The Information Technology Agreement, Manufacturing and Innovation – China's and India's Contrasting Experiences[1,2]

by
Dieter Ernst,
East-West Center, Honolulu and Centre for International Governance Innovation, Waterloo
9/23/16

Abstract
The **Information Technology Agreement (ITA)**, a pluri-lateral trade agreement, seeks to accelerate and deepen the reduction of trade barriers for the critically important information and communication technology (ICT) industry. ITA thus provides an interesting case study of how tariff reduction within an industry-specific trade agreement might affect gains from trade for manufacturing and innovation.

From a global welfare perspective, trade expansion could reinforce the diffusion of innovation. Developing countries and especially emerging economies could thus reap significant gains for industrial manufacturing and innovation. But whether this really happens is an empirical question. This chapter compares the contrasting experiences of China and India throughout the history of ITA, from the conclusion of the original ITA-1 agreement in 1996 up to the extended ITA-2 agreement on December 16, 2015. India joined ITA early from a position of weakness in electronics manufacturing. This gap in technological development explains why tariff reductions increased IT imports, but failed to stimulate domestic electronic manufacturing and innovation. By contrast, China joined ITA six years after India from a position of strength as the global export factory in electronics manufacturing. Through a continuous upgrading of its industry, China was able to reap the gains from trade.

Two specific questions are addressed: First, why is it that China's electronics industry has benefited substantially from ITA, while in India the gains from trade liberalization have been overshadowed by major costs that are eroding domestic electronic manufacturing and innovation? And, second, to what degree are domestic economic structures and global network integration useful to explain these different experiences and the very different approaches of India and China to the ITA-2 negotiations about expanding the product lists covered by this agreement? The analysis focuses on the role played by differences in the stage of development of their ICT industry, but also more generally in their growth models and regulations, and their resources and capabilities. In addition, differences are considered in the integration of both countries into the global corporate networks of production (GPNs) and global innovation networks (GINs) of the ICT industry. By inserting these domestic determinants into the analysis of trade and innovation, new insights are expected for the study of trade and innovation within pluri-lateral and mega-regional trade agreements.

---

[1] This chapter draws on a paper presented at the agenda-setting workshop, funded by the National Science Foundation, *Mega-Regionalism – New Challenges for Trade and Innovation (MCTI)*, at the East-West Center, Honolulu, January 20 and 21, 2016. Earlier versions have been published as Ernst, D., 2016, "The Information Technology Agreement, Manufacturing and Innovation – China's and India's Contrasting Experiences", http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2737082 ; Ernst, D., 2014, *The Information Technology Agreement, Industrial Development and Innovation - India's and China's Diverse Experiences*, The World Economic Forum and the International Center for Trade and Sustainable Development (ICTSD), *Geneva*, March; and Ernst, D., 2013, *Is the Information Technology Agreement Facilitating Latecomer Manufacturing and Innovation? India's Experience*, *East-West Center Working Papers, Economics Series*, No.135, November.

[2] I am grateful for comments and suggestions received from Shigeyuki Abe, Center for Contemporary Asian Studies, Doshisha University, Tokyo; CHEN Tain-Jy, National Taiwan University, Taipei; Susan Helper, Case Western Reserve University, Cleveland; Derek L. Hill, National Science Foundation and the Federal Renewable Energy Laboratory, Arlington; Brian Kahin, University of Washington, Seattle; Konstantinos Karachalios, IEEE-Standards Association, Piscataway; Bill Lazonick, University of Massachusetts at Lowell and The Academic-Industry Research Network; Kate Linton, U.S. International Trade Commission, Washington, D.C.; Doug Lippoldt, HSBC, London; Keith E. Maskus, University of Colorado, Boulder; Michael Plummer, The Johns Hopkins University, SAIS, Bologna; WANG Ping, China National Institute for Standardization (CNIS), Beijing; Mark Wu, Harvard Law School, Cambridge; and XUE Lan, Dean, School of Public Policy and Management, Tsinghua University, Beijing.

The paper concludes with suggestions for policy and further research.

Key words: Information Technology Agreement, China, India, trade liberalization, electronics manufacturing, trade policy, industrial policy
JEL: F13,F23,F63,F68,L63,L86,L96,O14, O19,O24,O25,O38,O53

Will Trade accelerate industrial innovation?

This chapter examines the **Information Technology Agreement (ITA)**, a pluri-lateral trade agreement that seeks to accelerate and deepen the reduction of trade barriers for the critically important information and communication technology (ICT) industry.

