How Joining the Information Technology Agreement Spurs Growth in Developing Nations

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By reducing costs, the ITA leads to increased use of ICT goods, which spurs productivity and economic growth in signatory nations, while deepening their enterprises' participation in global value chains.

Implemented in 1996, the Information Technology Agreement (ITA) has played a pivotal role in facilitating global trade in information and communications technology (ICT) products. Under the ITA, 82 signatory countries have agreed to fully eliminate tariffs on hundreds of ICT products. By reducing their costs, the ITA leads to increased use of ICT goods, which spurs productivity and economic growth in signatory nations, while deepening their enterprises' participation in global value chains (GVCs) for the production of ICT goods and services. Recognizing these benefits, 53 nations agreed in December 2015 to reduce tariffs on an additional 201 ICT tariff lines (including hundreds of products, parts, and components) as part of an expanded list of goods covered by the ITA. Yet, despite its proven benefits, some developing countries have remained on the sidelines of the initial ITA and its recent expansion. In this report, ITIF analyzes the effects of six developing nations—Argentina, Cambodia, Chile, Kenya, Pakistan, and South Africa—joining the original ITA as well as its recent expansion. It finds that doing so will boost economic growth for each of these countries, while generating tax revenues from new economic growth in the 10th year following accession that more than offset tariff losses for two of the six nations, while recovering most tariff losses for another three.

EXECUTIVE SUMMARY

Participation in the ITA provides an opportunity for developing countries to reduce tariffs, thereby lowering the prices for, and expanding consumption of, productivity-enhancing ICTs, while deepening countries' participation in global value chains for the production of ICT goods and services. Moreover, joining the ITA can engender faster economic growth and higher living standards because it gives domestic businesses and households access to more affordable and higher-quality ICTs, which are the modern economy's chief drivers of productivity, innovation, and economic growth.

Table ES-1: Summary Economic Growth and Tax Revenue Impact of Countries' ITA Accession

	Argentina	Cambodia	Chile	Kenya	Pakistan	South Africa
ITA-Attributable GDP Growth (Year One)	0.17%	0.10%	0.02%	0.15%	0.14%	0.02%
ITA-Attributable GDP Growth (In Year 10)	1.52%	0.98%	0.23%	1.29%	1.30%	0.17%
ITA-Attributable Increase in GDP Output (In Year 10, US$ Millions)	$12,720	$320	$920	$1,410	$4,630	$770
Tax Revenue Gained as % Tariff Revenue Forgone (Year One)	43%	15%	31%	32%	29%	28%
Tariff Revenue Forgone (Year One, US$ Millions)	$430	$26	$65	$63	$173	$95
Tariff Revenue Forgone (In Year 10, US$ Millions)	$968	$105	$142	$127	$310	$166
Tax Revenue Gained (In Year 10, US$ Millions)	$1,291	$24	$94	$139	$231	$152
Tax Revenue Gained as % Tariff Revenue Forgone (In Year 10)	133%	23%	67%	109%	75%	92%

Total Revenue Gained as of Total Revenue Forgone (Over 10 Years)	106%	21%	55%	83%	58%	68%
Total Tariff Revenue Forgone (Over 10 Years, Cumulative US$ Millions)	$7,690	$720	$1,135	$1,047	$2,653	$1,435
Total Tax Revenue Gained (Over 10 Years, Cumulative US$ Millions)	$8,121	$153	$628	$871	$1,545	$983

This report finds that joining the ITA would boost economic growth for Argentina, Cambodia, Chile, Kenya, Pakistan, and South Africa, with some growth evident even in the first year post-accession, but much more over a 10-year period. Despite the concerns some have raised regarding lost tariff revenues resulting from ITA accession, the report finds that in the 10th year after ITA accession, two of the countries—Argentina and Kenya—would generate revenues from taxes in excess of tariffs forgone, while South Africa would come close and Chile and Pakistan would recover two-thirds to three-quarters of tariff revenue forgone. Table ES-1 summarizes key findings regarding the economic growth impact and tax revenue effects of these six nations joining the ITA. Bottom line, the growth and development benefits of joining the ITA over time far outweigh the short-term loss in tariff revenues that may occur.

Highlights of the report's findings include the following:

- ICTs are one of the most important drivers of economic growth in developing countries, and joining the ITA has a palpable impact on spurring the adoption and consumption of productivity-enhancing ICTs across all sectors of an economy.
- Already in the first year post-ITA accession, joining the ITA would generate positive economic growth for all countries studied.
- Over a 10-year period, joining the ITA would bolster Argentina's economic growth by an estimated 1.52 percent; Pakistan's by 1.30 percent; Kenya's by 1.29 percent; and Cambodia's by 0.98 percent.
- Chile and South Africa would realize positive economic impacts, but lower than for the other four countries. This is because these countries already have relatively low tariff rates on ITA-covered ICT products, due chiefly to their participation in free trade agreements (FTAs) with their largest trade partners in ICT goods, such as Chile's FTA with the United States.
- In the 10th year post-ITA accession, new tax revenues would allow Argentina to recover 133 percent of forgone tariff revenues it would have received in that 10th year,

while Kenya would recover 109 percent, South Africa 92 percent, Pakistan 75 percent, and Chile 67 percent. Cambodia would only recover 23 percent of forgone tariff revenues in year 10 (due in large part to its reliance on non-consumption taxes).

- When considered on a cumulative basis—that is, assessing the tariff revenues forgone versus the new tax revenues gained in each individual year and then summing them up—of the six study countries, only Argentina would fully overcome the gap between tariff revenues forgone and tax revenues collected over the full 10-year period, collecting an additional 6 percent above cumulative tariff revenues forgone. In total, Kenya would recover 83 percent of tariffs forgone during this period. However, the impact ITA accession would generate on a country's income profile in the 10th year post-ITA accession is much more indicative of the positive and enduring long-term impacts ITA accession can have on countries' finances.
- ITA accession makes countries more attractive locations for ICT goods and services producers and exporters. ITA membership sends a strong signal that these countries are open for trade and investment and can be used as a base of operations for global supply chains.
- ITA accession can bolster employment through a number of channels, including the following: 1) by making the country a more attractive location for ICT goods production; 2) by expanding a country's participation in specific tasks within global value chains for ICT production (e.g., testing ICT products or conducting final packaging or assembly; 3) by enabling countries' ICT services industries (e.g., mobile applications development or business-process outsourcing) to grow by helping make them more competitive and innovative; 4) by making a countries' goods exporters—whether they produce ICT components or end products, or leverage ICT components as inputs to produce other manufactured goods, such as automobiles or household appliances—more globally competitive; and 5) even just by reducing the costs enterprises have to pay for ICT goods, meaning they can invest more resources in hiring workers to more productively grow their own businesses.
- ITA accession matters not just to companies in a country's ICT goods- and services-producing sectors, but to all enterprises and industries that leverage ICTs and use them to digitalize their businesses and operations.

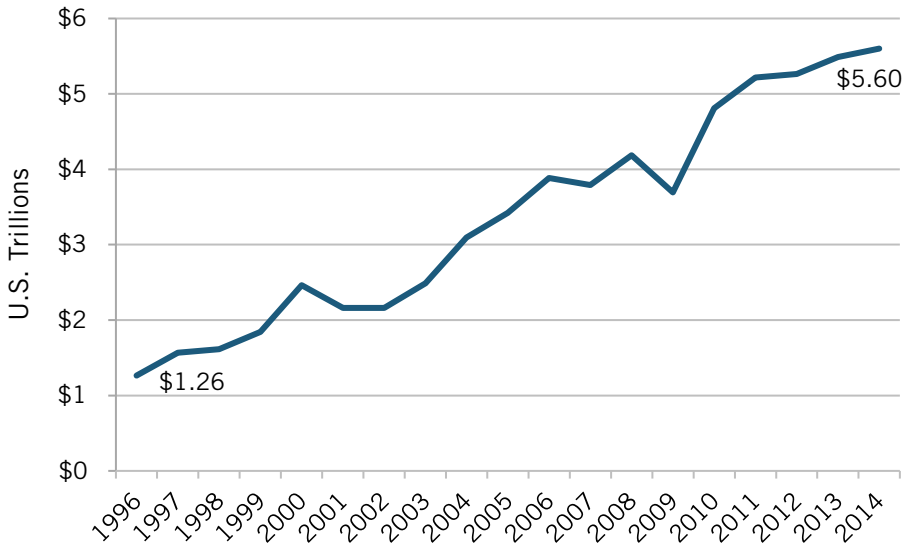
INTRODUCTION

In December 1996, 29 World Trade Organization (WTO) member nations launched the ITA, a novel trade agreement in which participating nations completely removed tariffs on eight categories of information and communications technology products (such as semiconductors, computers, and telecommunications equipment). In 2012, owing to the tremendous success of the ITA, member nations started negotiations toward expanding the ITA to add innovative ICT products commercialized since 1996 as well as some categories of ICTs not included in the original agreement. ITA expansion negotiations concluded in December 2015, and additional tariff eliminations began on July 1, 2016.[1] The expansion, which the WTO estimates will eliminate tariffs on an additional $1.3 trillion in annual global trade of ICT parts and products, represented the first major tariff-cutting deal completed at the WTO in 19 years.[2]

The ITA has played a critical role in promoting ICT trade and investment, which in turn has driven innovation, boosted productivity, increased employment, accelerated economic growth, and produced prosperity for participating nations.

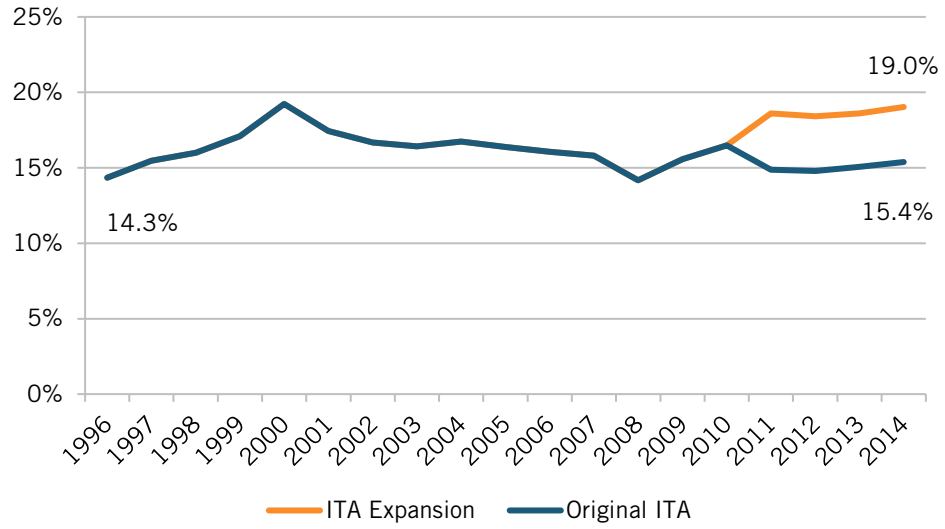
The ITA represents one of the most successful trade agreements the WTO has ever forged.[3] The ITA has played a powerful role in reshaping global trade since it first took effect 20 years ago by empowering the formation of efficient global ICT supply chains, thus enabling a shift from a linear, closed innovation model to an open innovation paradigm that relies on close collaboration among suppliers, network partners, and customers to bring breakthrough ICT products to market.[4] In 1996, global, two-way ITA trade (the sum total of imports and exports) amounted to $1.26 trillion. This figure more than quadrupled by 2014, with global trade in products under the original ITA reaching $5.6 trillion (figure 1). In fact, since 1996, trade in ITA products has grown by an average of 9.3 percent per annum, faster than the average growth of general global trade by half a percentage point. If including products covered by the ITA expansion, global two-way trade in ITA products amounted to $6.9 trillion in 2014. And, as figure 2 illustrates, post-ITA expansion, the share of ITA-covered ICT products as a percentage of global trade has grown from 14.3 percent in 1996 to 19.0 percent in 2014.

Figure 1: Value of Two-Way Global Trade in ITA Products, US$ Trillions, 1996–2014[5]



ICTs' growing share in global trade reflects not only how ICTs are now the global economy's most significant driver of growth (as elaborated upon shortly), but also the fact that prices for ICT products themselves have declined sharply. Prices have fallen due to two principal factors: 1) the economics of ICT products, and 2) the effects of the ITA itself. First, a significant decrease in ICT prices (i.e., Moore's Law and its implication of computer power doubling every two years for roughly the same cost) over the past two decades has made investing in ICTs much more affordable.[6] (For example, ICT capital prices decreased an annual average of 11 percent between 2004 and 2014, while non-ICT capital prices increased an annual average of 2 percent between 1990 and 2007.)[7] Second, the ITA has reduced prices for ICTs internationally, while breaking down barriers to greater trade in ICT goods. Put simply, the ITA has played a critical role in promoting ICT trade and investment, which in turn has driven innovation, boosted productivity, accelerated economic growth, increased jobs, and produced prosperity for participating nations.

Figure 2: Global Trade Share of ITA Products, 1996–2014[8]



The ITA promotes ICT goods trade principally by eliminating tariffs. Every country—even those that haven't joined the ITA—benefits from these cuts, because the ITA operates according to the most-favored nation (MFN) principle. Whether countries apply tariffs as a source of tax revenue or to protect domestic producers from foreign competition (e.g., in an effort to spur consumption of domestically produced goods), their effect is to artificially increase the prices of imported goods. Yet this harms both the consumers of imported final ICT products (businesses as well as citizens) in addition to domestic producers who rely on imports of intermediate ICT parts and components (e.g., semiconductors or circuit boards) as inputs for complex manufactured goods, such as mobile devices, automobiles, airplanes, and appliances. For domestic consumers of such finished manufactured goods, tariffs on ICTs only have the effect of raising their price; for a country's manufacturers who want to sell such products on international markets, tariffs on ICTs make their downstream goods

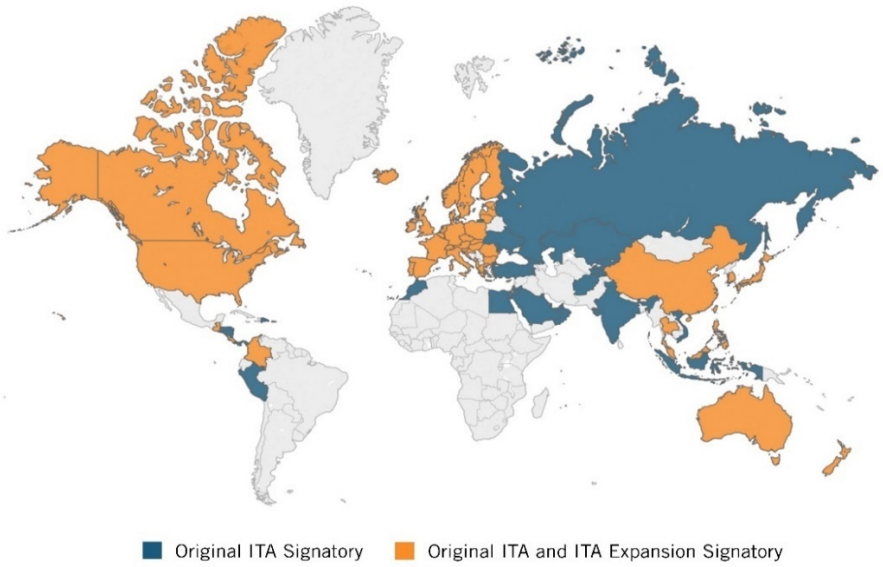
more expensive, and thus the manufacturers themselves less competitive in international markets.

