figure 5 shows applied MFN tariffs for ICT and disaggregated ICT product categories by income group.

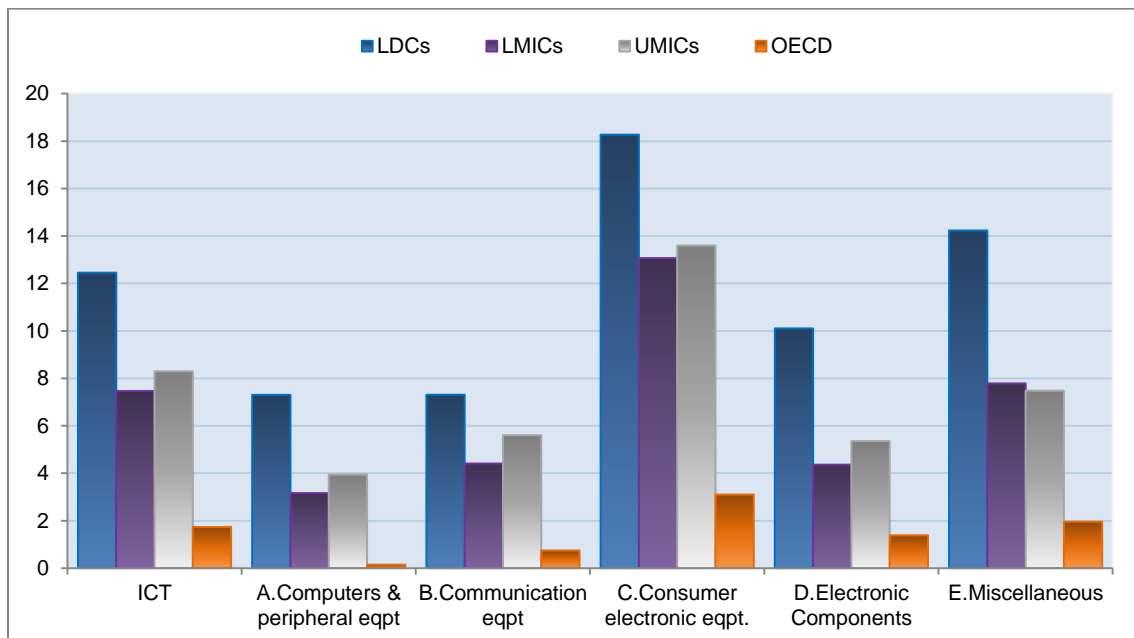
**Figure 4 Average applied MFN tariffs for ICT products and for non-agricultural products by income group and region**



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

Notes: EU is treated as one country and assigned to OECD. Data on country tariffs are from 2011 or the latest year available back to 2008 and are based on HS 2007 or on earlier HS versions for some countries. Annex A details the country composition of income and regional groupings.

**Figure 5 Average applied MFN tariffs by income group**



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

Notes: EU is treated as one country and assigned to OECD. Data on country tariffs are from 2011 or the latest year available back to 2008 and are based on HS 2007 or on earlier HS versions for some countries.

### Box 1 The WTO Information Technology Agreement (ITA)

Tariffs in the ICT sector are to a large extent covered by the WTO Information Technology Agreement (ITA) which was concluded at the Ministerial Conference in Singapore in 1996. The ITA fully liberalized trade on a MFN basis for 190 IT products corresponding to 154 HS1996 subheadings, *i.e.* 6-digit codes, or parts thereof (WTO, 2012). The agreement initially covered 29 economies and has grown to 75 participants over the years including all OECD members but Mexico, many developing countries but as yet no LDC.\*

Table 5 compares tariffs on ICT and ITA goods for countries that have signed the ITA agreement with those of countries that have not. Two main observations can be made. First, ITA participants have not only abolished tariffs on ITA products but have also a lower tariff burden on ICT products compared to non-participants in the ITA. Second, countries which have not joined the ITA have on average higher tariffs of about 3 percentage points on ICT products than on ITA products.

**Table 5 Average applied MFN tariffs on ICT and ITA products by income group and region (percentage)**

	ITA participant			ITA non-participant		
	Countries (no.)	Tariffs ICT (%)	Tariffs ITA (%)	Countries (no.)	Tariffs ICT (%)	Tariffs ITA (%)
<b>Income group</b>						
LDCs	0	-	-	33	12.5	9.2
LMICs	13	3.6	0.0	20	9.8	6.9
UMICs	11	4.8	0.0	25	9.8	7.0
OECD	10	1.6	0.0	0	-	-
<b>Region</b>						
Africa	3	2.8	0.0	40	12.6	9.1
America	8	4.0	0.0	22	9.6	6.4
Asia	9	5.5	0.0	10	9.8	7.3
Europe	4	2.7	0.0	1	3.0	1.2
Oceania	0	-	-	5	7.3	6.7
OECD	10	1.6	0.0	0	-	-

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

*Notes:* EU is treated as one country and assigned to OECD. Mexico is not included in the OECD average, but in the groupings for UMICs and America (see Annex A for details on country groupings). Data on country tariffs are from 2011 or the latest year available back to 2008 and are based on HS 2007 or on earlier HS versions for some countries. Annex A details the country composition of income and regional groupings.

The OECD ICT sector definition comprises 110 products in terms of HS2002 subheadings. Of these 110 products, the ITA covers 37 products fully, 12 partially and 61 products are not covered. On the other hand, the ITA covers 158 products in terms of HS2002 subheadings, of which 93 fully and 65 partially. Of the 93 products which are fully covered, 37 fall under the OECD ICT definition while of the 65 partially covered products 12 do so.

Table 6 shows the overlap between ICT and ITA products in terms of trade flows. Overall, 64% of ICT exports are covered by the ITA. While the ITA covers a large share of ICT trade of LDCs and LMICs, it covers a relatively low share of ICT trade of UMICs and OECD countries. For instance, only 70% of ICT exports of UMICs and 58% of ICT exports of OECD countries fall inside the scope of the ITA. In contrast, most of ITA trade actually consists of ICT products, *i.e.* 96% UMICs' exports and 82% for OECD members' exports. These differences in the overlap reflect the fact that the ITA was signed in 1996 and that product innovations in the ICT sector have made many ITA products almost irrelevant in terms of trade flows.

**Table 6 Overlap between trade covered by the ICT definition and the ITA in 2011**

	ICT products				ITA products			
	Exports		Imports		Exports		Imports	
	Value (mill. US\$)	% covered by ITA	Value (mill. US\$)	% covered by ITA	Value (mill. US\$)	% covered by ICT	Value (mill. US\$)	% covered by ICT
LDCs	249	92	2,223	80	238	97	1,943	91
LMICs	6,788	87	35,841	76	6,530	91	29,312	93
UMICs	662,469	70	522,231	46	486,545	96	281,036	86
OECD	656,159	58	949,319	66	457,996	82	692,581	91
<b>Total</b>	<b>1,325,666</b>	<b>64</b>	<b>1,509,614</b>	<b>60</b>	<b>951,309</b>	<b>89</b>	<b>1,004,872</b>	<b>90</b>

*Source:* WTO Secretariat, based on UN Comtrade database.

*Notes:* The share of ICT trade covered by ITA reflects how much of ICT trade falls within the scope of the ITA in terms of products and not how much ICT trade is actually traded duty-free under the ITA. Aggregates by income group are based on 92 countries for which data are available in both 2005 and 2011. Income groups have the following number of countries. LDCs (15), LMICs (17), UMICs (29), OECD (31). The Philippines and Indonesia were the largest LMICs exporters of ICT goods in 2011 but have not been included due to missing data in 2005. Aggregate exports for LMICs are hence underestimated compared to other income groups.

As a consequence of the substantial innovations in the ICT sector, a group of ITA participants have started negotiations in order to update the ITA by expanding its product coverage to adapt the agreement to the current technological environment. Furthermore, some proponents of an amended ITA would also like to introduce for the first time commitments regarding non-tariff measures (NTMs) such as technical regulations and conformity assessment procedures.

\*ITA signatories: Albania, Australia, Bahrain, Canada, China, Colombia, Costa Rica, Croatia, Dominican Republic, Egypt, El Salvador, European Communities (27 member states), Georgia, Guatemala, Honduras, Hong Kong, China, Iceland, India, Indonesia, Israel, Japan, Jordan, Korea, Kuwait, Kyrgyz Republic, Macao, China, Malaysia, Mauritius, Moldova, Montenegro, Morocco, New Zealand, Nicaragua, Norway, Oman, Panama, Peru, Philippines, Saudi Arabia, Singapore, Switzerland, Chinese Taipei, Tajikistan, Thailand, Turkey, Ukraine, United Arab Emirates, United States, Viet Nam.

While some governments intend to raise revenues or to protect domestic companies through import tariffs, there are at least three economic reasons why developing countries should refrain from imposing high import tariffs on ICT goods. First, ICT firms will find it more difficult to integrate into manufacturing value chains. Tariffs on imported intermediates increase the production cost for domestic firms making them less competitive compared to suppliers from countries with lower tariffs. This negative effect has also been highlighted by ICT lead firms in the OECD-WTO questionnaire, where more than a third of lead firms consider import duties a difficulty when bringing suppliers from developing countries into their value chain.

Second, ICT products are required by ICT services firms and also by firms in other manufacturing and services sectors as inputs for their activities. For instance, telecommunications operators need communications equipment to run their network, logistics companies need ICT technology to track shipments, managers need smartphones to increase the efficiency of their communication activities and businesses need computers and servers for their back-office activities and to control the production process. Hence, the productivity of domestic firms is affected by the availability and costs of imported ICT products.

Third, low tariffs on ICT products benefit consumers by helping them to more easily communicate, to access information and services and to increase the utility they draw from their leisure time. Nonetheless, Figure 5 shows that tariffs on ICT products are highest for consumer electronic equipment such as television sets and digital cameras with averages being above 12% for LMICs and UMICs and above 18% for LDCs.

#### *NTMs and trade facilitation*

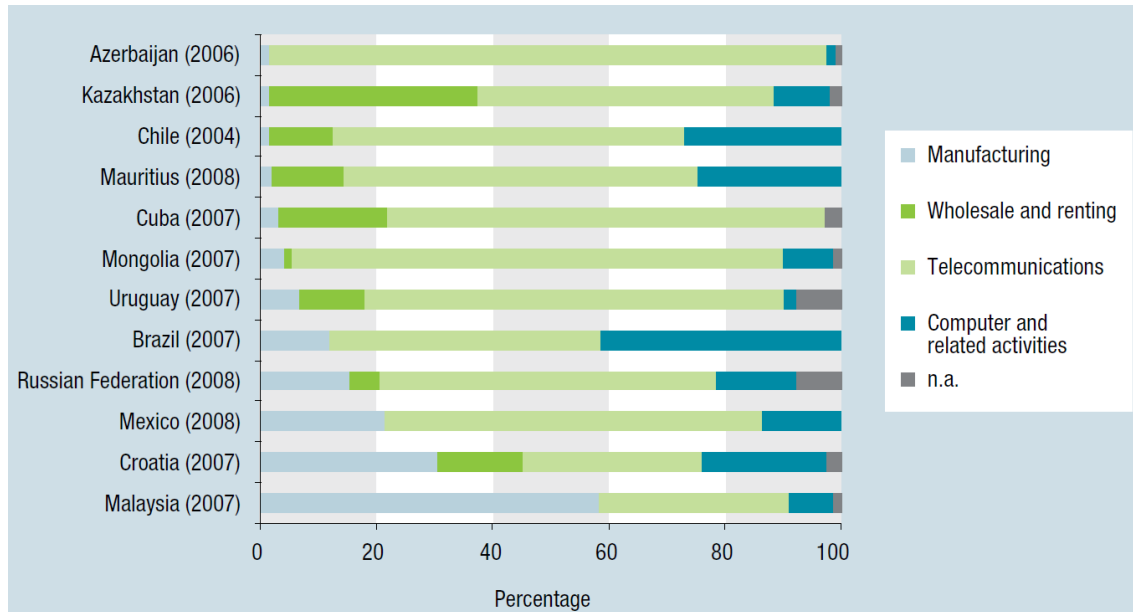
Since tariffs on ICT products are already relatively low, further trade reform would be most beneficial in the fields of non-tariff measures and trade facilitation, which are of particular importance for value chains. If NTMs such as technical regulations are increasingly complex and differ across countries, firms might find it difficult to organize their value chains across countries. Efforts to achieve some NTM commitments within the ITA might offer some insights regarding future possibilities to multi-lateralize trade rules relevant for value chains beyond market access and the existing disciplines of the TBT Agreement.

Furthermore, trade facilitation measures can reduce trade costs by reducing shipping times and by reducing the uncertainty regarding the arrival time. In the OECD-WTO private sector questionnaire, customs procedures are one of the three most often mentioned difficulties by both suppliers and lead companies. ICT value chains and trade in intermediate goods are particularly sensitive to time since ICT products depreciate quickly due to technological progress and since the production process is characterized by few inventories and just-in-time delivery. Since the production of the final product requires all intermediate inputs, a delay in shipping can put the production to a halt. For instance, Gamberoni *et al.* (2010) demonstrates that the ability to export on time is an important source of comparative advantage for intermediate goods.

### **ICT services**

#### *Production and trade patterns in ICT services chains*

Value chains in ICT manufacturing have received increasing interest from policymakers thanks to success stories of Asian economies and to illustrative examples for smartphones and tablets. However, ICT services might be of greater importance to developing countries as they often account for a larger share of value creation and offer myriad possibilities to entrepreneurs. Figure 6 shows that for many countries telecommunications and computer services generate significantly more value added than ICT manufacturing. For instance, in Brazil manufacturing accounts for just above 10% of ICT value added while telecommunication and computer services each account for more than 40% of ICT value added.

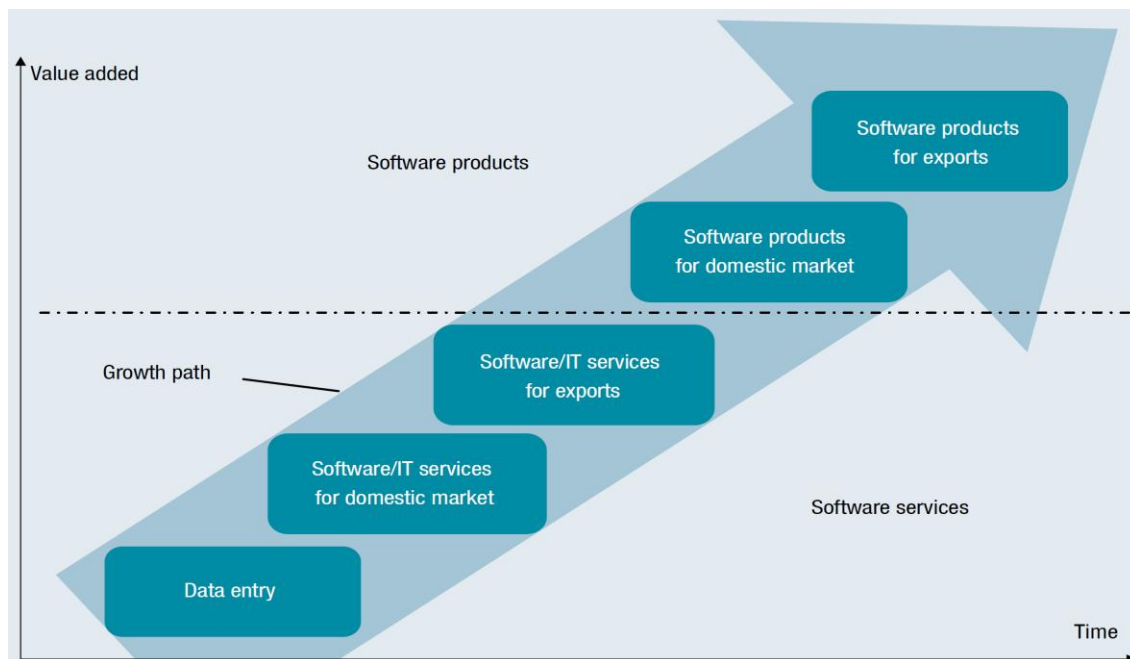
**Figure 6 Value added shares of ICT subsectors for selected economies, latest year**

Source: UNCTAD (2011).

ICT services are characterized by strong upward linkages in the sense that they constitute key inputs to the activities of other sectors. For instance, ICT technologies allow the tracking and tracing of shipments in the transport and logistics chain and a better management of intermodal transport. In the tourism value chain, ICTs allow suppliers to advertise their services online and to offer the possibility of online booking to potential clients. Hence, ICT services are essential for the efficiency of various services and manufacturing value chains.

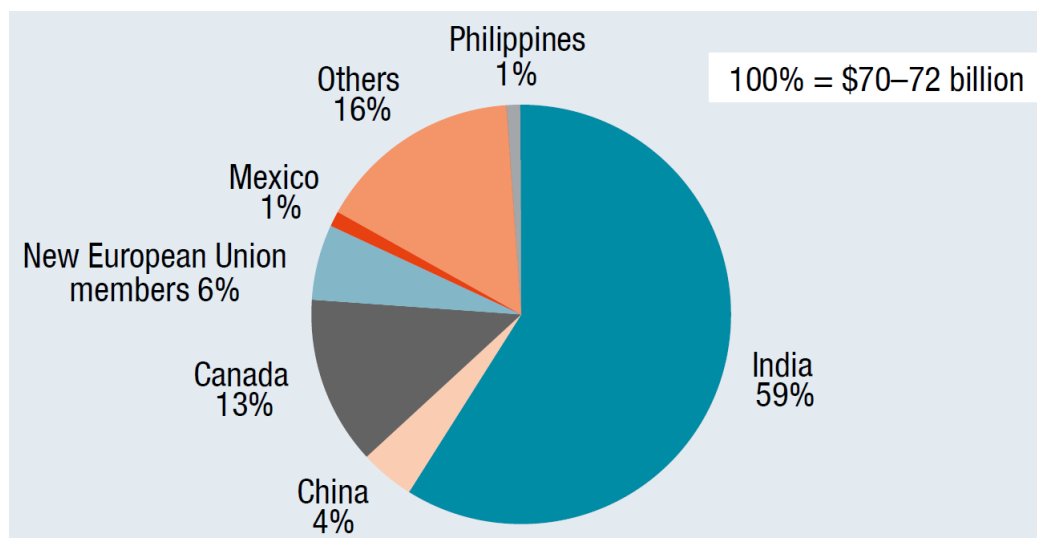
The development of a national software system and the software value chains can be an important contributor to economic development as highlighted in the UNCTAD Information Economy Report 2012 (UNCTAD, 2012b). Figure 7 shows a possible development path for countries along the software value chain from software services such as data entry and software development (*e.g.* analysis, design, maintenance) for the domestic market to software services for the export market and the move from software services to software products such as system software or application software.



**Figure 7 Possible development path along the software value chain**

Source: Information Economy Report 2012 (UNCTAD, 2012b).

India is the most prominent success story of a developing country integrating into ICT value chains by developing export-oriented software industries (UNCTAD, 2012b). India has become the main destination for IT services offshoring (Figure 8) exporting software and business process outsourcing services to the United States and the EU. India's success has been facilitated by proactive policies, including the development of higher education in engineering and technical professions, in addition to investments in institutions as well as physical ICT infrastructure, such as centers of excellence or software technology parks.

**Figure 8 Global market for IT services offshoring by destination in 2011**

Source: Information Economy Report 2012 (UNCTAD, 2012b).

The success of India and other countries such as the Philippines are further highlighted by their trade performance. Table 7 provides trade indicators for the top five exporters by income group for computer services, which covers hardware- and software-related services and data-processing services<sup>1</sup>.

India exported USD 33 billion of computer services in 2009 accounting for about 20% of world exports. India is also highly specialized in computer services exports. The revealed comparative advantage (RCA) measure of 5.49 indicates that its world market share in computer services exports is 5.49 times higher than its share in total services exports.

A second key development is that computer services exports in LMICs and UMICs have been growing at much higher rates than in OECD countries. Growth has been particularly high in the Philippines with exports growing from USD 89 million in 2005 at an annual rate of 85% to USD 1.9 billion in 2010 building up a comparative advantage in computer services. Similar success stories can be observed for the two upper-middle income countries in Latin America, namely Argentina and Costa Rica. Starting at similar levels in 2005, Argentina and Costa Rica experienced an average yearly growth rate of more than 35% from 2005 onwards so that both countries exported more than USD 1.2 billion in 2010. Furthermore, RCA indices of 1.79 for Argentina and in particular 5.28 for Costa Rica indicate that both countries are specialized and hence competitive in computer services exports.

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<sup>1</sup> Table B.4 in Annex B provides data for more countries.

Table 7 Top five exporters of computer services by income group

	Exports					Imports				
	Value ('000 USD)		Growth p.a. (%)	Share (%)	RCA	Value ('000 USD)		Growth p.a. (%)	Share (%)	RCA
	2005	2010	2005-2010	2010	2010	2005	2010	2005-2010	2010	2010
<b>Least developed countries (LDCs)</b>										
Bangladesh	18,557	37,440	15	0.02	0.58	3,792	4,873	5	0.01	0.04
Uganda	32,825	37,407	3	0.02	0.67	22,191	32,579	8	0.04	0.53
Mozambique	121	5,237	112	0.00	0.17	2,659	691	-24	0.00	0.02
Tanzania	265	4,634	77	0.00	0.04	4,597	9,561	16	0.01	0.16
Samoa	n.a.	972	n.a.	0.00	0.11	n.a.	n.a.	n.a.	n.a.	n.a.
<b>Lower-middle income countries (LMIs)</b>										
India (exp.: 2009)	n.a.	33,383,179	n.a.	20.35	5.49	1,048,870	2,175,840	16	2.70	0.57
Philippines	89,000	1,928,000	85	1.18	2.55	62,000	109,000	12	0.14	0.30
Morocco	n.a.	289,781	n.a.	0.18	0.45	n.a.	60,674	n.a.	0.08	0.32
Sri Lanka	82,470	265,000	26	0.16	2.02	n.a.	n.a.	n.a.	n.a.	n.a.
Pakistan	59,000	192,000	27	0.12	1.22	30,000	161,000	40	0.20	0.75
<b>Upper-middle income countries (UMIs)</b>										
Malaysia (exp./imp.: 2009)	435,260	1,453,770	35	0.89	0.77	379,295	1,206,030	34	1.50	1.31
Argentina	235,210	1,237,340	39	0.75	1.79	190,730	445,356	18	0.55	0.98
Costa Rica	254,378	1,216,190	37	0.74	5.28	10,721	20,844	14	0.03	0.35
Belarus	24,700	217,700	55	0.13	0.91	9,000	45,600	38	0.06	0.48
Brazil	80,223	195,100	19	0.12	0.12	1,656,840	3,414,480	16	4.24	1.73
<b>OECD Members (high income)</b>										
Ireland	19,369,000	37,196,458	14	22.67	7.14	378,053	752,273	15	0.93	0.21
Germany	8,415,411	16,304,988	14	9.94	1.31	8,587,027	14,066,711	10	17.47	1.62
United Kingdom	8,476,394	9,952,424	3	6.07	0.75	3,330,921	5,256,661	10	6.53	0.99
United States	3,554,000	8,771,000	20	5.35	0.31	2,000,000	18,394,000	56	22.84	1.50
Israel	4,528,500	7,699,500	11	4.69	5.94	n.a.	n.a.	n.a.	n.a.	n.a.

Source: WTO Secretariat, based on WTO Trade in Services database.

Note: RCA (revealed comparative advantage) is defined as the ratio of a country's world market share in computer services exports (imports) to its world market share in total services exports (imports).

Cross-border trade in telecommunication services covers mainly the transmission of sounds, images and other information through telephone, television and satellites. Table 8 provides exports and imports indicators of telecommunication services by income group. Most noteworthy is that with 19% yearly export growth and 23% yearly import growth, LDCs have experienced on average significantly higher trade growth than richer countries. Furthermore, LDCs have a revealed comparative advantage in exporting telecommunication services. The increasing participation of LDCs in telecommunication services reflects the positive developments in ICT infrastructure and access highlighted in Section C.1.

Table B.3 in Annex B provides country detail. Most LDCs export more telecommunication services than they import, implying predominance of incoming over outgoing transmissions, e.g. through phone calls from migrants living abroad and foreign businesses.

**Table 8 Exports and imports of telecommunication services by income group**

	Exports					Imports				
	Value ('000 USD)		Growth p.a. (%)	Share (%)	RCA	Value ('000 USD)		Growth p.a. (%)	Share (%)	RCA
	2005	2010	2005-2010	2010	2010	2005	2010	2005-2010	2010	2010
<b>LDCs</b>	446,724	1,274,509	23	2.51	3.64	258,472	890,328	28	1.99	0.95
<b>LMICs</b>	2,970,312	3,840,004	5	7.57	0.92	912,763	2,033,920	17	4.55	0.49
<b>UMICs</b>	3,065,424	4,037,498	6	7.95	0.99	1,755,222	3,072,279	12	6.87	0.61
<b>OECD</b>	23,669,432	41,606,354	12	81.97	0.99	24,138,680	38,702,781	10	86.58	1.12

Source: WTO Secretariat, based on WTO Trade in Services database.

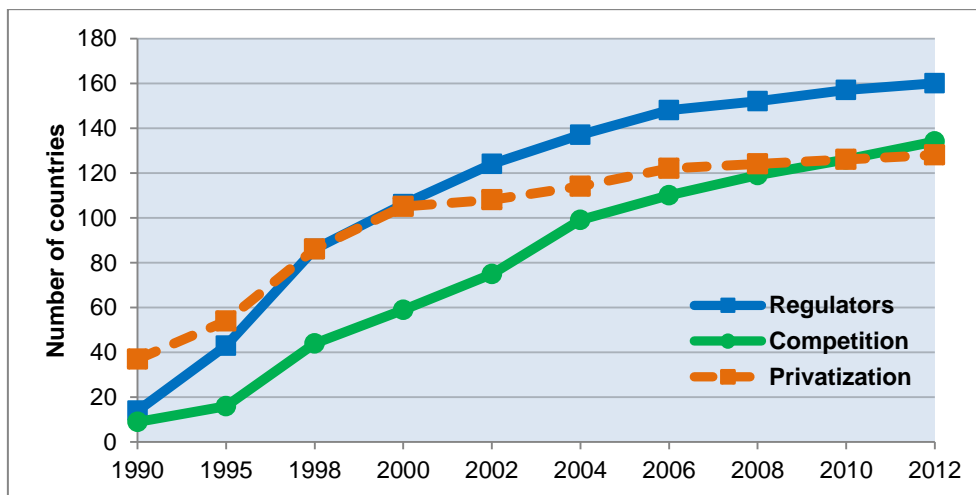
Notes: Only countries with data available in both 2005 and 2010 were used in calculating trade by income group. Income groups have the following number of countries. Exports: LDCs (24), LMICs (24), UMICs (25), OECD (22). Imports: LDCs (23), LMICs (22), UMICs (23), OECD (21). RCA is defined as the ratio of a country's world market share in telecommunication services exports (imports) to its world market share in total services exports (imports).