In contrast to multilateral WTO agreements, where all WTO members are party to the agreement, a pluri-lateral agreement implies that WTO member countries have a choice to agree to new rules on a voluntary basis. Their main purpose is to respond "to the changing needs of industries with agility by …[a]llowing flexibility in the choice of participants." [3] ITA for all practical purposes is about reducing all taxes and tariffs on ICT products, without any agreement thus far on non-tariff barriers (NTBs) and other "behind the border regulations". This sets ITA apart from regional trade agreements (RTAs) which increasingly contain provisions on intellectual property and other "behind the border" regulations[4]. Even more so does ITA differ from prospective mega-regional trade agreements like the Trans-Pacific Partnership agreement (TPP). ITA thus provides an interesting case study of how tariff reduction within an industry-specific trade agreement might affect gains from trade for manufacturing and innovation.

From a global welfare perspective, trade expansion could reinforce the diffusion of innovation[5]. Developing countries and especially emerging economies could thus reap significant gains for industrial manufacturing and innovation. But whether this really happens is an empirical question that is at the center of this chapter. ITA participants differ substantially not only in the stage of development of their ICT industry, but also more generally in their growth models and regulations, and their resources and capabilities. They also differ in how they are integrated into GPNs and GINs present in the ICT industry[6]. These four parameters encompass what might be called *domestic determinants* of the gains from ITA for industrial manufacturing and innovation.[7] Such divergent parameters matter in particular for the analysis of the ITA's impact on developing countries.

As discussed in a related chapter[8], manufacturing and innovation are closely intertwined, especially in a technology-intensive industry such as electronics. Of critical importance are innovations in generic industrial technologies that allow for new ways of manufacturing existing products (e.g., with new materials or by using smart robots or 3D printing) as well as for manufacturing new products derived from new ideas, discoveries, and inventions (e.g., nano-

[3] Nakatomi, M., 2013, *Plurilateral Agreements: A Viable Alternative to WTO?*, presentation at the WTO, March 11, https://www.wto.org/english/res_e/reser_e/wts_future2013_e/nakatomi.pdf

[4] Valdes, R. and M. McCann, 2014, *IP Provisions in Regional Trade Agreements: Revision and Update*, Staff Working paper ERSD 2014-14, 24 June https://www.wto.org/english/res_e/reser_e/ersd201414_e.pdf; and Mumford, P., 2014, Regulatory Coherencfe: blending trade and regulatory policy", *Policy Quarterly*, 10 (4).

[5] As argued in Curtis, J., 2013, *Trade and Innovation: Challenges and Policy Options*, background paper for the E-15 Expert Group on Trade and Innovation, International Center for Trade and Sustainable Development (ICTSD), Geneva, June 6-7.

[6] See the following related chapters in this book Ernst, D., 2016, *Beyond Value Capture - Exploring Innovation Gains from Global Networks***,** and by Susan Helper and Tim Krueger, Chen Tain-Jy, and Shigeyuki Abe.

[7] For details, see Ernst, D., 2014, "Trade and Innovation in Global Networks – Regional Policy Implications", chapter 3 in Jos Leijten, ed., *Can Policy Follow the Dynamics of Global Innovation Platforms?* The International Innovation Policy Network of the Six Countries Programme, Delft.

[8] Ernst, D., 2016, *Beyond Value Capture - Exploring Innovation Gains from Global Networks*

scale semiconductors or implanted sensors). This implies that a country can only aspire to become successful in industrial innovation if it has developed a strong manufacturing industry. Even the most sophisticated research and development (R&D) capabilities are of little use to generate innovations if a country lacks large-scale advanced manufacturing facilities, which can draw on an integrated domestic industrial value chain.

The argument is developed by comparing the contrasting experiences of China and India throughout the history of ITA, from the conclusion of the original ITA-1 agreement in 1996 up to the extended ITA-2 agreement on December 16, 2015. The analysis focuses on the role played by differences in the stage of development of their ICT industry, but also more generally in their growth models and regulations, and their resources and capabilities. In addition, differences in the integration of both countries into GPNs and GINs are considered. By inserting these domestic determinants into the analysis of trade and innovation, new insights are expected for the study of trade and innovation within pluri-lateral, regional and mega-regional trade agreements.

Two specific questions are addressed:

- First, why is it that China's electronics industry has benefited substantially from ITA, while in India the gains from trade liberalization have been overshadowed by major costs that are eroding domestic electronic manufacturing and innovation?

- Second, to what degree are domestic economic structures and global network integration useful to explain these different experiences and the very different approaches of India and China to the ITA-2 negotiations about expanding the product lists covered by this agreement?