The ITA's use of the MFN principle means that an ITA-signatory country must afford duty-free treatment to incoming ITA-covered ICT products whether they come from a country that is itself an ITA signatory or not. While it may seem that this creates an opportunity for "free riding" on the part of non-ITA-member countries—i.e., their exports of ITA-covered ICT products receive duty-free treatment in ITA-member countries without the country itself having to sign onto the ITA—this is not the case, for two reasons. First, countries not joining the ITA harm themselves by retaining tariffs that add to the cost of key productivity- and innovation-enhancing ICT products, thus constraining their consumption and adoption. Second, as noted, those tariffs only serve to diminish the competitiveness of a countries' goods that depend on intermediate ICT inputs.

Failure to join the ITA harms both business and citizen consumers of ICT products as well as enterprises that rely on imported ICT components as intermediate inputs to final products.

This report focuses on a small sample of countries that have not signed up to the ITA nor its expansion, as these countries are ones missing out on the sizable opportunities for economic development through increased ICT adoption that ITA participation can engender. Of secondary importance are the 29 countries (53 countries have signed up to both) that signed the original ITA but not the expanded ITA, as these countries at least have the original ITA in place. Figure 3 maps current ITA signatories; greyed out countries are not ITA signatories. (For a full list of original ITA and ITA expansion signatories, see Appendix A.) ITA member countries' trade in ITA-covered ICT products now accounts for more than 97 percent of world trade in those ICT products.[9]

Figure 3: Original ITA and ITA Expansion Signatories[10]



This report demonstrates that countries can realize significant economic benefits from joining the ITA. By eliminating tariffs on ITA-covered products, a country reduces the effective price that its businesses and citizens pay for these transformative technologies. In

doing so, consumers—whether businesses or households—gain access to a more affordable, more diverse, and more powerful and capable range of ICT products.[11] And, crucially, because ICT products are price elastic—meaning that a small price decrease will cause a much larger increase in consumption—eliminating tariffs will boost demand, generating productivity effects that ripple across all levels of an economy—including households, enterprises, and governments—which together aggregate to produce overall productivity growth, and thus economic growth, for a country's economy.

Despite this, some developing countries have refrained from joining both the ITA and its recent expansion, usually for one of two reasons: 1) concerns over the loss of tariff income, which may comprise a sizable portion of government tax revenue, and 2) concerns that tariff elimination may threaten domestic ICT industries. Unfortunately, these two concerns display a short-termism that limits long-term economic growth in such countries. Regarding the first concern, the second-order effect from eliminating ICT tariffs is to increase ICT adoption, in turn boosting productivity and economic growth, in turn leading to increased tax revenues. On the second point, the experience of countries such as Argentina that have imposed extremely high tariffs on ICT imports (e.g., up to 35 percent tariffs on computers and tablets) demonstrates that such tariffs chiefly serve to shield an uncompetitive domestic ICT production sector while harming all sectors of an economy that depend upon ICTs. As *CNN* notes, "Argentina's tariff went so badly that the government is ending it starting next year."[12]

It's also important to highlight the fallacy at the heart of the concern over lost tariff revenue. Whatever revenues a government "forsakes" in tariff revenue is not "lost" to the economy.[13] Rather, tariffs simply represent a transfer payment. The "revenue losses" to a government are actually gains for a nation's taxpayers, who are better off because they are enjoying cheaper products. If a country keeps tariffs on incoming ICT products, the government may collect more revenue (at least in the short run), but the country's businesses and consumers will pay higher prices. Conversely, every peso, shilling, rand, riel, or rupee a government no longer collects from tariffs on ICT products that come under ITA coverage flows through to the benefit of the countries' citizens and enterprises consuming those products.[14]

This report proceeds by analyzing the mechanisms through which ICTs drive economic growth. It then documents the specific benefits ITA accession can produce for developing countries, such as deepening their participation in global value chains for the production and export of ICT products and bolstering their ICT-services producing sectors. The report then turns to connecting the effects of ICT tariff elimination (e.g., via ITA accession) to economic growth and, ultimately, tax revenues that mostly offset tariff losses for at least five of the six study countries: Argentina, Chile, Kenya, Pakistan, and South Africa.

HOW ICTS DRIVE ECONOMIC GROWTH

Increasing productivity—that is, economic output per unit of input, whether that input is capital, labor, or technology—is the principal way economies grow over time.[15] Those productivity gains can come from all enterprises in an economy (e.g., banks, farms, manufacturers) becoming more productive or from economies shifting the mix of enterprises in their economy (e.g., replacing lower-value-added sectors with higher-value-added ones, such as replacing call centers with ICT services providers).[16] While both mechanisms are important, as the McKinsey Global Institute finds in the report "How to Compete and Grow: A Sector Guide to Policy," the overwhelming source of a country's productivity growth, and thus economic growth, comes from bolstering the productivity of all the enterprises and industries that already predominantly comprise an economy.[17]

Every peso, shilling, rand, riel, or rupee a government no longer collects from tariffs on ICT products that come under ITA coverage flows through to the benefit of the countries' citizens or enterprises consuming those ICT products.

And the principal way economies can increase their productivity arises from leveraging the power of ICTs. ICTs are such powerful tools precisely because they represent a general-purpose technology that enhances the productivity and innovative capacity of every individual, enterprise, and industry throughout an economy—something that holds true for developed and developing countries alike.

Indeed, ICT represents "super capital" that has a much larger impact on productivity than other forms of capital. As research performed in 2011 by Oxford Economics confirms, ICT generates a bigger return to productivity growth than most other forms of capital investment.[18] For instance, ICT capital has a three to seven times greater impact on firm productivity than non-ICT capital. ICT workers also contribute three to five times more productivity than non-ICT workers.[19] As Ahmed and Ridzuan explain this dynamic in their report, "The Impact of ICT on East Asian Economic Growth," "The ICT revolution has contributed significantly to the whole economy by raising productivity. First, ICT increases labor productivity in ICT-using industries by making labor produce more or work more efficiently. Second, ICT makes physical capital become more productive."[20] As a result, revenue collection by nations that tax this "super capital" is particularly damaging.

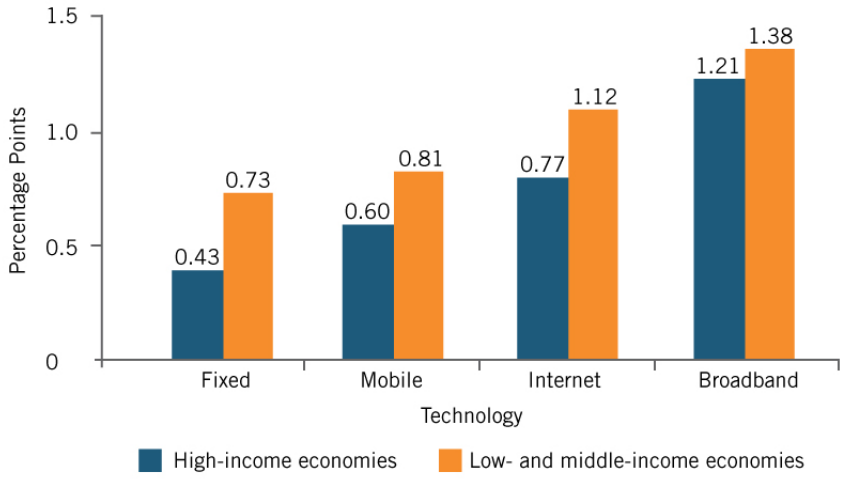
It's vital to emphasize that the central way ICTs drive a country's economic growth is not through the production of ICT goods (e.g., manufacturing computers or smartphones). Rather, the vast majority of the economic benefits in developing countries—more than 90 percent—stem from greater adoption of ICTs across an economy, while less than 10 percent of the benefits stem from ICT production.[21] Ultimately, ICTs' productivity-enhancing and innovation-enabling benefits at the individual, firm, and industry level aggregate to drive productivity and economic growth at an economy level.[22]

This explains why multiple academic studies have found strong linkages between ICT consumption (i.e., usage) and economic growth in developing countries. For example, a December 2010 World Bank report, "Kenya Economic Update," found that "ICT has been the main driver of Kenya's economic growth over the last decade."[23] Specifically, the report found that ICTs were responsible for roughly one-quarter of Kenya's GDP growth during the 2000s. Moreover, ICTs' contribution to Kenyan economic growth has only

grown over time, with the ICT sector providing a more than six-times-greater contribution to Kenyan GDP in 2009 compared with 1999.[24] Similarly, ICTs accounted for 38 percent of Chinese total factor productivity (TFP) growth and as much as 21 percent of Chinese gross domestic product (GDP) growth from 1980 to 2001.[25] Likewise, Ahmed and Ridzuan further find "a positive contribution of ICT to economic growth" across eight East Asian countries: China, Japan, Korea, Indonesia, Malaysia, Philippines, Singapore, and Thailand.[26] As Richard Heeks, professor of development informatics at the University of Manchester estimates, "ICTs will have contributed something like one-quarter of GDP growth in many developing countries during the first decade of the 21st century."[27]

Indeed, as Farhadi, Ismail, and Fooladi write in their report, "Information and Communication Technology Use and Economic Growth," "The more a country use[s] ICT, the greater is its economic growth."[28] The authors find that if countries improve their score on the "ICT Use Index" (which measures a country's number of Internet users, fixed broadband Internet subscribers, and the number of mobile-phone subscriptions per 100 inhabitants), then their economic growth increases by 0.17 percent.[29] The World Bank has likewise documented this effect. As figure 4 shows, the World Bank has found that a 10-percent increase in high-speed broadband Internet penetration adds 1.38 percent to annual per-capita GDP growth in developing countries. Likewise, a 10 percent increase in mobile-phone penetration adds 0.81 percent to annual per-capita GDP growth in developing countries.[30] More recently, studies have found that a 10-percent increase in mobile-device penetration increases productivity by 4.2 percentage points.[31]

Figure 4: Impact of a 10-Percent Increase in Penetration of Key ICTs on Annual Percent GDP Growth[32]



Despite this impressive body of evidence documenting the powerful impact of ICTs on economic growth in developing countries, some skeptics have questioned the extent to which ICT adoption can increase economic growth in such nations, arguing that developing countries may lack human capital, governance, or other ICT-complementary factors or that their labor-to-capital cost ratio is too low, making it less economical to add

ICT capital.[33] And some research conducted during the late 1990s and early 2000s did appear to suggest as much, or at least that ICTs' benefits were greater in developed economies. For instance, in 2004, economist Khuong Vu, in analyzing economic growth data between 1990 and 2000, suggested that, "the results indicate that ICT plays a more important role in determining the output growth for the developed economies than for the developing ones."[34]

It may well have been the case that developed countries realized higher rates of return from ICT investments than did developing countries in the 1990s. But that is clearly no longer true. Analyzing ICT investments and economic growth from 1995 to 2010 for 59 countries across various stages of development, economist Thomas Niebel concluded that, "the regressions for the subsamples of developing, emerging, and developed countries do not reveal a statistically significant difference of the output elasticity of ICT between these three country groups."[35] Niebel's estimates indicate that, on average, regardless of a country's development status, a 1 percent increase in ICT investment increases economic growth by 0.05 to 0.09 percent annually.[36] And, in fact, it appears that ICT investments generate higher returns now than ever before. In analyzing 29 economic studies that isolate the rate of returns to ICT investment, Cardona, Kretschmer, and Strobel find that "ordering the studies by their average year of the data used for the estimation, we find a positive time trend."[37] Further evidence supports the contention that, going forward, developing countries stand to gain even more from adopting greater levels of ICTs than do developed countries. For example, as the European Commission finds, developing nations' investments in telecommunications infrastructure are 10 to 40 percent more effective in generating economic growth than similar investments made by developed countries.[38]

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Put simply, a growing body of evidence documents the positive effects ICTs have on economic growth for developed and developing countries alike. Summarizing 58 empirical studies that estimate the economic impact of ICTs, Stanley, Doucouliagos, and Steel find that, "on average, these technologies [ICTs] have contributed positively to growth."[39] In terms of the magnitude that ICTs spur economic growth, a review of econometric literature by Cardona, Kretschmer, and Strobel finds that, on average, an increase in ICT capital stock of 1 percent leads to a 0.06 percent increase in a country's GDP.[40]

HOW ITA PARTICIPATION BENEFITS DEVELOPING COUNTRIES

The ITA has benefitted developing countries considerably.[41] By 2010, developing countries accounted for 64 percent of global exports of ICT products.[42] As Xiaobing Tang, a Counsellor in the Market Access Division of the WTO notes, the experiences of ASEAN [Association of Southeast Asian Nations] countries such as Malaysia and Thailand "show that the ITA has helped their development and economic growth."[43] ITA participation benefits developing countries in three principal ways, including by: 1) lowering costs for and thus spurring adoption of productivity-enhancing ICTs, which boosts the productivity, innovative, and competitive capacity of a country's enterprises and industries (which further creates new job opportunities); 2) deepening developing countries'

participation in global value chains; and 3) boosting exports of ICT goods and ICT services.

Promoting the Diffusion of Affordable ICTs Vital to Boosting the Productivity, Innovative, and Competitive Capacity of Domestic Enterprises

As noted, by eliminating ICT tariffs, ITA accession lowers prices for ICTs, which disproportionately raises demand for these productivity- and innovation-empowering capital goods.[44] Indeed, ICT goods are highly price elastic, meaning that a one percentage point decrease in price leads to a more than one percentage point increase in ICT adoption. In fact, economists estimate that a 1 percent decrease in the price of ICT products can lead to a 1.3 percent increase in demand for those products.[45] Accordingly, eliminating tariffs on imports of ICT products can have a powerful impact on increasing their adoption, thus deepening the extent of a nation's ICT capital stock, which in turn generates increased economic growth.