### *Regulation and trade policy in telecommunications*

#### *Liberalization and regulation in the telecommunications market*

Access to affordable telecommunication services is crucial for the productivity of domestic companies, their possibility to form and integrate into value chains and the economic development of countries. Telecommunications regulation plays an important role for promoting universal access, ensuring competition and bringing down prices.

The rapid progress in ICT technology has been accompanied by a successful trend in telecommunications liberalization over the last two decades. Figure 9 shows that starting from the mid-1990s more and more countries have privatized their state-owned incumbent operators, established independent regulators, and introduced competition by allowing new entrants to challenge the incumbent monopolist.

**Figure 9 Advances in telecommunication liberalization and reform since 1990**

Source: ITU Telecommunications/ICT Regulatory database.

The vast majority of countries have introduced full competition in telecommunications markets by allowing any company to apply for a licence and by setting no limits on the number of licences available. (Table 9). Countries from the

Americas are the most liberalized as most of them allow for full competition in the different markets. On the other hand, countries in Africa and Arab States still tend to have more monopolies in place or limit the number of licences available. In particular, markets for international gateways, which connect the domestic network with other countries by providing links to either undersea cables or satellites, are the least competitive. Efforts to increase competition are needed to help lower prices, thereby contributing to the proliferation and affordability of broadband access.

**Table 9 Level of competition for selected telecommunications markets**

		Number of countries/economies						Total
		Africa	Arab States	Asia & Pacific	CIS	Europe	The Americas	
Level of Competition: Fixed Wireless Broadband	Monopoly	9	2	2	0	2	1	16
	Partial competition	6	7	5	1	4	2	25
	Full competition	16	4	19	7	27	26	99
	N/A	1	2	0	0	3	0	6
Level of Competition: IMT (3G, 4G, etc.)	Monopoly	2	2	4	0	2	1	11
	Partial competition	6	6	7	0	11	0	30
	Full competition	19	4	12	2	25	25	87
	N/A	4	4	2	2	2	0	14
Level of Competition: International Gateways	Monopoly	7	6	5	2	1	2	23
	Partial competition	10	6	5	0	4	1	26
	Full competition	21	5	18	5	24	19	92
	N/A	1	1	0	0	5	2	9
Level of Competition: Mobile	Monopoly	2	5	5	0	2	2	16
	Partial competition	12	10	7	3	12	4	48
	Full competition	27	5	20	8	27	28	115
	N/A	0	0	0	0	1	0	1

*Source:* ITU Telecommunications/ICT Regulatory database.

*Notes:* Monopoly = service provided exclusively by one operator; Partial competition = regulatory framework limits the number of licensees; Full competition= any company can be licensed to provide the service, no limit on number of licensees. N/A not available.

Regulators are consistently faced with new challenges arising from changes in technology and markets such as the convergence of voice and data services. Box 2 draws from the ITU publication *Trends in Telecommunication Reform 2013* (ITU, 2013) to describe some of the current challenges faced by telecommunications regulators in both developed and developing countries such as spectrum management, international roaming and IP interconnection.

### Box 2 Trends in telecommunication reform

The technological advancement in the ICT sector and its network structure imply that developing and developed countries face similar challenges in terms of policy.

Current regulatory trends and challenges are described in Trends in Telecommunication Reform 2013 (ITU, 2013) and include among others the search for new spectrum. Spectrum management is especially relevant for developing countries for which wireless technology is more important than fixed lines to provide the population with broadband access.

Another remaining challenge is the high prices for international roaming which do not reflect the costs of the operator. International roaming is of particular importance to services trade if the service is supplied through the temporary movement of natural persons, *i.e.* GATS mode 4.\*

A third trend is the increasing relevance of efficient internet protocol (IP) interconnection arising from the growing traffic and services provided through the internet. The growth of the internet has been fostered by investments into internet exchange points (IXPs), content delivery networks (CDNs) and long-haul facilities such as undersea cables (see Section C for trends in broadband access). So far the development of global and regional IP interconnection has been subject to little regulation. Given the technological convergence between mostly unregulated IP interconnection and traffic and the regulated traditional voice telecommunication, both firms and regulators face new challenges.

The experiences with unregulated IP markets has been more positive so far as prices for unregulated IP traffic is by some magnitudes lower than prices for traffic in regulated circuit switched voice (TDM) markets. Also while, in traditional TDM market regulators imposed an obligation to interconnect in order to guard against discrimination and anti-competitive behaviour, in IP markets almost all interconnection agreements are informal hand-shake agreements (ITU, 2012c). While the case for the regulator to intervene seems rather weak and possibly limited in developed economies, the regulator might play a more active role in developing countries in the short-term (ITU, 2012c). In particular, in some developing countries the incumbent operator might still have enough market power to prevent the development of a domestic market.

\*International roaming and its relations to the WTO GATS commitments has been discussed at the WTO symposium on international mobile roaming: [www.wto.org/english/tratop\\_e/serv\\_e/sym\\_march12\\_e/sym\\_march12\\_e.htm](http://www.wto.org/english/tratop_e/serv_e/sym_march12_e/sym_march12_e.htm)

Regulatory agencies in developing countries can be quite fragile, under-resourced or lack political backing. Aid for trade can help regulators in developing countries by providing support to their policy making and capacity building. Box 3 describes in detail an EU-ITU project to support harmonized policies in countries belonging to the African Caribbean and Pacific group of states (ACP).

### **Box 3 Support for the establishment of harmonized policies for the ICT market in ACP countries**

This development Action, implemented by the ITU and financed by the EU (EUR 8 million) and the ITU (EUR 0.5 million), addresses the ICT policies and legislation challenges facing the countries belonging to the African Caribbean and Pacific group of states (ACP). It aims at contributing to the creation of an environment conducive to investments in ICT infrastructure and ICT-enabled applications. The Action started in September 2008 and is planned to end in September 2013.

#### **Objectives**

In particular, the Action has three key aims:

- To support regional organizations and the sub-regional economic groupings to develop and promote the use of harmonized ICT policies and legislation
- To support individual ACP countries to transpose these regional policies and legislations into their own national framework
- To provide human and institutional capacity building so that local competences are developed and existing knowledge is shared across all beneficiary countries.

#### **Three regional projects**

The Action consists of the following three regional projects, which have been customized to each region's specific needs:

1. Enhancing Competitiveness in the Caribbean through the Harmonization of ICT Policies, Legislation and Regulatory Procedures (HIPCAR);
2. Support for Harmonization of the ICT Policies in Sub-Saharan Africa (HIPSSA);
3. Capacity Building and ICT Policy, Regulatory and Legislative Frameworks Support for Pacific Island Countries (ICB4PAC).

The methodological approach is broadly the same for the three projects allowing for regional variations and will be illustrated using the HIPCAR project for the Caribbean ACP countries.

#### **1. Enhancing Competitiveness in the Caribbean through the Harmonization of ICT Policies, Legislation and Regulatory Procedures (HIPCAR)**

##### ***Background***

The project covers all 15 Caribbean countries in the ACP group of states\* and is being implemented within the framework of the Caribbean Single Market and Economy (CSME) and the CARICOM Connectivity Agenda. The ITU is the executing agency and the Caribbean Telecommunications Union (CTU) is the project advisor on behalf of the CARICOM secretariat.

In 1989, the CARICOM heads of government decided to establish the CSME, which came into force on 1 January 2006. In most CARICOM Member States, telecommunications laws were enacted between 1999 and 2002. They have taken the necessary steps to establish regulatory bodies and dismantle the existing monopolies. However, full liberalization is limited and differs across the Member States. One of the CSME's goals is to liberalize the telecommunications sector which requires removing barriers to trade and to harmonize policies, legislation and regulatory processes so that there is a greater degree of consistency across the Caribbean.

### ***Project methodology and activities***

The project has been launched in Grenada in 2008 with a multi-stakeholder kick-off meeting where the following list of priorities common to all beneficiary countries was adopted:

1. ICT legislative framework – information society issues

i) e-commerce – transaction; ii) e-commerce – evidence; iii) access to public information (freedom of information (FOI)); iv) privacy and data protection; v) cybercrime (e-crimes) and v) interception of communications.

2. Review of the telecommunications acts:

i) universal service/access framework; ii) interconnection; iii) licensing in a convergent environment.

In a second step, an assessment of the current situation for each priority was made, taking into account outcomes of previous initiatives and identifying regional as well as international best practices. The assessment results were then used to develop draft regional model policies for each of the identified priority areas. These documents were reviewed, discussed and adopted by at two regional workshops: the telecommunications acts meeting (Port of Spain, October 2009); and the ICT legislative framework – information society issues meeting (St. Lucia, March 2010).

After the discussion and adoption of these regional model policies at two workshops by stakeholders, draft regional model legislations were developed. These were reviewed, discussed and adopted by at three regional workshops: the telecommunications meeting (Paramaribo, April 2010); and the ICT legislative framework – information society issues meetings (St. Kitts and Nevis, July 2010 and Barbados, August 2010).

After the regional model policy guidelines and legislations were prepared, the final phase of the project started in January 2011 which consists in the transposition of the regional guidelines into national legislative and regulatory frameworks. In particular, the project team has been providing in-country assistance for the transposition of the model texts by i) comparing regional guidelines with national policies and legislation, ii) recommending amendments to national policies and legislation, iii) carrying out consultations with national stakeholders and iv) providing capacity-building activities for national stakeholders.

### ***Project success factors***

In order to ensure the development impact the three projects move away from the traditional ‘one-size-fits-all’ approach and put regional and national stakeholders at the heart of the project, from the initial kick-off meeting to the final stages, giving advice and monitoring progress. Besides stakeholder participation, a second success factor is to link the substance of policy and legislation with capacity building through in-country technical assistance (transposition and implementation of regional policies and legislation in the respective national frameworks) and training of stakeholders. From the outset, the learning of other relevant development projects has been incorporated. The project has also looked to the future and offered locally based capacity-building programs that will give the beneficiary countries the skills they need to effectively implement and manage the project’s outcomes at a local level.

Source: ITU summary report and project website:**Error! Hyperlink reference not valid.**

\*The beneficiary countries of the HIPCAR project are Antigua and Barbuda, The Bahamas, Barbados, Belize, The Commonwealth of Dominica, the Dominican Republic, Grenada, Guyana, Haiti, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, and Trinidad and Tobago.

### ***Trade barriers***

The WTO General Agreement on Trade in Services (GATS) covers market access and national treatment restrictions applying to telecommunication services and computer and related services. By 2009, 109 countries or more than two-thirds of all WTO Members have made commitments in telecommunications services which is third highest number of commitments after tourism and financial services (WTO, 2009a). However, as

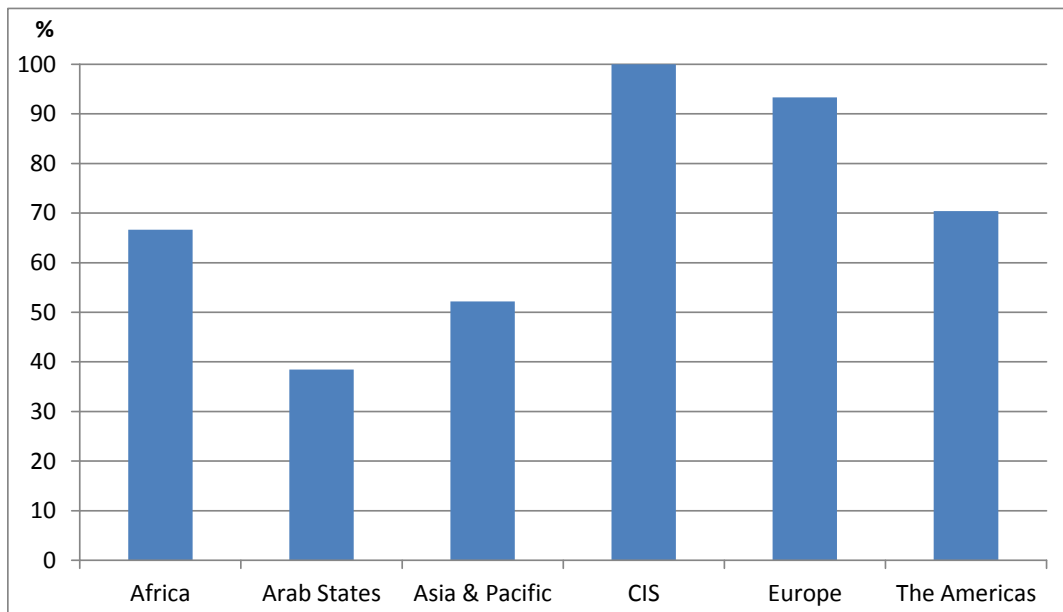


telecommunication services have experienced significant developments in terms of technology and regulatory environment some commitments no longer reflect actual regimes, which can be considerably more open or were opened without commitments, and uncertainties exist regarding the coverage and interpretation of commitments.

While developing countries have significantly liberalized their telecommunications sectors, still a significant number of countries maintain restrictions regarding the supply of services through a commercial presence, *i.e.* mode 3 in GATS terminology. In particular, according to the World Bank services trade restrictions database only about 40 out of 103 countries were fully open to the establishment of commercial presence by foreign providers (Borchert *et al.*, 2012).<sup>2</sup> In particular, a few countries still maintain significant government discretion regarding licences and entry of foreign firms such as at least one country in South Asia and some African countries.

Restrictions on foreign ownership have become less widespread due to the liberalization efforts in many countries. Out of 125 countries, 87 countries, or 70% of countries, have no restriction on foreign ownership in place. Figure 10 shows that FDI restrictions are still most common in the Arab States and in Asia & Pacific with respectively 8 and 11 countries still having restrictions in place. Removal of foreign ownership restrictions is also an example of an area in which GATS commitments no longer reflect actual liberalization in place.

**Figure 10 Percentage of countries with no foreign ownership restrictions in telecommunications**



Source: ITU Telecommunication/ICT Regulatory database.

Notes: Regional groupings follow ITU. For Africa, the percentage of countries with no foreign ownership restriction is based on 27 out of 44 countries that provided data. For the other regions, information is available for the following number of countries: Arab States (13/21), Asia & Pacific (23/30), Commonwealth of Independent States (CIS) (5/12), Europe (30/43), the Americas (27/35).

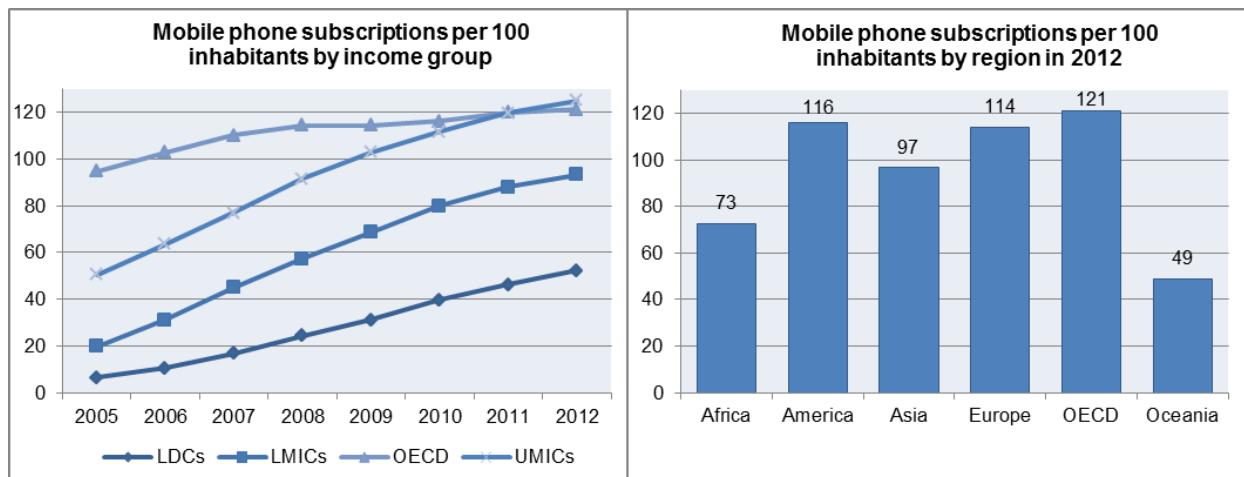
<sup>2</sup> The database is accessible online at: <http://iresearch.worldbank.org/servicetrade/>.

### 3. ICT infrastructure and access

#### Infrastructure access

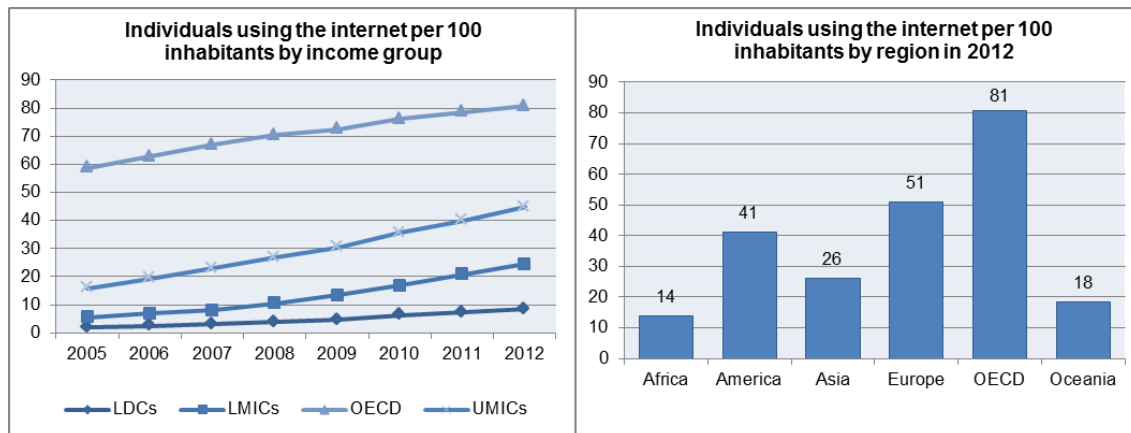
The spread of mobile telephony has been a success story for developing countries (Figure 11). Mobile phone subscriptions per 100 inhabitants in LDCs increased more than sevenfold from 7 in 2005 to 52 in 2012. LMICs and UMICs experienced similar increases in mobile phone penetration with UMICs now having more mobile subscriptions per 100 inhabitants than OECD countries. Nevertheless, LDCs still lag significantly behind, which is also reflected by the relatively low penetration rates in Oceania and Africa.

**Figure 11 Mobile phone subscriptions per 100 inhabitants by income group and region**



Source: ITU World Telecommunication/ICT Indicators database. Annex A details the country composition of income and regional groupings.

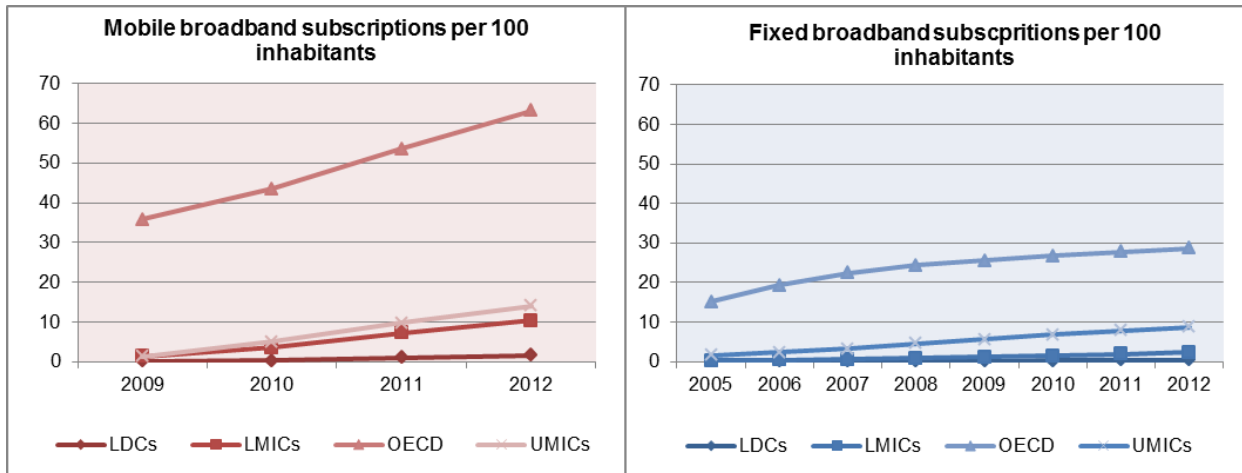
The possibility to access and use the internet is essential for the development of e-commerce and for integrating into ICT value chains. Figure 12 shows that more individuals use the internet than in 2005 but overall levels of internet use still remain rather low. Only 8 out of 100 individuals use the internet in LDCs and only 24 in LMICs. The low internet use in developing countries is also linked to the limited availability of fixed line networks. That is why much hope is connected to mobile technology and its potential to bring people online.

**Figure 12 Individuals using the internet per 100 inhabitants by income group and region**

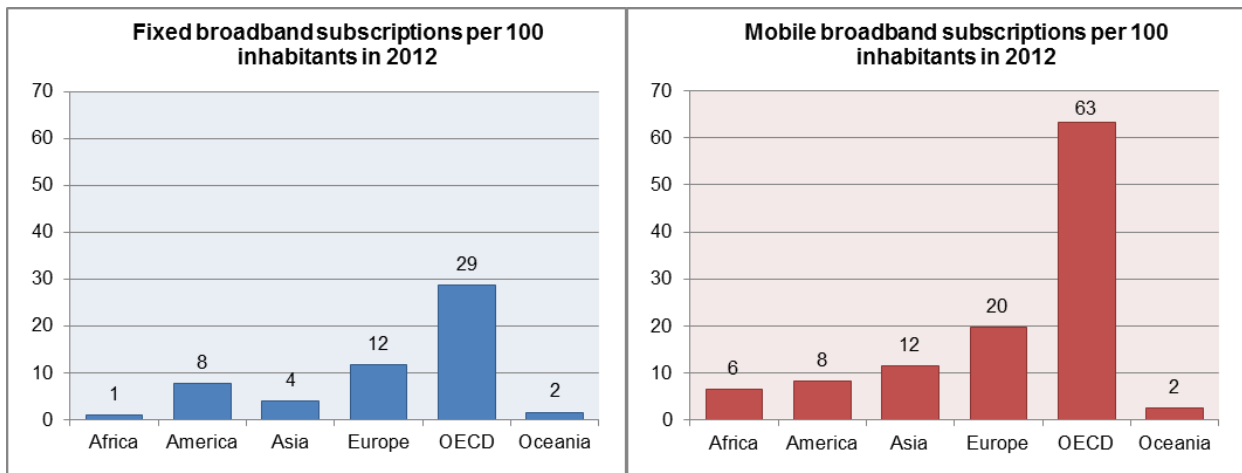
Source: ITU World Telecommunication/ICT Indicators database. Annex A details the country composition of income and regional groupings.

Broadband access can bring high speed internet to developing countries by fostering the use of e-commerce and allowing firms to integrate into value chains via cross-border services trade. For instance, a few developing countries such as India have successfully positioned themselves as a location for the offshoring of business services, such as accounting and bookkeeping, or have successfully integrated into ICT value chains with activities, software development for example. The potential development impact of broadband has been assessed by a large number of studies where findings indicate, for example, that a 10% increase in broadband penetration can result in a 0.25% to 1.38% increase in GDP p.c. growth (ITU, 2012b).

While the lack of fixed line connections in developing countries hinders the uptake of fixed broadband access, mobile broadband has the potential to become a thriving factor for development thanks to the rapid increases in mobile phone penetration. Figure 13 and Figure 14 show that the expansion of fixed broadband has been very modest since 2005 and that the "digital divide" still exists. In particular, fixed broadband penetration is less than 1% in LDCs and only above 2% in LMICs. On the other hand, mobile broadband subscriptions have grown very fast in LMICs and UMICs since 2009. In Africa, penetration has reached 6% in 2012 and could reach 11% by the end of 2013 according to ITU predictions.

**Figure 13 Fixed and mobile broadband subscriptions per 100 inhabitants by income group**

Source: ITU World Telecommunication/ICT Indicators database. Annex A details the country composition of income and regional groupings.

**Figure 14 Fixed and mobile broadband subscriptions per 100 inhabitants by region in 2011**

Source: ITU World Telecommunication/ICT Indicators database. Annex A details the country composition of income and regional groupings.

Table 10 highlights the 39 least connected countries (LCCs) for which the "digital divide", in terms of ICT access, usage and skills is greatest in 2011 (ITU, 2012a). The group of LCCs consists of 31 LDCs and 8 LMICs such as India, Pakistan, Nigeria and Ghana. The majority of LCCs, *i.e.* 29, are African countries, while 8 LCCs are in Asia and two in Oceania.

**Table 10 The 39 least connected countries in terms of the ICT Development Index (IDI) 2011**

Country	IDI	Country	IDI	Country	IDI	Country	IDI
<b>Ghana</b>	2.23	<b>Pakistan</b>	1.75	<b>Nepal</b>	1.63	<b>Mozambique</b>	1.28
<b>Bhutan</b>	2.13	<b>Djibouti</b>	1.74	<b>Cameroon</b>	1.60	<b>Guinea</b>	1.28
<b>India</b>	2.10	<b>Côte d'Ivoire</b>	1.69	<b>Tanzania</b>	1.60	<b>Liberia</b>	1.26
<b>Lao P.D.R.</b>	1.99	<b>Comoros</b>	1.68	<b>Congo</b>	1.60	<b>Ethiopia</b>	1.15
<b>Cambodia</b>	1.96	<b>Myanmar</b>	1.67	<b>Benin</b>	1.55	<b>Burkina Faso</b>	1.14
<b>Nigeria</b>	1.93	<b>Uganda</b>	1.67	<b>Papua New Guinea</b>	1.44	<b>Eritrea</b>	1.09
<b>Solomon Islands</b>	1.85	<b>Rwanda</b>	1.66	<b>Madagascar</b>	1.44	<b>Central African Rep.</b>	0.97
<b>Senegal</b>	1.85	<b>Togo</b>	1.65	<b>Malawi</b>	1.42	<b>Chad</b>	0.94
<b>Gambia</b>	1.84	<b>Zambia</b>	1.65	<b>Mali</b>	1.38	<b>Niger</b>	0.88
<b>Yemen</b>	1.76	<b>Mauritania</b>	1.64	<b>Congo (Dem. Rep.)</b>	1.30		

Source: ITU (2012a).

Notes: The IDI is a composite index produced by the ITU for 155 countries. It covers 11 indicators grouped by three ICT sub-indices, *i.e.* access, use and skills. The IDI ranges from 0 to 10 with scores increasing in ICT development.

## Broadband – the next step in ICT development

After the diffusion of mobile technology in developing countries, developing countries face the challenge of ensuring the proliferation of broadband access. Recognizing the importance of broadband access for achieving the Millennium Development Goals (MDGs), the ITU and UNESCO established the Broadband Commission for Digital Development in 2010. It consists of senior policy makers and industry leaders with the aim of boosting the importance of broadband on the international policy agenda.

