How ITA Expansion Benefits the Chinese and Global Economies

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ITA expansion would reduce tariffs paid by Chinese exporters of ICT products by $8 billion, while also increasing Chinese exports of ICT products by $12 billion due to increased global demand for ICT products generated through tariff elimination.

The Information Technology Agreement (ITA) has been one of the most commercially successful trade agreements ever undertaken, for the global economy, for the information and communications technology (ICT) industry, and for nations that signed the agreement—particularly China. Since the ITA took effect, China has become the world's largest exporter of ICT goods. China's exports of ICT goods have grown 30 percent annually (far outstripping the average 7 percent annual global increase in ICT goods exports), reaching $554 billion in 2012.[1] Just as the ITA has tremendously benefitted China's economy, ICT industries and enterprises, and workers and consumers, so will an expansion of the ITA—such as by making multi-component semiconductors (MCOs) and other key goods part of an expanded ITA.

INTRODUCTION

In December 1996, 29 World Trade Organization (WTO) members launched the Information Technology Agreement, a novel trade agreement in which participating nations eliminated tariffs on eight core categories of ICT products (including semiconductors, computers, and telecommunications equipment). The ITA's architects made the benefits of tariff elimination available on a most-favored nation (MFN) basis, meaning that ICT goods exporters from all WTO-member nations could enjoy tariff-free exports on the covered ICT products regardless of whether they participated in the agreement. Participating countries launched the ITA understanding that the 21st century would be an era of information and communications technology and that an agreement

eliminating tariffs on trade in hundreds of ICT products could play a vital role in promoting affordable access to these technologies for businesses and consumers.

Today, 79 nations are ITA signatories, and throughout its almost two decades, the ITA has had a significant impact on expanding trade in ICT products. Since the ITA came into force in 1997, global exports of ICT products have increased approximately 7 percent per year, as trade in ICT products has grown from $1.2 trillion in 1996 to over $5 trillion in 2014.[2] Over this time, the ITA has facilitated the formation of efficient global ICT supply chains and played a critical role in promoting ICT trade and investment, which in turn has driven innovation, boosted productivity, created new companies and new types of jobs, increased employment, and accelerated global growth.

Yet even as ICT innovation has flourished, the product scope of the ITA has not been expanded since the agreement was chartered. And even then, the initial ITA did not cover core ICT products such as DRAMs (dynamic random access memory chips) and dozens of every-day consumer electronic products, such as audio speakers, DVD players, and video recording equipment. Moreover, technology has since spawned the creation of hundreds of innovative new ICT products, everything from an entirely new class of semiconductor chips called multi-component semiconductors, GPS systems, flat panel displays, and video game consoles to ICT-enabled medical devices and home monitoring systems, virtually none of which are covered under the ITA.[3] Expanding the ITA would promote affordability and accessibility to a new generation of ICT products and further propel growth in trade of these prosperity-enhancing devices. In fact, an ITA expansion that includes approximately 250 new product lines could remove tariffs on at least an additional $1 trillion in global ICT trade.[4] A successful ITA expansion deal would represent the first significant market-access expanding agreement from the WTO in nearly two decades.[5]

An ITA expansion that adds 256 product lines to the ITA could remove tariffs on an additional $1 trillion in annual global trade in ICT products.

Semiconductors constitute the largest product category covered by the ITA.[6] From 2005 to 2010, semiconductor products experienced the highest export growth rate of any ITA product category, growing at 7.8 percent annually.[7] By 2010, semiconductors accounted for 33 percent of global exports of ICT products.[8] Because semiconductors represent such a foundational input to ICT products—and such a foundational component of the ITA itself—it's vital that any expansion of the ITA include all semiconductors, including MCOs. In fact, it's clear that the ITA was intended to cover all semiconductors and integrated circuits (ICs). In 1996, all semiconductors were classified in HS 8541 and HS 8542, both of which were fully covered in Attachment A. However, advances and innovation in semiconductor technology have outpaced the HS (harmonized schedule) tariff nomenclature, such that certain more advanced semiconductors, like MCOs, now do not meet the original HS definitions for semiconductors.

MCOs represent a new innovative type of custom-designed semiconductor that provides increased functionality for a wide range of products—from smartphones, tablets, medical devices, and automotive components (such as braking, steering, and air bag systems) to household appliances such as refrigerators, dishwashers, and vacuum cleaners—while at the same time reducing their energy consumption and the total number of components needed.[9] For example, using one MCO in a server can reduce the device's overall footprint

(e.g., form factor) by up to 50 percent and can reduce power losses by up to 15 percent. MCOs account for an estimated 1.5 to 3 percent of the global semiconductor market today, but as an innovative new product category these percentages will only increase going forward. Including MCOs would result in global tariff savings of up to $188 million on trade in these products.[10] Moreover, without an ITA expansion, the cost of MCOs will be artificially inflated relative to the previous generation of semiconductors, which actively discourages firms across the globe from investing in cutting-edge technology.

This report first examines how ICT has been and remains a central driver of Chinese economic growth. It then articulates how ITA expansion—including adding MCO semiconductors to the list of covered products—will benefit China's economy. In particular, ITA expansion will benefit China by: 1) directly contributing to China's economic growth; 2) promoting the diffusion of affordable ICTs that are vital to boosting across-the-board productivity growth and innovation; and 3) lowering costs for downstream manufacturing and services industries that rely on ICTs as inputs. Finally, the report addresses several misgivings coming out of China regarding ITA expansion—notably that expansion may threaten nascent indigenous Chinese manufacturing industries and that expansion is not affordable because it will result in reduced tariff income—explaining why these concerns are outweighed by the benefits that ITA expansion provides.

The following summarizes the report's key findings:

Key Findings:

- ICT accounts for approximately 20 percent of Chinese GDP growth; while ICT production is important for economies, ICT usage (i.e. consumption) is even more important.
- The ITA has played a catalytic role in expanding global two-way trade in ICT products to over $5 trillion annually.
- China has been a key beneficiary of the ITA as its share of global exports of ICT products has increased from 2.2 percent in 1996 to 30 percent in 2012.
- ITA expansion will result in an $8 billion reduction in tariffs incurred by exporters of ICT goods from China.
- Increased global demand for ICT products induced by ITA tariff elimination will increase China's exports of ICT goods by $12 billion annually.
- China's foregone $6.4 billion in tariff collections from ICT products now under consideration for ITA coverage will be more than made up for by these gains.
- Cost reductions for ICT products from eliminating tariffs would increase global demand for ICT products by 8 percent.
- ITA expansion will increase the competitiveness of enterprises that rely on ICT components as key inputs for their exported products—for example, more than half of the semiconductors China imports are inputs into final products for export.