But it's not just that the demand for ICT products is price elastic; it's also income elastic, meaning that a 1 percent increase in income leads to an increase greater than 1 percent in demand for ICT products.[46] In other words, demand for ICT products grows disproportionately when an economy grows and when prices for such products fall. Thus, as an economy grows, it engenders a virtuous cycle whereby the prices of ICT products fall and ICTs become more easily available, including for additional sectors of the economy, not to mention individuals, all eager to realize the productivity gains associated with their use.[47]

Furthermore, the economic benefits a country experiences intensify with ever-higher levels of ICT investment. When industries are first exposed to ICT technologies, they make limited improvements in productivity by automating basic functions. The true gains ICTs enable occur subsequently, when companies use the new technology to expand into new markets and transform how they compete.[48] Thus, ICT serves as a foundational investment that is complementary to further investment and serves as a springboard for further growth.[49] Indeed, robust ICT investment has been shown to lead to substantial growth in labor productivity. For example, in a study focused on South Korea, Jung, Na, and Yoon showed that ICT investment, particularly in software, contributed to productivity gains in both ICT and non-ICT industries and that these improvements increased over time.[50] Further, Liu and Nath have shown that ICT investment and the diffusion of Internet access across a population raises an emerging market economy's volume of international trade and leads to a larger share of total export goods compared to total imports.[51]

Indeed, throughout the developing world, robust evidence demonstrates that greater ICT usage supports higher sales, productivity, and even employment at the enterprise-level. In general, developing-country small- and medium-sized enterprises (SMEs) experience a 10-percent productivity boost from Internet usage.[52] In Chile, firms with greater ICT use achieved total factor productivity 40 percent higher than firms with lower ICT use.[53] In Vietnam, firms using e-commerce enjoy total factor productivity growth 3.6 percentage

points higher on average than firms that do not use it.[54] Likewise, Ahmed finds that the use of ICTs in Malaysia has had the largest impact on increasing manufacturing productivity, greater even than human capital.[55] Aggregating such analyses, a 2007 World Bank survey of over 20,000 businesses in low- and-middle income countries found that firms using more ICT experience greater sales, employment growth, and higher productivity.[56] Specifically, the report found that ICT-enabled firms in developing countries were twice as profitable, 65 percent more productive, and boosting employment 25 percent faster than firms that did not adopt ICTs. Likewise, a study of six West African countries found that approximately 40 percent of their increase in total factor productivity growth was attributable to ICT-related growth.[57] So whether it comes to computers, servers, mobile devices, or componentry for the data centers and telecommunications networks that underlie enterprises' ability to engage in e-commerce, create websites, or operate their businesses digitally, the ITA has played a key role in lowering prices for the ICT hardware, platforms, systems, and devices that underpin the digital revolution. In other words, the ITA supports the ICT hardware on which the global digital economy now runs.

ICTs will have contributed something like one-quarter of GDP growth in many developing countries during the first decade of the 21st century.

And the ITA's role in lowering prices for those ICT tools can be significant. Consider Argentina. In 2015, Argentineans paid 123 percent more for a basket of ICT products than did consumers in the European Union, in large part a result of the high taxes and tariffs Argentina imposes on imported ICT products.[58] As *The Economist* notes, "It can be cheaper [for Argentineans] to fly to New York and buy a phone than to get the same device in Buenos Aires."[59] In fact, an iPad Mini 4 costs more than twice as much in Argentina ($1,260) than it does in Chile ($640).[60] As of March 2017, a smartphone cost 109 percent more in Argentina than in the United States and a notebook computer 104 percent more.[61] Even Chilean consumers paid 33 percent more, and Mexican consumers 25 percent more, than their counterparts in Europe for the very same ICT products. In contrast, Colombian consumers paid only 10 percent more, in part a result of the country's recent accession to the ITA. But back to Argentina: On average, as of December 2015, Argentinean consumers paid 163 percent more for smartphones than their European peers, despite the fact that smartphones aren't luxury products, such as Rolexes, but a key productivity tool for businesses and citizens alike.

Cheaper ICT imports also drive productivity and economic growth through heightened competition, which benefits firms in all sectors. As Newman, Rand, and Tarp find in their paper, "Imports, Supply Chains, and Firm Productivity," which considers firm-level data on over 20,000 manufacturing firms in Vietnam, "foreign competition-induced gains from trade spill-over to downstream sectors through the domestic supply chain. We find that all downstream firms experience productivity gains through this channel, not just those that import intermediates."[62] Their findings suggest that "ignoring the gains from trade through the supply chain may significantly underestimate the impact of trade on the productivity of domestic firms ... and that ... the gains from trade may in fact be much larger than previous empirical studies have estimated."[63] In other words, increased imports enhance competitive pressures that compel enterprises throughout a supply chain to become more productive.

But not only are ICTs the modern economy's biggest enablers of productivity growth, they are also fundamental to driving innovation. For context, one study (though of European firms that identified themselves as "active innovators") found that ICTs were responsible for enabling 50 percent of those firms' product innovations and 75 percent of their process innovations.[64] But this comes as no surprise to the developing world. M-PESA has transformed mobile banking in Africa. In Kenya, the Apps for Africa award-winning M-Farm, a transparency tool for Kenyan farmers, enables them to use their mobile phones' SMS feature to retrieve information about the real-time retail price of their products and to find buyers for their produce.[65] A recent article in *The Economist,* "Tablet Teachers," explained how "tablets and other digital devices may soon be the rule in African schools," noting that they have already demonstrated measurable improvement in students' skills from Ethiopia to Ghana.[66] In short, mobile technologies have become platforms for innovation, and increased ITA participation by developing countries could play an important role in furthering their diffusion throughout the developing world.

Deepening Developing Countries' Participation in Global Value Chains

Keeping ICT prices low is paramount if countries wish to participate in global value chains for the production of ICT parts, components, and final products. In contrast, maintaining high ICT tariffs (in part by not joining the ITA) harms both developing countries' ICT-producing and ICT-consuming sectors.[67] In particular, failure to join the ITA has caused nations to be left out of global production networks for ICT products, causing them to miss out on tremendous growth opportunities.

To elaborate, in the 1970s, and with renewed yet misguided vigor over the past 10 years, countries such as Argentina, Brazil, India, and Malaysia have experimented with import substitution industrialization (ISI) policies that imposed high tariffs (among other trade barriers) on imported ICT products in an effort to spur development of their own nascent ICT-producing industries. Yet in the interest of favoring one sector—ICT producers, these policies have had the unintended effect of harming the entire economy, as enterprises (large and small alike) in other industries—from finance and education to hospitality, health, and retail—are forced to use fewer, inferior, or more expensive ICT products, thus hampering their own productivity, innovation potential, and global competitiveness. What's worse, high tariffs have proven largely ineffectual at achieving these countries' aim of spurring the development of indigenous ICT-producing sectors. By being shielded from best-of-breed international competitors, domestic firms lack a vital impetus for innovation that competition engenders. For instance, small business owners in Argentina have complained about the country's high ICT tariffs, noting that, "[T]he lack of competition gives manufacturers an incentive to produce low-quality products and charge high prices."[68]

Further, high ICT tariffs have precluded many ICT-producing enterprises from effectively participating in global value chains for the production of ICT products. Because of the interlinkage of global supply chains, manufacturers scour the globe searching for the highest-quality and most cost-competitive production locations. This means that global production networks consist of highly fragmented but specialized units of production,

predicated on countries being open to trade. To illustrate, in 1962, intermediate goods accounted for 30 percent of total trade within the same industry globally; this percentage doubled to 60 percent by 2006.[69] Countries imposing high tariffs on ICT parts and products only make themselves unattractive to multinational enterprises wishing to seamlessly integrate into global supply chains. This explains why the Organization for Economic Cooperation and Development (OECD) has found that countries not participating in the ITA saw their participation in global ICT value chains decline by more than 60 percent from 1995 (two years before the ITA went into effect) to 2009, as figure 5 shows.[70] Brazil provides a good example: Brazilian innovation in ICTs has lagged that of the rest of the world primarily because the country hasn't been involved in global value chains and has enjoyed limited market-based technology and skills transfer in the ICT sector. Put simply, if countries wish to participate in global value chains for ICT products, they have to remove the barriers. As the OECD's "Measuring Trade in Value Added" research finds:

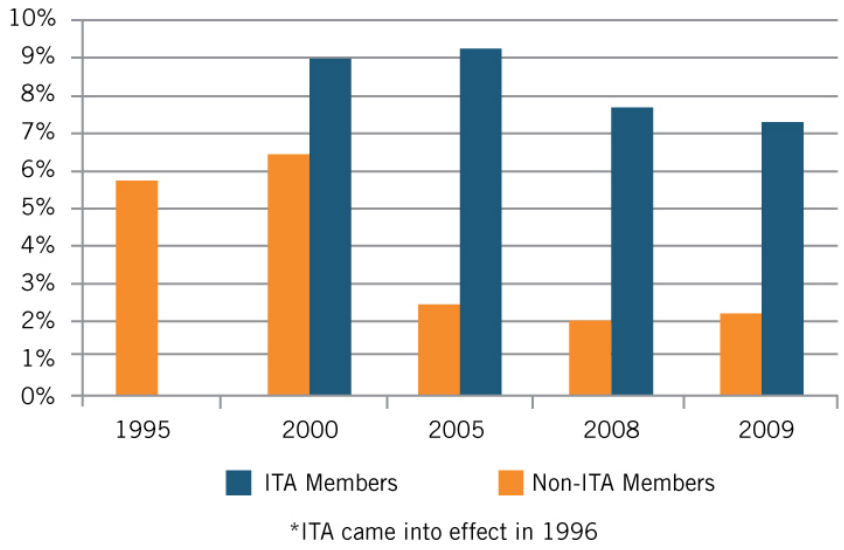
Cardona, Kretschmer, and Strobel find that, across 29 econometric analyses, an increase in ICT capital stock of 1 percent leads to an average 0.06 percent increase in GDP.

> The growing fragmentation of production across borders has important policy implications. It highlights the need for countries wanting to reap the gains from value chain participation to have open, predictable and transparent trade and investment regimes as tariffs and other unnecessarily restrictive non-tariff measures impact foreign suppliers, international investors, and domestic producers.[71]

It's also important to note that it's not just about producing final goods; countries can derive significant value-added from the production of intermediate inputs. A "zero-in; zero-out" tariff environment can help countries attract production for a wide range of goods, and over time, as countries' enterprises and their employees develop knowledge, skills, and relationships with international partners, they can move up the value chain to the production of higher-value-added goods.

But the message is clear: Countries that don't participate in open, cross-border flows of ICT products (whether by imposing high tariffs on ICTs or other restrictive measures such as localization barriers to trade) only end up excising themselves from global value chains and production networks for ICT products—and services.[72]

Figure 5: ITA Membership and Participation in IT GVCs (Participation Index in % of Gross Exports)[73]

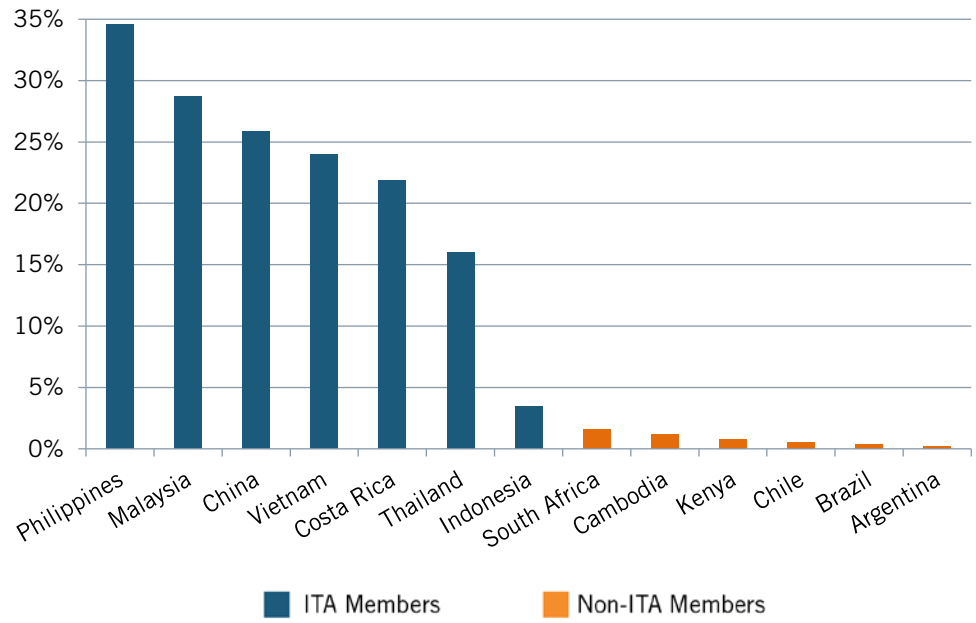


Boosting Developing Countries' Exports of ICT Goods and Services

The ITA has helped boost developing countries' levels of exports of ICT products. From 1996 to 2008, developing-country ITA exports expanded at an annual rate of 33.6 percent, compared with 7.2 percent for developed countries.[74] And the evidence shows that countries that have systematically reduced barriers to trade in ICT goods—including by eliminating tariffs, embracing trade facilitation, and eschewing other nontariff barriers such as localization requirements—have experienced increased ICT goods exports, both as a share of their total goods exports and in absolute value terms.

Figure 6, which shows developing countries' ICT goods exports as a share of total goods exports in 2014, renders these effects starkly clear. ICT goods exports as a share of total goods exports are consistently and significantly higher in ITA-member than in non-ITA member countries. ICT goods exports account for almost 35 percent of the Philippines's goods exports, 29 percent of Malaysia's, 26 percent of China's, 24 percent of Vietnam's, and 22 percent of Costa Rica's. In contrast, ICT goods exports account for less than 2 percent of total goods exports for all non-ITA members, as shown in figure 6, including South Africa, Cambodia, Kenya, Chile, Brazil, and Argentina (not coincidentally, five of the six countries included in this study).

Figure 6: Developing Country ICT Goods Exports as Share of Total Goods Exports, 2014[75]



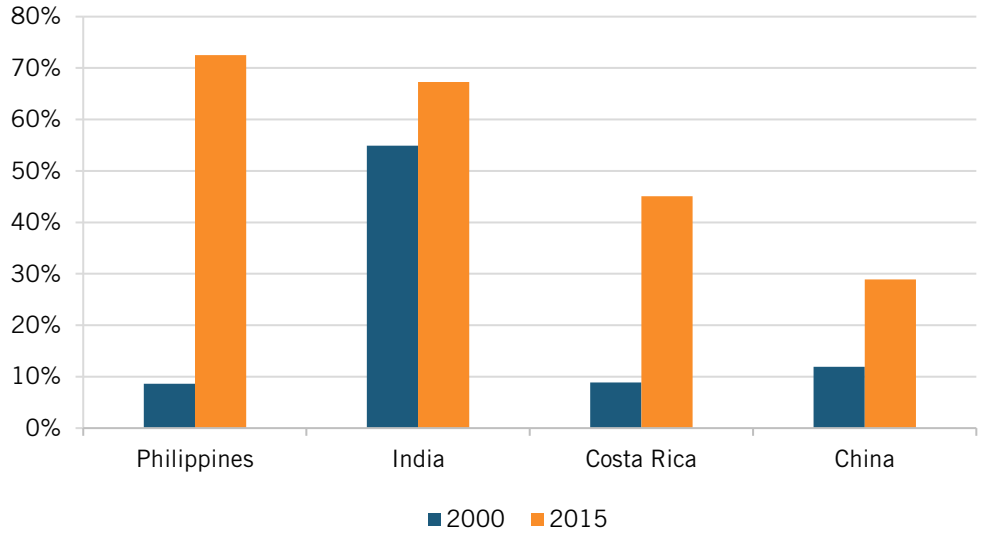
ICT products are price elastic—meaning that even a one percentage point decrease in prices leads to a more than one percentage point increase in ICT adoption.