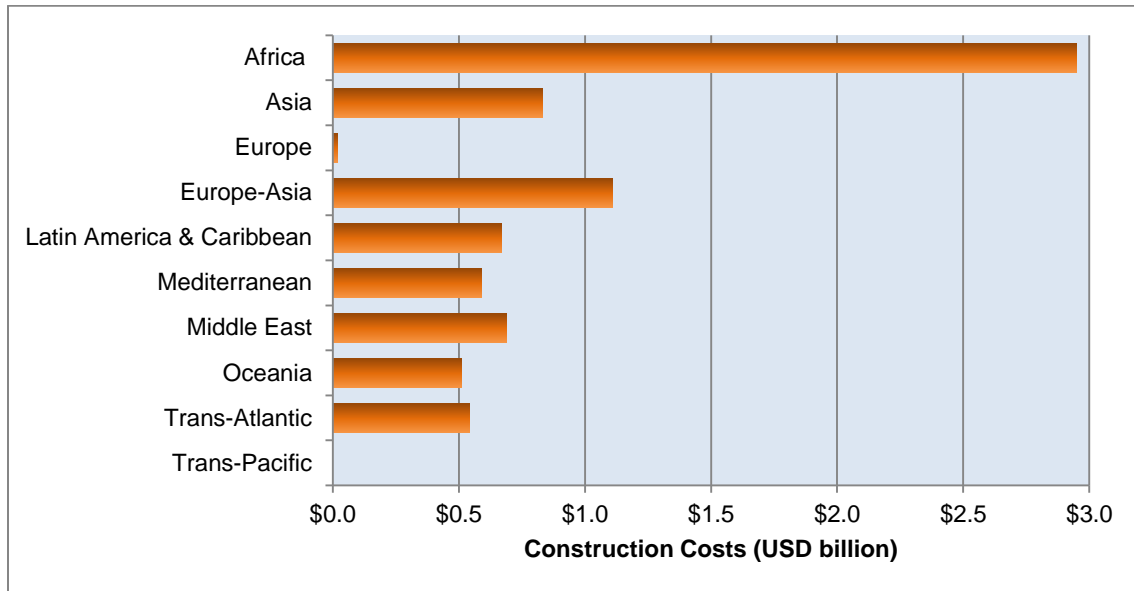
At its fourth meeting in Geneva 2011, the broadband commission set four broadband targets the world should achieve by 2015 (ITU, 2012a). These four targets are: 1) making broadband policy universal by establishing broadband plans and definitions; 2) making broadband affordable with prices below 5% of a country's GNI p.c.; 3) connecting homes to broadband by providing internet access to 40% of households; and 4) getting people online so that worldwide internet penetration reaches 60%.

Demand for bandwidth has grown rapidly over the last decade. Since 2002, international bandwidth capacity has increased more than 49-fold. Between 2007 and 2011, growth has been highest in Africa, Latin America, and the Middle East with compound annual growth rates of more than 70%. This growing demand has been matched by significant investments in the upgrade and construction of undersea cables. Since 2007, most of the growth in lit capacity has actually come from upgrades of existing cable systems, while new investment have made significant contributions to increased capacities in Sub-Saharan Africa between Europe and Asia and across the Pacific.

According to TeleGeography, 47 new cable systems worth USD 7.9 billion were launched between 2008 and 2011, 15 cables were expected to be launched in 2012 and a further nine in 2013. While the greatest numbers of undersea cable projects are currently carried out in Asia, Figure 15 shows that project costs are highest in Africa, which is in part due to the length of the cables. Box 4 provides some more detail on the development

of African undersea cables and illustrates the positive role development finance can play taking the successful public private partnership for the EASSy undersea cable taken as an example.

**Figure 15 Construction costs of new undersea cables entering service by region, 2011-2013**

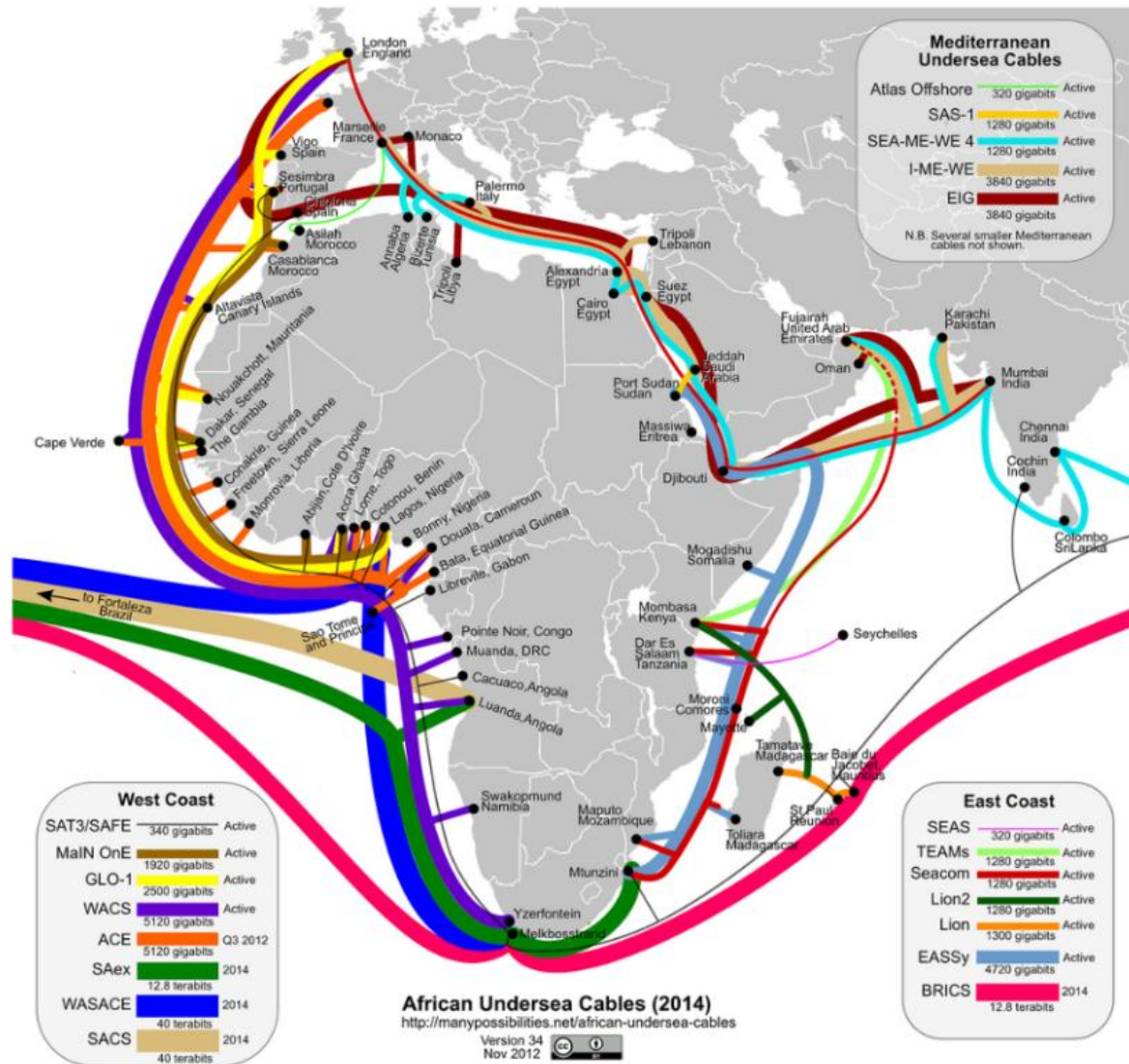


Source: TeleGeography.

### Box 4 Undersea cables in Africa

Broadband connectivity has the potential to have a significant positive long-term economic impact on the African continent. As part of its broadband transition, ICT infrastructure in Africa has experienced substantial developments after the first submarine undersea cable went live in 1999. The proliferation of investments resulted in approximately 20 undersea cables by 2012 connecting most of coastal Africa to the rest of the world (Map 1).

Map 1 African undersea cables



Source: <http://manypossibilities.net/african-undersea-cables/>

Investments into African undersea cables and ICT infrastructure more generally are to a large extent private-sector driven and often undertaken in the form of public-private partnerships. For instance, the West Indian Ocean Cable Company (WIOCC), which comprises 13 African telecommunications shareholders, has invested in five undersea cables throughout the sub-continent.

WIOCC is the largest shareholder (30%) of EASSy, a 10,000km submarine cable system connecting nine East African countries from Sudan to South Africa to the high-speed global telecommunications network. EASSy is owned and operated by a group of 16 African (92%) and 5 international (8%) shareholders. The USD 248 million project has been co-financed through the public-private-partnership (PPP) between 28 telecommunication operators' (including WIOCC parties) equity and loans from the following five Development Financial Institutions: the African Development Bank (AfDB), the Development Bank of France (AFD), the European Investment Bank (EIB), Germany's development bank (KfW) and International Finance Corporation (IFC).

Expected benefits from EASSy include increasing the supply of high quality reliable broadband capacity while simultaneously reducing wholesale and consumer prices. Increasing efficiency and reducing the cost of connectivity is also expected to benefit educational and medical institutions and will help boost general computer usage and literacy.

*Source:* Company websites of EASSy and WIOCC ([www.wiocc.net/](http://www.wiocc.net/) and [www.wiocc.net/](http://www.wiocc.net/)).

Undersea cables are the first step for developing countries in providing high-speed broadband access to their people. The second step relies on the development of terrestrial networks and to bridge the "last km" to the final user, the latter being particularly costly in sparsely populated areas.

The example of Sub-Saharan Africa shows that the spread of terrestrial networks is increasing rapidly but also that more than half of the population is still out of reach of a terrestrial fibre node. According to HamiltonResearch ([www.africabandwidthmaps.com](http://www.africabandwidthmaps.com)) the length of terrestrial transmission networks in Sub-Saharan Africa increased from 585,468km in 2010 to 732,662km in 2012. In 2012, 345 million people, or 40% of the population in Sub-Saharan Africa were within a 25km range of a terrestrial fibre node – up from 31% in 2010. If the network, which is currently planned and or under construction, is completed then 439 million people, or 51% of the population, should be within a 25km range of a node.

A significant question for Africa's broadband development will be whether the prices for accessing undersea cables will decrease. In particular, the continued high incidence of monopoly, or dominant operator control, over gateways might sustain high access charges.





## 4. ICT as enabler of economic and social development

### The mobile revolution and e-commerce

ICTs have allowed the rise of e-commerce, *i.e.* the sale or purchase of goods and services online. E-commerce can involve transactions between businesses and consumers (B2C), between businesses and governments (B2G) and between businesses (B2B), where transaction for the latter are estimated to account for about 90% of global e-commerce. In developing countries, potential for e-commerce is greatest in the form of "mobile" e-commerce (WTO, 2013). Since fixed line access is limited, high rates of mobile phone penetration and the prospect to increase mobile broadband access make mobile phones the most suitable means to conduct e-commerce in developing countries.

E-commerce and mobile e-commerce can contribute to development in a variety of ways. First, e-commerce can provide micro-entrepreneurs and companies with improved access to the domestic and foreign markets. Traditionally, the reach of individuals and companies has been confined to the nearest marketplace or established distribution networks. In contrast, the internet allows firms to display their products to all potential customers with internet access.

A successful example of a private initiative using e-commerce is "My Country My Village" from Bangladesh, which established an online market providing farmers and micro-entrepreneurs with nationwide and international access to customers.<sup>3</sup> My Country My Village set up several e-centres in rural areas of Bangladesh which are managed by local youth and women serving as a hub and providing support services for the e-commerce activities of rural micro-entrepreneurs. The initiative helps in bridging the digital divide between rural and urban areas in addition to generating employment for youth and women and also helps in alleviating poverty by increasing the income of micro-entrepreneurs.

E-commerce offers a particular potential for services trade. While online sales of goods still require the physical delivery and are therefore affected by transportation costs, e-commerce involving services is not affected by distance. Countries like India have managed to successfully integrate into international value chains as an offshore location for software development and other IT services.

Furthermore, e-commerce allows for new types of services creating new businesses and employment opportunities and benefiting domestic value chains and consumers. For instance, the Senegalese ICT company Manobi provides a variety of e-commerce services aimed at improving the efficiency along the agriculture value chain such as price monitoring of agricultural products in different markets, weather forecasts, yield calculation and the matching of farmers with suppliers and buyers.<sup>4</sup> Financial services

3 Information on the initiative "My Country My Village" based on a presentation given at the WTO Workshop on E-Commerce, Development and Small and Medium-sized Enterprises (SMEs): [www.wto.org/english/tratop\\_e/devel\\_e/wkshop\\_apr13\\_e/wkshop\\_apr13\\_e.htm](http://www.wto.org/english/tratop_e/devel_e/wkshop_apr13_e/wkshop_apr13_e.htm).

4 Information on Manobi based on company website ([www.manobi.com/](http://www.manobi.com/)) and on a presentation given at the WTO Workshop on E-Commerce, Development and Small and Medium-sized Enterprises (SMEs): [www.wto.org/english/tratop\\_e/devel\\_e/wkshop\\_apr13\\_e/wkshop\\_apr13\\_e.htm](http://www.wto.org/english/tratop_e/devel_e/wkshop_apr13_e/wkshop_apr13_e.htm).

conducted via a mobile phone are another example of new services types which have blossomed in developing countries. Box 5 describes in more detail the developments and challenges of "mobile money".

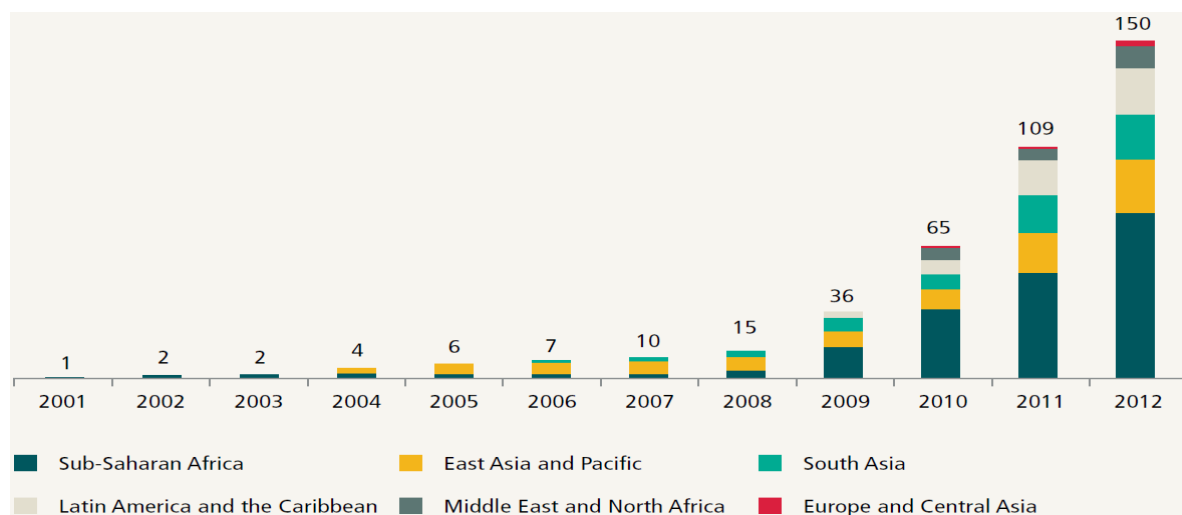
Despite the development potential of e-commerce and several success stories from developing countries, significant challenges remain for the further growth and development impact of e-commerce.<sup>5</sup> Many individuals and micro-entrepreneurs still lack access to the internet. Consumers have limited trust with on-line transactions and secure electronic payment systems are difficult to implement and are often missing. Lack of digital literacy hinders both potential producers and users to engage in e-commerce. Finally, many e-commerce transactions still involve the physical delivery of goods requiring solid transport infrastructure, distribution networks and functioning customs procedures. Aid-for-trade interventions and trade facilitation measures can help in overcoming these challenges.

### Box 5 Mobile money

Mobile money is increasingly used in developing countries and can provide poor people with access to formal financial institutions. While mobile money is still predominantly used to transfer money, more sophisticated financial services such as savings, credit and insurance could prove far more beneficial to the poor (WTO, 2013).

According to the GSMA Global Money Adoption Survey (Pénicaud, 2013), the number of available mobile money services has increased dramatically in recent years, growing from 15 in 2008, to 65 in 2010 and reaching 150 in 2012 (Figure 16). In 2012, 150 mobile money services were available in 72 countries and served about 30 million customer accounts. Mobile money is a particular success story in Sub-Saharan Africa, where 56% of worldwide mobile money services are offered.

Figure 16. Number of mobile money services by region (year-end)



Source: Pénicaud (2013).

<sup>5</sup> The presentation given by UNCTAD at the WTO Workshop on E-Commerce, Development and Small and Medium-sized Enterprises (SMEs) provides a summary of challenges and opportunities of e-commerce for developing countries: [www.wto.org/english/tratop\\_e/devel\\_e/wkshop\\_apr13\\_e/fredriksson\\_ecommerce\\_e.pdf](http://www.wto.org/english/tratop_e/devel_e/wkshop_apr13_e/fredriksson_ecommerce_e.pdf).

The mobile money market is dominated by mobile network operators which offer 72% of mobile money services and include companies such as M-Pesa (Rwanda), MTN MobileMoney (Benin, Cameroon, Cote d'Ivoire, Ghana, Guinea Bissau, Nigeria, Rwanda, South Africa, Swaziland, Uganda, Zambia), Tigo (Tanzania, Rwanda, Ghana, Paraguay, El Salvador, Guatemala, Honduras, Bolivia) or Telenor (Pakistan).

Domestic money transfers account for more than 80% of value moved on mobile money platforms. On the other hand, international transfers of remittances via mobiles are not yet widespread but offer a great development potential by making transfers easier and cheaper. Furthermore, operators are starting to offer customers the possibility to pay for water or electricity bills, for goods in shops, or to receive salary or government payments on their mobile money accounts. For instance, the DR Congo has introduced mobile banking for salary payments of civil servants replacing cash payments that are prone to partial retention by superiors.\*

Since mobile money is new, dynamic market and encompasses financial and telecommunication services, a number of regulatory questions arise. UNCTAD (2012c) highlights several issues which might be addressed by policy makers and regulators, *i.e.* consumer protection, registration and transaction limits, agent networks, interoperability, taxation and collaboration between national and international regulators. For instance, to protect consumers, transparency and information needs to be provided; appropriate privacy and data retention legislation is needed and issues such as theft, fraud or deposit insurance need to be addressed. Furthermore, in order to support the use of mobile money for international transactions such as remittances or mobile payments, the interoperability between mobile money platforms and other payment systems as well regulator collaboration become critical.

\* [www.globalpost.com/dispatch/news/afp/130413/dr-congo-banking-wage-revolution-state-workers](http://www.globalpost.com/dispatch/news/afp/130413/dr-congo-banking-wage-revolution-state-workers)

## ICT and social development

ICT does not only spur economic development, but also enables and catalyzes social development in areas such as health, education and women's empowerment towards the achievement of the Millennium Development Goals.

World Bank (2012a) provides examples of how ICTs contribute to Africa's development in a variety of areas including agriculture, climate change adaptation, health, education and modernizing government. For example, in the health sector, eLearning can improve human resources for health professionals by providing health education and training at distance; telemedicine allows the provision of healthcare services such as monitoring and diagnosis to people in rural areas; electronic health information systems can reduce paperwork and associated time costs, allowing for better analysis and decision making of health care providers and policy makers.

Further examples of the beneficial uses of mobile phones in developing countries are manifold (World Bank, 2012b). For instance, mobile phones can be used to track and increase student attendance and they help increasing the safety and independence of women.



## 5. Barriers to overcome

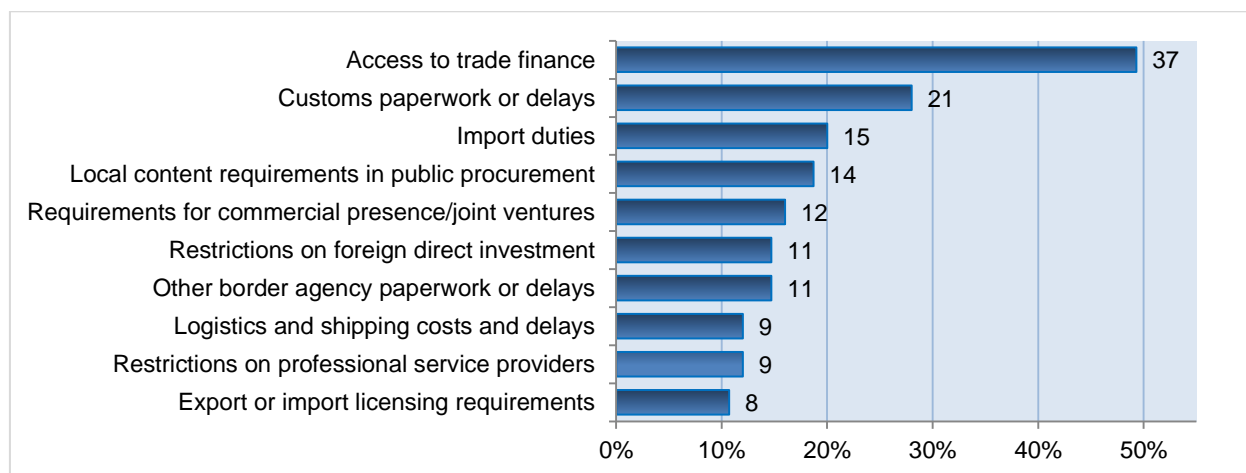
This section describes difficulties and barriers developing country ICT firms face when trying to integrate into value chains. Such difficulties and barriers can result directly from trade policy or trade-related administrative issues, such as import duties and customs procedures, or can result indirectly from national supply-side constraints, such as an inadequate telecommunications infrastructure or an opaque regulatory environment.

The analysis is based on results of an OECD-WTO private sector questionnaire covering 80 developing country suppliers and 44 lead companies in ICT value chains, which was conducted as part of the 4<sup>th</sup> Global Review of Aid for Trade. Annex C provides a short description of the survey sample and company characteristics. The perceptions of suppliers and lead firms are complemented by the views of aid for trade partners and donors from the respective aid for trade monitoring surveys.

### Trade policy and trade problems

The main trade-related difficulties for suppliers in developing countries to integrate into ICT value chains are with access to trade finance and customs procedures (Figure 17). Access to trade finance is mentioned by almost half of suppliers as the most common difficulty they face in entering, establishing or moving up ICT value chains, while 28% of suppliers regard customs paperwork or delays as difficulty. Trade policy factors such as import duties (20%) and export or import licensing requirements (11%) seem to be smaller obstacles for suppliers.

**Figure 17 Difficulties suppliers identify in entering, establishing or moving up ICT value chains (percentage and number of suppliers)**



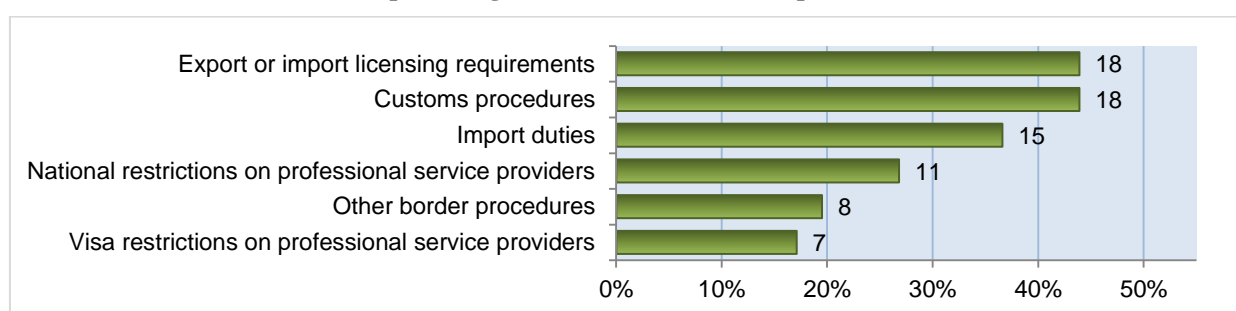
Source: OECD-WTO aid for trade monitoring survey: private sector questionnaire, 2013.

Note: Figure B.1 in Annex B shows all difficulties that suppliers could choose when answering the question.

Customs procedures are also a prevailing issue for lead firms (Figure 18). In particular, 44% (18) of lead firms face difficulties related to customs procedures when

bringing new suppliers from developing countries or LDCs into their value chain. Compared to suppliers, relatively more lead firms have mentioned export or import licensing requirements (44%) and import duties (37%) as further difficulty. However, this is not too surprising as lead firms will refer to trade policy barriers they encounter in developing countries while supply firms will refer to both developed and developing country barriers. Section B.3 (b) illustrates that tariffs on ICT products are indeed significantly higher in developing countries compared to OECD Members. For instance, while the average applied MFN tariff on ICT imports is less than 2% in OECD countries, the respective average tariff rate is above 12% in LDCs.

**Figure 18 Difficulties lead firms face in bringing new suppliers from developing countries into their supply chains (percentage and number of lead companies)**

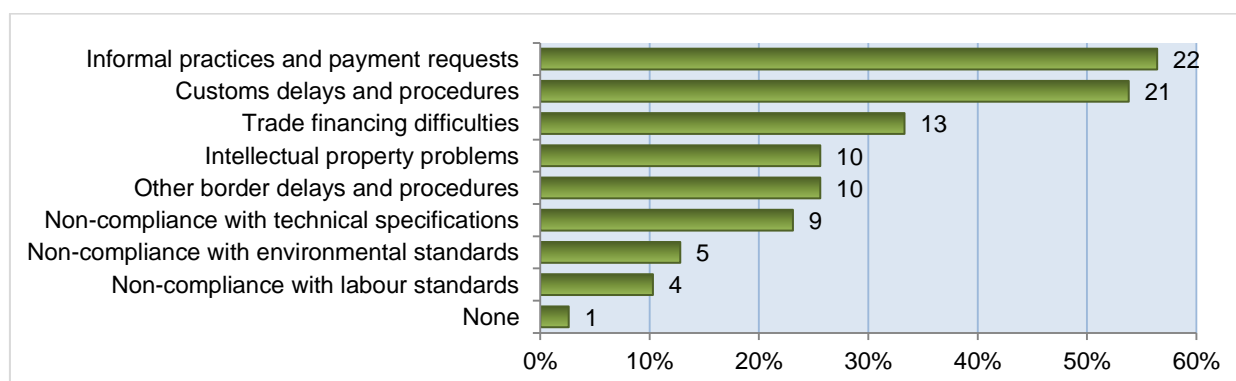


Source: OECD-WTO aid for trade monitoring survey: private sector questionnaire, 2013.

Note: Figure B.2 in Annex B shows all difficulties that lead companies could chose when answering the question.

Lead firms highlight three particularly typical trade problems that arise when dealing with developing country suppliers (Figure 19). Informal practices and payment requests constitute a problem for the majority (56%) of lead firms. Problems are also experienced with customs delays and procedures (54%) and trade financing (33%). Almost two thirds, *i.e.* 64% of lead firms, consider these trade problems to be specific to developing-country and LDC suppliers.

**Figure 19 Trade problems that lead firms identify when dealing with developing country suppliers (percentage and number of lead companies)**



Source: OECD-WTO aid for trade monitoring survey: private sector questionnaire, 2013.