Part One of the paper reviews conflicting perceptions of the distribution of trade liberalization gains from ITA-1. **Part Two** examines how domestic determinants might explain the contrasting experiences of India and China with ITA-1.The analysis compares China's and India's electronics manufacturing industries and their different policy approaches. The very different experiences of both countries with the first round of the ITA-1 are illustrated with data on exports, imports, and domestic production, and indicators of progress in innovation capacity.

Part Three traces negotiations to expand the product scope, culminating in the ITA-2 agreement . The analysis contrasts the different approaches of China and India to the ITA-2 negotiations, and examines to what degree domestic determinants might explain these divergent trade negotiation strategies. The paper concludes with suggestions for policy and further research, and insights that might be gained for the analysis of mega-regionalism.

Part One - The Information Technology Agreement – Who Benefits?

Concluded in 1996, the original ITA agreement (ITA-1) went into effect in April 1997 with 29 World Trade Organization (WTO) Member countries. ITA-1 focused exclusively on tariff reduction, establishing zero tariffs for 217 electronics products.[9] The main product groups

[9] Soon after ITA became effective in April 1997, participants commenced a schedule of phased duty reductions, with all duties slated for elimination by 2000.

covered were computers, semiconductors, semiconductor manufacturing and test equipment, telecommunications equipment, software, and scientific instruments.[10]

ITA provides "most favored nation" (MFN) treatment to all WTO Members, even if those countries have not joined the agreement. The United States government was a major driving force behind the establishment of ITA-1. The agreement's agenda was shaped by a core group of developed countries who accounted for nearly all the original signatories, with Indonesia and Turkey the only developing countries formally adopting the Declaration. By 2012, ITA-1 had 78 WTO Members—36 are non-Organisation for Economic Co-operation and Development (OECD) member countries, and 35 of them are developing countries.[11] The latter include significant players in the electronics industry (China, Taiwan, Malaysia, Thailand, and Vietnam), and other countries, such as India, Egypt, Indonesia, Philippines, and Turkey, which have the potential to become players.[12]

ITA does not allow any exception to the covered products. This sets it apart from other pluri-lateral trade agreements, such as the WTO-Government Procurement Agreement (GPA), which allows exceptions by way of offsets (for example, defence offsets). The only relaxation is identifying certain specified products as sensitive so that they qualify for a phased-in implementation period for extended implementation. India, which signed ITA-1 in 1997, has requested and received such an extension.[13] When China joined ITA-1 in April 2003, it requested and received a three-year phase-out for import-sensitive items.[14]

ITA-1 has enabled a substantial increase in the trade in electronics products that are covered by the agreement. A study by the U.S. International Trade Commission finds that aggressive tariff liberalization facilitated growth in ITA trade from $1.2 trillion to $4.0 trillion in 2010.[15] Opinions differ, however, on the distribution of trade liberalization gains. A widely held perception in the US is that developing countries can reap substantial benefits. For instance, Ezell (2012) argues that ITA-1 is likely to

> *"benefit developing countries in three principal ways: 1) reducing tariffs on a broader range of ICT products encourages greater adoption of ICT products that play a key role in spurring economic growth; 2) lower prices realized by reducing tariffs on ICTs increases the productivity of all other industries in a developing economy; and 3) by lowering the price of a key input, the ITA has undergirded development of the burgeoning*

[10] Not covered were mainly consumer electronics products, including CRT TV sets, video cameras, and photocopiers.
[11] For a list of participants and their date of participation, see WTO. 2012. *15 Years of the Information Technology Agreement, Trade, Innovation and Global Production Networks*. World Trade Organization, Geneva, p. 107.
[12] WTO members that have not joined ITA include Mexico, Brazil, Tunisia, South Africa, Argentina, and Chile. Of these countries, only Mexico is a leading exporter and importer of electronics products. Its government, however, has decided that non-membership better fits its economic interest.
[13] India and several other developing countries, including Costa Rica, Indonesia, South Korea, and Taiwan, implemented extended duty staging to 2005 on a product-by-product basis as permitted by the ITA Declaration.
[14] See China's Accession Protocol at http://www.wto.org/english/tratop_e/inftec_e/itscheds_e.htm .
[15] Anderson, M. and Mohs, J.. 2010. "The Information Technology Agreement: An Assessment of World Trade in Information Technology Products." *Journal of International Commerce and Economics,* US International Trade Commission, p. 41, http://www.usitc.gov/publications/332/journals/info_tech_agreement.pdf.