ICT AS A CENTRAL DRIVER OF CHINESE ECONOMIC GROWTH

Information and communications technologies have been a central driver of Chinese economic growth for at least the past three decades. In a 2006 study, Heshmati and Yang found that 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.[11] Updating this data in 2013, Wang and Lin found that the contribution of ICTs to Chinese GDP growth remained steady at approximately 20 percent from 2003 to 2007.[12] The contributions ICTs make to a country's economic growth arise through two principal channels: ICT production and ICT usage (i.e. consumption and application). The following section examines each in turn.

ICT Production

The most straightforward contribution comes from a country's ICT enterprises. As Figure 1 shows, the direct contribution of Chinese ICT industries to Chinese GDP has increased virtually every year since 2003, with China's ICT industry now directly contributing approximately 10 percent to China's annual GDP. ICTs now represent one of China's most important manufacturing industries. In fact, Wang, Lin, and Li find that, in 2007, the ICT industry's share of China's total industrial output reached 46 percent.[13]

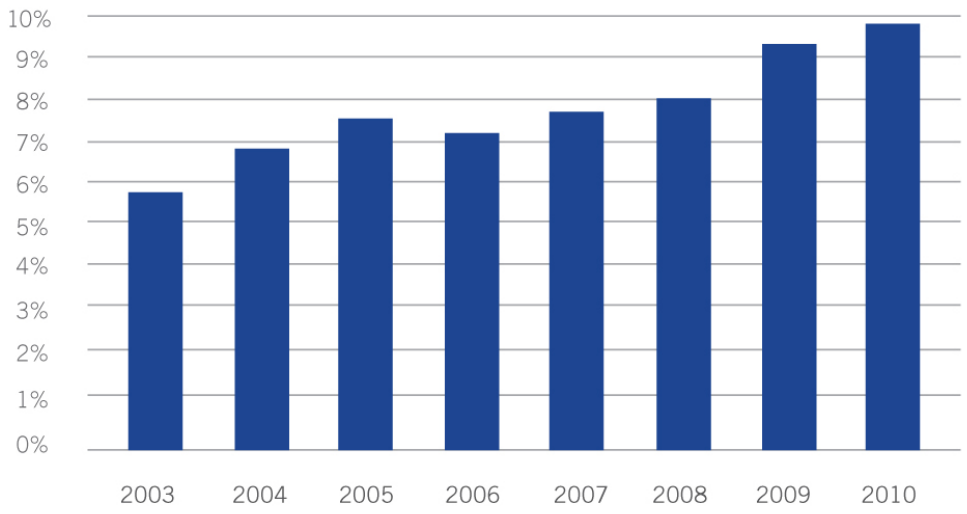

Figure 1: ICT Industry Contribution to Chinese GDP[14]

ICT manufacturing has also become one of China's most important export industries. In fact, as Figure 2 shows, China has risen to become the world's leading exporter of ICT products, with its $554 billion of ICT exports in 2012 more than 2.5 times greater than the ICT exports of second-place Hong Kong and almost four times greater than those of the United States.[15] Moreover, as Figure 3 shows, China's share of global ICT exports has grown consistently: from just 2.1 percent in 1996, to 15.8 percent in 2005, to 30 percent in 2012.[16] Figure 3 clearly shows that the beginning of the spike in China's share of global ICT goods exports came starting in 2001, the year China joined the WTO and began to enjoy the benefits of the ITA (though it did not itself become an ITA signatory until 2003)

because it nevertheless received duty-free treatment on its ICT goods exporters since the ITA operates on a MFN basis.

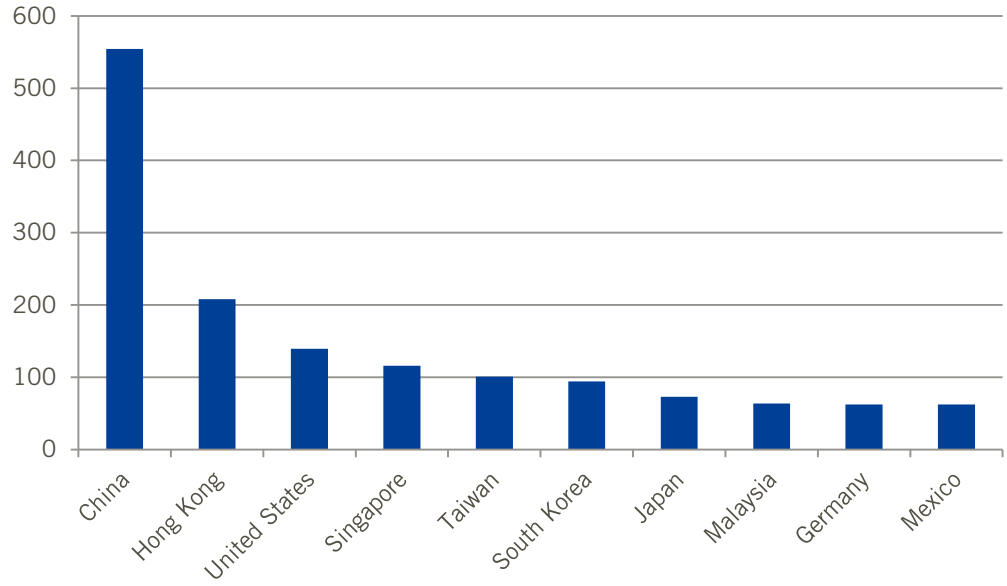

Figure 2: Leading ICT Goods Exporting Countries (billions USD), 2012[17]

As Figure 4 shows, China's ICT goods exports accounted for 27 percent of the country's total goods exports in 2011, the fourth-highest level in the world, and the second-highest among developing nations. From 1997 to 2010, the share of ICT goods exports as a percentage of China's total exports increased by 39 percent.[18] China's ICT exports have produced significant trade surpluses for the country. From 2003 to 2012, China's annual surplus in ICT trade increased from almost $40 billion to over $280 billion.[19]

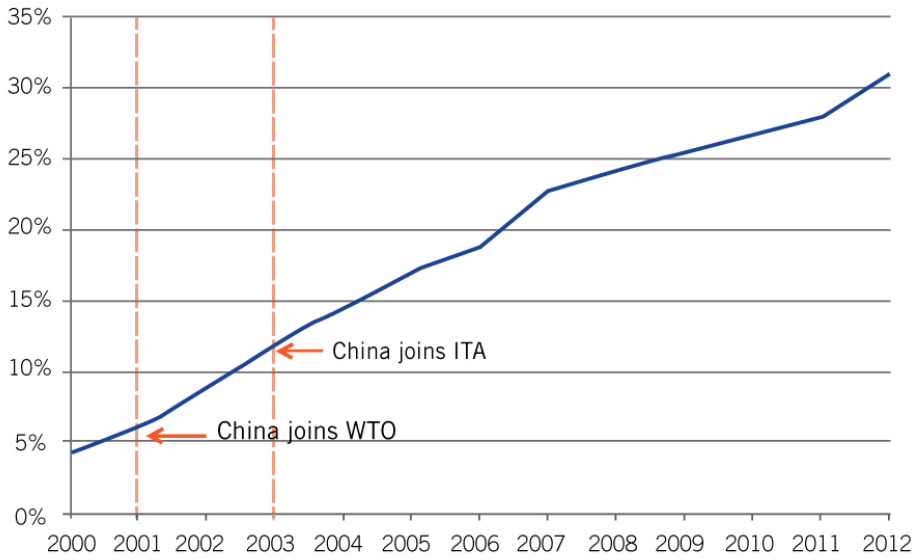

Figure 3: Chinese Share of Global ICT Goods Exports, 2000-2012[20]