And it's not that the first seven countries listed in figure 6 are in the ITA because they are strong ICT goods exporters; they are robust ICT goods exporters in large part because they have become members of the ITA. Of course, ITA membership alone is not enough; membership must also be complemented with strong innovation and foreign direct investment (FDI) policies. Costa Rica provides an illustrative example. Since it joined the ITA in 1997, Costa Rica has implemented a number of policies to intentionally attract FDI targeting high-tech sectors, including the ICT sector. These policies have borne fruit, and Costa Rica is currently Latin America's largest high-tech exporter (in terms of exports per capita) and the world's fourth-most technology-intensive exporter per capita.[76] Costa Rica also enjoys the third most inbound foreign direct investment per capita. Multinationals in Costa Rica's high-tech sector pay wages 20 to 52 percent higher than local companies and generate $5 billion in annual exports, boosting Costa Rican living standards considerably.[77] As Tang notes, "Experience has also shown that for small economies who are participants to the ITA, they benefitted from the globalization of in the ICT sector."[78] It's a powerful example of what countries can achieve when they open their markets to both trade and foreign direct investment.

By contrast, Indonesia appears a laggard compared with other ITA-member ICT goods exporters shown in figure 6. Again, membership in the ITA is not a panacea; it must be complemented with other tech-sector trade liberalization policies as well as a welcoming environment for domestic and foreign investment. Membership is necessary but not sufficient for ICT industry success. Since 2012, Indonesia's Ministry of Communication and Informatics (MCI) has operated Regulation 82/2012, which includes requirements for source-code surrender as a condition of market access and a requirement for the local storage of data.[79] Moreover, in 2016, Indonesia introduced policies such as forced local

data-storage requirements for Internet-based, over-the-top content providers.[80] These types of forced localization policies counteract the positive benefits of ITA accession, and in part explain why Indonesia isn't enjoying a higher share of ICT goods exports.

Figure 7: Developing Country ICT Services Exports as Share of Total Services Exports, 2015[81]



Beyond ICT goods exports, a similar story plays out in ICT services, as figure 7 illustrates. Today, ICT services exports account for roughly 70 percent of the Philippines' and India's total services exports, almost 50 percent of Costa Rica's, and 30 percent of Indonesia's and Chile's. India's ICT services sector accounted for 7.5 percent of GDP in 2012, a significant increase from just 1.2 percent in 1998, shortly after India joined the ITA.[82] The Philippines, Costa Rica, and China have experienced significant increases in ICT services exports' share of total services exports since 2000, and part of the dynamic here is that ITA membership helped to lower prices for key ICT hardware inputs that ICT services enterprises depend upon, helping them to innovate and become more globally competitive.

In fact, it's actually a reluctance to embrace ICT imports and adoption that hurts an economy's ability to grow and create jobs. As described by the WTO, "open economies tend to grow faster and more steadily than closed economies and economic growth is an important factor in job creation. Profitable companies tend to hire more workers than those posting a loss."[83] This intertwined effect of trade, profitability, and employment growth is especially evident in firms in developing economies that adopt ICTs.

To the Information Technology and Innovation Foundation's (ITIF's) knowledge, only two comprehensive econometric studies have analyzed the trade-creation effects of the ITA. (See Appendix B for a more detailed discussion of findings from these two studies). Bora and Liu analyzed the imports of 217 countries from 1988 to 2003. Because the ITA took effect during this period, the study includes imports before and after a country entered the ITA. Their analysis finds that, specific to the average developing nation, joining the ITA increases trade by 13 percent.[84]

A more recent econometric study by Christian Henn and Arevik Gnutzmann-Mkrtchyan evaluates the economic impact of the ITA by assessing the exports and imports of 234 countries over the period 1996 to 2012. The authors find that joining the ITA leads to higher ITA exports on average, in large part through an increase in importing ITA intermediate goods. Henn and Gnutzmann-Mkrtchyan show the importance of the ITA in integrating developing countries into global supply chains, finding that, on average, ITA exports increase by 37 percent post-ITA implementation.[85] They further find that post-ITA-accession countries that experience sizable increases in ITA exports also tend to invest strongly in education, policies favorable toward conducting business, and efficient legal institutions.[86]

The ITA supports the ICT hardware on which the global digital economy now runs.

Importantly, the authors find that "reducing tariffs to zero may have an additional impact on imports beyond tariff reduction."[87] This means that fully eliminating tariffs has a tremendously powerful effect, much more than marginal tariff reductions. Eliminating tariffs creates a "commitment effect" that sends a signal to firms across all industries that a country provides a robust environment for both imports and exports. Without tariffs, firms can also be more confident in their production targets for long-run production, since they no longer have to factor in possible tariff cuts or hikes on ITA intermediate goods.

Finally, it's important to note that, in joining the ITA, both countries' ICT imports *and* exports tend to increase. For instance, Henn and Gnutzmann-Mkrtchyan estimate that joining the ITA increases a country's ICT imports by 21 to 30 percent.[88] This finding is not surprising; it's a fundamental characteristic of global production chains for ICT products, as imported ICT parts and components are regularly reassembled as part of value-added or final ICT exports. This is why four of the five largest importers of ICT products in the world—China, the United States, Hong Kong, and Singapore—actually account for four of the top five ICT exporters in the world. China provides a good example: More than half of the semiconductors brought into the Chinese market are used in products (whether ICT hardware such as mobile phones or tablets, or consumer products such as cars or appliances) that are exported.[89]

The point here is that an increase in ICT imports post-ITA-accession should not be viewed negatively (i.e., as harming budding ICT industries), because, for the vast majority of countries, imports go hand-in-hand with corresponding increases in ICT exports. If joining the ITA did indeed hurt nascent ICT industries more than aid them, economic evidence would show that ITA exports stagnate post-ITA accession, or, at best, grow at the same rate as imports. But, rather, ICT exports tend to grow faster than ICT imports post-ITA accession. In summary, the empirical results are quite clear: Developing countries, after dropping tariffs on ITA products, experienced a decrease in ICT prices for consumers and producers, adopted ICT products more readily, plugged domestic ICT industries into global ICT value chains, and expanded exports of ITA products. In other words, the econometric studies completed to date show that ITA membership delivers considerable benefits to developing countries, something further borne out in the analysis presented in the following section of this report.

OVERVIEW OF THE ICT ECONOMY IN STUDY COUNTRIES

Argentina

Argentina's ICT potential turned a corner with the election of President Mauricio Macri in 2015. President Macri introduced major economic policy reforms to normalize Argentina's economy given the expansionary macroeconomic policies, standoff over an international debt dispute, and market intervention that characterized his predecessor, Cristina Kirchner. President Kirchner had enacted a range of tariffs, taxes, and restrictions on the ICT sector and related areas.[90] In contrast, the Macri government has recently announced it will reduce tariffs on some classes of ICT products. Specifically, Argentina's Commerce and Ministry of Production Secretary started conversations in 2016 to analyze the impacts of a tariff reduction on certain technology imports. In January 2017, Argentina's Ministry of Production officially announced that, as of April 2017, the import tariff on personal computers, notebooks, and tablets will be eliminated, and officials expect that the prices of these products could drop up to as much as 50 percent. Officials estimate that the tariff elimination will help to create more than 15,000 new jobs in three years related to commercial and repair activities and in other industries benefited by the access to cheaper ICTs. The estimates produced in this report on the economic impacts of an Argentinean accession to the ITA were completed before these anticipated unilateral tariff reductions.

Meanwhile, more and more Argentinians are involved in and connected to the digital economy. Argentina performs well in comparison with some regional neighbors on several measures of ICT penetration and use (such as mobile, fixed line, and broadband use); however, these rates can differ significantly between the different regions of Argentina.[91] Argentina's efforts to upgrade its ICT infrastructure include $1.8 billion to install 58,000 kilometers of fiber network to cover 97 percent of its population.[92] From 2006 to 2015, Internet participation increased from 21 percent to 70 percent.[93] Despite a high tax on mobile services and high tariffs on smartphones, smartphone connections have increased from 16 percent of all connections in 2012 to 40 percent in 2015.[94] Studies estimate that there are 33,250 jobs in Argentina's app-development economy, mostly in Buenos Aires.[95]

Cambodia

Cambodia is currently in the process of ICT technological leapfrogging, skipping past fixed-line telephony and traditional mass-media systems, where adoption rates remain stagnant. Instead, mobile and Internet subscriptions have surged.[96] In 2008, fewer than 10,000 Cambodians had Internet access; by 2014, 2.5 million Cambodians had home Internet subscriptions, while 2 million Cambodians accessed the Internet daily through their smartphones.[97] The agriculture sector has also been improved through greater ICT adoption. Oxfam has provided female farmers with mobile phones, arming them with real-time market information, better enabling them to time their harvests and receive competitive prices for their crops.[98] In 2014, the Korea International Cooperation Agency and Cambodia's Ministry of Posts and Telecommunications

launched the "Cambodia ICT Masterplan 2020" to continue developing the country's ICT sector.[99]

Chile

Chile has one of the most modernized telecommunications sectors in Latin America. Chile has updated its original "2020 Digital Agenda," launched by President Michelle Bachelet in 2014, to reflect its approach to developing its ICT economy. The Agenda sets several ambitious goals, such as reaching 90 percent of homes with broadband and 20 percent with fiber optic cable, for 90 percent of subnational governments to have public Wi-Fi areas, to have an average Internet access speed of 10 MPBS, and for all 100 public schools to have a broadband connection. Current investments designed to increase LTE mobile spectrum and fiber network coverage are already more than $100 million.[100] Because of such investments, Chileans enjoy average Internet speeds of 9.3 MPBS for fixed lines and 1 MPBS for mobile connections. Certain regions of the country also enjoy free Wi-Fi access.[101] Chile has allocated $40 million toward a start-up program to attract entrepreneurs from around the world to position Santiago as the innovation and entrepreneurship hub of South America.[102] For the most part, Chile remains committed to integrating ICTs into its businesses and government operations: Its mining industry (a key sector of Chile's economy) taps into data analytics to increase efficiencies; its Ministry of Health is creating a nationwide database for patient data; and cities are improving traffic management with smart-city platforms.

Kenya

ICTs have made critical contributions to Kenyan economic growth. For instance, a December 2010 World Bank report, "Kenya Economic Update," found that "ICT has been the main driver of Kenya's economic growth over the last decade."[103] Specifically, the report found that ICTs were responsible for roughly one-quarter of Kenya's GDP growth during the 2000s. (Moreover, ICTs' contribution to Kenyan economic growth has only grown over time, with the ICT sector providing a more than six-times-greater contribution to Kenyan GDP in 2009 compared with 1999.)[104] Kenya Vision 2030 is the country's chief long-term development strategy from 2008 to 2030, which seeks to transform Kenya into a "newly industrializing, middle income, globally competitive and prosperous economy with a high quality of life by 2030." Kenya Vision 2030 increasingly calls on ICTs to help realize these goals, and the ITA can facilitate this effort, although it should be noted that Kenya would have to join the ITA as part of the East African Customs Union.

Kenya's app and mobile digital economy are world renown. Internet and broadband penetration rates increased from 38.3 percent and 9.9 percent in 2014 to 54.2 percent and 16.4 percent in 2015, respectively. Mobile-phone subscriptions increased from 78.3 percent in 2014 to 85.4 percent in 2015.[105] This partly explains why Kenya has become one of the world's foremost adopters of mobile-money and mobile-banking applications.[106] Approximately 93 percent of Kenya's adult population has registered for M-Pesa (Kenya's first mobile-money platform, launched in 2007), and mobile-money transactions total more than 20 percent of Kenya's GDP.[107]

Pakistan

ICT production contributes 4.4 percent of gross value-added to Pakistan's economy and accounts for 2 percent of the country's workforce.[108] Pakistan's ICT sector is indeed growing, but it would be helped by broader broadband penetration across the country. In 2015, only 10.9 percent of citizens owned a smartphone, while mobile broadband penetration was only 14 percent.[109] A major part of Pakistan's effort to improve this is trying to ensure full telecommunication connectivity across the country by 2018, of which mobile broadband (4G/5G) will have to play a key role, given the rural and remote nature of many communities in Pakistan.[110] Further network connectivity will allow many Pakistanis, especially lower-income citizens in geographically remote regions, to gain access to banking services and credit through mobile-banking platforms. Indicative of the potential for a thriving app economy, Easypaisa (Pakistan's first mobile-banking platform, launched in 2009) has more than 21 million users and transacted $3 billion in 2014.[111]

South Africa

The ICT sector currently contributes 6 percent of South Africa's total GDP.[112] While South Africa's ICT sector has shown dynamic growth, particularly in the mobile sector, it lags in many other areas, such as broadband access and the cost of telecommunication services.[113] Indicative of its overall progress, South Africa jumped 10 places to 65th in the World Economic Forum's Network Readiness Index in 2016.[114] While South Africa's average broadband speed increased 25 percent in 2015, at 4.1 MPBS, it still lags the global average of 5.6 MPBS.[115] South Africa has long had relatively high broadband prices, but collaboration among government, industry, and research networks to increase broadband access have resulted in Internet prices decreasing to just 10 percent the level of three years ago.[116] Still, even as of May 2016, broadband costs are estimated at 15 to 20 percent of monthly household income, far above the global average of 5 percent.[117] From a policy perspective, in 2016, South Africa approved a *National Integrated Information and Communication Technologies Policy White Paper* as the basis for a holistic policy toward ICT out to 2030.[118]

ECONOMIC IMPACT OF DEVELOPING COUNTRIES' ITA ACCESSION

This report examines the economic impact of six countries—Argentina, Cambodia, Chile, Kenya, Pakistan, and South Africa—joining both the ITA-1 and ITA Expansion agreements. These countries were chosen because they are representative of developing nation peers in South America, Africa, and Southeast Asia that are seeing ICTs play a more significant role in driving economic growth and so stand to gain substantial benefits by taking the next step to eliminate tariffs across a broad range of ICT products.

This section proceeds by briefly describing the economic framework and methodology used in the analysis, by applying the model to estimate the anticipated 1-year and 10-year economic impacts of full ITA accession, and by then assessing the impact ITA accession will have on government revenues for these six countries.