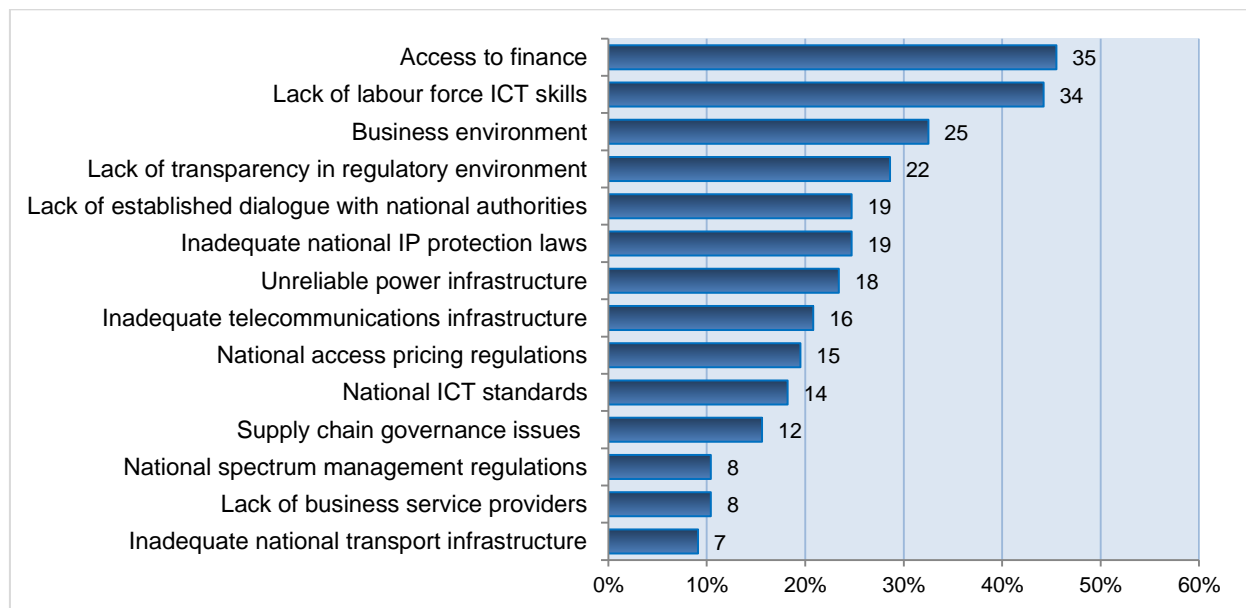
Customs procedures, tariffs and other barriers are also highlighted by company case studies on value chain barriers (WEF, 2013). For instance, a global semiconductor

manufacturer mentions customs delays as a major problem driving up costs for working capital, administration and warehousing. Further barriers encountered in various countries are unclear or inconsistent regulations, low security levels, difficulties in obtaining export licences and local-content and technical standards requirements. Reporting on its operations in Latin America and Africa, a mobile handset distributor identifies import tariffs as a major barrier. While in large markets like Brazil, the company has decided to set-up a local assembly. In the African countries of Nigeria and the Democratic Republic of Congo, import duties and regulations have led the company to choose not to deliver to these countries.

### National supply-side constraints

Figures 20 and 21 present national supply-side constraints that respectively hinder developing country suppliers to integrate into ICT value chains and lead companies to establish a commercial presence in developing countries. In the following section, survey results will be discussed by the main groupings of supply-side constraints.

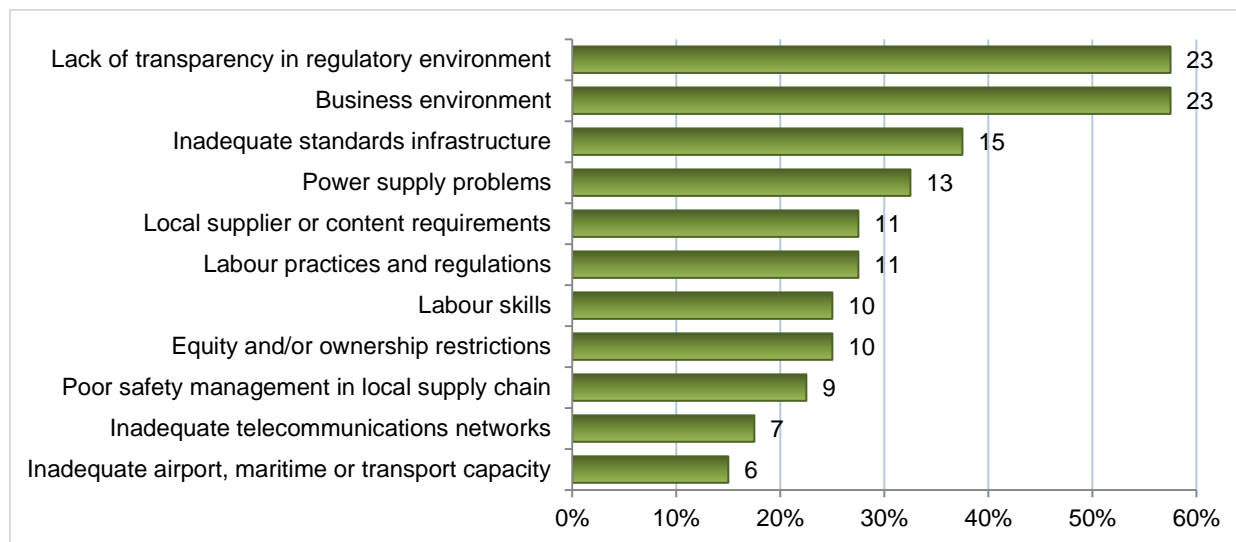
**Figure 20 Main national supply-side constraints, identified by suppliers that affect their ability to enter, establish and move up ICT value chains (percentage and number of suppliers)**



Source: OECD-WTO aid for trade monitoring survey: private sector questionnaire, 2013.



**Figure 21 Obstacles identified by lead companies in establishing a commercial presence in developing countries (percentage and number of lead companies)**



Source: OECD-WTO aid for trade monitoring survey: private sector questionnaire, 2013.

### *Access to finance and human capital*

Access to finance and a lack of ICT labor force skills are the most significant national supply-side constraints as each factor is mentioned by about 45% of suppliers. Access to finance is a typical problem for firms who would like to establish themselves on the export market, as exporting requires firms to burden additional fixed costs related to foreign market entry and transport, including search costs for trading partners, market research, and marketing or transport insurance costs.

While access to finance affects firms in different sectors in a similar way, the lack of ICT skills of workers represents a constraint that is more specific to ICT firms. Many segments of the ICT sector require high-skilled workers being capable of conducting activities such as software and product engineering, computer programming, web design or database administration. However, more general skills such as English language skills or general business skills are important for the sector. While the lack of (ICT) skilled labor force constitutes a difficulty for about a quarter of lead firms, it appears to be a more pressing difficulty for suppliers in developing countries.

Certain trade and supply-side factors affect small companies more heavily than large ones. Not surprisingly, micro companies and SMEs mention that access to finance is their main supply-side constraint, less so for large suppliers and multinationals. On the other hand, the lack of ICT labor force skills is a significant constraint to suppliers of all sizes.

### *Institutional and regulatory environment*

After access to finance and lack of ICT skills in the labour force, suppliers highlight the business environment (33%) and the lack of transparency in the regulatory environment (29%) as the main national supply-side constraints.

For lead companies, a sound business and regulatory environment are the most important factors for the integration of developing country suppliers into ICT value

chains. In particular, 51% of lead companies regard the lack of transparency in the regulatory environment as a major difficulty in bringing developing country suppliers into their value chains (Figure B.2 in Annex B). Likewise, Figure 21 shows that the business environment and the lack of transparency are also the most relevant obstacles when establishing a commercial presence in developing countries, as mentioned by 58% of lead companies.

Closely related to a sound business and regulatory environment is the absence of corruption and graft. For about 60% of lead companies, these two factors have the most negative influence on their sourcing and investment decisions in their value chains.

While the lack of transparency in regulatory environment is more general in nature, it is of particular importance to the telecommunication sector. Furthermore, a significant part of suppliers underline the importance of telecommunications regulation. In particular, suppliers mention national regulations regarding access pricing (20%) and spectrum management (10%) respectively as important national supply-side constraints. Since the sample covers a broad array of ICT companies, the fact that 20% of suppliers have highlighted access pricing regulations as a main constraint reflects the importance of telecommunication regulation for creating competition in the telecommunications market resulting in higher-quality and lower-priced services.

Section B.4(b) describes the remarkable progress that developing countries have made in terms of liberalizing their telecommunication markets but also points to regulatory challenges such as spectrum management, roaming and IP interconnection. In particular, more efforts are needed regarding the liberalization of international gateways which is vital to provide firms and individuals with affordable access to broadband internet.

### ***Physical infrastructure***

When it comes to physical or "hard" infrastructure both suppliers and lead companies highlight difficulties with power supply. Energy infrastructure and power supply is a fundamental supply-side factor that allows the continuous operations of businesses and is of great importance to ICT firms relying on fixed-line internet access for its servers. While IT technology increases the connectivity of remote areas and offers great business opportunities for individuals and micro companies, in many LDCs access and provision of electricity is still a major problem.

In particular, 23% of suppliers regard unreliable power infrastructure as a main national supply-side constraint and 33% of lead companies mention power supply as a typical obstacle when establishing a commercial presence in a developing country. Unreliable power infrastructure is the most important barrier in LDCs. In particular, suppliers from LDCs most often mention unreliable power infrastructure (13 out of 17) as a main national supply-side constraint, even before access to finance (10 out of 17).

Even though other barriers seem more important, telecommunications infrastructure still matters for developing country suppliers. In particular, the quality of the telecommunication infrastructure is of similar importance to ICT suppliers in developing countries as power supply. Unreliable internet access and bandwidth (Figure B.1 in Annex B) as well as inadequate telecommunications networks hamper just above 20% of developing country suppliers to integrate into ICT value chains. Also close to a fifth of lead companies face difficulties due to inadequate telecommunication networks when

integrating developing country suppliers in their supply chains or setting up a commercial presence in developing countries.

The case for higher investments into telecommunications infrastructure has also been made in Section C, which shows that there is still a large digital divide between developing and developed countries, in particular in terms of internet use and broadband access. In LDCs, less than 10% of individuals use the internet and fixed broadband penetration is below 1%.

In contrast to energy and telecommunications infrastructure, less than 10% of suppliers perceive inadequate transport infrastructure as difficulty to integrate into value chains and as national supply-side constraint. On the other hand, a similar share of lead firms, *i.e.* about 20% perceive inadequate telecommunication networks and transport capacity and links as a difficulty for integrating developing country suppliers or setting up a commercial presence in developing countries.

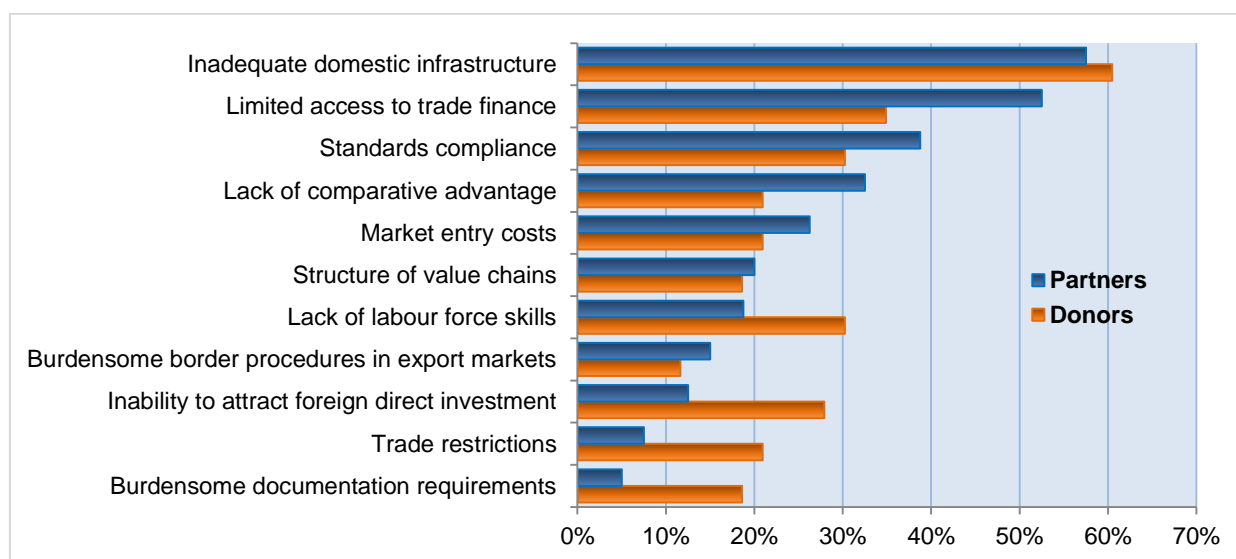
### Partner and donor country views

As part of the Aid for Trade monitoring exercise, the OECD-WTO questionnaires for partners and donors asked about the main obstacles to greater participation of developing country firms in value chains (Figure 22).

Partners and donors both highlight the same main obstacles. In contrast to the private sector, partners and donors regard inadequate domestic infrastructure as the most important obstacle to a greater participation of companies in value chains, followed by limited access to trade finance and standards compliance.

There is however also some heterogeneity in the views of partners and donors. While partners highlight the lack of comparative advantage and market entry costs as further main obstacles, donors consider the lack of labor force skills and the inability to attract foreign direct investment as more important.

**Figure 22 Main obstacles identified by donors and partners for a greater participation of developing country firms in value chains**



Source: OECD-WTO aid for trade monitoring survey: partner and donor questionnaires, 2013.

Note: Replies of partners and donors regarding obstacles to participation in value chains are not specific to the ICT sector.

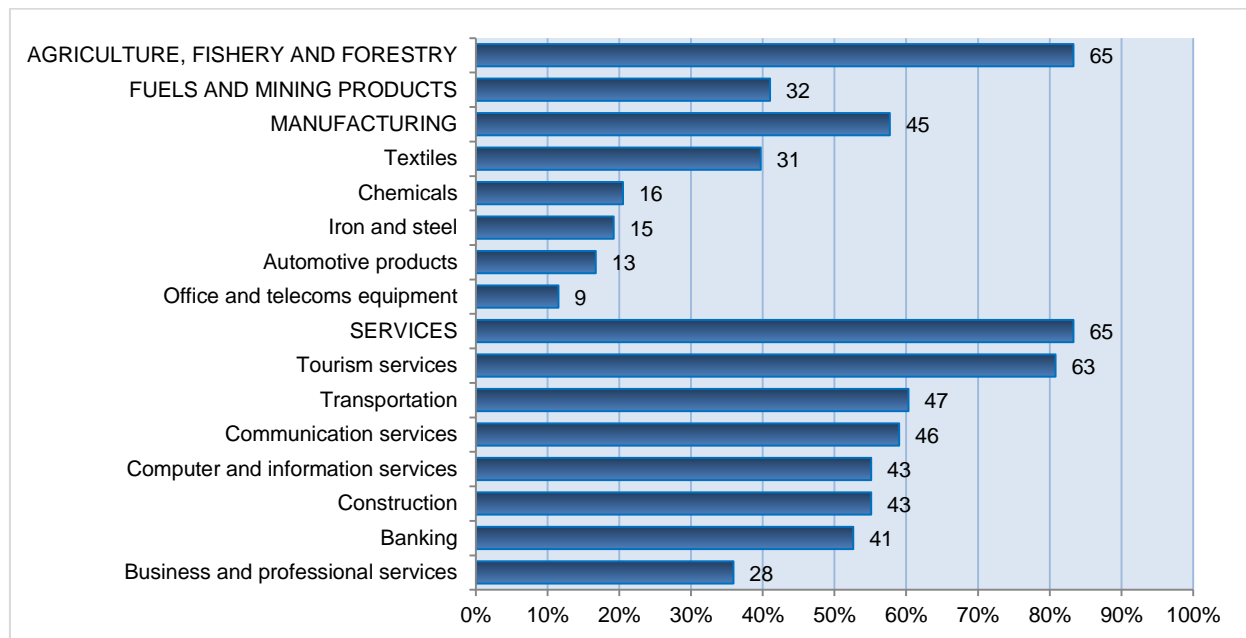
## 6. Where do resources currently go?

### Priorities in partners' strategies and in donors' activities

In the OECD-WTO partner questionnaire, beneficiaries were asked whether their national development strategies identify specific sectors as sources of growth (Figure 23). More than 80% (65 out of 79) of beneficiaries have identified the following sectors as sources of growth in their development strategies: agriculture; fisheries and forestry; and services. Manufacturing seems to be less relevant as it is included by less than 60% of beneficiaries in their development strategies.

With regard to specific sectors, ICT services sectors are considered priority sectors by developing countries. In particular, close to 60% of aid-for-trade beneficiaries have included communication services and computer and information services in their development strategies. On the other hand, only 9 partners identified manufacturing of office and telecoms equipment in their development strategies. Most countries also have national strategies for these sectors but only about half of partners have trade objectives for services integrated into their sector strategies.

**Figure 23 Sectors identified in national development strategies as sources of growth (percentage and number of partners)**

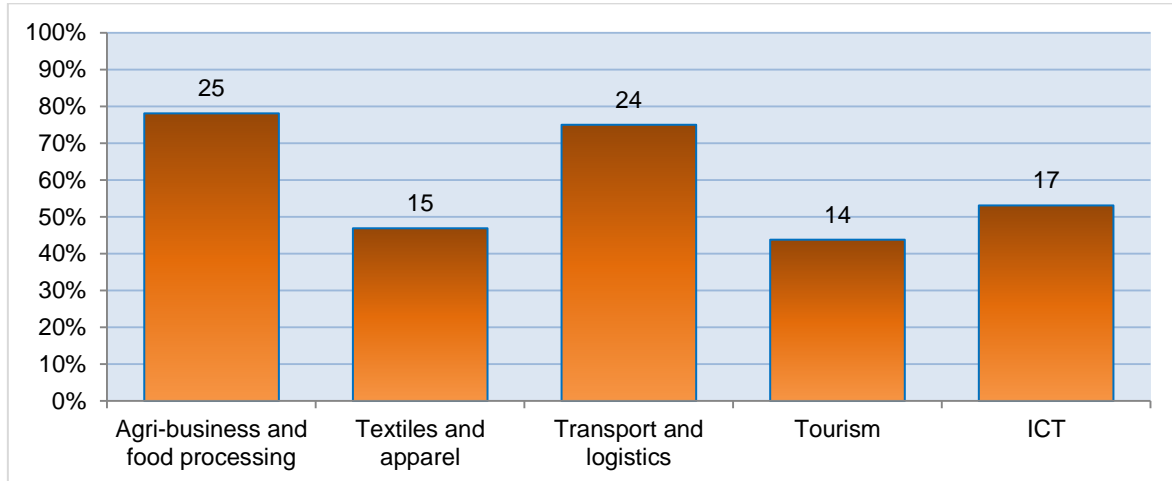


Source: OECD-WTO AFT monitoring survey; partner questionnaire.

According to the OECD-WTO donor questionnaire, almost all donors (38 out of 41) engage the private sector in the implementation of their aid-for-trade strategy. More than half of these 38 donors are engaged in public-private partnerships that have ICT as a

sectoral focus. However, while most donors have experience in value chain development in traditional development sectors such as agriculture, only few donors have experience in ICT value chain development.

**Figure 24 Sectoral focus of private sector engagement in the implementation of aid-for-trade projects (percentage and number of donors)**



Source: OECD-WTO aid for trade monitoring survey: donor questionnaire, 2013.

## Aid-for-trade disbursements on ICT

### *Aid for trade in ICT compared to other categories*

In Aid-for-trade statistics, the ICT sector is covered by the three communications categories i) communications policy and administrative management, ii) telecommunications and iii) information and communication technology (ICT). Within these three categories, aid-for-trade projects can have different objectives and linkages to other sectors. Projects may support firms in the ICT sector, help firms or governments to use ICT, assist telecommunication regulators or support and facilitate investments in ICT infrastructure.

Table 11 provides information on disbursements of official development assistance (ODA), *i.e.* aid for trade, and non-concessional other official flows (OOF) by aid-for-trade category.<sup>6</sup> OOF is, to a large extent, loans by development banks with grant elements of less than 25% and therefore increases in importance with a country's development.

ICT-related aid-for-trade flows amounted to USD 418 million in 2011. While ICT accounted for only 1.2% of total aid for trade, the other economic infrastructure categories – transport and storage and energy generation and supply – accounted for 30% and 21% of disbursed aid for trade in 2011. Hence, ICT is a low priority compared to other aid-for-trade categories.

<sup>6</sup> Other official flows are defined as transactions by the official sector with countries on the DAC List of ODA Recipients which do not meet the conditions for eligibility as Official Development Assistance, either because they are not primarily aimed at development, or because they have a grant element of less than 25 per cent.

Furthermore, aid for trade to support ICT grew significantly less than total aid for trade, including aid for trade to economic infrastructure. Specifically, nominal ICT aid-for-trade disbursements in 2011 were only 19% higher than the 2006-2008 average, which is a significantly lower increase compared to 53% and 62% for total aid for trade and aid for trade to economic infrastructure respectively.

On the other hand, OOF on ICT amounted to USD 665 million in 2011 accounting for 2.4% of total OOF. While OOF disbursements on ICT projects were greater than respective ODA disbursements, for transport and storage and energy generation and power supply ODA disbursements were higher.

The lower level of aid for trade to ICT, compared to other infrastructure categories – transport and storage and energy generation and supply – is likely to reflect the fact that investments in ICT infrastructure tend to be more private-sector driven. Investment in energy and transport infrastructure tends to be more basic and capital intensive but still underdeveloped in many LDCs and developing countries. For instance, in the aid-for-trade private sector questionnaire, 23.4% of suppliers from developing countries mention that unreliable power infrastructure is a main supply-side constraint.

Despite the positive developments in ICT infrastructure, the digital divide between developing and developed countries still exists and is widening in the case of LDCs. Hence, there should be a more prominent role for aid for trade in some of the least connected countries if private investment is lacking.

**Table 11 Aid for trade official development assistance and other official flows by category (disbursements, USD million)**

Category	Official development assistance (ODA)					Other official flows (OOF)				
	2006-08 avg.	2010	2011	Δ%: 06/08-2011	Share (%) in 2011	2006-08 avg.	2010	2011	Δ%: 06/08-2011	Share (%) in 2011
<b>Trade Policy &amp; Regulations</b>	704	1,170	982	39.5	2.9	86	379	232	169.2	0.8
02_Trade Facilitation	112	325	259	130.8	0.8	17	324	94	465.8	0.3
<b>Economic Infrastructure</b>	10,973	17,636	17,740	61.7	52.6	4,055	13,498	14,720	263.0	52.2
06_Transport and Storage	6,028	9,804	10,165	68.6	30.1	2,603	7,322	8,218	215.7	29.2
07_Communications	467	536	506	8.3	1.5	243	668	685	182.3	2.4
<b>of which ICT</b>	<b>352</b>	<b>419</b>	<b>418</b>	<b>18.8</b>	<b>1.2</b>	<b>243</b>	<b>666</b>	<b>665</b>	<b>173.9</b>	<b>2.4</b>
08_Energy Gen. and Supply	4,478	7,296	7,069	57.9	21.0	1,209	5,508	5,817	381.0	20.6
<b>Building Productive Capacity</b>	10,314	14,053	14,999	45.4	44.5	5,619	16,226	13,239	135.6	47.0
09_Business And Other Services	1,742	1,576	1,600	-8.2	4.7	460	1,241	894	94.3	3.2
10_Banking & Financial Services	2,164	2,440	2,699	24.7	8.0	1,741	7,602	5,061	190.7	18.0
11_Agriculture	3,935	6,764	6,549	66.4	19.4	731	1,439	1,135	55.3	4.0
12_Forestry	520	1,200	1,110	113.6	3.3	52	248	217	317.6	0.8
13_Fishing	274	343	351	28.0	1.0	2	52	7	359.2	0.0
14_Industry	1,208	1,402	2,060	70.6	6.1	1,983	3,799	4,448	124.2	15.8
15_Mineral Resources and Mining	400	172	464	16.0	1.4	593	1,728	1,373	131.5	4.9
16_Tourism	72	155	167	131.2	0.5	57	117	104	82.3	0.4
<b>Trade-related Adjustment</b>		68	17							
<b>Total</b>	<b>22,001</b>	<b>32,927</b>	<b>33,739</b>	<b>53.4</b>	<b>100</b>	<b>9,760</b>	<b>30,102</b>	<b>28,191</b>	<b>188.8</b>	<b>100</b>

Source: OECD, DAC-CRS Aid Activities database.

Note: ICT covers the categories communications policy and administrative management, telecommunications and information and communication technology (ICT).

### *Aid for trade and investment in telecommunications infrastructure*

Table 12 shows capital expenditure in telecommunication services by income group and region. Capital expenditure in 2010 was USD 156 billion in 28 OECD countries, which is significantly higher than the USD 93 billion of the 43 developing countries –

underlying income and regional aggregates. Growth in capital investment was highest in LDCs and negative in OECD countries, reflecting the greater need for ICT infrastructure in developing countries.

The role of aid for trade to ICT infrastructure investments is marginal. For instance, in 2010, USD 419 million of aid for trade was disbursed to ICT for all partners (Table 11), while capital expenditure on telecommunication infrastructure, of eight LDCs, amounted to USD 6,884 million (Table 12).

In relative terms, telecommunication investment is most important in LDCs and Africa, accounting respectively for 10% and 8.4% of overall gross fixed capital formation. This stresses the greater need of LDCs and developing countries to improve their infrastructure in order to foster private sector development while in advanced economies relatively more investment can be undertaken in manufacturing and services sectors.

**Table 12 Capital expenditure in telecommunication services by income group and by region**

	Capital expenditure (in million USD)			Growth p.a. (%)		Share in gross fixed capital formation (%)		
	2000/02	2005/07	2010	02-10	07-10	2000/02	2005/07	2010
<b>By income group</b>								
LDCs	391	5,429	6,884	43.1	8.2	8.8	13.0	10.0
LMICs	7,052	24,723	23,735	16.4	-1.3	5.8	7.9	5.0
UMICs	46,513	47,818	62,606	3.8	9.4	4.8	3.2	3.3
OECD	159,349	166,030	156,324	-0.2	-2.0	3.5	2.1	2.2
<b>By region</b>								
Africa	3,571	10,794	14,381	19.0	10.0	8.4	11.0	8.4
America	14,295	14,059	19,758	4.1	12.0	5.3	5.0	3.7
Asia	35,140	48,864	54,899	5.7	4.0	3.8	4.1	2.9
Europe	949	4,253	4,188	20.4	-0.5	5.6	4.8	4.7
OECD	159,349	166,030	156,324	-0.2	-2.0	3.5	2.1	2.2

Source: WTO Secretariat, based on ITU World Telecommunication/ICT Indicators database.

Notes: Data have been averaged over the three year periods 2000/02 and 2005/07. Aggregates are based on data for 71 countries allocated as follows: 8 LDCs, 15 LMICs, 20 UMICs and 28 OECD Members; 14 Africa, 10 America, 13 Asia, 6 Europe and 28 OECD. Table B.5 in Annex B provides country information.