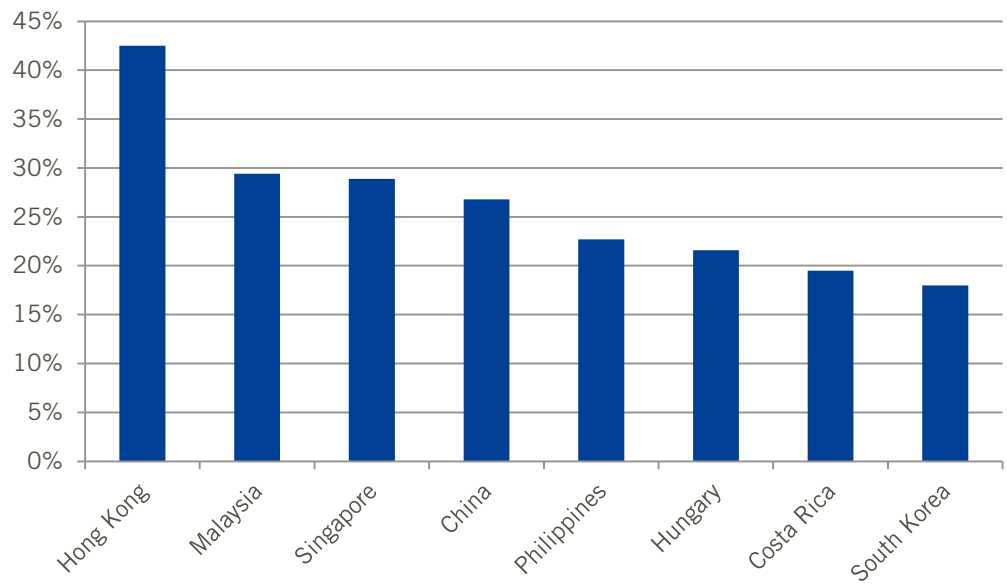

Figure 4: ICT Goods Exports as Percentage of Total Goods Exports, 2012[23]

While ICT production is important, promoting widespread ICT usage and application across all organizations in an economy is actually far more important.

Despite China's robust and growing exports of ICT goods, some have argued that Chinese value-added in ICT exports remains low because a large share of the value in Chinese ICT exports resides in imported foreign components that are assembled into final ICT products in China's trade processing zones. But as the Organization for Economic Co-operation and Development's (OECD) trade in value added (TIVA) data shows, in 2009 China's surplus in value-added trade with the United States remained over $130 billion. The OECD's TIVA data further shows that Chinese entities added more than 55 percent of the value-added in Chinese exports of electrical equipment in 2009.[24] In other words, Chinese enterprises are contributing a significant share of the value-added of their ICT exports. This highlights a broader point: economies are competitive in information technology industries through a combination of indigenous and foreign production. Indigenous production confers many advantages (i.e., increasing domestic employment, increasing domestic enterprises' capture of value-added, etc.), but so also does production by foreign-invested enterprises (FIEs). FIEs increase a recipient country's stock of capital and R&D investment, introduce new technologies and manufacturing processes, and engender spillovers in the form of skills and technologies that expand local knowledge and talent. This is the reason why leading countries in ICT industries foster a complex ecosystem combining innovative domestic and foreign producers.

And in fact, the Chinese electronics industry has grown phenomenally since the ITA entered force in 1997, contributing to significant increases in global trade in ICT products ever since. Sales by the top 100 Chinese electronics companies grew from $24 billion in 1997 to $230 billion in 2010 and to over $300 billion by 2013.[25] Such statistics counter the common misperception that only foreign enterprises have reaped the benefits of the ITA in China. A closer look at the numbers reveals that Chinese domestic enterprises have also been significant beneficiaries of the ITA.

Finally, China's ICT industry contributes substantially to Chinese employment. In fact, Chinese ICT manufacturing employment experienced a 12 percent annual growth rate from 2003 to 2013, a rate more than four times greater than the 30-year average of 2.3 percent across all other sectors. In fact, from 2002 to 2007, Chinese jobs in the manufacture of electronic equipment increased by 115.6 percent—one of the highest percentage growth rates for any Chinese industry.[26] The number of employed citizens in China's ICT sector exceeds 9 million.[27] But these jobs also support others in the economy, for most economists agree that jobs in manufacturing and export-oriented technology industries—such as ICTs—have a large multiplier effect. For example, in the United States, one study found that 15 other jobs are supported for every job created in California's electronic computer manufacturing industry. [28] Assuming a rather conservative multiplier of 3.0, then China's 9 million jobs in the ICT sector support approximately 27 million jobs across the rest of China's economy.

In summary, by reducing tariffs on global trade in ICT products, the ITA has boosted global demand for ICT exports and played an important role in bolstering Chinese ICT manufacturing, exports, and employment.

ICT Usage/Consumption

But the impact ICT has on China's economy goes far beyond the industry's direct contributions to Chinese GDP, exports, and employment, for ICT is the Chinese (and global) economy's strongest driver of productivity and innovation across all industries, whether they are ICT-producing or consuming.[29] ICT achieves this status by virtue of being the modern economy's pre-eminent general purpose technology, or "GPT." GPTs are transformative "platform" technologies that share three key characteristics: they 1) are pervasive, touching all industries and sectors of an economy and society; 2) experience rapid performance improvements and price declines over time; and 3) make it possible to invent and to produce new products (e.g., computer numerically controlled machine tools), processes (e.g., self check-in at airports), business models (e.g., e-businesses models based on fractional ownership or the simultaneous aggregation of supply and demand), and even fundamental new inventions (e.g., mapping the human genome).[30]

As this era's sole GPT, ICTs are powerful precisely because they enhance the productivity and innovative capacity of every individual, enterprise, and industry they touch throughout an economy—and this holds true for developed and developing countries alike.[31] As Ahmed and Ridzuan observe in *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."[32] Indeed, as research performed in 2011 by Oxford Economics confirms, ICT generates a bigger return to productivity growth than most other forms of capital investment.[33] In fact, ICT workers contribute three to five times more productivity than non-ICT workers.[34] In other words, ICT is "super capital" that has a much larger impact on productivity than other forms of capital.[35]

ICTs are just as vital to enabling innovation as they are to boosting productivity. For example, the OECD found that the probability of innovation in a firm increases with the intensity of ICT use, and that this holds true for both manufacturing and services firms and for different types of innovation.[36] Likewise, in the European Union, 32 percent of companies report being "active innovators," with ICT enabling half of those firms' product innovations and 75 percent of their process innovations.[37] Ultimately, ICTs' productivity-enhancing and innovation-enabling benefits at the individual, enterprise, and industry level aggregate to enable productivity and economic growth at an economy-wide level.