Summary Explanation of Methodology and Data Sources

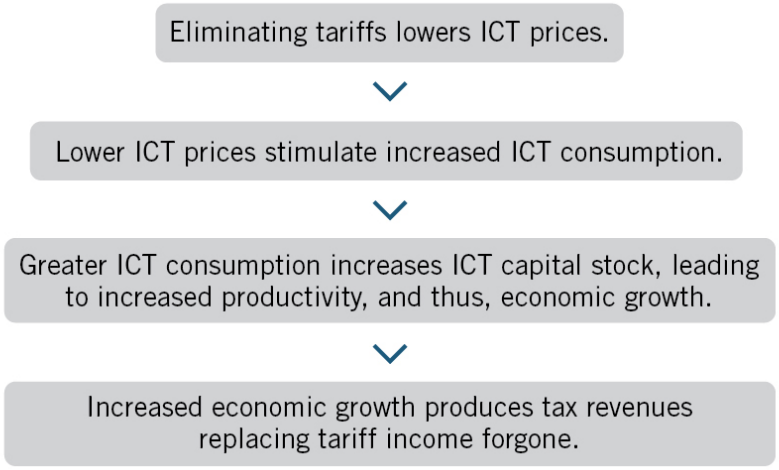
The following provides a very brief summary of the economic model that will be laid out in more detail over the following pages. Because most of the economic benefits produced by ICTs stem from their adoption (not their production), ITIF's analysis targets how the increase in ICT imports engendered through tariff elimination and lower prices would spur greater ICT adoption and economic growth.

The vast majority of the economic benefits from ICTs in developing countries, more than 90 percent, come from their use and adoption, not their production.

The analysis begins by identifying the effective tariff rates the six study countries currently apply (i.e., once their current FTA commitments are considered) to ITA-covered ICT products and by determining the current value of each countries' ITA imports on a trade-weighted basis (across all ICT products in the original and expanded ITA), which allows us to calculate the dollar value of tariff revenues countries would forgo by eliminating ICT tariffs. But, as noted previously, tariffs on ICT products effectively represent a transfer payment from ICT consumers (both businesses and citizens) to governments, and in the absence of those tariffs, the prices of ICT products could be expected to fall in the importing countries by a corresponding amount. Such a decrease in ICT prices should lead to an increase in ICT consumption, especially since, as noted, demand for ICT products is price elastic—meaning that a 1 percent decrease in ICT prices leads to a 1.3 percent increase in consumption.

Combining these concepts allows us to estimate the increase in ICT consumption in an economy that would result from tariff elimination as part of ITA accession. Over time, this increased ICT consumption leads to an increasing ICT capital stock in a country—and as noted that ICT capital stock would exert powerful effects, enabling domestic enterprises (private and public) to become more productive and innovative—thus raising a country's productivity and economic growth levels. This is why economists estimate that a 1 percent increase in ICT capital stock increases a country's GDP by approximately 0.06 percent per year. The study leverages this dynamic—while distinguishing and accounting for the fact that a certain percentage of the increased imports of ICT products would be for intermediate goods and thus be reexported, while others represent final goods that would remain in the domestic economy and boost its capital stock (and while also applying appropriate depreciation rates)—to calculate how increased ICT capital stocks engendered by ITA adoption would bolster countries' economic growth rates over 1- and 10-year periods. The study concludes by assessing the increased tax income (from a variety of sources) this increased economic growth could be expected to produce and comparing that to the amount of tariff revenue forgone. Appendix C contains a detailed elaboration on the primary data sources and the estimation methodology. Figure 8 graphically depicts the report's core analytical framework.

Figure 8: Graphical Depiction of Study's Conceptual Analytic Framework



Data for calculating trade in ITA goods comes from the United Nations Comtrade Database.[119] ITIF developed a list of commodity codes based on WTO documentation; a detailed listing of all 269 commodities can be found in Appendix D. Trade flows per country for the year 2014 were then estimated by identifying the relevant commodities covered under the ITA, and summing the value of those imports together. Data for estimating the value of tariffs comes from the WTO's Tariff Analysis Online (TAO) database.

Modeling the Economic Impact of Developing Countries' ITA Accession

This section expands on the summary explanation of the economic model described briefly above, walking readers in some detail through each step of the analysis and providing relevant commentary on data for each of the study countries. Appendix E provides a single summary table showing the economic and tariff revenue impacts of these six countries' potential ITA accession.

Countries' ICT Import Profile

Table 1 summarizes the current ITA import profile for each of the six study countries, including: 1) the value of the countries' imports of ITA-covered ICT products in 2014; 2) the share of ITA imports as a percentage of the countries' total imports; 3) the countries' average tariff rate on ITA imports; 4) the effective tariff rate countries apply on ITA imports; and 5) the total revenues study countries currently collect from tariffs on ITA-covered ICT products.

Table 1: ITA Import Profile, 2014[120]

	Argentina	Cambodia	Chile	Kenya	Pakistan	South Africa
Imports of ITA-Covered Products (US$ Millions)	$7,597	$790	$7,789	$1,298	$3,229	$12,173
ITA Imports as a Share of Total Imports	11.6%	4.2%	10.8%	7.9%	6.8%	12.2%
Average WTO-Bound Tariff Rate on ITA Imports	12.4%	13.8%	6.0%	6.4%	9.2%	1.0%
Effective Realized Tariff Rate on ITA Imports	5.7%	3.3%	0.8%	4.8%	5.4%	0.8%
ITA Tariff Revenue (US$ Millions)	$430	$26	$65	$63	$173	$95

Countries not participating in the ITA have seen their participation in global ICT value chains decline by more than 60 percent from 1995 to 2009.

Trade data is drawn from the 269 commodity groups the ITA covers fully and partially across both the original ITA and its expansion (each commodity group contains one or more products; the ITA provides coverage over all or some of the products per group). Table 1 shows that South Africa leads these countries, with $12.2 billion of ITA imports in 2014, followed by Chile with $7.8 billion, and Argentina with $7.6 billion. Cambodia imports less than $1 billion in ITA-covered ICT products, with Kenya at $1.3 billion, and Pakistan at $3.2 billion.

Table 1 also makes clear that countries' bound tariff rates on ICT products may be considerably higher than the rates that, on average, are effectively applied (i.e., trade-weighted) to the actual imports of ITA-covered ICT products entering the countries from their trade partners. For instance, Chile's average bound tariff rate for ICT products covered by the ITA is 6.0 percent; yet, after accounting for the free trade agreements Chile has in place with its two largest trade partners—China and the United States—ITIF finds that, on average, the tariff rate Chile effectively applies on the actual ITA-covered ICT products entering its country is 0.8 percent.[121] Likewise, because Cambodia trades largely with China and South East Asian countries, which it has free trade agreements with, its real tariff levels deviate significantly from its average tariff levels for ITA products. Even though Argentina drops the tariff hit by over half when considering bound versus effectively applied rates, it still applies the highest tariff rates on ICT products of countries in the study (5.7 percent), followed by Pakistan at 5.4 percent, and Kenya at 4.8 percent. The effective realized average tariff rate allows calculation of the actual tariff revenue countries

receive from ITA products, and can be used as a proxy to estimate how much prices of ITA products would fall after ITA accession.

Economic Impact of the Elimination of ITA Tariffs

Eliminating tariffs decreases the effective price that importers pay for ICT goods, whether these are parts and components that represent intermediate inputs or final end products, such as computers or mobile devices. This effect, also known as import demand elasticity, describes the percentage change in imports, given a 1 percent change in prices, assuming no other variable than prices change. ITIF's analysis applies an import elasticity value of 1.3 for ICT goods.[122] This means that if a country applies an average tariff level of 6 percent on ICT imports, an elimination of these tariffs should lead to ICT imports increasing by approximately 7.8 percent.[123] (As a comparison, agricultural products are price inelastic, and so a reduction of prices by 1 percent usually leads to an increase in imports of less than 1 percent.) The expected increase in ITA-covered imports is calculated by multiplying the current value of ITA imports by the estimated change in import quantity, given that tariffs fall to zero. ITIF estimates that eliminating tariffs would lead to an increase in ITA imports that would range between 1.0 percent (South Africa) and 7.4 percent (Argentina) across the countries studied, as table 2 shows. We estimate ITA accession would increase the quantity of ITA products imported by 7.0 percent in Pakistan, 6.3 percent in Kenya, 4.3 percent in Cambodia, and 1.1 percent in Chile.

Table 2: Impact of Tariff Elimination on ITA Imports[124]

	Argentina	Cambodia	Chile	Kenya	Pakistan	South Africa
Effective Realized Average Tariff Rate on ITA Imports	5.7%	3.3%	0.8%	4.8%	5.4%	0.8%
Change in ITA Quantity Imported Due to Tariff Elimination	7.4%	4.3%	1.1%	6.3%	7.0%	1.0%
Increase in ITA Imports Through Joining ITA (US$ Millions)	$559	$34	$84	$82	$225	$124
Increase in Total Imports Post-ITA Accession	0.86%	0.18%	0.12%	0.50%	0.47%	0.12%

Based on this, Argentina stands to gain the most from joining the ITA, since it has the highest effective realized average tariff rate on ITA imports. Chile and South Africa still

stand to gain, even given their existing low effective tariffs on ITA products. It's important to note that the trade-creation impact estimated by ITIF appears smaller than the econometric analyses put forth by the previously mentioned Bora and Liu, and Henn and Gnutzmann-Mkrtchyan studies because of two factors: 1) their analyses provide aggregated estimates at the international level, not at the individual country level; and 2) their studies do not estimate the effective tariff rate on ITA products by considering trade agreements, leaving open the possibility of overestimates. Regardless, ITIF finds that all study countries stand to realize noticeable economic growth across both the short- and long-run from ITA accession.

ITIF estimates the impact of joining the ITA on short- and long-run economic growth by calculating the percentage change to ICT capital stock from the increase in ICT goods consumed as a result of eliminating tariffs. As noted, Cardona, Kretschmer, and Strobel's review of ICT and productivity literature, "ICT and Productivity: Conclusions From the Empirical Literature," concludes that, "Over the last two decades an increase of ICT investment by 10 percent translated into higher output growth of 0.5-0.6 percent."[125] Although recently published, this study only evaluates the empirical evidence up to 2005 and further suggests that ICT elasticities have increased over time. This means that the impact of an increase in ICT investment by 1 percent today likely would be even higher than a 0.06 percent increase in productivity. Nevertheless, for this study, ITIF conservatively defaults to the conclusions established by Cardona et al., whereby a 1 percent increase in a country's ICT capital stock increases a country's GDP by 0.06 percent.[126]

In tying a country's increased ICT capital stock to long-term economic growth, ITIF incorporates three key mechanisms:

1. The value of increased ICT consumption from an increase in ITA imports. Since this analysis focuses on the effects of ICT consumption in an economy, we isolate ICT capital and consumption goods as a share of increased ITA imports from joining the ITA, as these goods directly generate economic growth.[127]

2. The value of domestically produced ICT invested into the economy. As every country has some level of domestic ICT production, we use the country's existing ITA goods import-export mix to proxy some level of annual domestically produced ICT investment.

3. As any capital stock depreciates annually, we use data from the Conference Board's Total Economy Database to apply a depreciation rate of 32.4 percent.[128]

The analysis finds that every country in the study would benefit economically by joining the ITA. Table 3 shows each country's current ICT capital stock, the increased ICT capital stock expected in year one following ITA accession, and an estimate of the increased GDP growth a country is likely to experience in the first year following ITA accession. The analysis finds Argentina's economy would grow by 0.17 percent in the first year subsequent to ITA accession, followed by Kenya's at 0.15 percent, Pakistan's at 0.14 percent, and Cambodia's at 0.10 percent. Growth rates for Chile and South Africa in the first year would be positive at 0.02 percent, although, as noted, lower than for peers because effective applied tariff rates are lower. The results for Argentina and Kenya are much more indicative of what most developing countries should expect, as very few developing countries have pursued as extensive a free trade network as has Chile, which now has 64 FTAs with global trade partners.

The results for Argentina and Kenya are much more indicative of what most developing countries should expect, as very few developing countries have pursued as extensive a free trade network as has Chile.

Table 3: Economic Growth Benefits From Joining the ITA[129]

	Argentina	Cambodia	Chile	Kenya	Pakistan	South Africa
Current Stock of ICT Capital (US$ Millions)	$9,425	$1,090	$15,439	$2,487	$6,313	$31,581
ITA Capital and Consumption Imports as a Share of Total ITA Imports	47.4%	55.6%	75.7%	76.5%	65.9%	70.0%
ITA-Attributable Contribution to ICT Capital Stock (US$ Millions)	$265	$19	$64	$63	$148	$86
Real GDP Growth (Annual Average)	4.40%	6.97%	4.63%	6.02%	3.52%	2.44%
ITA-Attributable GDP Growth (Year One)	0.17%	0.10%	0.02%	0.15%	0.14%	0.02%

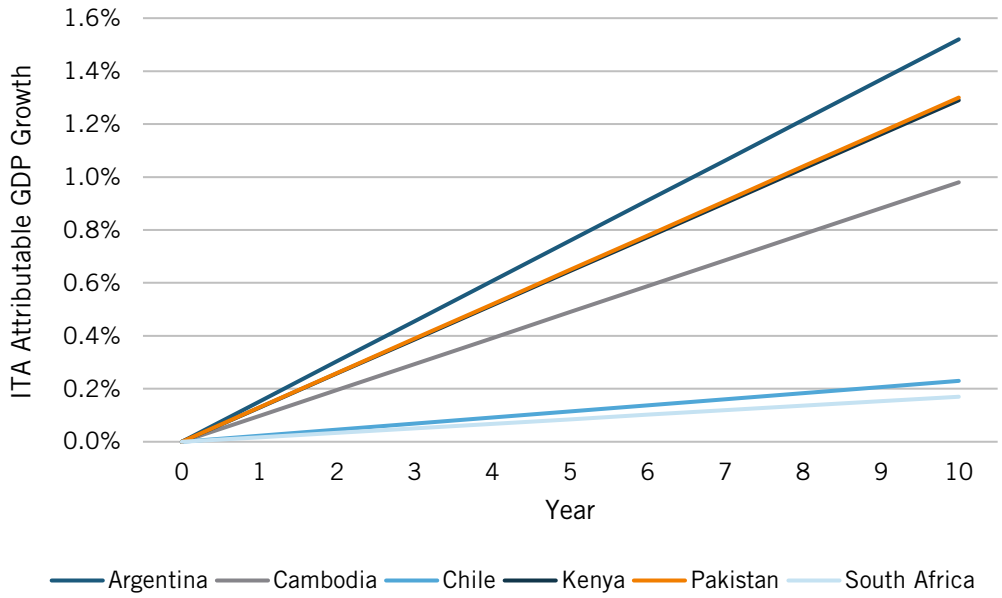
Table 4: ITA's Economic Growth Effects in Year 10

	Argentina	Cambodia	Chile	Kenya	Pakistan	South Africa
GDP (2014, US$ Billions)	$543	$17	$258	$61	$251	$350
Real GDP Growth (2010–2014)	4.40%	6.97%	4.63%	6.02%	3.52%	2.44%
GDP with ITA Accession (2024, US$ Billions)	$849	$33	$407	$111	$360	$446
ITA-Attributable GDP Growth	1.52%	0.98%	0.23%	1.29%	1.30%	0.17%
ITA-Attributable Increase in GDP Output (US$ Billions)	$12.72	$0.32	$0.92	$1.41	$4.63	$0.77

The economic benefits of ITA membership stand to increase over time. Accordingly, ITIF's model incorporates how the ITA's economic benefits—in terms of productivity and economic growth—compound over time. Table 4 provides an estimate of countries' increased economic growth over the 10-year period following ITA accession. To estimate this, ITIF starts with countries' average economic growth rates experienced from 2010 to 2014 and applies this percentage as a baseline over the next 10 years. To this baseline, it adds consideration to the increasing ICT capital stock ITA accession would engender over the 10-year period (again taking into account the extent to which countries' increases in capital stock result from domestic production versus foreign imports). This calculation finds that 10 years after ITA accession, Argentina's GDP would be 1.52 percent larger than if it did not join the ITA. Likewise, in 10 years, ITIF estimates Pakistan's and Kenya's economies would be about 1.3 percent larger, and Cambodia's 1 percent larger, as a result of joining the ITA. It finds that Chile's GDP would be 0.23 percent higher than its current baseline growth, while South Africa's economy would grow by 0.17 percent. In absolute terms, the size of Argentina's economy would be almost $13 billion larger in 10 years than it would otherwise be as a result of joining the ITA; Pakistan's economy would be nearly $5 billion larger.