ICT software and services industries in many developing countries such as India, Indonesia, Malaysia, and the Philippines."[16]

Unfortunately, this argument neglects fundamental differences among ITA-1 participants in their capabilities for manufacturing and innovation, as well as in their position in GPNs and GINs. As argued in this paper, these structural differences go a long way to explain why ITA participants differ in their capacity to reap the potential gains from trade liberalization. In addition, as stated by the US International Trade Commission, "The paucity of conclusive research on the impact of the ITA on global trade attests to the difficulties in empirically measuring the effects of the ITA and signals that … considerable discussion and analysis are still needed to determine the magnitude of the ITA's impact on IT [information technology] trade and technology diffusion" (Anderson and Mohs 2010: p. 41).

Closer to reality are industry insiders and US government officials who argue that leading US multinational corporations (MNCs) "benefit disproportionally" from ITA-enabled trade liberalization.[17] ITA-1 has indeed provided significant benefits for leading US vendors of ICT products. Take semiconductors, an important product covered by ITA-1. While before 1997 the US share of the worldwide market in semiconductors hovered around 40%, since the signature of the ITA-1 agreement, it has moved up to around 50%[18]. From 2005 to 2009, semiconductors were the number one product export from the US on an aggregate basis, with exports totaling US$48 billion (US$10 billion more than automobile exports, in second place). And in 2011, US semiconductor producers had global sales of US$152 billion, representing more than half the global semiconductor market.[19]

ITA-1 also provided a big push to the expansion of GPNs/GINs of US ICT companies. The US International Trade Commission finds that ITA-1 boosted foreign direct investment (FDI) in China, especially by leading US MNCs, which "had a major role in China's accelerating ITA exports, as … [these companies] sought to reduce costs by directly adding capacity in China. Once China joined the WTO, products exported from China were guaranteed MFN access to other countries, providing strong incentives for multinational corporations to establish production and assembly operations in China" (Anderson and Mohs 2010: p. 17).

Part Two - What Explains the Contrasting Experience of India and China with ITA-1?

Trade theory suggests that all countries would benefit from trade liberalization once they adjust their policies to comply with WTO regulations. However, while China's electronics industry has benefitted substantially from ITA-1, in India the gains from trade liberalization have been overshadowed by (domestically-determined) major costs, which are eroding domestic electronic

[16] Ezell, S. J. 2012. *Boosting Exports, Jobs and Economic Growth by Expanding the ITA.* Information Technology and Innovation Foundation (ITIF), Washington, DC, March, pp 8–9.

[17] Quote from presentation by Greg Slater, Intel's director for Trade and Competition Policy, at an event hosted by the Information Technology and Innovation Foundation (ITIF) on *Boosting Exports, Jobs and Economic Growth by Expanding the ITA*, Washington, DC, 15 March 2013. At the same event, Miriam E. Sapiro, Deputy US Trade Representative, argued that "ITA has been one of the most successful agreements ever undertaken in the multilateral trading system," as it had boosted US IT exports.

[18] Semiconductor Industry Association. 2010. "Doubling Semiconductor Exports Over the Next Five Years." http://www.sia-online.org/clientuploads/directory/ DocumentSIA/ Export/Doubling_Exports_Paper_0610.pdf.

[19] USITC, hearing transcript, 8 Nov 2012, 39,41 (testimony of Ian Steff, Semiconductor Industry Association).

manufacturing and innovation in the context of trade liberalization. What explains the puzzling India-China contrast?

India joined ITA from a position of weakness in electronics manufacturing. In line with Grossman and Helpman (1991)[20], this gap in technological development explains why tariff reductions increased IT imports, but failed to stimulate domestic electronic manufacturing and innovation. In addition, India's thriving IT services industry and its R&D system remained disconnected from electronics manufacturing. By contrast, China joined ITA from a position of strength as the global export factory in electronics manufacturing. But most importantly, it is through a continuous upgrading of its absorptive and innovation capacity that China was able to reap the gains from trade in the electronics industry.[21]

1. Why India Struggles

India joined ITA-1 early in 1997 with an under-developed electronics manufacturing industry, and its main concern was to facilitate the growth of its then still nascent IT services industry through ICT imports and inward FDI. ITA-1 participation and the resulting price reduction for IT imports did, indeed, facilitate the expansion of India's IT services industry.[22] At the same time, however, domestic electronic manufacturing does not seem to have benefitted much from India's participation in ITA-1 and, indeed, was most likely hurt by it.