This is why multiple academic studies have found strong linkages between ICT consumption (i.e. usage) and economic growth in developing countries, including China. For example, Wong finds that the contribution from ICT capital deepening to Chinese economic growth from 1991 to 2000 reached 32 percent.[38] Kanamori and Motohashi find that 20 percent of Korean GDP growth from 1995 to 2004 arose from the use of ICT.[39] And Ahmed finds that the use of ICT in Malaysia had the largest impact on increasing manufacturing productivity, greater even than human capital.[40]

Similarly, Farhadi, Ismail, and Fooladi find in *Information and Communication Technology Use and Economic Growth*, "The more a country use[s] ICT, the greater is its economic growth."[41] 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.[42] 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.[43] In this regard, it's concerning that, despite China's prowess in ICT production, it trails many peer countries in the penetration and diffusion of information and communications technology. For example, the World Economic Forum's 2013 Networked Readiness Index ranks China's level of ICT uptake at 58th in the world, down seven spots from its position in 2012.[44] Only 12 percent of Chinese citizens have fixed broadband subscriptions, and only 40 percent report using the Internet regularly, partially due to an underdeveloped Internet infrastructure.[45]

It's also important to note that the positive correlation between a country's ICT usage and economic growth intensifies with 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 that ICT enables occur subsequently, when companies use the new technology to expand into new markets and transform industries.[46] Thus, ICT serves as a foundational investment that is complementary to further investment and serves as a springboard for further growth.[47] Indeed, laying the groundwork for growth through significant 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 revealed that ICT investment, particularly in software, contributed to productivity gains in both ICT and non-ICT industries and that these improvements strengthened over time.[48] 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.[49]

These types of effects are clearly evident in World Bank studies, which demonstrate that greater penetration of ICTs among consumers and businesses directly boosts economic growth in developing countries. By helping decrease the prices for ICTs through tariff reduction, the ITA has helped facilitate the diffusion of ICTs, such as mobile phones and broadband Internet, throughout developing countries. This is because a 1 percent decrease in the price of ICT products engenders a 1.5 percent increase in demand for them.[50] As Figure 5 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.[51]

Because China exports more ICT products than any other country, it's poised to better benefit from the tariff eliminating effects of ITA expansion than any other country.

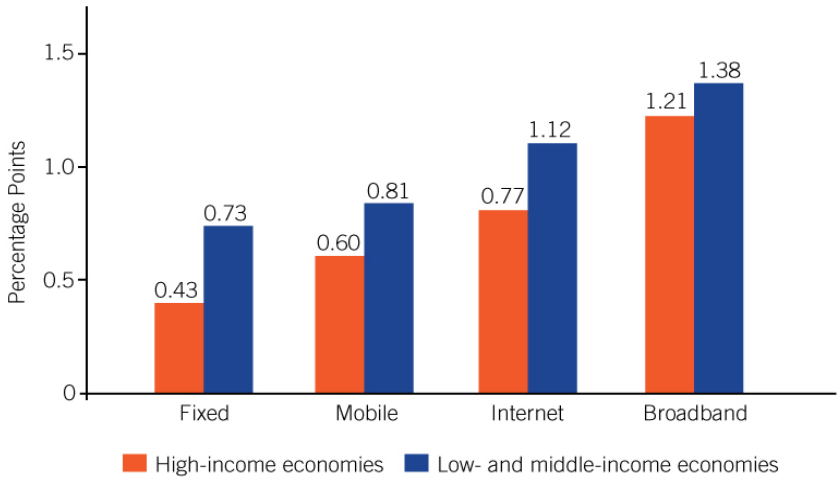

Figure 5: Impact of a 10 Percent Increase in Penetration of Key ICTs on Annual Percent GDP Growth[52]

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.[53] 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 ICT becomes more easily available, including for additional sectors of the economy eager to realize the productivity gains associated with its use.[54]

Put simply, while ICT production is important, promoting widespread ICT usage and application across all actors in an economy is far more important, and here the tariff-eliminating nature of the ITA has played a transformative role, for all nations. For countries worldwide, this means that a government's policies should focus not so much on encouraging ICT production but on promoting ICT usage among consumers and businesses.

China actually recognized this in its 10th and 11th Five-Year Plans for National Economic and Social Development. As Amiri et al. explain, in those plans, China's government recognized "that the promotion of the application of information technology…was the key link to upgrading China's industrial structure and realizing industrialization and modernization. China's government understood that information technology needed to be used extensively in all circles of society and the use of computers and the Internet needed to be widespread."[55] Yet this also suggests how much more room ICT has to increase its contributions to Chinese economic growth. As Van Ark notes in *The Linked World: How ICT Is Transforming Societies, Cultures and Economies*, China still has very low levels of ICT capital per worker. In fact, the United States leverages seven times more ICT capital per worker than China does.[56] In China's drive to become an increasingly innovative economy, enhancing investment in ICT capital per worker should be a leading objective.

HOW ITA EXPANSION BENEFITS CHINA

Chinese exporters of ICT goods would immediately benefit from ITA expansion by saving almost $8 billion in reduced tariffs on their overseas sales each year.

Developing countries have benefitted tremendously from the ITA, with their share of global exports of ICT products more than doubling—from 31 to 70 percent—from 1996 to 2012.[57] Perhaps no country has benefited more from this than China.[58] As the U.S. International Trade Commission (ITC) concluded in its report *The Information Technology Agreement: An Assessment of World Trade in Information Technology Products*, "China's rise to preeminence in the global ITA market is the most significant shift in ITA trade in Asia—and the world."[59] As the ITC report continued, "China's ITA trade accelerated after implementing its WTO commitments to reduce trade impediments, including eliminating its tariffs on ITA products. By 2003, when China entered the ITA, it was already the third largest exporter…by 2008 it was the largest."[60] Indeed, it's in no small part because of the ITA that China's exports of ITA-covered products have increased from just $11 billion in 1996 to $387 billion in 2010, a 30 percent annual increase that far outstrips the pace of global increase in exports of ITA-covered products. In fact, China's share of global exports of ICT products has doubled since it joined the ITA in 2003.

ITA expansion is poised to benefit China's economy and ICT industries in a variety of ways. First, it will generate economic growth for China by expanding global markets for the consumption of ICT products (which will directly benefit Chinese ICT-producing and exporting enterprises). This economic growth will actually offset the reduction in government income experienced by eliminating tariffs on several hundred more ICT product lines. Second, by reducing tariffs on ICTs, ITA expansion will benefit all ICT-consuming industries, enterprises, and citizens in China, which will raise China's across-the-board productivity levels. ITA expansion will also provide a third distinct benefit: increasing the competitiveness of a wide range of downstream manufacturing and services industries that use ICT components as inputs in their products and service offerings.