Figure 9 depicts long-run economic growth projections as a result of countries' accession to the ITA. Again, Argentina, Pakistan, Cambodia, and Kenya would be the biggest beneficiaries, through economic growth clearly would accelerate in Chile and South Africa as well.

Figure 9: Long-Run Economic Growth Projections from Joining the ITA[130]



Developing countries, after dropping tariffs on ITA products, experienced a decrease in ICT prices for consumers and producers, adopted ICT products more readily, plugged domestic ICT industries into global ICT value chains, and expanded exports of ITA products.

Addressing Developing Countries' Economic Concerns Over ITA Accession

Despite the clear economic benefits of joining the ITA, some developing nations have held back, principally for two main reasons, that doing so: 1) would lead to a decrease in tariff revenues that may comprise a sizable portion of a government's tax revenue, and 2) might harm countries' domestic ICT production industries and employment therein. This section addresses both concerns.

ITA Tariffs and Government Finances

Some developing-country policymakers have argued that joining the ITA means forsaking important and easy-to-collect import tariff revenue. For them, tariff revenues derived from ITA imports represent a stable revenue stream. But ITIF's study shows this perspective is flawed, since tariff revenues forgone from joining the ITA could be substituted by tax revenues from other sources generated through ICT-fueled economic growth.

It's certainly true that most developing countries count more on tariffs to generate government revenues than do developed countries. That dynamic is highlighted by a 2005 OECD study, which estimated that, on average, tariff revenues accounted for 4 percent of low- and middle-income countries' GDP from 1995 to 2000, but less than 1 percent of high-income countries' GDP.[131] Figure 10 depicts this, showing that for our six-country sample, tariff revenue amounts to approximately 3.7 percent of Cambodia's GDP, while for Argentina, Kenya, Pakistan, and South Africa, tariffs amount to between 0.7 percent and 1.5 percent of GDP. In contrast, tariff revenues account for only 0.2 percent of U.S. GDP, with Chile also at the same level due in part to its extensive network of free trade agreements (mentioned previously). In current U.S. dollars, tariffs generate $3.7 billion for Argentina, $615 million for Cambodia, $592 million for Chile, $931 million for Kenya, $2.4 billion for Pakistan, and $3.7 billion for South Africa.[132]

Figure 10: Tariff Revenue as a Share of GDP, 2014[133]

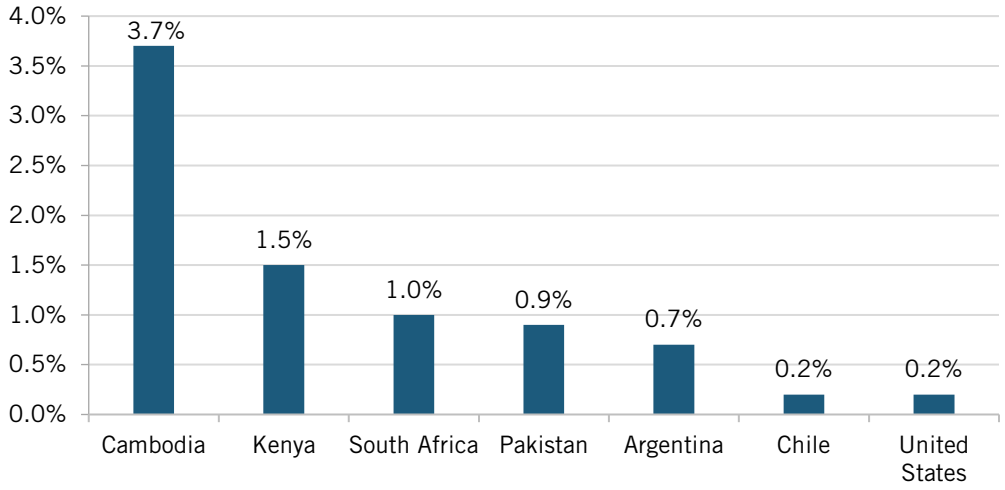
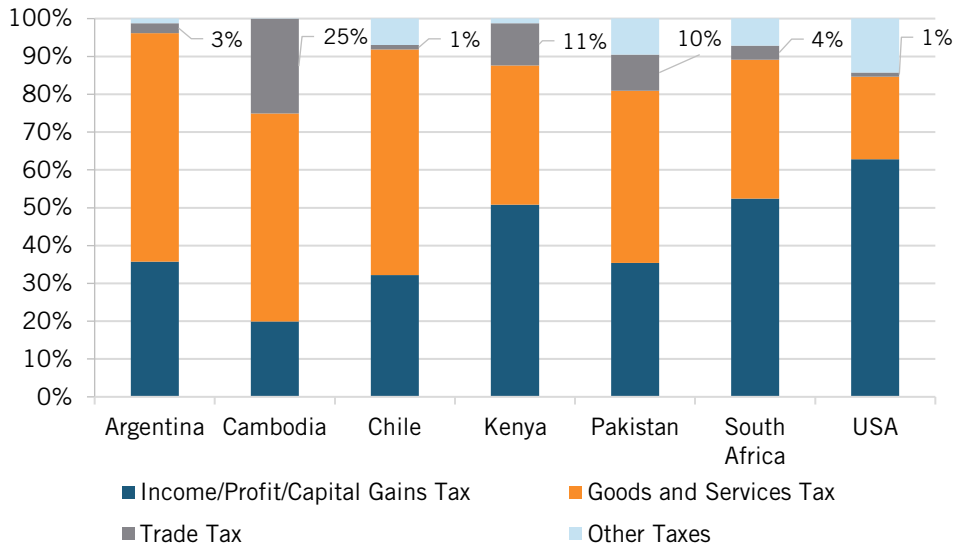


Figure 11 shows a similar dynamic, breaking down the composition of study countries' tax revenues into four broad categories. Income tax comprises mainly personal income tax and company income taxes; the goods and services category comprises excise tax and VAT tax; trade tax covers mainly tariffs; and other taxes include those on fuel, etc. In the six-country group, Cambodia generates one-quarter of its tax revenue through tariffs, while Chile's tariff revenues add a minimal 1 percent to total revenues. This significant variance indicates that, for the six countries, an elimination of ITA tariffs would lead to very different impacts, as the subsequent analysis shows.

Figure 11: Composition of Tax Revenue (Label Indicates Tariff Revenue as a Share of Total Revenue) 2014[134]



Tax Revenue Analysis Post-ITA Accession

To complement ITIF's analysis on the economic benefits of ITA accession, we analyze tax revenue after each country's accession to the agreement. The productivity impact of ITA accession would support broader economic growth and thus a subsequent increase in consumption and income taxes. Consumption taxes include sales taxes paid by consumers of final products or value-added tax along the manufacturing and distribution process. Estimates of the average consumption tax on ICT products are tabulated in ITIF's report "Digital Drag: Ranking 125 Nations by Taxes and Tariffs on ICT Goods and Services."[135] This report calculates the increased tax revenue from consumption taxes by multiplying the average consumption tax by the projected increased value of ITA imports for each country.

Income taxes include tax revenue collected from household and businesses income. Because income and business tax rates differ between and within countries, a broad estimate of the effective tax rate is determined by dividing government tax revenue from the multiple sources of income tax by GDP. Table 5 provides the tax rates used to estimate the fiscal impact of joining the ITA.

Scholarly economic evidence suggests that investments in ICTs are generating higher returns than ever before.

Table 5: Generalized Effective Tax Rates

One-Year Estimate	Argentina	Cambodia	Chile	Kenya	Pakistan	South Africa
ITA Tariff Rate	5.7%	3.3%	0.8%	4.8%	5.4%	0.8%
Goods and Services Tax Rate	21.0%	10.0%	19.0%	16.0%	17.0%	14.0%
Income Tax Rate	8.1%	3.2%	6.4%	8.0%	3.5%	15.9%

The model applies these generalized effective tax rates on calculated increases in GDP derived from earlier calculations and creates an estimated increase in income-tax revenue attributable to joining the ITA. Table 6 summarizes both the short- and long-run revenue implications of ITA accession. The table also illustrates that the bulk of the tax benefits would start to accrue only after a number of years into the agreement.

In the year immediately following ITA accession, governments would have to make adjustments to their budgets to address the decrease in tariff revenues. Cambodia would face the greatest governmental budgetary losses in the short term, recovering in the first year post-accession just 15 percent of tariff revenue forgone through additional tax dollars induced through the ITA. Argentina's short-run tax revenue balance would be the healthiest of the study countries, collecting 43 percent of tariff revenues forgone from new taxes in the first year post-accession. The other four countries would be able to recoup an average of 30 percent of tariff revenues forgone through ITA-induced tax increases in year one. It's important to recognize that these tariff dollars forgone in the short run can be

replaced by other forms of income, such that government expenditure and revenue can remain constant. As tariff revenue is essentially a tax on consumption, shifting to taxes on other consumption goods will have minimal impact beyond increasing consumption of ICT goods and thereby encouraging growth.

In the 10th year subsequent to ITA accession, ITIF estimates that Argentina would collect tax revenues in excess of ITA tariff revenues forgone in that year by 33 percent, while Kenya would collect 9 percent in excess of tariff revenues forgone. (In other words, in the 10th year, Argentina would recover from newly generated tax revenue 133 percent and Kenya 109 percent the amount of tariff revenue they would have generated in that year from the ICT products now coming under ITA coverage.) In that 10th year, South Africa would recover 92 percent of tariffs forgone, Pakistan 75 percent, Chile 67 percent, and Cambodia 23 percent.

Over the 10-year period subsequent to joining the ITA, the gap between tariff revenues forgone and tax revenues gained would narrow (as shown in the 10-year cumulative estimate). However, when accounted for on a cumulative basis—that is, assessing the tariff revenues forgone versus the new tax revenues gained in each individual year and then summing them up—of the six study countries, only Argentina would fully overcome the gap between tariff revenues forgone and tax revenues collected over the 10-year period, collecting an additional 6 percent above cumulative tariff revenues forgone. Kenya would come close to eliminating that gap, with cumulative tax revenues collected reaching 83 percent of tariff revenue forgone. Chile, Pakistan, and South Africa would collect 55 percent, 58 percent, and 68 percent of total tariff revenue forgone over the course of the decade. Cambodia will have to go the farthest given the magnitude of its current tariffs and will only recoup 21 percent of total tariff revenues forgone over 10 years. However, the expected economic growth from joining the ITA can make the endeavor a net positive for the country.

Table 6: Tax Revenue Impact From Joining the ITA[136]

Year-One Estimate	Argentina	Cambodia	Chile	Kenya	Pakistan	South Africa
Tariff Revenue Forgone (US$ Millions)	$430	$26	$65	$63	$173	$95
Goods and Services Tax Revenue Gained (US$ Millions)	$117	$3	$16	$13	$38	$17
Income Tax Revenue Gained (US$ Millions)	$68	$1	$4	$7	$12	$9

Revenue Gained as % of Revenue Forgone	43%	15%	31%	32%	29%	28%

Year-10 Difference	Argentina	Cambodia	Chile	Kenya	Pakistan	South Africa
Tariff Revenue Forgone (US$ Millions)	$968	$105	$142	$127	$310	$166
Goods and Services Tax Revenue Gained (US$ Millions)	$264	$14	$35	$27	$68	$30
Income Tax Revenue Gained (US$ Millions)	$1,027	$10	$59	$112	$162	$122
Revenue Gained as % of Revenue Forgone	133%	23%	67%	109%	5%	92%

10-Year Cumulative Impact	Argentina	Cambodia	Chile	Kenya	Pakistan	South Africa
Total Tariff Revenue Forgone (US$ Millions)	$7,690	$720	$1,135	$1,047	$2,653	$1,435
Total Goods and Services Tax Revenue Gained (US$ Millions)	$2,099	$94	$280	$218	$586	$261
Total Income Tax Revenue Gained (US$ Millions)	$6,021	$60	$347	$653	$959	$721
Total Revenue Gained as % of Total Revenue Forgone	106%	21%	55%	83%	58%	68%

Joining the ITA can mean losing some government revenue in the short run, but this is a small price to pay as part of the broader effort to grow a country's GDP and standard of living.

Countries should focus on the long-term benefits of ITA membership over short-term concerns about a decrease in tariff revenue. In fact, concerns over lost tariff revenue have not prevented countries that generate a large proportion of their revenue through tariffs from joining the ITA. In the case of the following ITA signatories, 32 percent of Russia's tax revenues come from tariffs, 21 percent of the Philippines', 19 percent of the Kyrgyz Republic's, and 32 percent of Kazakhstan's (it intends to join the ITA).[137] These countries clearly find that being a part of the ITA provides more economic benefits than the tax revenue forgone, as most are able to find other, less growth-imperiling ways to collect revenue.