Electronics manufacturing in India is struggling despite a huge and still growing domestic market and pockets of world-class capabilities in IT services and chip design[23]. Local production faces cost disadvantages that constrain investment in plants and equipment, technology absorption, and innovation. Cost disadvantages result for instance from the lack of a unified tax system, poor infrastructure, the lack of power and water, too many ill-defined and often conflicting regulations, and the lack of a robust ecosystem for components and production equipment. In addition, local production hardly benefits from India's chip design capabilities, which are integrated, instead, into global MNC networks of innovation and production. And there is a huge gap between the rapid growth of domestic demand and nearly stagnant domestic production.

Given the weakness of domestic production, India's growing demand for electronic products generates rising imports of final products and high import dependence for key manufacturing components. These imports have become the third most important contributor, after petroleum and gold, to the country's record current account deficit.

A defining characteristic of India's electronics market is that a handful MNCs dominate without engaging in substantial manufacturing in the country (whether directly or through electronics

[20] Grossman, G., and E. Helpman. (1991). *Innovation and Growth in the Global Economy*. Cambridge, MA: The MIT Press.

[21] Defined as "a firm's ability to recognize the value of new information, assimilate it, and apply it to commercial ends", absorptive capacity is the necessary prerequisite for developing and improving the firm's innovation capacity (Cohen and Levinthal (1990), "Absorptive capacity: A new perspective on learning and innovation", *Administrative Science Quarterly*, Volume 35, Issue 1 pg. 128-152.)

[22] Sen, A. 2014, "IT Sector Exports to Grow 13-15% in FY15, says Nasscom," *LiveMint*, 11 February.

[23] Ernst, D., 2014, *Upgrading India's Electronics Industry – Regulatory Reform and Industrial Policy. An East-West Center Special Study*, East-West Center, Honolulu: 90 pages.

manufacturing services, or EMSs), with the exception of low value-added final assembly. Those MNCs can rely on their extended GPNs to source the relevant products for the Indian market from low-cost production sites, primarily in China.[24]Where local Indian firms seek to compete with MNCs for the domestic market, they follow the same pattern of sourcing their products from offshore production sites in China. Indian firms thus have to compete on the "China price," relying on offshore outsourcing to China-based EMSs.[25]

India's liberalization of information and telecom services has boosted the demand for telecom equipment, but this has not led to the development of a domestic telecom manufacturing industry. Instead, global telecom equipment vendors such as Alcatel, Ericcson, and increasingly Huawei and ZTE, have been the primary beneficiaries. And consumer electronics, the largest segment of India's electronics market, is dominated by Japanese, Korean and now also Chinese companies. Over the last few years, these companies have substantially decreased domestic production, and now rely overwhelmingly on imports from China. As for domestic vendors, they are even less reliant on domestic production—they almost completely source from China.

It is important to emphasize that India's thriving integrated circuit (IC) design sector remains largely disconnected from the domestic market. Most of the design work is done for MNCs and the design is taken back to their home country where decisions are made where to locate manufacturing, many times ending up in places like Shenzhen. As a result, India's electronics manufacturing industry is not benefitting from its rich pool of sophisticated IC design engineers. The work of these engineers remains disconnected from the development of the domestic electronics manufacturing industry.

In short, deep integration of electronic design capabilities into global R&D networks is paired in India with almost no integration into the domestic electronics manufacturing value chain. For instance, all major electronic design automation (EDA) tool providers for chip design have large facilities in India. But all of them are 100% focused on export markets (Ernst 2014). Hence, little of these capabilities are likely to disseminate within India.

Despite India's integration into GINs for chip design, its integration into GPNs of the ICT industry remains very limited. FDI in India's electronics industry has been extremely low, even relative to other sectors—the industry ranks 26 out of 64 sectors in terms of the cumulative FDI received from April 2000 to April 2013. This very low global network integration cuts India off from global knowledge sources, setting it apart from China.

India faces a fundamental challenge—its electronics industry cannot rely so far on a vibrant industrial innovation system. In turn, this constrains the industry's capacity for productivity-enhancing innovation. There is ample evidence that India's R&D system remains stuck at a low

[24] In addition to China's substantial cost advantages, what matters most for MNCs is that they can benefit from accumulated capabilities for rapid and low-cost scaling up of sophisticated production lines that exceed India's current capabilities by far.

[25] According to an Indian component supplier, "MNCs … are asking us to be 15% lower than Chinese cost, only then they will source from us" (Ernst 2014: p. 30).

level, unable to provide capabilities and innovations that would enable its electronics industry to reap the benefits of ITA liberalization.[26]

For many domestic firms, inadequate size prevents economies of scale and scope, while high costs of doing business, Byzantine regulations, and low domestic value-added constrain profit margins, and hence investment in production and R&D. In addition, larger foreign original equipment manufacturers (OEMs) and EMSs typically conduct only final assembly in India, and are reluctant to invest in full-scale manufacturing and R&D.