ITA Expansion Directly Contributes to Chinese Economic Growth

Global GDP growth has slowed in recent years among developed and developing nations alike. In fact, Chinese GDP grew just 7.7 percent in 2013 (matching 2012's level) and Chinese economists forecast similar growth for 2014, growth rates well off the pace of the annual double-digit gains China regularly racked up over the past thirty years.[61] As the *Wall Street Journal* wrote, "China's growth prospects in 2014 depend on the gains it can

chalk up from exports and the pains that come from trying to remake the world's No. 2 economy. China's leaders have said they want to remake the economy so it relies less on heavy investment in real estate, infrastructure and capital-intensive industries, and exports abroad."[62] ITA expansion can contribute on both accounts: first by directly contributing to economic growth and secondly by contributing to across-the-board productivity growth that will help rebalance China's economy with stronger growth from its non-traded sectors.

First, ITA expansion will directly contribute to increases in Chinese exports of ICT products. In fact, because China exports more ICT products than any other country in the world, it's poised to better benefit from the tariff-eliminating effects of ITA expansion than any other nation. Specifically, ITIF estimates that if ITA expansion proceeds on the basis of the products currently under discussion, then an additional $150 billion in Chinese ICT exports will come under ITA coverage. The global, weighted-average, most-favored nation tariff on ICT goods not currently covered by the ITA is 5.3 percent.[63] If these tariffs are eliminated through ITA expansion, then Chinese exporters of ICT goods would immediately benefit by saving roughly $8 billion in reduced tariffs on their overseas sales each year, savings that can be passed on to consumers, reinvested in innovation and new product development, and/or allocated to stakeholders including the owners and/or workers at Chinese ICT manufacturing enterprises.

The global increase in demand for ICT products engendered by ITA expansion could boost Chinese exports of ICT goods by as much as $12 billion annually.

Second, the reduction in tariffs imposed on ICT products will simultaneously expand global demand for them, an economic phenomenon known as import demand elasticity. In other words, cutting tariffs lowers prices on ICT products, increasing demand for them. As noted previously, for every 1 percent drop in the price of ICT products there is a 1.5 percent increase in demand for ICT goods. Also, the average global tariff on non-ITA covered ICT products is 5.3 percent. Assuming that the majority of benefits from tariff elimination arising from ITA expansion are passed on to consumers, cutting tariffs will result in an 8 percent increase in global sales for the $500 billion worth of global ICT exports coming under ITA coverage. Measured against China's $150 billion in annual ICT exports that will now come under ITA coverage, Chinese ICT goods manufacturers can expect to realize an increase in ICT exports of approximately $12 billion annually from increased global demand for ICT products engendered from tariff elimination. As Ye Qing, a Professor in the School of Public Finance and Taxation at the Zhongnan University of Economics and Law in Wuhan, China presciently summarizes, "As China's foreign trade growth is slowing, now is a good time for our country to join the [ITA expansion] treaty."[64]

ITA Expansion Raises Productivity by Benefitting ICT-Consuming Chinese Enterprises

Beyond providing direct benefits to China's economy, ITA expansion will further benefit China by benefitting the consumers of ICT products. First, by reducing tariffs on, and thus the cost of ICT products, ITA expansion promotes the diffusion of affordable ICTs that are vital to boosting the productivity of all industries, enterprises, and individuals in China's economy. Second, ITA expansion will reduce the cost of key inputs for ICT components that will in turn make a wide range of downstream Chinese industries—from manufacturers of automotive parts, medical devices, and household appliances to services

industries—that rely on ICT inputs more productive and also more competitive in global markets.

ITA Expansion Promotes Diffusion of Affordable ICTs Vital to Boosting Productivity and Growth

The aforementioned *Wall Street Journal* article noted that continued robust Chinese economic growth needs to come from both exports and a rebalancing of China's economy toward greater internal consumption and higher productivity of domestic (non-traded) industries. As the economist Paul Krugman has noted, "Productivity growth is the single most important factor affecting a country's economic well-being."[65] Yet, as of 2013, Chinese labor productivity stood at just 17 percent of U.S. levels.[66] Thus, dramatically raising the productivity of all industries and enterprises in China will generate the greatest and most sustainable economic gains for China. And by lowering the cost of key ICT products, ITA expansion can increase the take-up of ICT throughout a wide range of domestic service sectors such as education, government, financial services, retail, and transportation, causing productivity growth in all these sectors to flourish.

Economies can increase their productivity in two ways. First, firms can become more productive, usually by investing in new technologies or improving the skills of their workers. This is called the "growth effect," whereby a nation's productivity goes up not by some sectors getting bigger or smaller, but by all sectors becoming more productive. For example, a country's retail, hospitality, banking, transportation, and automobile manufacturing sectors can all increase their productivity at the same time. The second way to increase productivity—called the "shift effect"—is more dynamic and disruptive: low-productivity firms and/or industries lose out in the marketplace to high productivity firms and/or industries that are more efficient and can cut prices or boost quality to gain market share.[67] Across-the-board productivity growth and shifts in the mix of establishments toward more productive ones can both contribute to an increase in a nation's productivity and average incomes.

However, the lion's share of productivity growth in most nations—and especially large ones such as China—comes not from changing the sectoral mix to higher-productivity industries, but from all firms and organizations, even low-productivity ones, boosting their productivity. Overall, the evidence shows that changes in organizations (e.g., businesses, government, non-profits, etc.) drive productivity, with around 80 percent of productivity growth coming from organizations improving their own productivity and only about 20 percent coming from more productive organizations replacing less productive ones.[68]

This has been confirmed by research in the McKinsey Global Institute's report *How to Compete and Grow: A Sector Guide to Policy*, which explains that countries that outperform their peers do not have a more favorable sector mix, but instead have individual sectors that are more competitive and productive.[69] In other words, it's not share that matters, but rather it is productivity growth across all sectors. Put succinctly, the productivity of a nation's sectors matters more than its mix of sectors. As McKinsey's report concludes:

> The mix of sectors is surprisingly similar across countries at broadly equivalent stages of economic development. It is not the mix of sectors that decides the

> growth in developed economies, but rather the actual performance within the sectors compared with their counterparts in peer economies. [There is] a similar pattern in developing countries; even if they started with a less favorable sector mix; the fastest-growing countries outperformed their peers in terms of their sector competitiveness.[70]

Nevertheless, a central goal of recent Chinese economic development strategy has been to promote seven key Strategic and Emerging Industries (SEIs)—ICT, clean energy, materials science, nuclear fusion and nuclear-waste management, stem cells and regenerative medicine, public health, and the environment—and to have these seven industries contribute 15 percent of overall value-added to China's GDP by 2020.[71] But even if China is successful in this "shift strategy" to promote these seven Strategic and Emerging Industries—spending the equivalent of $1.5 trillion to do so—it will have only gained the equivalent of 14 months of productivity growth (assuming a continuation of past overall Chinese economic and productivity growth trends).