Compared to transport and energy infrastructure, market-driven investment by private investors plays a greater role for the development of ICT infrastructure. For instance, Africa experienced significant inflows of private investment following the liberalization of the telecommunications sector in many countries in the 1990s (ITU, 2012a; World Bank, 2011). Most of the investments were Greenfield projects financed to a large extent by investors from developing countries and with African investors accounting for more than half of investments. Private investors relied mainly on debt from banks in developing countries or on bonds. Development finance institutions also contributed to finance infrastructure projects, such as undersea cables (see Box 4). France Telecom and Vodafone were the main private investors from the OECD area. More recently, India emerged as a new investor in African telecommunications, while China financed network equipment supplied by large Chinese manufacturers.

Table 13 further highlights that investment into ICT infrastructure is more private-sector driven and relies less on aid for trade than energy infrastructure. In particular, it shows that the ratio of aid-for-trade disbursements to private infrastructure investment is significantly lower for communications than for energy in most countries. For instance, in Nicaragua aid-for-trade disbursements on ICT projects equaled 1.19% of private

investment into telecommunications infrastructure, while disbursements on energy projects equaled 49.78% of private investments into energy infrastructure.

**Table 13 Ratio of aid-for-trade disbursements to private investment for selected countries in 2011**

Country	Ratio of Aft to private investment (%)		Country	Ratio of Aft to private investment (%)	
	Comm-unications	Energy		Comm-unications	Energy
Albania	1.11	219.03	Sri Lanka	3.06	25.94
Argentina	0.26	1.98	Mexico	0.04	4.10
Bangladesh	1.14	53.95	Malaysia	0.03	9.46
Belarus	0.02	0.37	Nicaragua	1.19	49.78
Brazil	0.02	0.73	Pakistan	0.21	26.29
Botswana	0.70	0.90	Panama	0.52	1.72
Chile	0.18	8.13	Peru	0.24	5.37
Cote d'Ivoire	0.21	414.63	Philippines	0.72	3.74
Colombia	0.04	0.76	Rwanda	8.62	59.32
Georgia	1.01	19.74	Sierra Leone	105.88	28.71
Ghana	0.99	26.33	Thailand	0.66	0.21
Honduras	0.31	25.12	Turkey	0.17	0.44
Indonesia	0.81	901.30	Tanzania	1.20	59.93
India	0.23	3.99	Uganda	0.61	196.57
Kazakhstan	0.02	65.55	Ukraine	0.03	56.32
Kenya	2.66	39.04	Zambia	1.52	20.61

Source: WTO Secretariat, based on OECD, DAC-CRS Aid Activities database and the World Bank PPI database.

### *Aid for trade by partner*

LDCs and African countries have been the largest recipients of ICT-related aid-for-trade disbursements in 2011 (Table 14). Compared to the 2006-2008 average, growth in ICT-related aid for trade has also been highest for LDCs among income groups with an increase of 48%. Among other regions, Europe and Oceania experienced impressive increases in ICT aid for trade by 156% and 129% respectively. On the other hand, LMICs and Asian economies traditionally used to be the largest recipients but are now experiencing a significant decline in 2011, after a peak in 2010.

**Table 14 Aid-for-trade flow official development assistance of ICT categories by income and region (disbursements, USD million)**

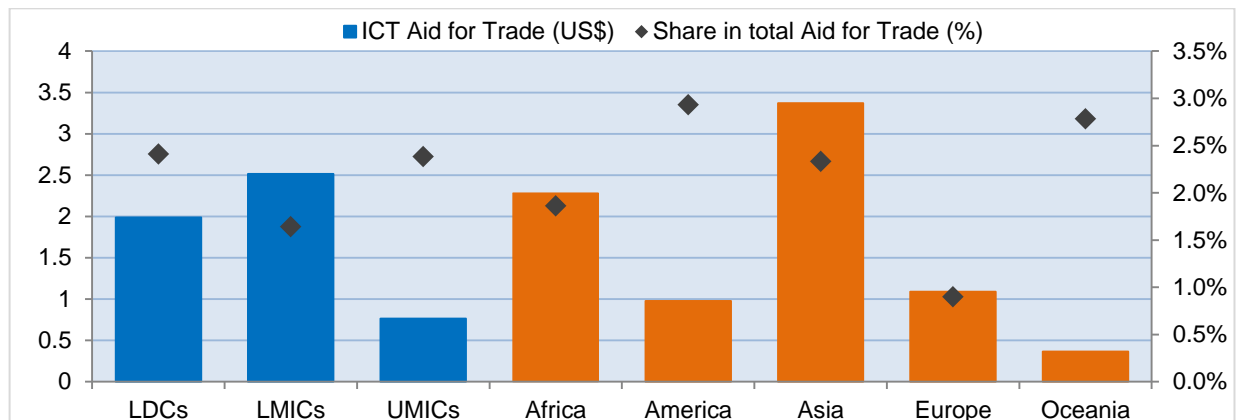
	Total ICT-related Aid for Trade					Communications policy and admin. management			ICT		Telecommunications			
	2006-08 avg.	2010	2011	Δ%: 06/08-2011	Share (%) in 2011	2011	Δ%: 06/08-2011	Share (%) in 2011	2011	Δ%: 06/08-2011	Share (%) in 2011	2011	Δ%: 06/08-2011	Share (%) in 2011
<b>Total</b>	351.5	418.7	417.5	19	100	102.5	-4	100	192.1	93.4	100.0	123.0	-16	100
<b>By income group</b>														
LDCs	89.3	77.7	132.6	48	32	21.5	20	21	69.4	185.3	36	41.7	-12	34
LMICs	104.1	155.3	82.0	-21	20	21.6	8	21	50.9	44.9	26	9.5	-81	8
UMICs	40.8	41.3	48.8	20	12	13.2	-15	13	22.5	49.6	12	13.1	29	11
Not allocated	351.5	144.4	154.1	-56	37	46.3	-13	45	49.2	98.6	26	58.7	49	48
<b>By region</b>														
Africa	119.2	117.9	176.7	48	42	30.6	-13	30	92.5	241.2	48	53.6	-6	44
America	31.7	37.9	40.1	27	10	4.2	-30	4	28.6	88.3	15	7.3	-30	6
Asia	131.8	174.5	112.2	-15	27	22.8	5	22	50.9	29.9	27	38.4	-46	31
Europe	9.2	12.4	23.6	156	6	5.2	9	5	8.6	157.1	4	9.8	812	8
Oceania	3.4	6.4	7.9	129	2	4.7	108	5	0.1	-85.9	0	3.1	418	3
Not allocated	56.3	69.6	57.1	2	14	35.0	-5	34	11.4	-17.8	6	10.7	88	9

Source: OECD, DAC-CRS Aid Activities database.



Over the period 2006-2011, LDCs have received, on average, less aid for trade to ICT projects than LMICs (Figure 25). Even though the average share of ICT in total aid for trade was higher in LDCs than in LMICs, it would be appropriate to prioritize aid for trade more towards ICT in LDCs, given the large digital lag of most LDCs and the importance of ICTs for private sector development. Relative to other aid-for-trade categories, aid for trade to ICT projects has been most important in American countries and Oceania, constituting on average more than 2.5% of total aid for trade.

**Figure 25 Country averages of ICT disbursements and ICT shares in total aid for trade by income groups and regions (2006-2011)**



Source: OECD, DAC-CRS Aid Activities database.

Notes: ICT disbursements and shares by income groups and regions are simple country averages. Aid-for-trade flows not assigned to a country are excluded.

Table 15 provides some country examples along the lines of Figure 25. In particular, it shows that over the period 2006-2011, disbursements to ICT projects were highest for three Asian countries: Iraq; Bangladesh; and Vietnam. All of the top 10 receivers are African or Asian countries. Table 15 further shows the top 10 partner countries in terms of the share of ICT projects in total aid-for-trade disbursements. Aid for trade to ICT plays a significant role for small and remote countries. For instance, the top three countries of Sao Tome & Principe, St. Kitts-Nevis and Maldives are all islands, for which ICT projects accounted for 33%, 21% and 14% respectively of aid-for-trade disbursements over the period 2006-2011.

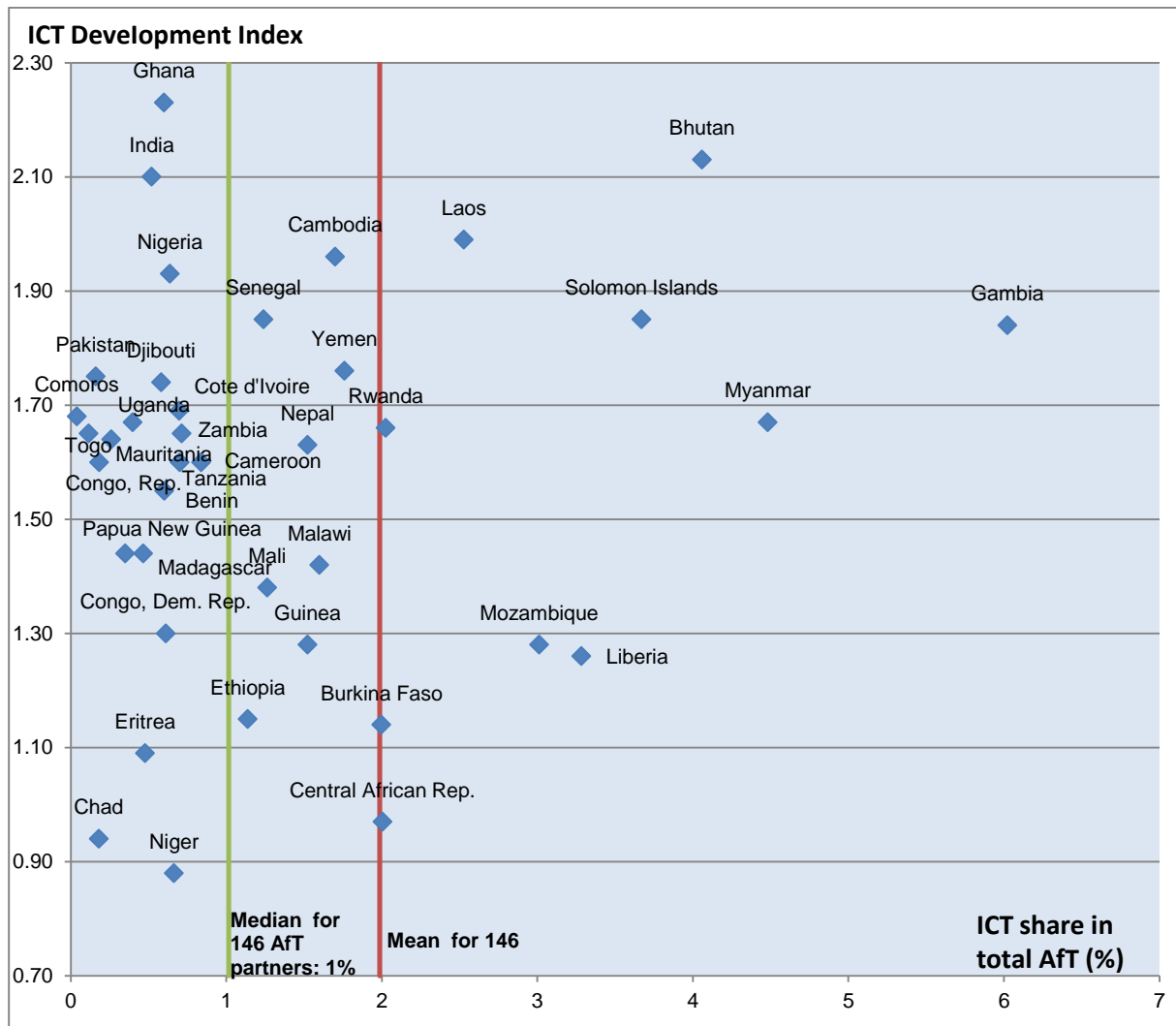
**Table 15 Top 10 partners in terms of ICT disbursements and ICT share in total aid for trade**

Top 10 partners: Average value of ICT disbursements (2006-2011)				Top 10 partners: Average share of ICT in total aid for trade disbursements (2006-2011)			
Country	USD million	% of total Aft	IDI	Country	USD million	% of total Aft	IDI
Iraq	16.8	1.6		Sao Tome & Principe	2.6	33.0	
Bangladesh	12.7	3.2		St. Kitts-Nevis	0.5	20.9	
Vietnam	12.1	0.9	3.68	Maldives	1.5	13.9	4.30
Mozambique	10.3	3.0	1.28	Fiji	1.0	11.5	3.50
India	8.7	0.5	2.10	Syria	7.5	10.1	3.15
Egypt	8.6	1.4	3.66	Panama	0.9	8.4	4.41
Indonesia	8.2	1.0	3.19	Gambia	1.7	6.0	1.84
Syria	7.5	10.1	3.15	Angola	2.7	6.0	
Kenya	7.0	2.0	2.32	Niue	0.2	5.8	
Ethiopia	7.0	1.1	1.15	Mongolia	5.8	5.7	3.63

Source: OECD, DAC-CRS Aid Activities database and ITU (2012a).

Figure 26 sets the ICT development of the 39 least connected countries (LCCs) in terms of the ITU ICT Development Index (IDI) 2011 and in relation to their relative reliance on aid for trade to ICT. Only for a few LCCs such as Gambia, Bhutan, Myanmar or the Solomon Islands, the share in total aid-for-trade disbursements to ICT is above the mean across all 146 aid-for-trade partner countries. For the majority of LCCs this share is below both the mean and median of aid-for-trade partners. Therefore, it might be useful for LCC partners to consider whether aid-for-trade priorities should be moved more towards ICT and how aid for trade can better support ICT development and facilitate private investments.

**Figure 26 The 39 least connected countries (LCCs) in terms of the ICT development index (IDI) 2011 and their ICT share in total aid-for-trade disbursements**



Source: WTO Secretariat, based on ITU (2012a) and OECD, DAC-CRS Aid Activities database.



## 7. Overcoming the barriers

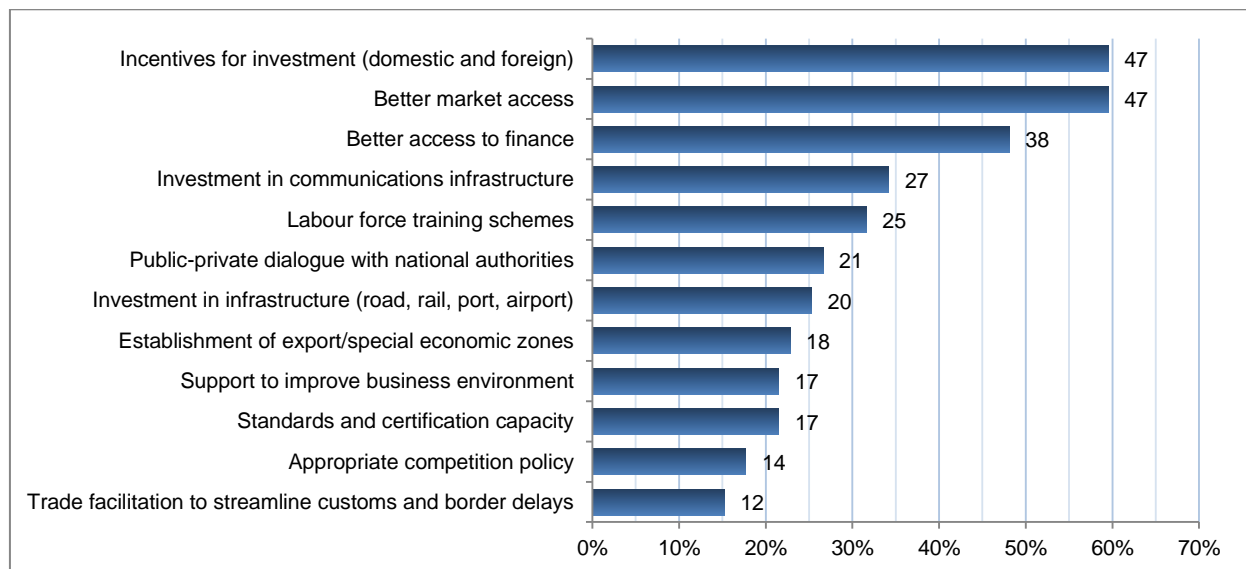
### Support types to help suppliers integrate into ICT value chains

Three types of support are considered by the majority of suppliers as most effective in helping them enter, establish or move up value chains (Figure 27). In particular, better market access and investment incentives are considered by 60% of supply firms as an effective support, followed by better access to finance (48%).

Further support types often mentioned are investment in communications infrastructure (34%) and labor force training schemes (32%). The request for labor force training schemes is ranked higher by the 34 suppliers that consider the lack of ICT labor force skills as a main supply-side constraint. Of these 34 suppliers, 21 (62%) consider labor force training schemes as most effective.

Support to improve the business environment and trade facilitation measures to streamline customs are only considered by about a fifth of suppliers as the most effective form of support, even though the business environment and customs procedures are regarded as the main constraints to integrate into value chains.

**Figure 27 Types of support identified as ‘most effective’ by developing country suppliers in helping them to enter, establish, or move up value chains (percentage and number of suppliers)**

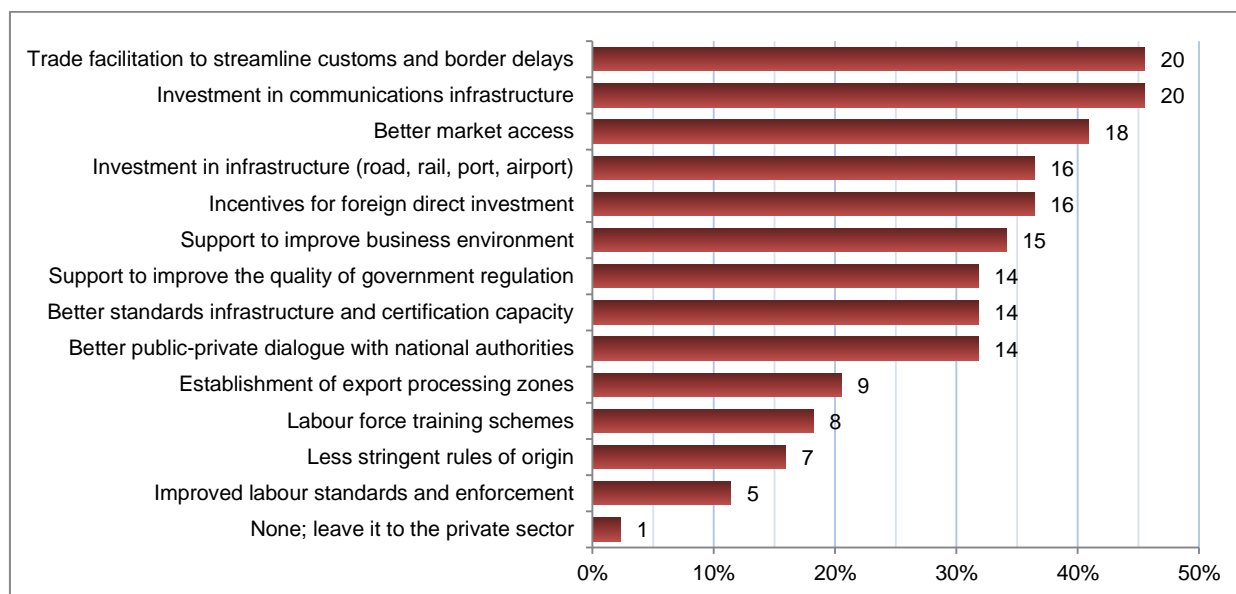


Source: OECD-WTO AFT monitoring survey: private sector questionnaire.

The majority of suppliers (55%) think that future support should be best focused at improving the business environment, followed by sectors with the most export potential (34%) and through participation of foreign investors (32%).

Similar to suppliers, many lead companies regard better market access as an effective support type to bring new developing-country suppliers into their value chain (Figure 28). However, the two support types most often mentioned by lead companies are investments in communications infrastructure and trade facilitation measures to streamline customs.

**Figure 28 Types of support lead companies suggest would be ‘most effective’ to bring new developing-country suppliers into their value chains (percentage and number of lead companies)**



Source: OECD-WTO aid for trade monitoring survey: private sector questionnaire, 2013.

As a result, both suppliers and lead companies regard measures aimed at better market access, incentivizing investment, as well as investments in communication’s infrastructure as priority. Furthermore suppliers are particularly interested in measures to improve access to finance and labor force training schemes, while lead firms regard trade facilitation measures as key to integrating developing country suppliers into their value chain.

According to the OECD /WTO aid for trade monitoring survey, partner countries consider infrastructure development support as most effective, followed by labor skills development, support to improve the business climate, including trade and investment promotion. The Caribbean Community Regional Aid-for-Trade Strategy 2013-2015 is an example of partner countries prioritizing infrastructure development, including ICT infrastructure, in their Aid-for-trade Strategies (Box 6).

### Box 6 Caribbean Community regional aid-for-trade strategy 2013-2015

At the 24th Inter-Sessional Meeting of the Conference of the Caribbean Community (CARICOM) in Haiti in February 2013, heads of government endorsed the Regional Aid-for-trade Strategy 2013-2015. The strategy is considered as a critical tool for mobilizing resources needed for the region to enhance its competitiveness in the international market place.

The goals of the Strategy are i) upgrading key economic infrastructure; ii) enhancing competitiveness and facilitating trade expansion and diversification; iii) and deepening regional integration and maximizing gains from external trade agreements. Regarding i) economic infrastructure, the principal objective of the Strategy is to secure complementary resources or identify public-private partnerships for upgrading the infrastructures of maritime transport, ICT and energy.

The upgrading of the ICT infrastructure aims at reducing the digital divide between Caribbean economies and developed economies, which at present is greater than the development gap. In particular, the strategy highlights the development of a Caribbean Broadband Transformation Strategy as one of five regional anchor projects for early harvest. The project has the objective to increase competition in the delivery of broadband services to promote increased internet access. Besides national projects, the development of a Caribbean Broadband Transformation Strategy will include regional projects aimed at creating a single ICT space, developing a broadband strategy and roadmap for analog switchover, and creating a mechanism for public-private partnerships.

Source: Caribbean Community Regional Aid-for-trade Strategy 2013-2015

## Participation in support initiatives

More than a third of suppliers in the sample, *i.e.* 31 out of 81, have benefited from support, the majority of which, from either a government or development agency initiative. Suppliers mentioned the following beneficial impacts, in part from support received: Better export market intelligence (14); Exports to new markets (14); higher exports sales in existing markets (10); investment in sector (10); improved firm or sector competitiveness (10); improved workforce skills (19); and resolution of a market access problem (10).

Among the 31 suppliers who benefitted from initiatives, there are nine Bangladeshi ICT firms which have participated in a project by the Netherlands Trust Fund and the International Trade Centre (ITC), which are aimed at assisting with market access and export promotion. Box 7 describes in more details the objectives, activities, and outcomes of the project.

A larger share of lead companies have participated in support initiatives compared to suppliers. Of the 44 lead firms, 28 (64%) have taken part in an action to address value chain obstacles, 17 of which have been led by the company itself. As the main motives for their engagement, lead companies mention that the activities relate to their core business strategy (16), or that they were part of their corporate social responsibility (CSR) agenda (12).

The majority of the activities of 28 lead companies focus on ICT infrastructure development or ICT training, the latter being consistent with the lack of labor force ICT skills highlighted by suppliers. Furthermore, more than a third of lead companies are engaged in activities addressing the business environment, customs and border procedures, and sustainable development. The majority of lead companies found support

activities to be useful to build networks with governments but, at the same time, have experienced difficulties in working with the public sector.

Box 8 and Box 9 illustrate the activities of the International Trade Centre (ITC) and the African Development Bank (AfDB) regarding ICT. While the ITC helps companies to use ICTs to facilitate access to export markets, the most recent AfDB project focuses on building up an ICT platform for payment and settlement systems in countries of the Eastern African Community.

### **Box 7 NTF II – Improving the export competitiveness of the IT and ITES sector in Bangladesh**

The information technology (IT) and information technology enabled services (ITES) sector in Bangladesh offers a strong value proposition, with a large pool of trained engineers and operators. However, despite the fast growth of the sector, it remains a marginal contributor to Bangladeshi exports. Some of the binding constraints are a) the lack of concrete, coordinated actions to exploit the sector's foreign-trade potential, b) the inability of the IT association to provide a results-oriented B2B matchmaking service to its members and c) the insufficient, sporadic branding efforts, which result in a low visibility of Bangladesh on the global IT outsourcing marketplace.

Against this backdrop, the Netherlands Trust Fund II (NTFII) project, funded by the Government of the Netherlands, is supporting the IT and ITES sector in Bangladesh to improve its export competitiveness and to benefit from business links with selected markets in Europe. The International Trade Centre (ITC) has been implementing the project in partnership with Dhaka Chamber of Commerce and Industry (DCCI) and Bangladesh Association of Software & Information Services (BASIS). The project, which was implemented between October 2010 and 30 June 2013, has benefited 40 Bangladeshi companies.

In order to address these constraints, the main activities and outcomes of the project have been the following:

#### **1. Establish sustainable business relationships**

Between January 2011 and October 2012, the project organised nine specialized business matchmaking events in Denmark (2 events), the Netherlands (3), the United Kingdom (1), Germany (2) and Bangladesh (2). These events were attended by 32 Bangladeshi companies, 147 buyers from the target markets, and resulted in 737 pre-scheduled business to business meetings.

The business-linkage activities resulted in an increase in exports of Bangladeshi IT & ITES services. A survey undertaken in November 2012, in which 25 of the 40 NTFII companies participated, showed that 52% of the companies had experienced an increase in exports in 2012 directly related to NTFII Bangladesh B2B activities.

Amongst the success stories of Bangladeshi-European partnerships, which can be accredited to the project, nSales, a Danish company is now outsourcing its sales automation to Bangladeshi-based BrainStation-23. The Bangladeshi firm Structured Data Systems Ltd (SDSL) was hired by a Danish consulting company to develop an iPhone application, as well as to create the server back-end and a website to accompany it. Furthermore, follow-up business resulted from this initial deal for SDSL.

#### **2. Strengthening of competencies of trade support institutions to provide business linkage services to SMEs**

ITC provided assistance to the trade support institutions BASIS and DCCI to extend their service portfolio with a B2B matchmaking service so that they can contribute to the development of the Bangladeshi IT & ITES sector on overseas markets. Support consisted in assisting and training staff at BASIS and DCCI to design the business linkage service as a viable support service for SMEs; to manage the business linkage service effectively; to undertake demand side analysis for the new service offering; and to build links with partner trade support institutions in the selected European markets. Both partner organizations, BASIS and DCCI, deployed the B2B matchmaking service as part of their service portfolio and have assigned a specific person to manage the

service. For the first time, BASIS provided the service commercially to 16 of its members during the visit of a delegation of European IT companies looking for business partners in February 2013.

### 3. Enhancing branding capacity

ITC supported BASIS and DCCI to develop a more effective and comprehensive brand for the industry through specific public relations activities and mobilizing industry analysts. The project has been able to define a strategic framework for the IT industry and to catch the attention of media and consultancies specialized in IT outsourcing in the target markets.