In the final analysis, the misery of India's electronics manufacturing industry points to a broader challenge. India's economic institutions, both public and private, were largely designed for a time before the country was opened to the global economy. These institutions are ill-equipped to cope with the requirements of transforming India into an internationally competitive industrial economy that can reap the benefits of ITA-1 participation.[27]

The following data briefly illustrate India's negative experience with ITA-1. Joining ITA-1 led to a reduction in India's tariffs for final products to zero or close to zero, and this led to an acceleration of ITA imports. In 2000, 96 product lines were reduced to zero tariff, and in 2005, 121 product lines. While India's ITA imports grew by 18% annually between 1997 and 2000, their growth rate increased to nearly 38% between 2001 and 2005.[28]

An immediate effect has been an increase in the import content of raw material consumption by India's electronics industry in the last seven years, from 50.5% to 55.9%.[29] Further, India's electronics imports under HS code 85 have grown faster than its electronics consumption.[30] Between financial year (FY) 2010-11 and FY 2012-13, India's imports grew especially fast for integrated circuits (82.02%), the second largest electronics import category.[31]

---

[26] The most recent Global Innovation Index 2015 provides ample evidence of India's weak industrial innovation capacity - out of a total 143 countries, India is ranked 81 (Cornell University, INSEAD and WIPO, eds, 2015. *Global Innovation Index 2015.* Geneva, Ithaca, and Fontainebleau). According to the Battelle Institute, a primary source of international R&D data, India's gross expenditure on research and development (GERD) was 0.85% of gross domestic product (GDP) in 2012 (compared to 1.6% in China), a figure essentially unchanged since 2000. Note that China's GDP is much larger than India's and growing substantially faster.

[27] For an early analysis, see Kelkar, Vijay. 1999. "India's Emerging Economic Challenges." *Economic and Political Weekly*, 14 Aug, pp. 2326–29.

[28] Kallummal, M. 2012. "Process of Trade Liberalisation under the Information Technology Agreement (ITA): The Indian Experience." Centre for WTO Studies (CWS) Working Paper 200/3, Indian Institute of Foreign Trade, New Delhi, p. 15.

[29] Kallummal (2012), Figure 19, p, 36. The import content was growing even faster for two strategically important product groups. In computers, peripherals and storage devices, from an already very high import content of 61.76% in FY 2005, it became more than 75% in FY 2012. Other electronics (which basically can serve as a proxy for electronic components) saw it move from more than 45% in FY 2005 to almost 53% in FY 2012.

[30] HS code 85 covers electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts. India's consumption of electronics products grew by 14% from FY 2010 to FY 2012. During the same period, its imports of electronics (HS 85) products increased by 31%.

[31] India's imports grew very fast for some electronic components like capacitors (35.9%), rectifiers and inductors (38.4%), and consumer-related products like video recorders and monitors (81.11%), and microphones and loudspeakers (109.1%). For details, see the DGFT website.

In principle, trade deficits are not always negative for economic growth. Empirical research points to the importance of imports in boosting productivity.[32] Yet in India's case, the local value added of electronics manufacturing is around 7%, while electronics imports account for almost two-thirds of the country's consumption of electronics products (Frost and Sullivan 2013). In addition, an analysis of the number of Triadic patent families by applicant's country of residence shows that between 1999 and 2005, India recorded merely 26 such patents. During the same period, China recorded 208, Korea 4,862, and the US 37,907.[33]

In short, the Indian electronics industry has failed to reap the potential benefits from ITA-1 participation. Due to the zero tariffs under ITA-1, India is now an easy target for low-cost electronics imports, especially from China – a country that is far ahead in its electronics manufacturing industry. Some observers fear that with the influx of such imports into the domestic market, "the existing domestic producers may become domestic assemblers and traders in the IT products" (Kallummal 2012: p. 15).

2. China's ITA-1 Experience is Very Different

China joined the ITA-1 six years after India in 2003 from a position of strength as the third largest exporter of ITA products and the fourth largest importer. By 2003, China's per capita GDP (US$1,270) was three times higher than India's 1997 per capita GDP (US$427).[34] "China was . . . [already] a leading manufacturer and trader of IT products prior to joining the ITA and deeply engaged in the global IT production chain even before tariff liberalization" (Anderson and Mohs 2010: p. 7).