If China wishes to more deeply integrate itself into global value chains, one of the best ways is participating in a robust ITA expansion.

Ultimately, if China wants to restore the greater than 10 percent annual GDP growth to which it has become accustomed, it cannot do so by simply creating a few hundred thousand more jobs in some ICT manufacturing industries; it must transform all its industries—including non-traded ones in domestic-serving sectors of the economy—and having those sectors use more ICT, and do so more efficiently, will be key to realizing this goal.[72] Failure to reduce tariffs on these key ICT growth drivers is a step backward, not forward, for China. In other words, just as the original ITA has been doing for some time, ITA expansion will continue to lift productivity for all sectors that consume ICT products in China.

This nicely complements several of the objectives articulated at the Third Plenum of the 18th Central Committee of the Chinese Communist Party in November 2013. For example, a prominent theme of the Plenum was that China needs to "change its export- and investment-driven model to a more consumption-driven one."[73] And as a letter addressed to Premier Li signed by 81 associations from 31 economies and regions around the world supporting ITA expansion states, another key objective articulated in the Third Plenum leadership communiqué calls on Chinese policymakers "to more deeply integrate China into the global economy."[74] And as an OECD report on the *Trade Policy Implications of Global Value Chains* finds, "global value chains are particularly strong in industries covered by the ITA."[75] In fact, as the report notes, "The expansion of ICT global value chains coincides with the entry into force of the ITA in 1997."[76] This is why the OECD has found that countries not participating in the ITA saw their participation in global ICT value chains decline by over 60 percent from 1996 to 2009.[77] Put simply, if China wishes to more deeply integrate itself into global value chains, one of the best ways is participating in a robust ITA expansion.

ITA Expansion Empowers Downstream Industries that Rely on Core ICT Inputs

ITA expansion also helps industries—including exporting industries—that depend on ICT components and inputs. These components include semiconductors (i.e., integrated circuits), which are a foundational input to a wide range of electronics, computing, and

ICT products and applications that span far beyond ICT industries themselves. Indeed, semiconductor-empowered, ICT-enabled applications have increasingly become a core feature of a wide variety of downstream products: everything from automotive vehicles, medical devices, jet aircraft and engines, and industrial goods to consumer products. For example, as much as 40 percent of the cost of a modern automobile is comprised of electronic components.[78] Even modern manufacturing processes themselves have become increasingly ICT-dependent. And virtually all services industries—from financial services, hospitality, and transportation to health care, education, and government—depend on ICTs to boost their productivity and innovation capacity. Put simply, all these downstream "ICT-consuming" industries benefit when the duty-eliminating effects of ITA expansion lowers the prices for key ICT inputs. Some industries benefit because cheaper ICTs keep their export costs lower, others benefit because cheaper ICTs bolster their productivity.

ITA Expansion Benefits Chinese Export Industries that Rely on ICT Inputs

This is particularly true for China, especially since more than half of the semiconductors consumed in the Chinese marketplace are used in products that are exported.[79] That demand for semiconductors as critical inputs to final products for export is a key reason why China led the world in consumption of semiconductors in 2012 with a 52.5 percent share of global semiconductor consumption.[80] China accounted for 40 percent of global semiconductor consumption for use in data processing (i.e. computing) and 30 percent for use in manufacturing of communications products, with compound annual growth rates (CAGRs) of 19 and 20 percent, respectively.[81] But the industries with the fastest-growing demand for semiconductors in China are automotive, industrial, medical, and military/aerospace, which collectively saw their semiconductor consumption grow at 22 percent CAGR in 2012.[82] Meanwhile, Chinese manufacturers of consumer goods account for approximately 15 percent of total global semiconductor consumption for use in consumer goods products, with a 12 percent CAGR in 2012. To be able to manufacture globally competitive industrial and consumer products, Chinese industries depend upon access to affordable, best-in-class ICT inputs. Including coverage for foundational inputs such as MCOs is another reason why ITA expansion is so important.

Chinese industries depend upon access to affordable, best-in-class ICT inputs, and this is why an ITA expansion that includes coverage for foundational inputs such as MCO semiconductors is so important.

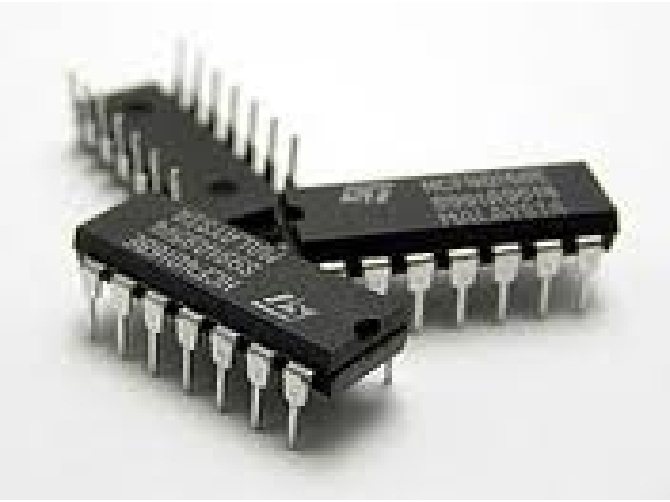

Figure 6: MCO Semiconductors

ITA Expansion Bolsters Productivity and Innovation in Manufacturing Sectors

Yet ITA expansion is important not just because it will enable manufacturers of a wide range of consumer and industrial goods to produce more globally competitive products, but also because ICT has become a critical input to the manufacturing process itself. For example, a recent study by the IDA Science and Technology Policy Institute finds that modern manufacturers "rely less on labor-intensive mechanical processes and more on sophisticated information-technology-intensive processes."[83] Indeed, numerous examples of information technology usage exist in the manufacturing domain, including in digital control systems, asset-management software, computer-aided design (CAD), integrated sensing, robotics, and modeling and simulation.

The use of information technology spurs overall productivity in the factory by increasing communication speed and efficiency and by helping maintain quality by better controlling processes. It's why a study by Joseph and Abraham found that ICT investment in the manufacturing sector has been a key factor to rapid increases in labor productivity in developing countries.[84] The tasks that can be monitored and controlled with information technology are increasing in number as well as complexity, and these increases are enabling high-speed production with increasing accuracy.[85] Going forward, there will be greater use of information technology in linking the design stage of an individual component to the larger assembly manufacturing system and to the use of manufactured products. Thus, the use of computer-enabled technologies improves communication that enables both "smart manufacturing" in the factory and "smart supply-chain design"—sending the right products to the right suppliers.

The implications are clear: if a nation's manufacturers wish to successfully compete in global markets, they will have to create and use data and information throughout the product life cycle, while adopting new computer-controlled machine tools, modeling and simulation, and real-time optimized production approaches. Governments that provide open access to the necessary manufacturing components and inputs will benefit their domestic producers; those that make access to these critical ICT inputs more expensive by imposing tariff duties on them will only damage their domestic manufacturers (including both their ICT manufacturers and non-ICT manufacturers).