Companies that are actively participating in the NTFII project have also completed the WTO/OECD questionnaire. It is clear that linking Bangladeshi ICT sector is just one piece of the puzzle. There remain challenges to the IT and ITES sector in Bangladesh in moving up or entering the value chain. Branding has been highlighted as a challenge because Bangladesh is a destination difficult to sell on the global sourcing market. Aside from branding, the companies indicated that the main challenges to entering or moving up the value chain are inadequate or unreliable power infrastructure, requirements for commercial presence or joint ventures, access to trade finance and unreliable internet access. Additional supply-side constraints include the business environment and lack of labour force with high-end ICT skills.

This was the first project of this kind and scale at ITC. Given the success of the project, discussions are on-going with development partners and countries to undertake similar activities for other emerging IT & ITES sourcing destinations.

*Source:* International Trade Centre

### **Box 8 Activities of the International Trade Centre (ITC) to support the use of ICTs in developing countries**

For many years ITC has been involved in promoting the use of ICTs by developing countries and transition economies to support trade development efforts. ITC has focused on two main areas of intervention:

1. Use ICTs to support the development of services' exports
2. Use ICTs to improve positioning and visibility of partner countries in export markets

#### **1. Use ICTs to support the development of services' exports**

ICT and other Business Services cover a broad spectrum of services, including IT & Software Services, Business Process Outsourcing and other IT Enabled Services (ITES). Focusing on the IT and ITES sector, the International Trade Centre aims at enhancing the capacity of developing countries to increase ICT and other business services exports. In particular, ITC aims at targeting its technical assistance towards youth, as the employment generation in this sector primarily targets young, skilled graduates.

ITC has used an integrated sectoral approach to re-enforce and expand current services' exports, which include the following activities:

- Supporting branding /marketing
- Supporting analysis of /build stakeholder confidence in developing the appropriate regulatory framework needed for IT and ITES
- Strengthening sector associations
- Business-to-business linkages

Some examples of ITC work in this area:



- In Bangladesh, within the framework of the NTFII project, funded by the Netherlands, ITC provided advisory services on web strategies to export-oriented SMEs from the local IT industry, with a focus on web advertisement, social media and search-engine optimization (SEO), as well as selling services to new markets. As a result, NTFII beneficiaries have reported improved online visibility for their companies and landed new clients.
- In Fiji, ITC links rural producers with traders and exporters thanks to an innovative business-matching platform which combines mobile and web applications. Current work focuses on connecting this system to the local mobile-payment facility to cover the complete transaction cycle. Thanks to the financial support of the EU, ITC has deployed similar services in the Maldives, Liberia and Benin.

## 2. Use ICTs to improve positioning and visibility of partner countries in export markets

In the second area of work, ITC focuses on using Information and communication technologies (ICTs) to achieve increased market visibility and export development. Typically, to support this area, ITC projects include production of websites and platforms (static, dynamic, with varying levels of complexity) to deliver information and increase the visibility of partners export capabilities and competitive advantage. The ITC projects might include as well the creation of web- or CD Rom-based tools such as diagnostic tools and use of mobile solutions to enhance export competitiveness.

A few examples of such solutions delivered by ITC as part of its Trade-Related Technical Assistance (TRTA) projects:

- In Morocco, ITC has supported the upgrade of the web portal of the textile industry association AMITH and is currently doing the same for the leather industry association FEDIC within the framework of ITC's EnACT programme. This allows the associations to link potential buyers with local suppliers online.
- In Algeria, ITC's web marketing and e-commerce capacity building portfolio has been deployed across seven cities to benefit more than 160 trainees, close to half of them women. This was done with the support of the Algerian trade promotion organization ALGEX and the women entrepreneurs association SEVE. The carpet makers association of Ghardaia, for example, is among the 70% of participants who reported that their businesses had benefited directly from the training within 6 months

*Source:* International Trade Centre

### Box 9 Activities of the African Development Bank on ICT to support regional integration

The African Development Bank (AfDB) is well positioned to foster Africa's economic integration to create larger, more attractive markets, link landlocked countries to international markets and support intra-African trade. Infrastructure being a key impediment to trade, the AfDB is taking a regionally integrated approach to infrastructure development and is therefore participating fully in the implementation of the Programme for Infrastructure Development in Africa (PIDA). According to the AfDB's Annual Report for 2011, the largest share (38.1%) of the Bank Group's loan and grant approvals in 2011 was targeted at the infrastructure sector, comprising Information and Communication Technology (ICT), amounting to UA 1.57 billion (approximately USD 2.41 billion). Only two ICT projects were approved for a total amount of UA 21.6 million (approximately USD 33.2 million), which constituted 0.5% of the AfDB's total sectoral approvals in 2011.

ICTs represent a vital factor for an economy to compete and grow. In the case of the African continent, which has been lagging behind in terms of fixed-line telephony, current innovative technologies and business models are circumventing market inefficiencies and institutional bottlenecks. The strategic application of ICTs is transforming African markets, with mobile money and e-banking at the lead. The AfDB's two projects in 2011 were aligned to the Bank Group's Medium-Term Strategy as well as its ICT Strategy. The objective of one of the two projects, namely, 'the Bamako Digital Complex Support Project', was to support the Government of Mali's development strategy through sustainable capacity building in ICT fields, and so boost the country's competitiveness and economic growth. The expected outcomes *e.g.* include: sustainable ICT training and incubation capacity; private-public partnerships established for: development of the sector; 25 ICT SMEs established; and more women trained and involved in ICT activity.

The most recent AfDB intervention in the ICT sector in Africa is an UA15 million ADF (Regional Operations) Grant financed Multinational Project entitled 'the EAC Payment and Settlement Systems Integration Project'. The project which covers all the East African Community (EAC) member countries – Kenya, Tanzania, Uganda, Rwanda and Burundi and will be implemented from January 2013 to December 2016 encompasses an ICT-based technological platform that provides a common foundation for the countries in the region and a basis for further enhancements and development. The project also has a capacity development component to ensure sustainability. The expected outcome of the proposed project is a sound platform aimed at enhancing payment and settlement systems in the EAC Partner States as a prelude to the successful introduction of the East African Monetary Union. Amongst others, this innovative project will contribute to:

- Technical upgrade to payments systems, in the EAC Partner States, making cross-border settlements faster and safer, and providing a basis for regional currency convertibility;
- More effective implementation of monetary policy in the region and hence promotion of macroeconomic stability and mitigation of systemic risk;
- Increased cross-border trade in the EAC region;
- Better financial market regulation and greater predictability to financial transactions ; and
- Policy dialogue and movement toward economic integration; and
- Assist the EAC to redress weaknesses in the legal and regulatory arrangements in banking and payment and settlement systems through the harmonization of national legislation, regulations and policies

*Source:* African Development Bank



## 8. Conclusions

- ICT value chains cover both manufacturing and services activities. Value chains in ICT manufacturing are concentrated in "Factory Asia" with China, Japan and Korea being the largest producers of ICT goods, and China alone accounting for 37% of world ICT exports. Developing countries which are not close to Factory Asia or to another big market such as the United States only play a minor role in ICT manufacturing value chains.
- ICT services might offer a greater potential for developing countries to integrate into ICT value chains as distance and scale economies are less important than for manufacturing. Furthermore, ICT services such as telecommunications and computer services are vital inputs to other sectors and are hence crucial for the productivity of domestic firms and a country's broader economic development. Results from the OECD-WTO partner questionnaires confirm that ICT services are a greater priority for developing countries than ICT manufacturing. While more than 55% of ODA recipients have included communication services and computer and information services in their development strategies, only 12% have done so for the manufacturing of office and telecommunications equipment.
- The most prominent example of a successful developing country in ICT services value chains is India which is the main destination for IT offshoring and accounts for about 20% of world exports in computer services. Other developing and emerging countries like the Philippines, Argentina and Costa Rica have also been able to build up comparative advantages in computer services exports.

While the focus of this report is on ICT value chains, it also examines advances in ICT infrastructure and ICT as an enabling technology as ICT can be an important catalyst to the achievement of the Millennium Development Goals. While the spread of mobile telephony across developing countries has been a success story in development, with mobile phone penetration in LDCs increasing from 8% in 2005 to 52% in 2012, the digital divide between developing and developed countries is still large as illustrated by a fixed broadband penetration in LDCs of below 1%.

The proliferation of fixed and mobile broadband access is promoted by the ITU-UNESCO Broadband Commission for Digital Development and regarded as a stepping stone for developing countries. While private investments in undersea cables in Africa have grown significantly in recent years, regulators face the challenge to increase competition in order to lower access prices to these cables and further investments into terrestrial networks are required to bridge the "last kilometre" to users.

To identify the barriers that developing country firms face in integrating into ICT value chains and possible support measures, the report analyses the results of a joint OECD-WTO private sector questionnaire covering 80 suppliers and 44 lead companies in ICT value chains from 55 countries.

In many instances, ICT firms face similar problems to suppliers in other value chains, and would hence benefit from Aid-for-trade interventions targeted at such horizontal constraints. These main horizontal constraints are access to finance and trade financing, the business and regulatory environment and customs procedures and delays. The importance of customs procedures stresses furthermore the potential benefits from agreement on trade facilitation at the WTO.

Aid-for-trade interventions play a significant role in helping to overcome three sector-specific barriers. First, the lack of ICT skills of the labour force represents a major constraint faced by firms in developing countries. The ICT sector is skill intensive as workers are required to conduct activities such as software and product engineering, computer programming, web design or database administration. Aid-for-trade projects may complement educational initiatives or support labour force training schemes to address skills shortages. However, besides ICT-specific skills, ICT workers require also horizontal skills such as English language skills or general business skills. In a broader context, the digital literacy of ICT users is needed to foster the growth of e-commerce and to allow poor people to exploit the development opportunities of ICT.

Second, developing country suppliers and lead firms highlight inadequate telecommunications infrastructure as a significant barrier for developing country firms to integrate into ICT value chains. Similarly, both partner and donor countries regard inadequate domestic infrastructure as the most important obstacle of to greater participation of companies in value chains. However, Aid for Trade on ICT projects is much lower than Aid for Trade on transport and energy infrastructure. This lower support can be explained by the fact that investments in ICT infrastructure tend to be more private-sector driven and less capital intensive. Furthermore, the OECD-WTO questionnaire reveals that, while ICT infrastructure is as important as power supply to many developing country suppliers, power supply is the main supply-side constraint faced by LDC suppliers. On the other hand, the digital divide between developing and developed countries still exists and is widening in the case of LDCs. Hence, there should be a more prominent role for Aid for Trade in certain LDCs and least connected countries (LCCs) to support ICT development and facilitate private investments into ICT infrastructure.

Third, Aid for Trade can achieve significant development outcomes by supporting the capacity-building and the policy-making of telecommunications regulators. For instance, existing Aid-for-trade projects foster regional integration and competitiveness by supporting regulators to harmonize telecommunications legislation and regulation at a regional level. Besides fostering competition and low prices, a sound regulatory environment can facilitate private investment in ICT infrastructure.

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## Annex A

### Country groupings by income and region

Countries are grouped according to the OECD DAC list of official development assistance (ODA) recipients. For practical purposes, the low income countries Kenya, Kyrgyz Republic, Tajikistan and Zimbabwe are grouped together with LMICs. Income and regional aggregates of ODA recipients are benchmarked against OECD Members. The OECD Members Chile, Mexico and Turkey are included in the respective ODA income or regional grouping and are therefore not included in OECD aggregates.

48 Least-developed countries (LDCs)							
Country	Region	Country	Region	Country	Region	Country	Region
Afghanistan	Asia	Djibouti	Africa	Madagascar	Africa	Sierra Leone	Africa
Angola	Africa	Equatorial Guinea	Africa	Malawi	Africa	Solomon Islands	Oceania
Bangladesh	Asia	Eritrea	Africa	Mali	Africa	Somalia	Africa
Benin	Africa	Ethiopia	Africa	Mauritania	Africa	Sudan	Africa
Bhutan	Asia	Gambia	Africa	Mozambique	Africa	Tanzania	Africa
Burkina Faso	Africa	Guinea	Africa	Myanmar	Asia	Timor-Leste	Asia
Burundi	Africa	Guinea-Bissau	Africa	Nepal	Asia	Togo	Africa
Cambodia	Asia	Haiti	America	Niger	Africa	Tuvalu	Oceania
Central African Rep.	Africa	Kiribati	Oceania	Rwanda	Africa	Uganda	Africa
Chad	Africa	Laos	Asia	Samoa	Oceania	Vanuatu	Oceania
Comoros	Africa	Lesotho	Africa	Sao Tome & Principe	Africa	Yemen	Asia
Congo, Dem. Rep.	Africa	Liberia	Africa	Senegal	Africa	Zambia	Africa

40 Low income and lower middle income countries (LMICs)							
Country	Region	Country	Region	Country	Region	Country	Region
Armenia	Asia	Georgia	Asia	Micronesia, F. States	Oceania	Sri Lanka	Asia
Belize	America	Ghana	Africa	Moldova	Europe	Swaziland	Africa
Bolivia	America	Guatemala	America	Mongolia	Asia	Syria	Asia
Cameroon	Africa	Guyana	America	Morocco	Africa	Tajikistan	Asia
Cape Verde	Africa	Honduras	America	Nicaragua	America	Tonga	Oceania
Congo, Rep.	Africa	India	Asia	Nigeria	Africa	Turkmenistan	Asia
Cote d'Ivoire	Africa	Indonesia	Asia	Pakistan	Asia	Ukraine	Europe
Egypt	Africa	Iraq	Asia	Papua New Guinea	Oceania	Uzbekistan	Asia
El Salvador	America	Kenya	Africa	Paraguay	America	Vietnam	Asia
Fiji	Oceania	Kyrgyz Republic	Asia	Philippines	Asia	Zimbabwe	Africa

46 Upper middle income countries (UMICs)							
Country	Region	Country	Region	Country	Region	Country	Region
Albania	Europe	Costa Rica	America	Libya	Africa	South Africa	Africa
Algeria	Africa	Cuba	America	Macedonia, FYR	Europe	St. Kitts-Nevis	America
Antigua and Barbuda	America	Dominica	America	Malaysia	Asia	St. Lucia	America
Argentina	America	Dominican Republic	America	Maldives	Asia	St. Vinc.&Grenadines	America
Azerbaijan	Asia	Ecuador	America	Mauritius	Africa	Suriname	America
Belarus	Europe	Gabon	Africa	Mexico	America	Thailand	Asia
Bosnia-Herzegovina	Europe	Grenada	America	Montenegro	Europe	Tunisia	Africa
Botswana	Africa	Iran	Asia	Namibia	Africa	Turkey	Europe
Brazil	America	Jamaica	America	Panama	America	Uruguay	America
Chile	America	Jordan	Asia	Peru	America	Venezuela	America
China	Asia	Kazakhstan	Asia	Serbia	Europe		
Colombia	America	Lebanon	Asia	Seychelles	Africa		



31 OECD Members			
Australia	France	Japan	Slovakia
Austria	Germany	Luxembourg	Slovenia
Belgium	Greece	Netherlands	Spain
Canada	Hungary	New Zealand	Sweden
Czech Rep.	Iceland	Norway	Switzerland
Denmark	Ireland	Poland	United Kingdom
Estonia	Israel	Portugal	USA
Finland	Italy	Rep. of Korea	

## Annex B

### Tables and figures

**Table B.1 OECD definition of the ICT sector based on ISIC Rev. 3.1**

ICT manufacturing industries	
<b>2610</b>	Electronic components and boards
<b>2620</b>	Computers and peripheral equipment
<b>2630</b>	Communication equipment
<b>2640</b>	Consumer electronics
<b>2680</b>	Magnetic and optical media
ICT trade industries (wholesale)	
<b>4651</b>	Computers, computer peripheral equipment and software
<b>4652</b>	Electronic and telecommunications equipment and parts
ICT services industries	
<b>5820</b>	Software publishing
<b>61</b>	Telecommunications
<b>620</b>	Computer programming, consultancy and related activities
<b>631</b>	Data processing, hosting and related activities; web portals
<b>951</b>	Repair of computers and communication equipment

*Source:* OECD (2011).

Table B.2 Exports and imports of ICT goods by country (1)

	Exports						Imports					
	Value (in 100,000 USD)		Growth p.a. (%)	% of WLD ICT exports	% Interm. in cou. ICT exports	RCA	Value (in 100,000 USD)		Growth p.a. (%)	% of WLD ICT imports	% Interm. in cou. ICT imports	RCA
	2005	2011	2005-2011				2005	2011	2005-2011			
<b>Least developed countries (LDCs)</b>												
Uganda	164.1	1,362.5	42.3	0.0	2	0.69	1,549.8	4,337.3	18.7	0.0	15	0.74
Bhutan	24.3	719.1	75.9	0.0	0	1.74	204.7	236.5	2.4	0.0	17	0.22
Senegal	57.7	113.1	11.9	0.0	42	0.05	1,352.7	1,539.2	2.2	0.0	15	0.25
Tanzania	43.1	70.3	8.5	0.0	29	0.02	1,894.2	3,944.7	13.0	0.0	24	0.34
Zambia	7.0	36.5	31.6	0.0	6	0.00	1,180.8	2,106.2	10.1	0.0	13	0.28
Malawi	7.6	34.6	28.8	0.0	5	0.03	412.1	835.9	12.5	0.0	14	0.33
Ethiopia	0.0	33.2	328.3	0.0	22	0.01	2,850.8	3,310.3	2.5	0.0	25	0.36
Cambodia	14.1	32.6	15.0	0.0	35	0.01	592.8	1,285.8	13.8	0.0	41	0.20
Madagascar	29.0	32.4	1.9	0.0	7	0.02	780.7	734.8	-1.0	0.0	27	0.24
Rwanda	17.9	19.5	1.4	0.0	9	0.05	344.9	947.1	18.3	0.0	27	0.67
Niger	8.8	18.8	13.4	0.0	59	0.02	237.6	698.9	19.7	0.0	39	0.35
Nepal	n.a.	13.9	n.a.	0.0	23	0.02	n.a.	3,052.3	n.a.	0.0	17	0.49
Burkina Faso	5.9	7.9	4.9	0.0	4	0.00	522.6	760.2	6.4	0.0	26	0.30
Mozambique	18.7	6.8	-15.5	0.0	66	0.00	1,080.6	934.0	-2.4	0.0	47	0.14
Togo	2.5	6.1	15.7	0.0	4	0.01	230.6	541.4	15.3	0.0	18	0.43
Yemen	n.a.	4.6	n.a.	0.0	46	0.00	n.a.	1,046.2	n.a.	0.0	48	0.10
Samoa	n.a.	3.4	n.a.	0.0	0	0.06	n.a.	94.5	n.a.	0.0	17	0.26
Gambia	n.a.	1.0	n.a.	0.0	3	0.01	n.a.	65.6	n.a.	0.0	22	0.18
Vanuatu	n.a.	0.3	n.a.	0.0	14	0.00	n.a.	87.6	n.a.	0.0	31	0.30
Afghanistan	n.a.	0.0	n.a.	0.0	n.a.	0.00	n.a.	212.3	n.a.	0.0	15	0.03
Central African Republic	n.a.	0.0	n.a.	0.0	n.a.	0.00	n.a.	126.5	n.a.	0.0	36	0.56
Kiribati	0.0	0.0	n.a.	0.0	n.a.	0.00	9.8	18.9	11.6	0.0	19	0.20
Mauritania	n.a.	0.0	n.a.	0.0	n.a.	0.00	n.a.	350.7	n.a.	0.0	28	0.14
<b>Lower-middle income countries (LMIs)</b>												
Philippines	n.a.	109,249.8	n.a.	0.8	71	2.50	n.a.	83,822.4	n.a.	0.5	88	1.26
Indonesia	n.a.	67,581.7	n.a.	0.5	43	0.36	n.a.	130,873.9	n.a.	0.8	49	0.71
India	11,125.8	65,828.3	34.5	0.5	30	0.24	107,574.3	272,048.1	16.7	1.8	38	0.56
Ukraine	n.a.	6,093.5	n.a.	0.0	24	0.10	n.a.	20,973.6	n.a.	0.1	22	0.24
Egypt	n.a.	717.0	n.a.	0.0	57	0.02	n.a.	21,816.3	n.a.	0.1	41	0.34
Pakistan	822.0	600.0	-5.1	0.0	50	0.03	21,834.0	15,349.6	-5.7	0.1	18	0.34
Sri Lanka	673.8	388.2	-8.8	0.0	96	0.04	4,052.3	6,755.3	8.9	0.0	16	0.33
Guatemala	150.4	327.1	13.8	0.0	15	0.04	6,330.1	9,763.8	7.5	0.1	14	0.56
Nigeria	n.a.	210.8	n.a.	0.0	24	0.00	n.a.	24,783.2	n.a.	0.2	36	0.37
El Salvador	66.1	163.2	16.2	0.0	12	0.03	2,455.0	4,856.6	12.0	0.0	12	0.47
Moldova	33.1	124.2	24.7	0.0	42	0.06	833.2	1,751.3	13.2	0.0	32	0.32
Armenia	27.3	96.3	23.4	0.0	87	0.08	608.6	1,684.0	18.5	0.0	12	0.39
Ghana	5.1	88.4	60.8	0.0	49	0.01	2,346.1	7,077.7	20.2	0.0	31	0.50
Côte d'Ivoire	456.1	60.2	-28.7	0.0	26	0.01	2,200.4	2,045.1	-1.2	0.0	21	0.29
Paraguay	27.9	56.1	12.4	0.0	18	0.01	5,698.0	26,305.9	29.0	0.2	11	2.04
Kyrgyz Republic	4.4	47.1	48.6	0.0	25	0.03	364.7	1,596.2	27.9	0.0	12	0.36
Nicaragua	12.1	32.6	18.0	0.0	32	0.02	1,556.3	2,153.6	5.6	0.0	15	0.41
Guyana	1.5	29.1	63.8	0.0	5	0.03	151.1	599.2	25.8	0.0	14	0.34
Belize	0.6	18.9	77.4	0.0	1	0.05	257.2	195.1	-4.5	0.0	9	0.22
Zimbabwe	11.8	11.2	-0.8	0.0	5	0.00	511.7	2,377.6	29.2	0.0	8	0.26
Cameroon	8.6	9.3	1.3	0.0	27	0.00	896.1	1,408.3	7.8	0.0	25	0.27
Bolivia, Plurinational State of	12.1	0.1	-59.7	0.0	98	0.00	903.7	2,447.0	18.1	0.0	20	0.31
Tonga	n.a.	0.0	n.a.	0.0	21	0.00	n.a.	72.5	n.a.	0.0	20	0.36
Cape Verde	n.a.	0.0	n.a.	0.0	n.a.	0.00	n.a.	309.0	n.a.	0.0	14	0.31

Source: WTO Secretariat, based on UN Comtrade database.

Note: RCA (revealed comparative advantage) is defined as the ratio of a country's world market share in ICT goods exports (imports) to its world market share in total goods exports (imports).

Table B.2 Exports and imports of ICT goods by country (2)