Of course, joining the ITA can mean losing some government revenue in the short run, but this is a small price to pay as part of the broader effort to grow a country's GDP and standards of living. In other words, continued reliance on ITA product tariffs represents a contradiction for developing countries that seek to be part of and reap the benefits of global trade and the digital economy. Consider Cambodia. Although Cambodia would gain almost 1 percent in additional GDP over 10 years, it is the only country in our sample where gains in tax revenue from ICT-fueled growth would barely make up one-quarter of tariff revenue forgone. This outcome emerges in part because Cambodia has the lowest income tax as well as goods and services tax in our sample. As countries develop economically, their tax burdens tend to shift away from direct taxes such as tariffs to indirect taxes such as goods and services taxes. To maximize the economic gains from joining the ITA, Cambodia would have to restructure its tax system.

So, in many ways, this is an issue about short-term costs versus longer-term gains. An International Monetary Fund research paper estimates that the short-run adjustment costs from trade liberalization are about 10 times less than the long-run (approximately 20 years) benefits a country will receive.[138] As the OECD suggests, these short-run costs should be seen as an investment for long-term economic growth. Ultimately, for developing countries, the decision to join the ITA requires governments to choose between prioritizing short-term tariff income or taking a proactive step toward enacting policies that would lead to greater levels of sustainable, long-term, ICT-powered economic growth.

Impacts on Domestic ICT Industries and Employment

Developing country policymakers have raised concerns about the impact that removing tariffs may have on domestic ICT firms and their workers. Indeed, tariffs remain a popular (if discredited) tool for those who think that protectionism is an effective way to develop domestic industries by protecting them from the forces of global competition.

But where will the employment come from if domestic ICT firms are unable to compete in the absence of tariff protection? There are several answers. First, there is some employment elasticity of growth—that is, the percentage change in employment in response to a 1 percentage change in output. For instance, the International Labor Organization has found that (in the early 2000s) for every one percentage point of additional GDP growth, total global employment grew by 0.30 percentage points, suggesting that the additional GDP growth documented here would produce new employment in study countries.[139] However, the employment elasticity of growth is generally recognized as a limited measure by economists, most notably because it has nothing to say about the quality of jobs created. Further, it says nothing about the actual extent of job creation since a country that grew by 1 percent and enjoyed a 1 percent increase in employment would have the same employment elasticity rate as a country which had a 10 percent growth rate accompanied by a 10 percent increase in employment.[140]

Second, as countries' ICT enterprises become more globally competitive and grow, these firms expand and employ more individuals in the process. For example, U.S. ICT services

trade with various Latin American countries shows that joining the ITA did not decimate ICT sectors in those countries, but instead made them better positioned to compete globally and, in that process, grow employment. The difference in ICT-services imported by the U.S. between ITA-member Latin American countries and non-ITA-member Latin American countries is stark. In 2015, the United States imported ICT services valued at up to 0.44 percent of Honduras' GDP from it, 0.32 percent of El Salvador's GDP, and 0.13 percent of Costa Rica's GDP, all three countries signatories to the ITA. In contrast, non-ITA-signatory Latin American countries fared more poorly, with the equivalent figure equaling 0.09 percent of Mexico's GDP, 0.03 percent of Brazil's GDP, and 0.02 percent of Chile's GDP.[141]

The impact of an increase in ICT investment by 1 percent today likely will be even higher than an 0.06 percent increase in productivity.

A third place to look is in the new jobs ICT goods and services are enabling in these countries. For instance, South Africa's business-process outsourcing (BPO) sector already generates more than $1.5 billion in revenue and accounts for 54,000 South African jobs.[142] The BPO sector thus accounts for approximately one-quarter of the 225,000 jobs currently supported by the ICT sector in South Africa.[143] Going forward, analysts estimate that if South Africa could increase the size of its ICT sector by 10 percent, it could create 45,000 direct new jobs (and as many as 140,000 jobs if direct and indirect employment is counted) over the next eight years.[144] In India, it's estimated that growth in mobile usage (including the development of mobile applications) has created 7 million jobs.[145]

SMEs are pivotal to employment growth in developing nations. In fact, according to a recent World Bank study conducted across 99 countries, SMEs represent the biggest contributors to employment in developing nations, on average being responsible for over 66 percent of permanent full-time employment and 86 percent of new jobs created.[146] With SMEs such an important contributor of employment growth in developing nations, it is imperative that policymakers empower them by giving them access to the best ICTs at the lowest prices, which is exactly what the ITA is positioned to do. In fact, as Nicola Mawson of *IT Web* notes, if South Africa is to meet its government's target of creating 11 million new jobs by 2030, SMEs will have to play a key role and for them "ICT will be a critical enabler."[147] For Chile and South Africa, which the 2015 Global Connectivity Index identified as the countries "that have the most potential to use ICT to boost their economic growth" the ITA can help bring down the costs of and increase the penetration of growth-enabling ICT goods.[148]

The ICT revolution has reduced the transaction costs and information asymmetries associated with international trade through platforms and support services that make it easier for firms, especially SMEs, to access international markets. This has given rise to the so-called "micro-multinationals," small businesses worldwide that can leverage cloud-based digital platforms such as Alibaba, Amazon, Facebook, or eBay to connect with customers and suppliers from around the world.[149] For instance, in South Africa, more than 90 percent of eBay sellers export to more than 10 international markets.[150] Amazon now hosts two million third-party sellers, while some ten million SMEs globally have become merchants on Alibaba platforms.[151] This growing ability of small businesses to reach global

customers supports economic growth everywhere. This global reach is important in helping ensure SMEs can survive. In a study of eight developing and emerging countries, eBay's report "Commerce 3.0 for Development" found that the number of sellers from these markets doubled between 2008 and 2012 and that 60 to 80 percent of new eBay sellers (those who did not sell the previous year) in these countries "survive" their first year. The respective figure for traditional exporters is only around 30 to 50 percent.[152]

Finally, mobile applications development will become an increasingly important source of ICT services employment. Argentina had roughly 33,250 app-economy jobs, that is, jobs developing productivity, gaming, and social applications for mobile devices (a figure up from zero in 2007), according to research from the Progressive Policy Institute.[153] (They also find 29,000 app-economy jobs in Vietnam and 22,000 in Indonesia). But despite this progress, Argentina has an "app intensity" (app-economy jobs as a percentage of all jobs) of only 0.2 percent, compared with an intensity of 0.7 percent in Europe and 1.2 percent in the United States.[154] Unfortunately, as the paper points out, Argentina's tariffs and taxes on smartphones (as of 2015) were the second-highest in the world, and this has significantly crimped a sector that could otherwise be making even more substantial contributions to employment growth. And countless other downstream businesses are affected: Fewer TV purchases mean fewer jobs from those who would install TVs; fewer tablet or mobile-phone purchases mean fewer data plans sold for mobile-phone devices; the more money firms have to spend purchasing ICT products means the fewer staff they can hire to run other parts of the business. In short, as Santiago Urbiztondo, an economist at the Foundation of Latin American Economic Investigations, puts it, "The impact [of the tariffs] on employment certainly has been very negative."[155] By decreasing their prices, the ITA would help promote diffusion of ICT tools that can help create the enterprises and jobs of tomorrow in the study countries.

CONCLUSION

ICT is a key driver of growth in both developed and developing nations. As such, government policies that add to the cost of ICT goods and services limit the ICT intensity of an economy. ICT tariffs are one such policy. That is why ITA tariff elimination leads to greater consumption and investment in ICT goods, critical fundamentals in today's global digital economy. Developing economies benefit just as much as, and under some circumstances more so than, developed economies from increased ICT adoption. If Argentina, Cambodia, Chile, Kenya, Pakistan, and South Africa join the ITA, their GDP growth will be expected to be between 0.17 percent and 1.52 percent larger than otherwise over ten years. Between the six countries analyzed, their aggregate total GDP growth over a decade is equivalent to $12.3 billion. Furthermore, the study shows that concerns over government tax revenue forgone are generally misplaced because the economic growth induced by increased ICT consumption would create tax revenues that can substantially offset tariff revenue loss. In conclusion, countries that haven't joined the ITA have, so far, missed a significant opportunity for economic growth and development, innovation, and greater levels of prosperity.

APPENDIX A: MEMBER COUNTRIES OF THE ITA[156]

ITA Signatory	Joined Expansion?	ITA Signatory	Joined Expansion?
Afghanistan	No	Lithuania	Yes
Albania	Yes	Luxembourg	Yes
Australia	Yes	Macao	No
Austria	Yes	Malaysia	Yes
Bahrain	No	Malta	Yes
Belgium	Yes	Mauritius	Yes
Bulgaria	Yes	Moldova	No
Canada	Yes	Montenegro	Yes
China	Yes	Morocco	No
Colombia	Yes	Netherlands	Yes
Costa Rica	Yes	New Zealand	Yes
Croatia	Yes	Nicaragua	No
Cyprus	Yes	Norway	Yes
Czech Republic	Yes	Oman	No
Denmark	Yes	Panama	No
Dominican Republic	No	Peru	No
Egypt	No	Philippines	Yes
El Salvador	No	Poland	Yes
Estonia	Yes	Portugal	Yes
Finland	Yes	Qatar	No
France	Yes	Romania	Yes
Georgia	No	Russia	No
Germany	Yes	Saudi Arabia	No
Greece	Yes	Seychelles	No
Guatemala	Yes	Singapore	Yes
Honduras	No	Slovakia	Yes
Hong Kong	Yes	Slovenia	Yes
Hungary	Yes	South Korea	Yes
Iceland	Yes	Spain	Yes
India	No	Sweden	Yes
Indonesia	No	Switzerland	Yes
Ireland	Yes	Taiwan	Yes
Israel	Yes	Tajikistan	No
Italy	Yes	Thailand	Yes
Japan	Yes	Turkey	No
Jordan	No	Ukraine	No
Kazakhstan	No	United Arab Emirates	No
Kuwait	No	United Kingdom	Yes
Kyrgyz Republic	No	United States	Yes
Latvia	Yes	Vietnam	No
Liechtenstein	Yes		

APPENDIX B: LITERATURE REVIEW

Although the ITA entered into effect in 1997 (its text was finalized in 1996), econometric analyses evaluating the economic impact of the agreement have thus far been sparse. To ITIF's knowledge, just two econometric studies focus on the impact of the ITA on international trade flows. Unfortunately, no study has evaluated the impact of the ITA on an entire economy, in terms of increasing productivity, investment, incomes, government revenues, etc.

The earliest study that evaluates the trade impact of the ITA comes from the economists Bijit Bora and Xuepeng Liu and is based on trade flows between 1988 and 2003. Their main finding indicated that developing countries that signed onto the ITA have benefited disproportionately compared with developed countries. Their study examines changes to import magnitudes across multiple dimensions, before versus after ITA implementation, developed versus developing countries, and ITA members versus non-ITA members. They use a trade-weighted gravity model that is quite standard and robust in understanding trade creation. Note that this model does not feed back onto macro economy effects.

Their model estimates that the value of a country's imports depends on first the economic size of its trading partners, and second, on the magnitude of trade barriers between an importer and exporter country. Regarding the first, a country's main bulk of imports normally comes from large economies, mainly because large economies are also the largest exporters (e.g., the United States, China, and the European Union). Regarding the second factor, trade barriers include a host of variables. For example, tariffs increase the costs of trade, thus reducing imports; countries that are geographically further apart trade less; countries import less from landlocked countries because of higher transportation costs compared with shipping; and whether (or not) countries are part of any bilateral or regional trade agreements can increase free trade.

Being a trade flow model, their model does not estimate the economic feedback effects of increased imports. What this means is that it does not make predictions on how the economy will grow, be it through increased employment, investment, etc., even though increased ITA imports would have a positive impact on these macroeconomic factors.

The second econometric analysis by Henn and Mkrtchyan evaluates the impact of the ITA on both imports and exports, finding that signing onto the ITA increased imports of ITA goods, and subsequently exports of ITA goods, specifically through lowered costs of intermediate goods. They look at ITA commodity level trade flows between 1996 and 2012, covering 234 countries. They adapt specifications, the first being Bora and Liu's model, which they re-estimate with slight modifications. Although they do not compare developed with developing countries, they estimate that ITA membership increases imports by 21 to 30 percent. Importantly, even when taking China out of the model, the results do not change much.

They suggest that the ITA's elimination of tariffs first increases ITA product imports, but also provides an economic signal that firms are sure to respond to favorably in the sense

that they don't have to await further tariff cuts. In other words, the act of going to zero, of eliminating tariffs entirely on a category of products, is tremendously significant. Also, because ITA products are intermediate inputs, elimination of tariffs reduces costs to ICT producers who would expand production domestically and export more. As the analysis finds, accession likely boosts exports by 37 percent. By going further than aggregated data into commodity codes, they intend to trace the composition of imports and exports. At the product level, joining the ITA increases exports by 8 to 9 percent. When isolating the effects of tariffs, a 1 percentage point reduction in tariffs would result in an import increase of 0.25 percent (import demand elasticity estimates in other studies have this ranging from .32 to 1.2). But reducing tariffs to zero increases imports by 11 percent. As they note, "Zero tariffs reduce border formalities considerably." This is important because a whole economy uses ICTs, not just the electronics sector. As they conclude, "By creating policy certainty, it affects the location decisions of MNEs. Second, lowering the cost of inputs makes producers more competitive when exporting. This is reflected in a much higher ITA semi-elasticity for zero tariffs in intermediate goods vis-à-vis final goods."

In summary, the ITA agreement impacted developing countries much more than developed countries. Although one factor was much higher tariffs on ICT products imposed by developing countries relative to developed countries prior to the ITA, the empirical results have proven quite clear: Developing countries, after dropping tariffs on ITA products, experienced a decrease in ICT prices for consumers and producers, adopted ICT products more readily, plugged domestic ICT industries into global ICT chains, and expanded exports of ITA products.

APPENDIX C: DETAILED METHODOLOGY

Calculating ITA Trade Flows

Data for calculating trade in ITA goods come from the United Nations Comtrade Database.[157] The database provides the value and weight of imports and exports between each country and its trading partners broken down by year and commodity type. The database releases trade data according to three classification systems for commodities; of the three classification systems, commodities covered under the ITA are defined through the Harmonized Commodity Description and Coding System (HS). HS coding comprises about 5,000 commodity groupings, has a specific classification group for over 98 percent of all merchandise traded globally, and receives updates every five to six years to incorporate new commodities or revise existing groupings.[158] HS defines commodities at the two-digit, four-digit, and six-digit level; the two-digit level illustrates the most general grouping of products, such as "Live Animals," while the six-digit level gives the most specific definitions. Currently, the HS2012 is the most up-to-date classification system.

Because the first ITA (ITA I) was agreed to in 1996, it used the relevant HS classification of that time—HS1996. Likewise, the ITA expansion (ITA II) was negotiated according to HS2007. Of note, a number of commodities covered under the ITA do not have a relevant HS code assigned to them; these commodities are also known as "Attachment B" products. For our analysis, ITIF excluded Attachment B products for consistency purposes across countries.