Also, it's worth noting that the ITA has been a significant enabler of innovation in developing nations' ICT-producing sectors. For example, as the World Trade Organization's *15 Years of the Information Technology Agreement* report notes, "Among developing-country ITA participants, the rise of China, Korea, and Chinese Taipei as the top traders in the GPNs [global production networks] of IT products is mirrored by a profound shift of relative innovation efforts into ITA-related industry fields in these economies."[86] Likewise, the report notes that, "patenting activity among applicants from China shifted disproportionately into computer technology and telecommunications after 2000."[87] ITA expansion is likely to only accelerate these effects.

ITA Expansion Supports Productivity and Innovation in ICT Services Sectors

ITA expansion also benefits a wide range of downstream services industries, not just manufacturing industries. Having access to affordable, best-of-breed ICT products is essential for firms in ICT software and services sectors, including business process

outsourcing (BPO), systems integration, ICT consulting, application management, custom applications, infrastructure management, software testing, and Web development. Access to affordable, state-of-the-art ICT hardware for China's ICT services sector through ITA tariff elimination has played an important role in helping China build a competitive ICT services sector. In fact, ICT services as a percentage of China's total services exports rose from nearly 25 percent in 2005 to almost 35 percent in 2012, an increase of 40 percent.[88]

ADDRESSING CHINESE CONCERNS REGARDING ITA EXPANSION

Some in China have expressed two principal concerns regarding ITA expansion, particularly as it pertains to China's economy in general and ICT industries in particular. Their first concern is that ITA expansion—by eliminating tariffs and thus making imports of foreign ICT products more cost-competitive in Chinese markets—threatens China's efforts to establish nascent semiconductor manufacturing industries. The second is that ITA expansion will cost China tens of billions in lost revenues from duties collected on imports of ICT products that would come under ITA coverage. While at first glance both concerns might appear to be warranted, closer inspection reveals that they are not really on the mark.

Maintaining High Tariff Barriers Fails to Foster Nascent ICT Industries

Over the past several years, China has invested considerable resources in trying to develop an indigenous Chinese semiconductor industry. For example, in December 2013, China allocated $5 billion to establish a Regional Semiconductor Investment Fund.[89] The Fund intends to invest in:

1. Semiconductor design, manufacturing, assembly, testing, and core equipment with the aim of creating a complete, interactive, and high-end industry chain;
2. Engineering research centers, engineering labs, corporate research and development centers to improve indigenous innovation capabilities; and
3. Industry consolidation, mergers, and acquisitions.[90]

According to a government announcement, the official aim of the investment is to "rapidly raise the competitiveness of the integrated circuit industry and create a new 'northern' growth point for China's IC industry, use capital to accelerate the consolidation of resources and firms, and optimize the industry development environment for key Beijing-based or even nationwide firms in the IC industry or large projects and innovation entities or platforms."[91] Chinese officials view the Fund's launch as the first step toward the creation of three to five regionally based "semiconductor development companies," with state backing for the initiative expected to reach $16.5 billion.[92]

As China attempts to establish these regional semiconductor competitors, some hold that China needs to maintain existing tariff levels on non-ITA covered semiconductor products to give indigenous Chinese semiconductor producers a cost advantage and thus shield them to some degree from foreign competition. For example, Yu Jianhua China's Ambassador to the World Trade Organization, recently argued that "many industries in China are still in a critical growth stage" and that "it is reasonable to have some sensitive products which should be allowed for exclusion."[93] But—from Argentina and India to Mexico—countries'

experiences with such "infant industry" strategies as applied to general purpose technologies such as ICT have severely disappointed. In such dynamic, rapidly evolving high-technology industries as semiconductors, enterprises that are shielded from competition at the global frontier of technology development quickly fall behind, producing inferior devices that swiftly become obsolete. Moreover, by raising the cost of GPTs and/or lowering their relative quality, these policies hurt GPT-using industries, many of which must also compete in global markets.

Mexico's experience provides a poignant example. In the 1990s, in the interest of trying to spur development of an indigenous computer manufacturing sector, Mexico's government imposed joint venture and domestic content requirements on leading computer manufacturers including Apple, Compaq, Hewlett-Packard (HP), and others. But by forcing the computer manufacturers to source components from domestic producers whose components were more expensive and of inferior quality, these requirements contributed to the computers coming off Mexican assembly lines being three to four years behind industry standards and selling for prices 150 to 300 percent higher than the world average.[94]

Maintaining high tariffs on ICT products (i.e. by not supporting ITA expansion) is not a step in the right direction toward fostering an innovative Chinese economy.

In contrast, once Mexico abandoned the mandatory joint ventures required by its domestic content informatics policy, it achieved results not unlike those previously seen in East Asian countries such as Malaysia, Singapore, and Thailand. Mexico's decision to allow IBM to establish a wholly owned plant dedicated to exporting components and products into the parent's Western Hemisphere sourcing network stimulated Apple and HP to follow in IBM's footsteps, building new full-scale production sites for export as well as domestic sales. These moves saw the emergence of a "Little Silicon Valley" near Guadalajara, Mexico, as companies such as 3Com, IBM, Intel, and HP started bringing their component suppliers such as Flextronics and NatSteel Electronics with them from Southeast Asia.

India's experience provides a similar example. In the 1970s and 1980s, India erected barriers, including high tariffs, to the importation of computers and other ICT hardware with the intent of spurring development of a domestic computer manufacturing industry. But the economists Kaushik and Singh found that for every $1.00 of tariffs India applied to imported computers, the country lost $1.30 due to spillover effects, particularly the productivity losses that occurred in other sectors of the economy as they used relatively less ICT.[95] As the authors wrote, "High tariffs did not create a competitive domestic [hardware] industry, but [they] limited adoption [of ICT by users in India] by keeping prices high."[96] Thus, in the interest of favoring one industry—domestic ICT hardware manufacturers—India ended up harming all the other industries in its economy. Thus, India's experience with imposing high tariffs on ICT products as part of its import substitution industrialization policies in the 1970s provides a strong example of how higher costs for ICTs—whether as a result of high tariffs or a failure to lower them—retards productivity growth in other sectors of the economy as well as overall economic growth.