	Exports						Imports					
	Value (in 100,000 USD)		Growth p.a. (%)	% of WLD ICT exports	% Intern. in cou. ICT exports	RCA	Value (in 100,000 USD)		Growth p.a. (%)	% of WLD ICT imports	% Intern. in cou. ICT imports	RCA
	2005	2011	2005-2011				2005	2011	2005-2011			
<b>Upper-middle income countries (UMIs)</b>												
China	2,340,862.3	4,921,807.5	13.2	36.6	34	2.85	1,668,490.0	3,136,454.0	11.1	20.3	84	1.72
Malaysia	614,441.6	661,263.3	1.2	4.9	69	3.20	434,732.3	478,933.5	1.6	3.1	86	2.44
Mexico	385,333.6	588,905.7	7.3	4.4	17	1.85	380,263.3	603,471.7	8.0	3.9	63	1.65
Thailand	257,951.3	350,301.0	5.2	2.6	52	1.68	205,263.6	269,525.4	4.6	1.7	71	1.13
Turkey	32,269.3	22,261.9	-6.0	0.2	7	0.18	71,465.2	89,219.0	3.8	0.6	21	0.35
Costa Rica	16,972.9	19,917.3	2.7	0.1	99	2.14	21,732.4	32,994.0	7.2	0.2	69	1.73
Brazil	37,012.8	16,532.2	-12.6	0.1	33	0.07	89,020.3	196,282.2	14.1	1.3	67	0.83
Tunisia	2,075.6	14,088.0	37.6	0.1	29	0.87	6,025.9	15,749.0	17.4	0.1	56	0.63
Panama	6.9	11,407.8	243.5	0.1	12	0.86	3,768.7	17,320.8	28.9	0.1	13	0.76
South Africa	5,873.3	7,493.7	4.1	0.1	49	0.09	61,048.9	79,771.9	4.6	0.5	21	0.77
Chile	2,061.7	2,919.1	6.0	0.0	19	0.04	27,138.7	51,992.5	11.4	0.3	9	0.66
Serbia	244.9	1,638.1	37.3	0.0	11	0.15	5,801.7	7,613.9	4.6	0.0	15	0.37
Belarus	1,530.6	1,564.4	0.4	0.0	42	0.04	4,013.1	7,581.7	11.2	0.0	25.9	0.16
Dominican Republic	n.a.	1,264.5	n.a.	0.0	37	0.23	n.a.	6,082.9	n.a.	0.0	19	0.32
Kazakhstan	176.4	1,253.4	38.7	0.0	5	0.02	6,992.5	21,209.8	20.3	0.1	11	0.53
Jordan	n.a.	1,165.8	n.a.	0.0	26	0.16	n.a.	7,422.0	n.a.	0.0	22	0.39
Argentina	778.6	873.3	1.9	0.0	56	0.01	33,391.1	61,056.4	10.6	0.4	47	0.79
Colombia	524.5	553.8	0.9	0.0	24	0.01	27,644.5	45,423.2	8.6	0.3	8	0.80
Lebanon	345.3	415.9	3.2	0.0	49	0.11	3,039.4	4,554.0	7.0	0.0	17	0.22
Namibia	147.3	370.5	16.6	0.0	19	0.07	1,219.7	2,332.9	11.4	0.0	22	0.35
Ecuador	223.2	258.8	2.5	0.0	66	0.01	10,682.2	14,761.5	5.5	0.1	12	0.58
Peru	413.1	240.3	-8.6	0.0	27	0.01	10,443.3	26,988.9	17.1	0.2	11	0.68
Iran	151.1	148.2	-0.3	0.0	17	0.00	17,691.9	30,468.3	9.5	0.2	34	0.43
FYR Macedonia	79.0	142.2	10.3	0.0	44	0.04	1,380.6	2,525.8	10.6	0.0	30	0.35
Mauritius	2,848.1	123.3	-40.7	0.0	15	0.06	4,036.7	2,203.3	-9.6	0.0	15	0.41
Albania	38.7	101.8	17.5	0.0	41	0.06	988.6	1,880.6	11.3	0.0	19	0.33
Saint Kitts and Nevis	n.a.	101.1	n.a.	0.0	100	2.47	n.a.	142.2	n.a.	0.0	19	0.55
Botswana	n.a.	84.2	n.a.	0.0	33	0.02	n.a.	1,783.2	n.a.	0.0	30	0.23
Bosnia and Herzegovina	66.5	80.5	3.2	0.0	58	0.02	2,944.5	2,691.9	-1.5	0.0	14	0.23
Venezuela, Bolivarian Rep. of	n.a.	77.4	n.a.	0.0	36	0.00	n.a.	23,244.3	n.a.	0.2	20	0.61
Suriname	n.a.	23.0	n.a.	0.0	33	0.01	n.a.	436.9	n.a.	0.0	29	0.26
Algeria	25.1	22.4	-1.9	0.0	11	0.00	16,112.7	15,156.7	-1.0	0.1	24	0.31
Montenegro	n.a.	15.1	n.a.	0.0	20	0.03	n.a.	816.3	n.a.	0.0	19	0.31
Azerbaijan	4.4	10.0	14.5	0.0	64	0.00	1,942.6	3,324.8	9.4	0.0	49	0.33
Saint Vincent and the Grenadines	n.a.	2.5	n.a.	0.0	8	0.07	n.a.	130.8	n.a.	0.0	10	0.33
Maldives	2.7	0.0	-100.0	0.0	n.a.	0.00	834.9	806.6	-0.6	0.0	18	0.55
Montserrat	0.5	0.0	-100.0	0.0	n.a.	n.a.	14.8	10.6	-5.3	0.0	17	0.30
<b>OECD Members (high income)</b>												
USA	1,289,425.3	1,391,992.9	1.3	10.4	51	1.03	2,367,875.3	2,834,058.5	3.0	18.4	25	1.20
Rep. of Korea	853,144.7	994,016.0	2.6	7.4	72	1.97	398,357.8	543,919.8	5.3	3.5	72	0.99
Japan	1,008,138.6	756,737.3	-4.7	5.6	78	1.01	694,974.1	843,601.2	3.3	5.5	42	0.94
Germany	771,677.3	647,999.0	-2.9	4.8	48	0.48	897,093.1	957,118.6	1.1	6.2	45	0.73
Netherlands	587,136.8	599,847.3	0.4	4.5	35	1.24	582,192.4	608,872.4	0.7	3.9	31	1.18
Czech Rep.	86,677.4	246,039.8	19.0	1.8	25	1.66	85,547.8	235,030.0	18.3	1.5	46	1.49
France	273,265.6	240,393.4	-2.1	1.8	62	0.45	406,616.0	443,687.2	1.5	2.9	32	0.61
Hungary	159,442.8	239,806.2	7.0	1.8	17	2.37	123,571.5	177,167.8	6.2	1.1	70	1.67
United Kingdom	538,808.8	234,112.1	-13.0	1.7	36	0.54	635,872.4	511,835.7	-3.6	3.3	22	0.77
Sweden	146,128.5	171,669.1	2.7	1.3	32	1.01	124,084.3	181,898.3	6.6	1.2	33	0.99
Poland	35,576.7	132,072.7	24.4	1.0	21	0.77	80,405.1	151,221.0	11.1	1.0	48	0.69
Slovakia	29,914.7	125,186.0	26.9	0.9	11	1.75	28,556.6	86,857.3	20.4	0.6	50	1.08
Canada	139,897.4	110,117.3	-3.9	0.8	38	0.27	285,153.3	353,435.9	3.6	2.3	27	0.75
Italy	115,810.2	109,088.4	-1.0	0.8	48	0.23	271,339.9	338,532.9	3.8	2.2	48	0.58
Belgium	134,607.8	96,673.6	-5.4	0.7	38	0.22	157,401.9	153,112.3	-0.5	1.0	38	0.32
Ireland	246,749.1	73,304.6	-18.3	0.5	43	0.63	167,348.3	62,124.5	-15.2	0.4	39	0.89
Israel	32,100.8	72,045.5	14.4	0.5	58	1.17	43,893.0	63,184.4	6.3	0.4	39	0.82
Austria	64,667.0	63,602.7	-0.3	0.5	50	0.41	91,813.9	88,013.8	-0.7	0.6	31	0.46
Spain	71,965.4	45,252.1	-7.4	0.3	51	0.17	209,462.0	185,357.6	-2.0	1.2	25	0.49
Denmark	58,359.4	38,529.6	-6.7	0.3	32	0.38	92,227.6	75,496.2	-3.3	0.5	22	0.74
Finland	132,375.5	38,500.3	-18.6	0.3	26	0.54	83,570.6	59,090.6	-5.6	0.4	38	0.67
Switzerland	34,077.3	34,182.4	0.1	0.3	60	0.16	93,736.6	112,540.8	3.1	0.7	23	0.52

Portugal	29,722.6	22,398.9	-4.6	0.2	78	0.42	51,500.6	39,142.6	-4.5	0.3	37	0.47
Estonia	14,054.3	20,820.1	6.8	0.2	23	1.26	14,363.4	21,515.6	7.0	0.1	74	1.10
Australia	17,814.2	19,659.4	1.7	0.1	44	0.09	139,875.7	223,189.1	8.1	1.4	19	0.91
Norway	12,677.6	16,583.3	4.6	0.1	32	0.11	48,660.6	61,237.9	3.9	0.4	23	0.65
Greece	4,876.7	6,359.8	4.5	0.0	33	0.22	31,532.0	29,777.5	-0.9	0.2	39	0.47
Slovenia	2,285.3	5,522.3	15.8	0.0	28	0.21	8,482.2	12,123.5	6.1	0.1	30	0.37
Luxembourg	9,983.7	4,647.4	-12.0	0.0	49	0.31	14,700.4	10,275.3	-5.8	0.1	30	0.38
New Zealand	3,691.5	4,398.6	3.0	0.0	48	0.13	25,149.7	27,700.4	1.6	0.2	19	0.73
Iceland	31.3	36.0	2.3	0.0	25	0.01	3,178.3	2,073.2	-6.9	0.0	15	0.41

Source: WTO Secretariat, based on UN Comtrade database.

Note: RCA (revealed comparative advantage) is defined as the ratio of a country's world market share in ICT goods exports (imports) to its world market share in total goods exports (imports).

Table B.3 Exports and imports of telecommunication services by country (1)

	Exports					Imports				
	Value ('000 USD)		Growth p.a. (%)	Share (%)	RCA	Value ('000 USD)		Growth p.a. (%)	Share (%)	RCA
	2005	2010	2005-2010	2010	2010	2005	2010	2005-2010	2010	2010
<b>Least developed countries (LDCs)</b>										
Angola	14,039	35,122	20	0.06	1.78	23,301	362,170	73	0.67	0.98
Bangladesh	19,237	275,492	70	0.47	9.90	18,394	19,014	1	0.04	0.20
Benin	5,388	32,935	44	0.06	4.11	16,388	30,930	14	0.06	2.67
Burkina Faso	385	49,770	164	0.09	8.09	1,238	35,103	95	0.07	1.87
Cambodia	33,795	40,000	3	0.07	1.04	32,000	37,000	3	0.07	1.48
Djibouti	5,824	7,765	6	0.01	2.27	n.a.	n.a.	n.a.	n.a.	n.a.
Ethiopia	40,509	100,741	20	0.17	2.20	17,056	25,307	8	0.05	0.43
Gambia	7,660	12,999	11	0.02	6.40	288	4,523	73	0.01	2.74
Guinea	610	32,670	122	0.06	23.35	6,930	12,800	13	0.02	1.46
Guinea-Bissau	n.a.	12,144	n.a.	0.02	16.09	3,811	4,659	5	0.01	2.34
Haiti	9,250	16,550	12	0.03	3.92	19,610	12,000	-9	0.02	0.43
Lao People's Dem. Rep.	5,847	27,259	36	0.05	2.42	1,527	8,891	42	0.02	1.50
Lesotho	1,267	859	-7	0.00	0.85	2,000	1,559	-5	0.00	0.14
Madagascar	1,798	n.a.	n.a.	n.a.	n.a.	5,566	n.a.	n.a.	n.a.	n.a.
Mali	44,236	120,143	22	0.21	14.68	22,940	67,637	24	0.13	2.95
Mozambique	10,557	38,160	29	0.07	2.88	11,177	46,097	33	0.09	1.75
Nepal	39,701	57,901	8	0.10	4.31	4,052	54,715	68	0.10	2.81
Rwanda	4,260	13,300	26	0.02	2.38	4,460	14,430	26	0.03	1.42
Samoa	n.a.	4,479	n.a.	0.01	1.23	n.a.	32	n.a.	0.00	0.02
Sao Tome and Principe	915	1,180	5	0.00	4.41	52	1,100	84	0.00	1.55
Senegal	104,702	176,450	11	0.30	8.16	37,481	67,180	12	0.12	2.71
Sierra Leone	69	161	18	0.00	0.12	200	3,950	82	0.01	1.28
Sudan	3,840	65,336	76	0.11	12.68	3,520	15,816	35	0.03	0.31
Tanzania	33,749	38,897	3	0.07	0.83	15,744	20,478	5	0.04	0.48
Timor-Leste	n.a.	5,911	n.a.	0.01	9.16	n.a.	2,250	n.a.	0.00	0.63
Uganda	16,671	19,470	3	0.03	0.81	9,588	16,592	12	0.03	0.39
Vanuatu	2,825	5,949	16	0.01	0.95	1,282	8,336	45	0.02	3.03
Yemen	41,388	105,400	21	0.18	3.14	9,244	24,700	22	0.05	0.47
<b>Lower-middle income countries (LMICs)</b>										
Armenia	26,814	64,020	19	0.11	3.71	12,825	20,150	9	0.04	0.89
Belize	7,530	13,936	13	0.02	1.86	1,283	2,719	16	0.01	0.77
Bolivia, Plurinational State of	35,465	62,804	12	0.11	5.15	12,680	23,530	13	0.04	0.91
Côte d'Ivoire	86,032	n.a.	n.a.	n.a.	n.a.	65,380	n.a.	n.a.	n.a.	n.a.
El Salvador	102,600	168,100	10	0.29	7.74	18,800	33,460	12	0.06	1.42
Fiji	26,727	9,139	-19	0.02	0.50	17,760	69,946	32	0.13	6.03
Georgia	18,495	25,138	6	0.04	0.72	16,852	11,257	-8	0.02	0.49
Guatemala	172,000	313,200	13	0.54	6.21	11,400	36,400	26	0.07	0.67
Guyana	29,124	44,250	9	0.08	7.75	19,448	29,549	9	0.05	3.73
Honduras	132,900	252,200	14	0.43	10.92	6,548	205,400	99	0.38	6.80
India	782,958	705,417	-2	1.21	0.25	209,005	597,218	23	1.11	0.22
Iraq	n.a.	n.a.	n.a.	n.a.	n.a.	236,400	n.a.	n.a.	n.a.	n.a.
Kenya	176,492	356,878	15	0.61	5.31	106,994	162,963	9	0.30	3.90
Kyrgyz Republic	6,432	19,756	25	0.03	1.26	5,489	11,745	16	0.02	0.56
Micronesia, Federated States of	1,300	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Moldova	54,760	110,960	15	0.19	7.27	23,940	35,130	8	0.07	2.09
Mongolia	14,450	8,969	-9	0.02	0.81	23,370	26,094	2	0.05	1.49
Morocco	327,887	706,077	17	1.21	2.53	43,906	63,095	8	0.12	0.48
Nicaragua	28,300	71,200	20	0.12	6.36	5,100	26,000	39	0.05	1.64
Nigeria	20,217	47,428	19	0.08	0.79	144,707	271,760	13	0.50	0.59
Pakistan	284,000	239,000	-3	0.41	3.52	74,000	151,000	15	0.28	1.01
Papua New Guinea	n.a.	478	n.a.	0.00	0.07	n.a.	40,231	n.a.	0.07	0.64
Paraguay	16,000	15,500	-1	0.03	0.51	n.a.	n.a.	n.a.	n.a.	n.a.
Philippines	522,000	305,000	-10	0.52	0.94	115,000	154,000	6	0.29	0.60
Sri Lanka	43,870	83,300	14	0.14	1.47	18,920	56,040	24	0.10	0.79
Syrian Arab Republic	125,000	139,016	2	0.24	0.86	17,000	19,474	3	0.04	0.25
Tajikistan	13,091	76,616	42	0.13	18.24	7,736	26,990	28	0.05	3.02
Tonga	4,600	882	-34	0.00	1.31	2,882	4,290	10	0.01	4.33
Zimbabwe	3,200	2,100	-8	0.00	0.52	n.a.	n.a.	n.a.	n.a.	n.a.

Source: WTO Secretariat, based on WTO Trade in Services database.

Note: RCA (revealed comparative advantage) is defined as the ratio of a country's world market share in telecommunication services exports (imports) to its world market share in total services exports (imports).

Table B.3 Exports and imports of telecommunication services by country (2)

	Exports					Imports				
	Value ('000 USD)		Growth p.a. (%)	Share (%)	RCA	Value ('000 USD)		Growth p.a. (%)	Share (%)	RCA
	2005	2010	2005-2010	2010	2010	2005	2010	2005-2010	2010	2010
<b>Upper-middle income countries (UMICs)</b>										
Albania	71,201	100,669	7	0.17	1.94	14,582	44,375	25	0.08	0.97
Algeria	86,000	143,000	11	0.24	1.77	123,000	70,000	-11	0.13	0.26
Argentina	169,950	244,090	8	0.42	0.82	238,599	327,465	7	0.61	1.03
Azerbaijan	n.a.	75,294	n.a.	0.13	1.62	n.a.	51,922	n.a.	0.10	0.60
Belarus	90,300	167,300	13	0.29	1.63	70,100	102,100	8	0.19	1.54
Bosnia and Herzegovina	115,957	126,474	2	0.22	4.28	56,317	69,630	4	0.13	5.73
Botswana	8,709	4,061	-14	0.01	0.46	14,678	24,143	10	0.04	1.21
Brazil	231,629	401,349	12	0.69	0.58	108,419	269,673	20	0.50	0.20
Colombia	210,059	215,498	1	0.37	2.15	133,189	205,714	9	0.38	1.12
Costa Rica	31,451	37,972	4	0.06	0.38	40,045	74,700	13	0.14	1.82
Dominican Republic	113,500	166,800	8	0.29	1.45	17,100	40,000	19	0.07	0.85
Ecuador	80,075	161,898	15	0.28	5.13	5,982	23,635	32	0.04	0.35
FYR Macedonia	43,920	77,652	12	0.13	3.74	20,375	46,981	18	0.09	2.50
Kazakhstan	70,078	82,195	3	0.14	0.92	68,759	122,960	12	0.23	0.48
Lebanon	240,578	380,820	10	0.65	1.04	138,428	301,746	17	0.56	0.98
Libya	n.a.	12,000	n.a.	0.02	1.27	n.a.	48,800	n.a.	0.09	0.40
Malaysia	614,848	560,054	-2	0.96	0.82	679,804	771,798	3	1.43	1.20
Mauritius	17,061	72,125	33	0.12	1.18	16,112	50,778	26	0.09	1.13
Mexico	547,927	202,448	-18	0.35	0.58	118,606	79,949	-8	0.15	0.16
Montenegro	n.a.	35,543	n.a.	0.06	1.56	n.a.	19,917	n.a.	0.04	1.99
Namibia	16,774	14,223	-3	0.02	0.74	283	215	-7	0.00	0.02
Panama	126,800	249,300	14	0.43	1.80	25,100	46,200	13	0.09	0.78
Peru	68,719	101,862	8	0.17	1.16	96,490	180,049	13	0.33	1.34
Serbia	n.a.	150,261	n.a.	0.26	1.85	n.a.	107,034	n.a.	0.20	1.34
Seychelles	12,616	7,583	-10	0.01	0.56	n.a.	923	n.a.	0.00	0.09
South Africa	176,044	207,336	3	0.35	0.66	153,740	365,397	19	0.68	0.88
Tunisia	45,166	302,082	46	0.52	2.40	27,747	59,592	17	0.11	0.82
Turkey	412,000	462,999	2	0.79	0.59	183,000	226,000	4	0.42	0.54
Uruguay	17,910	29,762	11	0.05	0.51	15,854	43,192	22	0.08	1.26
Venezuela, Bolivarian Rep. of	61,000	78,000	5	0.13	2.08	69,000	298,000	34	0.55	1.23
<b>OECD Members (high income)</b>										
Australia	212,563	170,617	-4	0.29	0.16	436,861	409,114	-1	0.76	0.36
Austria	754,862	908,555	4	1.56	0.73	634,234	822,468	5	1.53	0.97
Belgium	1,418,942	3,540,186	20	6.06	1.80	962,543	2,758,776	23	5.12	1.53
Canada	1,133,063	1,726,883	11	2.96	1.25	817,819	1,168,752	9	2.17	0.64
Czech Republic	353,332	480,104	6	0.82	1.00	342,618	546,975	10	1.02	1.41
Denmark	607,814	426,558	-7	0.73	0.31	686,019	578,227	-3	1.07	0.50
Estonia	75,772	193,735	21	0.33	1.87	89,111	193,678	17	0.36	3.04
Finland	212,058	148,508	-7	0.25	0.23	500,771	404,877	-4	0.75	0.64
France	n.a.	4,448,741	n.a.	7.61	1.34	n.a.	3,756,068	n.a.	6.97	1.24
Germany	2,676,217	3,570,648	6	6.11	0.67	3,717,107	5,236,774	7	9.72	0.87
Greece	342,014	393,937	3	0.67	0.46	285,803	n.a.	n.a.	n.a.	n.a.
Hungary	293,173	376,452	5	0.64	0.85	305,905	379,280	4	0.70	1.07
Iceland	n.a.	30,104	n.a.	0.05	0.54	n.a.	43,716	n.a.	0.08	0.88
Ireland	430,284	580,098	6	0.99	0.26	705,119	1,280,718	13	2.38	0.52
Israel	161,400	288,800	12	0.49	0.52	211,300	298,200	7	0.55	0.73
Italy	1,979,804	6,492,355	27	11.11	2.89	2,444,909	6,264,594	21	11.63	2.50
Korea, Republic of	n.a.	599,900	n.a.	1.03	0.30	n.a.	892,200	n.a.	1.66	0.41
Luxembourg	1,068,249	2,575,476	19	4.41	1.69	1,112,023	797,966	-6	1.48	0.95
Netherlands	1,875,986	n.a.	n.a.	n.a.	n.a.	1,657,976	n.a.	n.a.	n.a.	n.a.
Norway	302,211	563,792	13	0.97	0.62	219,480	1,546,220	48	2.87	1.59
Poland	279,093	467,616	11	0.80	0.62	337,817	534,607	10	0.99	0.79
Portugal	480,612	578,151	4	0.99	1.09	327,625	534,273	10	0.99	1.63
Slovak Republic	102,456	106,484	1	0.18	0.80	69,249	114,430	11	0.21	0.73
Slovenia	109,009	283,873	21	0.49	2.01	134,234	310,535	18	0.58	3.13
Spain	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2,240,926	n.a.	4.16	1.12
Sweden	1,268,819	1,557,401	4	2.67	1.03	1,428,191	1,865,968	5	3.46	1.68
United Kingdom	5,792,748	6,808,008	3	11.65	1.20	4,954,563	5,819,101	3	10.81	1.58
United States	4,748,000	11,095,000	19	18.99	0.91	4,519,000	8,006,000	12	14.87	0.94

Source: WTO Secretariat, based on WTO Trade in Services database.

Note: RCA (revealed comparative advantage) is defined as the ratio of a country's world market share in telecommunication services exports (imports) to its world market share in total services exports (imports).

Table B.4 Exports and imports of computer services by country (1)

	Exports					Imports				
	Value ('000 USD)		Growth p.a. (%)	Share (%)	RCA	Value ('000 USD)		Growth p.a. (%)	Share (%)	RCA
	2005	2010	2005-2010	2010	2010	2005	2010	2005-2010	2010	2010
<b>Least developed countries (LDCs)</b>										
Bangladesh	18,557	37,440	15	0.02	0.58	3,792	4,873	5	0.01	0.04
Uganda	32,825	37,407	3	0.02	0.67	22,191	32,579	8	0.04	0.53
Mozambique	121	5,237	112	0.00	0.17	2,659	691	-24	0.00	0.02
Tanzania	265	4,634	77	0.00	0.04	4,597	9,561	16	0.01	0.16
Samoa	n.a.	972	n.a.	0.00	0.11	n.a.	n.a.	n.a.	n.a.	n.a.
Gambia (exp./imp.: 2009)	n.a.	949	n.a.	0.00	0.14	685	2,307	35	0.00	0.83
Ethiopia (exp./imp.: 2009)	87	320	38	0.00	0.00	1,308	2	-80	0.00	0.00
Cambodia	141	320	18	0.00	0.00	363	850	19	0.00	0.02
Sudan	n.a.	240	n.a.	0.00	0.02	4,590	1,558	-19	0.00	0.02
Vanuatu	n.a.	165	n.a.	0.00	0.01	763	1,992	21	0.00	0.50
Guinea (exp.: 2009)	50	60	5	0.00	0.01	600	610	0	0.00	0.05
Benin	13	2	-31	0.00	0.00	3,077	12,579	33	0.02	0.76
Angola (exp.: 2009)	n.a.	-62	n.a.	0.00	0.00	17,831	65,506	30	0.08	0.12
Sierra Leone	n.a.	n.a.	n.a.	n.a.	n.a.	666	838	5	0.00	0.19
Bhutan	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	483	n.a.	0.00	0.17
Guinea-Bissau	n.a.	n.a.	n.a.	n.a.	n.a.	650	2,281	29	0.00	0.69
Yemen	n.a.	n.a.	n.a.	n.a.	n.a.	800	5,000	44	0.01	0.07
Madagascar	120	n.a.	n.a.	n.a.	n.a.	-70	n.a.	n.a.	n.a.	n.a.
Rwanda	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	10,000	n.a.	0.01	0.68
Burkina Faso	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	12,311	n.a.	0.02	0.46
Niger	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
<b>Lower-middle income countries (LMICs)</b>										
India (exp.: 2009)	n.a.	33,383,179	n.a.	20.35	5.49	1,048,870	2,175,840	16	2.70	0.57
Philippines	89,000	1,928,000	85	1.18	2.55	62,000	109,000	12	0.14	0.30
Morocco	n.a.	289,781	n.a.	0.18	0.45	n.a.	60,674	n.a.	0.08	0.32
Sri Lanka	82,470	265,000	26	0.16	2.02	n.a.	n.a.	n.a.	n.a.	n.a.
Pakistan	59,000	192,000	27	0.12	1.22	30,000	161,000	40	0.20	0.75
Armenia	22,445	60,510	22	0.04	1.51	1,520	3,560	19	0.00	0.11
Moldova	970	22,010	87	0.01	0.62	2,350	17,690	50	0.02	0.73
Guatemala	9,500	11,900	5	0.01	0.10	1,700	9,100	40	0.01	0.12
Guyana	4,611	6,997	9	0.00	0.53	3,779	6,561	12	0.01	0.58
Paraguay	n.a.	4,000	n.a.	0.00	0.06	700	1,000	7	0.00	0.04
Kyrgyz Republic	1,184	3,084	21	0.00	0.08	2,200	13,647	44	0.02	0.45
Papua New Guinea	n.a.	1,839	n.a.	0.00	0.12	n.a.	11,400	n.a.	0.01	0.13
Syrian Arab Republic	60,000	1,642	-51	0.00	0.00	100,000	15,041	-32	0.02	0.13
Georgia	n.a.	1,597	n.a.	0.00	0.02	285	3,716	67	0.00	0.11
Fiji	2,541	1,138	-15	0.00	0.03	12,428	11,275	-2	0.01	0.68
Mongolia	780	905	3	0.00	0.03	2,260	5,041	17	0.01	0.20
El Salvador	n.a.	740	n.a.	0.00	0.01	2,900	6,850	19	0.01	0.20
Bolivia, Plurinational State of	415	505	4	0.00	0.02	9,300	11,054	4	0.01	0.30
Tajikistan	108	381	29	0.00	0.04	873	1,447	11	0.00	0.11
Tonga (exp./imp.: 2009)	5	16	34	0.00	0.01	16	11	-9	0.00	0.01
Cape Verde	n.a.	12	n.a.	0.00	0.00	n.a.	4,841	n.a.	0.01	0.51
Nigeria	n.a.	n.a.	n.a.	n.a.	n.a.	143,134	119,269	-4	0.15	0.18
Côte d'Ivoire	4,880	n.a.	n.a.	n.a.	n.a.	6,105	n.a.	n.a.	n.a.	n.a.
Iraq	n.a.	n.a.	n.a.	n.a.	n.a.	16,500	n.a.	n.a.	n.a.	n.a.

Source: WTO Secretariat, based on WTO Trade in Services database.

Note: RCA (revealed comparative advantage) is defined as the ratio of a country's world market share in computer services exports (imports) to its world market share in total services exports (imports).