ITIF drew up a list of commodity codes that covers ITA I and ITA II products according to the HS2007 classification system through two World Trade Organization documents—WTO JOB(07)/96 Annex Table 10 and WTO WT/L/956. The first WTO document referenced updates of the HS1996 codes of ITA I to HS2007 codes. The second WTO document referenced provides the list of products covered under ITA II. Combining these two documents provides a comprehensive list of ITA I and ITA II products (excluding Attachment B products) defined at the HS2007 six-digit level. Although six-digit HS codes are the most granular of commodity groupings, for some six-digit groups in the ITA, only some commodities within that group have coverage under the agreement.

In combining the two WTO documents that provide ITA product coverage at the HS six-digit level, certain HS codes (about 60 entries) appeared as duplicates. These appeared as duplicates due to either the commodity group being partially covered in ITA I but fully covered in ITA II, or updates from HS1996 to HS2007 changing the types of commodities within that six-digit commodity line. In total, 269 commodities defined at the HS six-digit level remained on the list of ITA-covered commodities. Since recent UN Comtrade data on trade flows have been reported through HS2012, the completed list of HS2007-coded ITA products are mapped onto their relevant HS2012 codes. Only Kenya's trade data still is reported under HS2007, while the other four countries report their trade data using HS2012. The United Nations Statistics Division provides correspondence tables for mapping older HS codes onto newer HS codes, or among the three commodity classification systems.[159] Because the completed list of ITA products underwent multiple transformations, and in each of those

transformations some commodity codes did not fully translate onto its updated code, our finalized data on traded goods contains some degree of unavoidable error.

Calculating the value of ITA imports is straightforward. UN Comtrade provides trade flows at the HS2012 six-digit level, and each country's total value of ITA imports is summed based on each HS2012 six-digit line covered in ITIF's list of ITA products. (Except for Kenya, where ITIF summed its ITA imports using HS2007.) Attachment B products are found under HS-999999, which is a catchall for all products that do not have a corresponding commodity code, and accounts for between 1 and 3 percent of total imports depending on country. ITIF did not attempt to estimate what portion of this catchall term contains ITA-covered products.

The full value of HS codes partially covered by the ITA agreement is considered in this analysis. Depending on commodity code, there may be one or more products classified under it, but only a portion of these products may fall under the ITA. ITIF assumes that products within a commodity code are similar enough to one another, in the sense that they are similar types of ICT products. Therefore, it would seem plausible that if the products within that HS category other than those covered by the ITA have existing tariffs, post-ratification of the ITA, ITA products would appear relatively cheaper than their substitutes, inducing additional demand outside of import demand elasticities.

Calculating ITA Tariffs

Data for estimating the value of tariffs come from the World Trade Organization's Tariff Analysis Online (TAO) database. In the database, the average tariff levied on each HS six-digit code for each country is provided (specifically, ITIF used the "Average of Ad-Valorem duties"). Note that within each of these tariff lines, two averages happen: one, the average of tariffs levied on the different commodities within each commodity code; two, the average of tariffs levied against different countries. Trade agreements such as free trade agreements, preferential trade agreements, and regional agreements complicate the matter of tariffs because the average tariffs reported in TAO are not trade-value weighted.

As an illustration, country X imports from country Y and country Z. Country X has a free trade agreement with country Y and imposes a 10 percent tariff on country Z, leading to an average tariff of 5 percent (assuming a 50-50 split in imports from countries Y and Z). But due to the presence of the free trade agreement, country X would likely import more of the product from country Y compared with country Z (assuming that there is some level of product differentiation and preference exhibited by country X, since if this is not the case, price differentiation would induce all imports to come from country Y, and zero imports from country Z). If we assume an 80-20 share of imports from countries Y and Z, the actual tariffs derived from imports would be only 2 percent of total import value (henceforth defined as "effective tariff rate" compared with the average tariff of 5 percent).

The value of tariff revenue derived from ITA product imports is estimated from the relative share of reported tariff revenues collected by the government. Data on the total reported value of tariffs collected by each country's government comes from the International

Monetary Fund's Government Finance Statistics, with the exception of Argentina, which the IMF does not have data for. Instead, tax revenue data for Argentina was obtained from the OECD.[160] To verify the reported tax revenue for these six countries provided by the IMF and OECD, we compared them to the official government budget figures released by respective countries' budgetary agencies.[161] Minimal differences are observed, but IMF statistics published are preferred due to IMF standardizing data categories across countries. ITIF estimates used the broad measure of tax revenue obtained from international trade, of which tariffs form the majority (other revenues within the international trade tax revenue category include compliance costs, etc.). Assuming that all international trade tax revenue equals tariff revenues allows streamlined categories for easier macro-analysis. As an extension for this assumption, various other tax revenue sources are collapsed into broader categories to target specific tax effects arising through the elimination of ITA tariffs.

Given the heterogeneity of tariff rates across commodities levied by a country (except Chile, where the average tariff rate is 6 percent regardless of commodity), it seems reasonable to assume that regardless of commodity, a country would likely import more from countries that it has established trade agreements with, as explained by tariffs imposing an effective price differential between imports from countries with free trade agreements in effect and countries that do not.

To calculate the tariff revenue obtained from ITA imports, the import value of each ITA HS six-digit commodity is multiplied by the average tariff reported in the TAO database. Next, a similar value is calculated for all non-ITA imports. The first estimate expresses the unadjusted value of ITA tariff revenue as a share of total unadjusted tariff revenue. The precise value of this unadjusted tariff revenue is an overestimate because it does not discriminate against the country likely importing more from partners it has existing trade agreements with. However, by adjusting this share by the actual tariff revenue obtained from the government, a suitable estimate for tariff revenue gained through ITA imports is derived, which partially accounts for the heterogeneity of tariffs across products and acknowledges the tariff revenue-distorting effects of trade agreements.

As a side note, some friction within the adjusted ITA tariff revenues should be expected due to countries reporting their tax revenues by fiscal year compared with trade data, which is reported by calendar year. Once adjusted by the actual tariff revenue, the real effective tariff rate on ITA products is calculated by dividing the total value of ITA imports by the adjusted tariff revenue from ITA imports. Examining the results, these numbers appear reasonable.

Take Chile as an example: Its two largest trading partners are China and the United States, both of which Chile has free trade agreements with. Therefore, although its average tariff rate on ITA products is reported as 6 percent, ITIF's estimate of the effective tariff rate of 0.8 percent seems highly plausible. Ultimately, the calculation of the real effective tariff level on ITA products provides a suitable estimate of the maximum average reduction in prices of ITA goods should that country sign onto the ITA.

APPENDIX D: LIST OF ITA-COVERED PRODUCTS (BY HS2002 CLASSIFICATION)

Information Technology Agreement			Information Technology Agreement Expansion			
381800	852910	902730	350691	850590	853190	901820
844331	852990	902750	370130	851430	853630	901850
844332	853120	902780	370199	851490	853650	901890
844339	853190	902790	370590	851519	853690	902150
844399	853210	903040	370790	851590	853810	902190
846900	853221	702000	390799	851761	853939	902212
847010	853222	848620	841459	851762	854231	902213
847021	853223	848690	841950	851769	854232	902214
847029	853224	848610	842010	851770	854233	902219
847030	853225	848640	842129	851810	854239	902221
847050	853229	848630	842139	851821	854290	902229
847090	853230	903082	842199	851822	854320	902230
847130	853290	903090	842320	851829	854330	902290
847141	853310	903141	842330	851830	854370	902300
847149	853321	903149	842381	851840	854390	902410
847150	853329	903190	842382	851850	880260	902480
847160	853331	851840	842389	851890	880390	902490
847170	853339	851890	842390	851981	880521	902519
847180	853340	901390	842489	851989	880529	902590
847190	853390	901380	842490	852110	900120	902710
847290	853400	853180	844230	852190	900190	902780
847321	853650	901720	844240	852290	900219	902790
847329	853669	901710	844250	852321	900220	902830
847330	853690	851590	844331	852329	900290	902890
847350	854110	901190	844332	852340	901050	903010
850440	854121	851490	844339	852351	901060	903020
850450	854129	850870	844391	852352	901090	903031
851711	854130	852871	844399	852359	901110	903032
851712	854140	852872	845610	852380	901180	903033
851718	854150	901090	846693	852550	901190	903039
851761	854160	901790	847210	852560	901210	903084
851762	854190	901290	847290	852580	901290	903089
851769	854231	847310	847310	852610	901310	903090
851770	854232	850490	847340	852691	901320	903110
851810	854233	851440	847521	852692	901390	903149
851829	854239	852290	847590	852712	901410	903180
851830	854290	841990	847689	852713	901420	903190
851950	854370	847790	847690	852719	901480	903220
852329	854390	853890	847989	852721	901490	903281
852340	854442	847990	847990	852729	901510	950410
852351	854449	842191	848610	852791	901520	950430
852352	854470	847340	848620	852792	901540	950490
852359	854890	846694	848630	852799	901580	
852380	902610	846693	848640	852849	901590	

852580	902620	846691	848690	852871	901811
852841	902680	843139	850440	852910	901812
852851	902690	842490	850450	852990	901813
852861	902720	852869	850490	853180	901819

APPENDIX E: SUMMARY STATISTICS TABLE OF ITA ECONOMIC IMPACT

Trade Impact	Argentina	Cambodia	Chile	Kenya	Pakistan	South Africa
Imports (2014, US$ Millions)	$65,323	$18,973	$72,344	$16,394	$47,545	$99,893
Real Import Growth (2010-2014)	8.4%	15.1%	8.2%	7.3%	6.0%	5.7%
Gross Tariff Revenue (2014, US$ Millions)	$3,686	$615	$592	$931	$2,384	$3,669
Average Tariff Rate on Non-Ag Imports (2014)	14.2%	10.6%	6.0%	11.5%	14.6%	7.4%
ITA Imports (2014, US$ Millions)	$7,597	$790	$7,789	$1,298	$3,229	$12,173
ITA Imports as a Share of Total Imports (2014)	11.6%	4.2%	10.8%	7.9%	6.8%	12.2%
ITA Tariff Revenue (2014, US$ Millions)	$430	$26	$65	$63	$173	$95
Average Tariff Rate on ITA Imports (2014)	12.4%	13.8%	6.0%	6.4%	9.2%	1.0%
Effective Realized Average Tariff Rate on ITA Imports (2014)	5.7%	3.3%	0.8%	4.8%	5.4%	0.8%
Change in ITA Quantity Imported From Tariff Elimination (From 2014 Baseline)	7.4%	4.3%	1.1%	6.3%	7.0%	1.0%
Increase in ITA Imports After Joining ITA (US$ Millions, From 2014 Baseline)	$559	$34	$84	$82	$225	$124
Increase in Total Imports After Joining ITA (From 2014 Baseline)	0.86%	0.18%	0.12%	0.50%	0.47%	0.12%

Growth Impact	Argentina	Cambodia	Chile	Kenya	Pakistan	South Africa
Current Stock of ICT Capital (2014, US$ Millions)	$9,425	$1,090	$15,439	$2,487	$6,313	$31,581
ITA Capital and Consumption Imports as a Share of Total ITA Imports (2014)	47.4%	55.6%	75.7%	76.5%	65.9%	70.0%
ITA-Attributable Contribution to ICT Capital Stock (US$ Millions, From 2014 Baseline)	$265	$19	$64	$63	$148	$86
GDP (2014, US$ Billions)	$543	$17	$258	$61	$251	$350
Real GDP Growth (Annual Average, 2010–2014)	4.40%	6.97%	4.63%	6.02%	3.52%	2.44%
ITA-Attributable GDP Growth (Year One)	0.17%	0.10%	0.02%	0.15%	0.14%	0.02%
GDP With ITA Accession (2024, US$ Billions)	$848.6	$33.2	$406.8	$110.7	$359.7	$446.0
ITA-Attributable GDP Growth (In Year 10)	1.52%	0.98%	0.23%	1.29%	1.30%	0.17%
ITA-Attributable Increase in GDP Output (In Year 10, US$ Billions)	$12.72	$0.32	$0.92	$1.41	$4.63	$0.77

Tax Impact	Argentina	Cambodia	Chile	Kenya	Pakistan	South Africa
ITA Tariff Rate (2014)	5.7%	3.3%	0.8%	4.8%	5.4%	0.8%
Goods and Services Tax Rate (2014)	21%	10%	19%	16%	17%	14%

Income Tax Rate (2014)	8.1%	3.2%	6.4%	8.0%	3.5%	15.9%
Tariff Revenue Forgone (Year One, US$ Millions)	$430	$26	$65	$63	$173	$95
Goods and Services Tax Revenue Gained (Year One, US$ Millions)	$117	$3	$16	$13	$38	$17
Income Tax Revenue Gained (Year One, US$ Millions)	$68	$1	$4	$7	$12	$9
Tax Revenue Gained as % of Tariff Revenue Forgone (Year One)	43%	15%	31%	32%	29%	28%
Total Tariff Revenue Forgone (Over 10 Years, Cumulative US$ Millions)	$7,690	$720	$1,135	$1,047	$2,653	$1,435
Total Goods and Services Tax Revenue Gained (Over 10 Years, Cumulative US$ Millions)	$2,099	$94	$280	$218	$586	$261
Total Income Tax Revenue Gained (Over 10 Years, Cumulative US$ Millions)	$6,021	$60	$347	$653	$959	$721
Total Revenue Gained as % of Total Revenue Forgone (Over 10 Years)	106%	21%	55%	83%	58%	68%
Tariff Revenue Forgone (In Year 10, US$ Millions)	$968	$105	$142	$127	$310	$166

Goods and Services Tax Revenue Gained (In Year 10, US$ Millions)	$264	$14	$35	$27	$68	$30
Income Tax Revenue Gained (In Year 10, US$ Millions)	$1,027	$10	$59	$112	$162	$122
Revenue Gained as % of Revenue Forgone (In Year 10)	133%	23%	67%	109%	75%	92%

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increase ITA goods sales by 1.30 percent. For simplicity, we assume away the substitution effect between imported goods and domestic goods and use the total value of imports as a proxy for physical quantity demanded. This assumes that the value of imports captures the physical quantity demanded, although the change in prices would in turn have increased physical quantity of ICT goods imported. (e.g., 10 CPUs cost $1,100 with 10 percent tariffs, and quantity demanded is 10, so cutting tariffs would mean that a CPU costs only $100; so, with that $1,100, one can get 11 CPUs, but as the value of that is still $1,100, it does not accurately represent the change in physical quantity. Note, this change is not import demand elasticity; it is the effect of using monetary value as a proxy for quantity demanded.) We next assume that prices paid for ITA products in that country are marked up by their equivalent tariff level (e.g., if tariff levels are 5 percent, consumers effectively pay 105 percent for an ITA product); eliminating tariffs would eliminate the markup, leading to consumers paying 100 percent of the product's price.

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