Infant industry strategies represent a form of import substitution industrialization. But as Georgetown University professor Michael Ryan observers, for countries that have tried to implement them, import substitution industrialization policies generally fail "because they

depend on demand conditions that are too protected to produce globally competitive industries."[97] New industries do not become competitive because of trade restrictions. Rather, protections typically resulted only in inefficient production of inferior products by insulated state-owned enterprises.[98] At the same time, import substitution industrialization policies entailed significant costs and wasted resources, as they required complex, time-consuming regulations; promoted inefficiently small industries; and set high tariff rates for consumers, including firms that needed to buy imported inputs. As Paul Krugman and Maurice Obstfeld conclude in *International Economics: Theory & Policy*, "import substitution industrialization policies [have] failed to promote economic development…countries adopting these policies grew more slowly than rich countries and other countries not adopting them."[99]

In contrast, exposing Chinese ICT industries, including semiconductor manufacturers, to competition from leading global competitors will only strengthen Chinese ICT industries in the long run. As Sang Baichun, Director of the Institute of International Business at Beijing's University of International Business and Economics, explains with regard to ITA expansion, "Of course some Chinese companies will be under pressure from intensified competition from their foreign peers. But it would be a good thing for the industry's development as a whole, as it will push them to improve their competitiveness."[100] Or, as *Forbes* contributor Panos Mourdoukoutas recently argued, Chinese companies need healthy competition to make great leaps forward, to move from "imitation to innovation."[101] More to the point, Chinese officials have clearly stated that they want China to become an innovation economy. Maintaining high tariffs is not a step in the right direction toward accomplishing that goal.

Further, if China wishes to support the development of more globally competitive semiconductor manufacturing industries, this will require sophisticated semiconductor fabrication facilities, and their construction actually relies on a range of parts and components that are an important part of ITA expansion. These include foundational components such as wafer transport and storage cassettes, vacuum pumps, heat exchange units, liquid and gas filtering equipment, valves, and insulated fittings.[102] Many of these components are produced by specialist manufacturers throughout the world, necessitating import. Even if China ultimately intends to domestically produce all these key inputs, that capacity won't exist for some time. Thus, if China's investments to seed indigenous semiconductor manufacturing industries are to bear fruit, the fabrication facilities will need to leverage best-of-breed technologies in their construction, else there's little chance that the semiconductors coming off production lines will be able to meet the cost and specification requirements of domestic industries, let alone global markets.

ITA Expansion Generates Economic Growth that Replaces Lost Tariff Income

A second source of Chinese concerns regarding ITA expansion relates to the impact of loss of tariff income on public finances. For example, on March 18, 2014, it was reported that Chinese WTO Ambassador Yu Jianhua said that, "At the time when [expanded ITA] negotiations are concluded and duties on these products are reduced to zero, China will lose tariff revenue over $27 billion."[103] By definition, while tariff income would fall to some degree as a consequence of eliminating tariffs on several hundred additional ICT

products, the reality is that this lost tariff revenue would be made up for through a number of mechanisms that ultimately leave the Chinese economy and Treasury in a better position. The academic logic of this effect is clear in reports such as the International Monetary Fund's report *Tax Revenue and (or) Trade Liberalization*, which finds that high-income countries—which China aspires to be—are clearly able to offset reductions in trade tax revenues with increased domestic tax revenues, and that middle-income countries—which China currently is—are generally able to achieve full recovery of reduced trade tax revenue with increased domestic tax revenue.[104]

This actually describes China's experience with tariff income after it joined the World Trade Organization. From 1994 to 2008, average tariff rates on Chinese imports were cut in half, from 10.2 percent to 4.9 percent. However, increased imports caused revenues to skyrocket from 30 billion yuan to over 170 billion yuan per year over this period. There is little reason to believe that continuing to liberalize trade will not continue to offset lost revenue with increased levels of global trade.[105] Some might say that the situation is different when tariffs on certain products are eliminated entirely; in other words, that while cutting tariffs incrementally can raise revenue by generating more imports to tariff, eliminating them altogether would seem to deplete income. However, this logic fails as related to ITA expansion. Reducing tariffs on one industry altogether still raises tax revenue by increasing imports into other sectors of the economy. Plenty of the trade agreements that have lowered China's average tariff rates have moved rates on specific goods to zero or near zero levels, including the original ITA agreement that China joined in 2003. Still, increases in overall tariff revenue were unaffected. These figures illustrate that countries do not need to rely on import duties as a strategy for levying taxation.

Every yuan the Chinese government no longer collects from tariffs on ICT products that come under ITA coverage inures to the benefit of Chinese citizens or enterprises consuming those ICT products.

In fact, assuming that ITA expansion brings an additional $500 billion in global imports of ICT products under ITA coverage, with China accounting for 18 percent of global ICT imports, then an additional $90 billion of Chinese ICT imports would come under ITA coverage.[106] If China imposes an average 7.1 percent tariff on these products, then China would forsake $6.4 billion of tariff income in a 256-product line ITA expansion as proposed. These losses are more than offset by the previously documented gains the ITA would produce for China's economy, including the estimated $12 billion in increased Chinese exports of ICT products engendered due to increased demand spurred by tariff elimination.

Moreover, the reality is that the loss of tariff income from Chinese imports of ICT products that would come under ITA coverage as part of ITA expansion is miniscule compared to China's robust—and rapidly growing—national public revenues. As Chinese Minister of Finance Xie Xuren recently noted, "Fiscal revenue has kept growing rapidly over the past few years."[107] In fact, China's fiscal revenues have been growing at a rate faster than Chinese GDP growth for some time. For example, in 2011, fiscal revenues grew 2.7 times faster than GDP growth.[108] In 2013, Chinese national public revenues reached an all-time record of 12.9 trillion yuan ($2.09 trillion), an increase of 10.1 percent over 2012 income.[109] With the lost tariff income incurred by ITA expansion amounting to just .31 percent of Chinese national public revenue, the argument that China cannot afford the hit to public income that ITA expansion would cause appears to be rather tendentious.[110]

But regardless, whatever the exact amount that China would forsake as a result of ITA expansion, the reality is that this money is not "lost" to the Chinese economy. Rather, the "gains" from the "missing" billions actually accrue both to Chinese workers—who are better off since they're exporting more products (because tariff elimination has reduced the cost of key inputs and thus improved the cost-competitiveness of their finished products)—and to Chinese consumers who are better off because they are enjoying cheaper products. In other words, tariffs, like any taxes, are transfer payments. If China keeps tariffs on these new ICT products, then the government may receive more revenue (at least in the short run) but Chinese consumers will pay higher prices. Conversely, every yuan the Chinese government no longer collects from tariffs on ICT products that come under ITA coverage inures to the benefit of Chinese citizens or enterprises consuming those ICT products.

CONCLUSION

The ITA has been one of the most successful trade agreements ever undertaken. It has played a critical role in expanding global trade in ICT products. In fact, the ICT sector remains one of the fastest growing sectors in world trade, with trade in ICT products now accounting for approximately 9.5 percent of global merchandise exports, a share higher than even agricultural products (9.2 percent) and automotive products (7.4 percent).[111] But not only has the ITA expanded trade in ICT products, it has played a catalytic role in spurring innovation, enhancing productivity, creating new companies and even new types of jobs, increasing employment, and accelerating global economic growth. Expansion of the ITA would bring immediate and significant benefits to both ICT producers and consumers, not just in China, but throughout the entire world. Now is the time for policymakers in all ITA-member countries to seize on the opportunity to further tariff rate reduction on ICT products, which promises to extend the already significant benefits the ITA has produced for individuals, businesses, and economies throughout the world.

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