Table B.4 Exports and imports of computer services by country (2)

	Exports					Imports				
	Value ('000 USD)		Growth p.a. (%)	Share (%)	RCA	Value ('000 USD)		Growth p.a. (%)	Share (%)	RCA
	2005	2010	2005-2010	2010	2010	2005	2010	2005-2010	2010	2010
<b>Upper-middle income countries (UMICs)</b>										
<b>Malaysia (exp./imp.: 2009)</b>	435,260	1,453,770	35	0.89	0.77	379,295	1,206,030	34	1.50	1.31
<b>Argentina</b>	235,210	1,237,340	39	0.75	1.79	190,730	445,356	18	0.55	0.98
<b>Costa Rica</b>	254,378	1,216,190	37	0.74	5.28	10,721	20,844	14	0.03	0.35
<b>Belarus</b>	24,700	217,700	55	0.13	0.91	9,000	45,600	38	0.06	0.48
<b>Brazil</b>	80,223	195,100	19	0.12	0.12	1,656,840	3,414,480	16	4.24	1.73
<b>Uruguay</b>	82,510	179,790	17	0.11	1.32	3,881	9,396	19	0.01	0.19
<b>Serbia</b>	n.a.	168,535	n.a.	0.10	0.89	n.a.	179,502	n.a.	0.22	1.56
<b>Lebanon</b>	n.a.	75,585	n.a.	0.05	0.09	n.a.	92,402	n.a.	0.11	0.21
<b>Colombia</b>	16,277	49,496	25	0.03	0.21	110,015	113,490	1	0.14	0.43
<b>Tunisia</b>	19,269	42,546	17	0.03	0.15	10,020	37,655	30	0.05	0.36
<b>Jamaica</b>	33,580	38,211	3	0.02	0.27	16,918	22,248	6	0.03	0.38
<b>Panama</b>	11,700	24,600	16	0.01	0.08	n.a.	n.a.	n.a.	n.a.	n.a.
<b>Dominican Republic</b>	15,400	17,000	2	0.01	0.06	7,600	24,200	26	0.03	0.36
<b>Kazakhstan</b>	642	7,704	64	0.00	0.04	32,929	80,502	20	0.10	0.22
<b>Algeria</b>	8,000	7,000	-3	0.00	0.04	31,000	41,000	6	0.05	0.11
<b>Azerbaijan</b>	n.a.	6,944	n.a.	0.00	0.06	n.a.	13,459	n.a.	0.02	0.11
<b>Albania</b>	2,204	4,678	16	0.00	0.04	2,372	7,464	26	0.01	0.11
<b>Botswana</b>	1,155	1,546	6	0.00	0.08	9,009	7,896	-3	0.01	0.28
<b>Namibia</b>	23	399	77	0.00	0.01	13,066	31,396	19	0.04	1.36
<b>Turkey</b>	n.a.	0	n.a.	0.00	0.00	n.a.	0	n.a.	0.00	0.00
<b>Bosnia and Herzegovina</b>	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	10,702	n.a.	0.01	0.61
<b>OECD Members (high income)</b>										
<b>Ireland</b>	19,369,000	37,196,458	14	22.67	7.14	378,053	752,273	15	0.93	0.21
<b>Germany</b>	8,415,411	16,304,988	14	9.94	1.31	8,587,027	14,066,711	10	17.47	1.62
<b>United Kingdom</b>	8,476,394	9,952,424	3	6.07	0.75	3,330,921	5,256,661	10	6.53	0.99
<b>United States</b>	3,554,000	8,771,000	20	5.35	0.31	2,000,000	18,394,000	56	22.84	1.50
<b>Israel</b>	4,528,500	7,699,500	11	4.69	5.94	n.a.	n.a.	n.a.	n.a.	n.a.
<b>Sweden</b>	2,608,025	6,813,995	21	4.15	1.94	1,384,166	2,341,998	11	2.91	1.47
<b>Finland</b>	1,484,704	6,494,659	34	3.96	4.38	1,123,862	2,104,325	13	2.61	2.31
<b>Netherlands (exp./imp.: 2009)</b>	3,497,662	4,559,722	7	2.78	0.62	3,662,548	4,742,034	7	5.89	1.31
<b>Canada</b>	3,130,983	4,076,066	5	2.48	1.13	1,270,879	1,920,090	9	2.38	0.65
<b>Belgium</b>	2,528,230	3,654,087	8	2.23	0.80	1,811,919	2,733,612	9	3.39	1.06
<b>Norway</b>	897,633	3,023,320	27	1.84	1.43	1,134,652	1,674,380	8	2.08	1.20
<b>Italy</b>	582,003	1,994,874	28	1.22	0.38	1,448,789	4,179,009	24	5.19	1.16
<b>Denmark</b>	989,176	1,773,979	12	1.08	0.56	1,067,050	1,801,005	11	2.24	1.08
<b>Austria</b>	1,109,287	1,734,996	9	1.06	0.60	749,888	1,264,825	11	1.57	1.03
<b>France</b>	n.a.	1,605,202	n.a.	0.98	0.21	n.a.	1,913,793	n.a.	2.38	0.44
<b>Poland</b>	179,880	1,396,876	51	0.85	0.80	389,432	1,471,496	30	1.83	1.51
<b>Czech Republic</b>	647,310	1,219,394	14	0.74	1.09	482,329	1,130,283	19	1.40	2.03
<b>Hungary</b>	362,979	1,165,977	26	0.71	1.13	454,225	661,640	8	0.82	1.30
<b>Australia</b>	778,620	1,164,049	8	0.71	0.46	710,039	1,201,658	11	1.49	0.73
<b>Luxembourg</b>	413,247	627,380	9	0.38	0.18	595,309	761,014	5	0.95	0.63
<b>Greece (imp.: 2009)</b>	n.a.	448,649	n.a.	0.27	0.22	n.a.	418,175	n.a.	0.52	0.64
<b>Portugal</b>	135,975	349,065	21	0.21	0.28	217,940	435,140	15	0.54	0.93
<b>Slovak Republic</b>	114,223	335,742	24	0.20	1.08	161,712	196,809	4	0.24	0.88
<b>Estonia</b>	46,857	193,672	33	0.12	0.80	28,235	83,567	24	0.10	0.91
<b>Korea, Republic of</b>	n.a.	149,000	n.a.	0.09	0.03	n.a.	170,600	n.a.	0.21	0.05
<b>Slovenia</b>	n.a.	121,748	n.a.	0.07	0.37	n.a.	138,907	n.a.	0.17	0.98
<b>Iceland</b>	n.a.	39,455	n.a.	0.02	0.30	n.a.	20,100	n.a.	0.02	0.28
<b>Spain</b>	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1,973,392	n.a.	2.45	0.69

Source: WTO Secretariat, based on WTO Trade in Services database.

Note: RCA (revealed comparative advantage) is defined as the ratio of a country's world market share in computer services exports (imports) to its world market share in total services exports (imports).

Table B.5 Capital expenditure in telecommunication services (1)

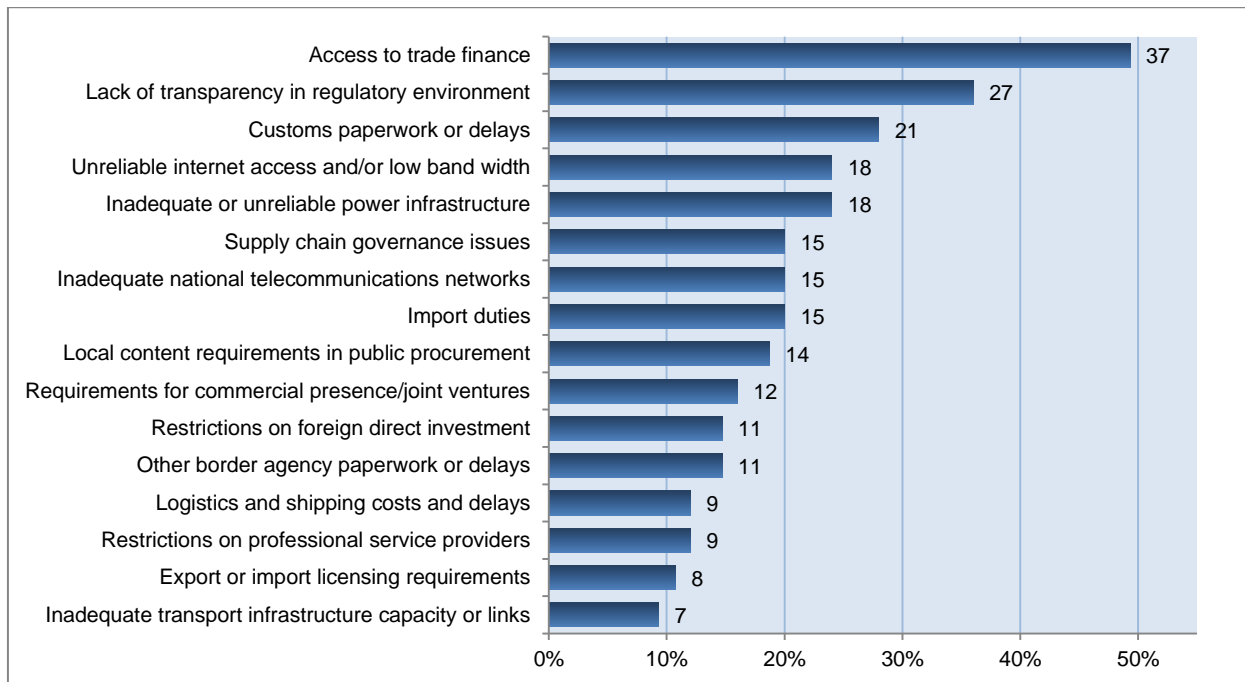
	Capital expenditure (in 100,000 USD)			Growth p.a. (%)		Share in gross fixed capital formation (%)		
	2000/02	2005/07	2010	02-10	07-10	2000/02	2005/07	2010
<b>Least developed countries (LDCs)</b>								
Sudan	1,099	49,654	62,550	65.7	8.0	4.3	58.4	47.9
Cambodia	n.a.	n.a.	4,290	n.a.	n.a.	n.a.	n.a.	23.6
Senegal	845	1,800	3,271	18.4	22.0	7.3	6.2	8.8
Bangladesh	799	n.a.	2,618	16.0	n.a.	0.7	n.a.	1.1
Mali	172	935	1,930	35.2	27.3	2.5	6.8	n.a.
Rwanda	n.a.	179	1,815	n.a.	116.4	n.a.	3.4	15.4
Niger	107	438	1,329	37.0	44.8	4.4	7.0	n.a.
Congo (Democratic Republic of the)	n.a.	5,516	1,209	n.a.	-39.7	n.a.	41.5	3.9
Uganda	637	673	1,006	5.9	14.3	5.4	3.0	2.5
Benin	280	695	934	16.3	10.4	6.0	7.3	5.5
Madagascar	107	508	886	30.2	20.3	1.6	3.1	n.a.
Togo	234	631	461	8.8	-9.9	11.7	17.9	7.7
Mauritania	676	651	429	-5.5	-13.0	30.9	6.4	4.9
Central African Rep.	1	n.a.	271	98.3	n.a.	0.1	n.a.	9.5
Lesotho	115	17	112	-0.3	85.7	4.3	0.6	1.8
Sao Tome and Principe	19	13	101	22.9	95.8	n.a.	n.a.	n.a.
Bhutan	23	169	81	16.9	-21.8	0.8	3.9	1.0
Vanuatu	n.a.	27	24	n.a.	-4.6	n.a.	2.8	n.a.
<b>Lower-middle income countries (LMIs)</b>								
India	35,119	131,111	132,747	18.1	0.4	3.0	4.1	2.6
Egypt	6,691	15,618	35,262	23.1	31.2	3.9	7.4	8.7
Indonesia	10,183	36,651	24,990	11.9	-12.0	3.0	4.2	1.1
Nigeria	1,623	9,310	15,303	32.4	18.0	n.a.	n.a.	n.a.
Philippines	9,305	n.a.	12,455	3.7	n.a.	5.5	n.a.	3.0
Pakistan	1,866	23,977	11,959	26.1	-20.7	1.6	9.5	4.9
Ghana	485	n.a.	7,664	41.2	n.a.	3.9	n.a.	10.3
Ukraine	3,760	17,990	7,415	8.9	-25.6	5.2	6.4	2.8
Morocco	5,703	5,534	7,223	3.0	9.3	5.9	2.8	2.6
Kenya	3,043	6,993	7,122	11.2	0.6	13.5	16.0	10.9
Iraq	n.a.	n.a.	2,991	n.a.	n.a.	n.a.	n.a.	n.a.
Syria	1,813	1,012	2,848	5.8	41.2	4.5	1.4	2.6
Cote d'Ivoire	1,072	3,097	2,720	12.3	-4.2	9.3	18.8	8.6
Bolivia	1,185	n.a.	2,613	10.4	n.a.	9.2	n.a.	8.0
Moldova	411	1,131	1,395	16.5	7.2	18.4	10.6	10.6
Georgia	767	n.a.	1,287	6.7	n.a.	9.3	n.a.	5.7
Armenia	224	343	1,195	23.3	51.6	5.5	1.4	3.9
Honduras	428	2,127	806	8.2	-27.6	2.4	6.8	2.2
Congo	n.a.	n.a.	738	n.a.	n.a.	n.a.	n.a.	3.0
Kyrgyzstan	32	542	680	46.4	7.9	1.2	8.3	5.0
Mongolia	33	555	663	45.5	6.1	1.1	5.0	3.3
Guyana	144	549	331	11.0	-15.5	9.1	15.7	5.8
Swaziland	88	n.a.	309	17.0	n.a.	3.2	n.a.	7.5
Belize	161	178	300	8.1	18.9	7.2	7.9	n.a.
<b>Upper-middle income countries (UMIs)</b>								
China	275,778	266,033	343,499	2.8	8.9	5.9	2.4	1.3
Brazil	68,611	66,413	88,056	3.2	9.9	7.2	3.6	2.1
Mexico	46,543	34,985	56,748	2.5	17.5	3.7	1.8	2.7
Turkey	3,958	16,794	25,022	25.9	14.2	1.0	1.4	1.8
Chile	8,356	12,956	19,198	11.0	14.0	5.5	4.3	4.1
South Africa	12,831	19,714	18,181	4.5	-2.7	7.1	4.0	2.6

Table B.5 Capital expenditure in telecommunication services (2)

	Capital expenditure (in 100,000 USD)			Growth p.a. (%)		Share in gross fixed capital formation (%)		
	2000/01	2005/06	2010	02-10	06-10	2000/01	2005/06	2010
Malaysia	11,625	16,726	17,338	5.1	1.2	4.9	4.5	3.2
Venezuela	9,452	14,170	14,668	5.6	1.2	3.8	3.3	2.0
Peru	2,444	4,126	8,471	16.8	27.1	2.4	2.2	2.2
Thailand	12,267	7,966	7,354	-6.2	-2.6	4.5	1.4	0.9
Uruguay	1,047	1,038	5,834	24.0	77.8	4.0	2.9	7.9
Belarus	538	4,842	4,916	31.9	0.5	1.8	4.4	2.3
Tunisia	2,260	2,656	4,070	7.6	15.3	4.1	3.4	3.8
Serbia	n.a.	4,251	3,567	n.a.	-5.7	n.a.	6.3	4.1
Jordan	2,249	2,009	3,096	4.1	15.5	12.6	4.9	5.1
Azerbaijan	190	1,549	2,541	38.3	17.9	1.2	2.5	2.9
Dominican Rep.	4,059	2,529	1,955	-8.7	-8.2	8.2	3.8	2.3
Bosnia and Herzegovina	583	1,168	1,693	14.3	13.1	5.0	3.5	6.0
Jamaica	1,871	1,701	1,517	-2.6	-3.7	7.1	5.3	5.7
Albania	242	600	1,436	24.9	33.8	2.3	2.4	4.7
Cuba	1,237	838	671	-7.4	-7.1	3.7	1.7	n.a.
Namibia	228	204	466	9.3	31.6	3.3	1.2	1.6
Saint Lucia	n.a.	113	137	n.a.	6.7	n.a.	3.5	3.5
Grenada	n.a.	130	70	n.a.	-18.4	n.a.	4.6	4.2
Dominica	n.a.	69	46	n.a.	-12.5	n.a.	8.9	4.5
Saint Kitts and Nevis	n.a.	83	37	n.a.	-23.7	n.a.	3.0	1.5
<b>OECD Members (high income)</b>								
United States	692,073	767,870	701,490	0.2	-3.0	3.5	3.0	3.4
Japan	255,187	190,281	169,359	-5.0	-3.8	2.5	1.9	1.5
France	63,569	83,669	86,212	3.9	1.0	2.5	1.8	1.7
Canada	47,451	59,890	81,553	7.0	10.8	3.4	2.1	2.3
Italy	75,565	94,637	81,457	0.9	-4.9	3.2	2.3	2.0
Germany	86,064	83,772	78,146	-1.2	-2.3	2.2	1.6	1.4
Australia	49,310	51,456	61,725	2.8	6.3	5.1	2.5	2.0
United Kingdom	152,943	n.a.	56,878	-11.6	n.a.	6.0	n.a.	1.7
Korea (Rep. of)	77,874	63,887	55,371	-4.2	-4.7	5.0	2.3	1.9
Spain	64,271	73,187	52,711	-2.4	-10.4	3.9	1.9	1.7
Netherlands	28,546	22,359	24,817	-1.7	3.5	3.3	1.6	1.8
Poland	13,685	21,445	23,914	7.2	3.7	3.5	3.0	2.6
Switzerland	18,469	30,349	20,673	1.4	-12.0	3.1	3.4	1.9
Belgium	12,973	14,006	16,435	3.0	5.5	2.7	1.6	1.8
Portugal	11,069	13,104	14,281	3.2	2.9	3.4	2.8	3.2
Greece	15,814	12,280	14,172	-1.4	4.9	5.2	1.9	2.7
Denmark	11,363	13,542	12,655	1.4	-2.2	3.5	2.3	2.4
New Zealand	3,017	5,605	11,175	17.8	25.9	2.6	2.0	4.2
Sweden	19,756	13,822	9,742	-8.5	-11.0	4.6	1.8	1.2
Israel	8,271	n.a.	9,692	2.0	n.a.	3.8	n.a.	2.5
Austria	10,331	10,293	9,229	-1.4	-3.6	2.3	1.4	1.2
Finland	7,855	5,775	8,344	0.8	13.1	3.2	1.3	1.9
Czech Republic	10,793	6,655	7,839	-3.9	5.6	5.7	1.7	1.6
Hungary	6,594	4,559	6,762	0.3	14.0	5.0	1.7	2.9
Ireland	3,763	6,273	5,868	5.7	-2.2	1.6	1.0	2.4
Slovak Republic	3,536	4,644	4,756	3.8	0.8	4.2	2.5	2.5
Slovenia	2,861	3,789	2,000	-4.4	-19.2	5.4	3.5	2.0
Luxembourg	632	1,175	1,215	8.5	1.1	1.4	1.3	1.3
Estonia	597	976	913	5.5	-2.2	3.4	1.6	2.5
Iceland	471	1,003	431	-1.1	-24.6	2.7	1.9	2.7

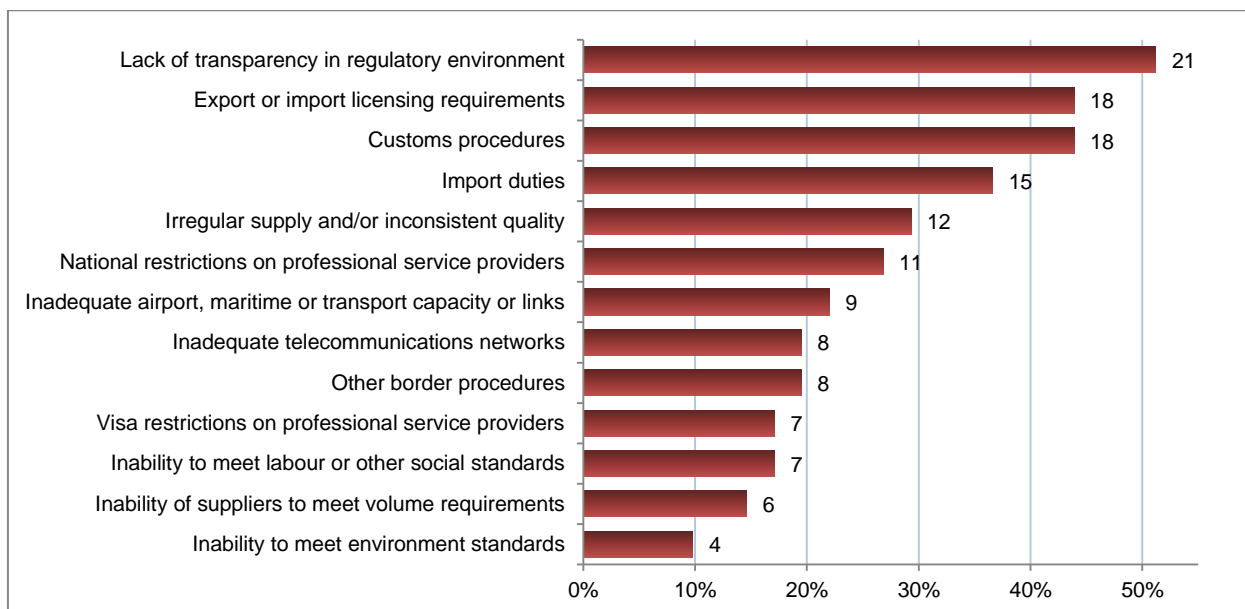
Source: WTO Secretariat, based on ITU World Telecommunication/ICT Indicators database.

**Figure B.1 Difficulties suppliers face in entering, establishing, or moving up ICT value chains (percentage and number of suppliers)**



Source: OECD-WTO AFT monitoring survey: private sector questionnaire.

**Figure B.2 Difficulties lead firms face in bringing new suppliers from developing countries into their supply chains (percentage and number of lead companies)**



Source: OECD-WTO AFT monitoring survey: private sector questionnaire.



## Annex C

### The private sector questionnaire

#### *Description of the sample*

The WTO/OECD private sector questionnaire was filled by 80 suppliers and 44 lead companies (Table C.1). While the majority these 124 respondents were companies (104), 20 associations replied also to the questionnaire.

**Table C.1 Supply and lead companies by type of respondent**

Respondent	Suppliers		Lead comp.	
	Share	Number	Share	Number
<b>Associations</b>	19%	15	11%	5
<b>Companies</b>	81%	65	89%	39
<b>Total respondents</b>	100%	80	100%	44

Source: OECD-WTO AFT monitoring survey: private sector questionnaire.

Suppliers with their head office in America are predominant in the sample constituting 32 out of 80 respondents, while 18 suppliers have their head office in Asia and 14 in Africa (Table C.2). The countries which have been mentioned most often are Bangladesh (9), Uruguay (8), Costa Rica (6), Mexico (5) and India (4). Out of the 44 lead companies, 19 are headquartered in OECD countries followed by 12 in Africa and 6 in America. The three countries Japan (7), Barbados (3) and the United States (3) have been mentioned most often by lead companies as their head office country.

**Table C.2 Supply and lead companies by region of head office**

Region	Suppliers		Lead comp.	
	Share	Number	Share	Number
<b>Africa</b>	18%	14	27%	12
<b>America</b>	40%	32	14%	6
<b>Asia</b>	23%	18	9%	4
<b>Europe</b>	1%	1	2%	1
<b>Oceania</b>	1%	1	2%	1
<b>OECD</b>	15%	12	43%	19
<b>Other</b>	3%	2	2%	1
<b>Total</b>	100%	80	100%	44

Source: OECD-WTO AFT monitoring survey: private sector questionnaire.

Table C.3 shows the distribution of suppliers and lead companies by company size. Not surprisingly, 39% of suppliers are micro companies with less than 10 employees while almost half of lead companies are multinationals. On the other hand, the group of developing country suppliers also covers 10 multinationals, which are predominantly

subsidiaries of multinationals headquartered in developed countries but also few multinationals headquartered in developing countries.

**Table C.3 Supply and lead companies by company size**

Company size	Suppliers		Lead comp.	
	Share	Number	Share	Number
Micro (less than 10 employees)	39%	25	21%	8
Small (10 - 49 employees)	17%	11	13%	5
Medium (50 - 250 employees)	17%	11	11%	4
Large (more than 250 employees)	12%	8	8%	3
Multinational (more than 250 employees and operating in more than one country)	15%	10	47%	18
All companies	100%	65	100%	38

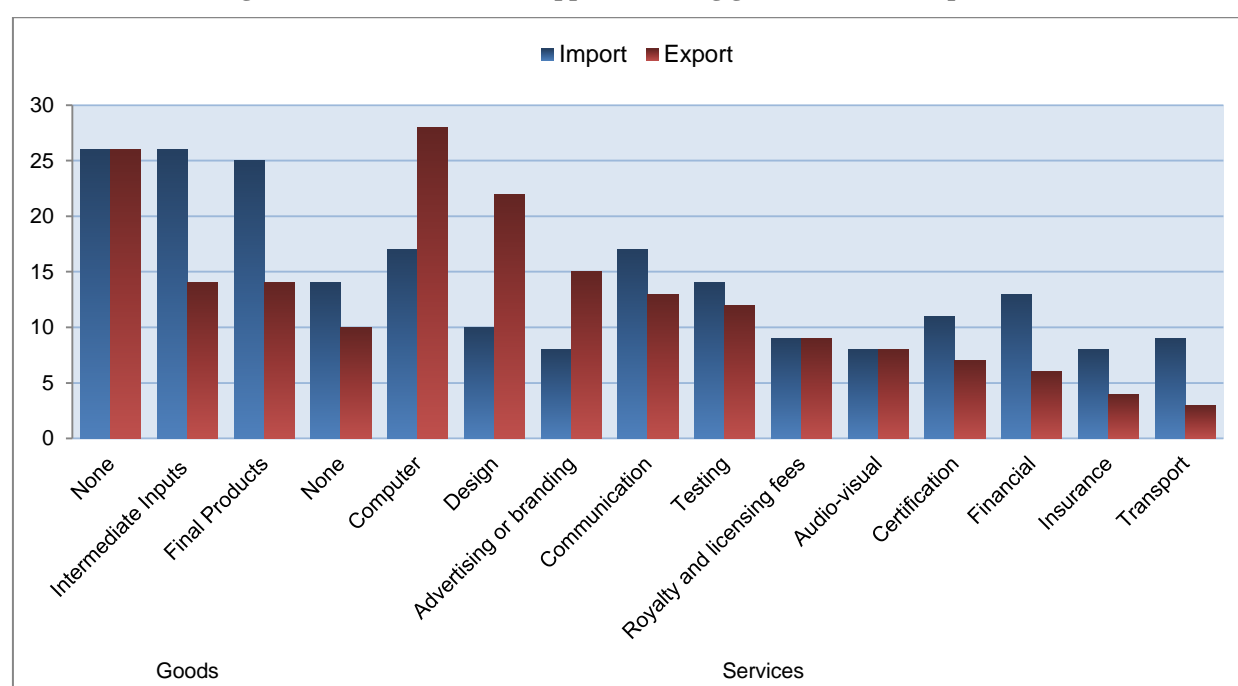
Source: OECD-WTO AFT monitoring survey: private sector questionnaire.

Note: The 20 associations which responded to the questionnaire are not covered by the table.

### Trade patterns

Figure C.1 shows the number of ICT suppliers (out of 80) which are engaged imports or exports of goods and services products. Several issues are worth highlighting.

**Figure C.1 Number of ICT suppliers trading goods and services products**



Source: OECD-WTO AFT monitoring survey: private sector questionnaire.

First, more ICT suppliers are engaged in the exports of services than of goods. In particular, the most commonly exported services are computer services, design services, advertising services and communication services.

Second, imported goods and services are essential for the activities of ICT suppliers. More suppliers import rather than export intermediate or final ICT goods which indicates that ICT firms rely on imported intermediate inputs in order to serve the domestic market with ICT goods. Furthermore, imported ICT goods are needed by ICT services firms for their business. Likewise, ICT suppliers rely on imports of intra-industry inputs such as computer and communication services, but also on imports of inter-industry inputs such as financial services and transport services. The importance of imports can be summarised by the fact that more than 75% of suppliers regard imports of goods and services as important for their exports, with almost half of suppliers regarding them as essential.

Third, firms in developing countries may find it easier to integrate into international value chains by offering services. For instance, out of 17 LDC suppliers in the sample, not one exports ICT goods and, *i.e.* intermediate inputs or final products. On the other hand, 7 suppliers export computer services and 4 design services among others. This illustrates well the point that it can be easier for companies in LDCs to join value chains providing ICT services rather than producing ICT goods as scale economies, transport infrastructure and access to finance are less of lesser importance for services than for goods production.



# AID FOR TRADE AND VALUE CHAINS IN INFORMATION AND COMMUNICATION TECHNOLOGY

The study highlighted that ICT manufacturing is highly fragmented internationally with value chains mainly concentrated in “Factory Asia”. Barriers for developing country firms to enter, establish or move up ICT value chains are access to (trade) finance, the business and regulatory environment and customs procedures and delays. In addition, more ICT-related constraints are the lack of ICT skills in the labor force, telecommunications infrastructure and the regulation of telecommunications market. Given the “digital divide” between developed and developing countries and the importance of ICT for a country’s economic and social development, aid for trade could play a prominent role in facilitating investments in ICT infrastructure, particularly for the “Least Connected Countries” and certain LDCs.

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3. ICT infrastructure and access
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*Annex A.* Country groupings by income and region

*Annex B.* Tables and figures

*Annex C.* The private sector questionnaire