In 2004, China expanded its market share, becoming the world's largest exporter of ITA products. The next year, China surpassed both the European Union (EU) and the US to become the leader in overall ITA trade. From 2009 to 2011, China's high-technology exports (in current US$) expanded by almost 48% (from US$309.6 billion to US$457.2 billion (compared to US ICT exports of US$145.3 billion in 2011).[35] Further, China's share of global exports of IT products rapidly expanded from 2.2% in 1996 to 27.5% in 2012.[36]

China's innovation policy has played an important role in the country's rapid rise in the ICT industry. Massive investments in the country's R&D infrastructure and higher education, on a scale never seen before, have been fast-tracking the speed of learning and capability development[37]. Since 2000, China has increased R&D spending roughly 10% each year—a pace

[32] OECD. 2010. *How Imports Improve Productivity and Competitiveness*. OECD, Paris

[33] WTO Secretariat data, based on OECD Stat Extracts (27 Feb 2012), quoted in WTO. 2012. *15 Years of the Information Technology Agreement, Trade, Innovation and Global Production Networks.* WTO, Geneva: p. 71.

[34] http://search.worldbank.org/data?qterm=India%20per%20capite%20GDP%20for%201997&language=EN .

[35] http://data.worldbank.org/indicator/TX.VAL.TECH.CD, quoting the United Nations Comtrade database. High-technology exports are products with high R&D intensity, such as in aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery.

[36] http://stat.wto.org/StatisticalProgram/WSDBStatProgramHome.aspx?Language=E.

[37] For China's push to upgrade its semiconductor industry, see Ernst, D., 2015, *From Catching Up to Forging Ahead: China's Policies for Semiconductors*, East-West Center Special Study, September, 74 pages (http://www.eastwestcenter.org/node/35320, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2744974). See also Ernst, D., 2016, "From Catching Up to Forging Ahead? China's New Role in the Semiconductor Industry", *Solid State Technology*, May.

the country maintained during the 2008-2009 recession. This sustained commitment to a rapid expansion of R&D sets China apart from India's weak industrial innovation system.

China's push to upgrade its high-tech export industries through innovation has produced measurable results. The most recent data available from the OECD-WTO TiVA database for 2011show that, for key export sectors (like ICT, electrical machinery and transport equipment), the domestic value added (DVA) content of exports has significantly increased, from 25% in 1995 to almost 50%. Specifically for ICT and electronics, the DVA share moved up from less than 30% in 1995 to almost 50% in 2011.

However, two important caveats need to be added to the above headline figures. First, foreign-invested enterprises (FIEs) continue to dominate China's high-tech exports, rising from 79% in 2002 to 82% in 2010. [38] Second, domestic value-added remains very limited—estimates range from 5% to 15%, depending on the complexity of production technology and value chain stage. Strikingly, for high-end smartphones, China's domestic value addition remains stuck below 5%.[39] Recent research documents that while China's reliance on imported intermediates has declined significantly in lower-tech ICT sectors,[40] its "dependence on imported intermediates did not abate in the higher-tech sectors such as electrical and optical equipment, transport equipment or chemicals"[41].

3. Economic Structure and Global Network Integration Shape Benefits and Costs of Participation in ITA-1

What explains the very different experiences of China and India? China's ITA-1 experience demonstrates that a progressive integration into GPNs and GINs, which was accelerated by China's WTO accession and policy reform, played an important enabling role in the development of its electronics industry. Global network integration facilitated technology diffusion and absorption, and enhanced China's capacity to reap the potential gains from ITA-1 trade liberalization. A proxy for China's high degree of GPN integration is that 44% of its exports are produced under so-called "processing trade" arrangements, in which imported inputs are assembled into exports.[42] Another indicator is that two-thirds of China's production of merchandise goods and services are intermediates, which is substantially higher than the world average (Baldwin and Lopez-Gonzales 2013: p. 13).

As for integration into GINs, China is the largest "net importer" of R&D, and it is the third most important offshore R&D location (after the US and UK) of the 300 top R&D spending

[38] Congressional Research Service., 2015, *China's Economic Rise: History, Trends, Challenges, and Implications for the United State*, October 21: p. 13.
[39] China's domestic value added for the iPhone 4 was reported to be less than 2% (Lin, F. and Tang, H. C. 2013. "People's Republic of China Cracks Electronic Export Sophistication: Fact or Fallacy?" 17 Sep, p. 2, http://www.aienetwork.org/blog/48/the-peoples-republic-of-china-cracks-electronic-export-sophistication-fact-or-fallacy).
[40] For example, the domestic value added for computers improved from 20% in 2002 to 33% in 2007 (Lin and Tang 2013).
[41] Baldwin, R. and J. Lopez-Gonzalez, 2013, *Supply-Chain Trade: A Portrait of Global Patterns and Several Testable Hypotheses*, NBER Working Paper No. 18957, April: p.48.
[42] General Administration of Customs, PRC, "2011 Trade by Trade Regime," http://www.customs.gov.cn/publish/portal0/tab44604/module109000/info353199.htm.

multinationals.[43] China is thus deeply integrated, albeit still unevenly, into the international circulation of technological and managerial knowledge needed to enhance its absorptive capacity.

What distinguishes China, however, is that trade liberalization was combined with well-funded and focused support policies for manufacturing and industrial innovation. Even if one factors in massive inefficiencies, this pragmatic policy mix has produced results. As Peter Petri observes, "China is not averse to intervening, but it has done that against the background of a lot of liberalization. It's paying off."[44] This description nicely captures China's approach until quite recently. However, China's new leadership has shifted the balance in favor of industrial upgrading through innovation, as codified in the Strategic Emerging Industries (SEI) plan.[45] As discussed in **Part Three**, this singe-minded focus on industrial innovation may explain China's approach to ITA-2 negotiations.

India's situation is very different. By negotiating a bad deal for its electronics manufacturing industry and delaying necessary regulatory reforms, India's government bears the primary responsibility for the lack of growth and innovation in this industry. At the same time, however, India's experience with ITA-1 indicates that poorly negotiated membership terms may well create additional challenges once a country seeks to reduce investment barriers in its domestic electronics industry.

Raghuram Rajan, the former Reserve Bank of India's governor, emphasizes that the government needs to better align domestic policies to unblock barriers to investment and growth in the electronics industry.[46] There is ample evidence that existing restrictive regulations and the largely dysfunctional implementation of support policies in the past have constrained investment and growth in India's domestic electronics manufacturing.[47]

When the government of Narendra Modi took power in May 2014, bold action was promised in the "Make in India" initiative to overcome the self-imposed strangulation of India's electronics industry. Chief among the necessary first steps is a speedy transition to a unified goods and services tax (GST) system, the single most commonly cited "reform wish" of electronics manufacturers. There was hope that, in addition, drastic simplifications would be implemented in the business regulatory environment, in particular in dispute resolution for customs conflicts as well as formal and informal penalties, and that long overdue reforms would finally be implemented in taxation, customs, compliance, and inspections, and all the other restrictive

[43] Ernst, D. 2011. "Testimony To the US-China Economic and Security Review Commission Hearing on China's Five Year Plan, Indigenous Innovation and Technology Transfers, and Outsourcing," 15 June, note 17, http://scholarspace.manoa.hawaii.edu/bitstream/handle/10125/20265/wire20110615testimony-PP.pdf?sequence=2.
[44] Email to the author from Peter Petri, 28 Jan 2014.
[45]国务院关于印发"十二五"国家战略性新兴产业发展规划的通知 [The State Council Notification on the Long-term Development Plan for Strategic Emerging Industries during the 12th Five Year Plan], 国发〔2012〕28号, 7 July 2012.
[46] Rajan. R. 2013. "Why India Slowed." 30 April, http://www.project-syndicate.org/print/the-democratic-roots-of-india-s-economic-slowdown-by-raghuram-rajan .
[47] As demonstrated in Ernst, D. 2014. *Upgrading India's Electronics Industry – Regulatory Reform and Industrial Policy*. *An East-West Center Special Study.* East-West Center, Honolulu.

regulations. There was also hope that effective regulatory reform will be accompanied by a longer-term and structural industrial-development agenda that would build on the previous Government's National Policy on Electronics (NPE). That policy initiative sought to improve India's international competitiveness through incentives for capability development, cluster formation, R&D, and technology transfer through FDI.

However, very little of these policy announcements have been implemented thus far[48]. In the electronics industry, the main tangible result of the "Make in India" initiative is the Taiwanese-owned Foxconn's announcement to invest up to $5 billion until 2020 in a new facility in Maharashtra to assembly smart phones from Apple, as well as China's Xiaomi[49]. Foreign investors, who are the main target of this policy, remain unconvinced "that India has a competitive advantage in making anything."[50]

In short, differences in domestic economic structure and global network integration may go a long way in explaining the very different experiences of India and China with participation in ITA-1. But are these domestic determinants also useful to explain why India and China differ in their approaches to the ITA-2 negotiations?

Part Three - Divergence continues – China's role in the Making of ITA-2

In May 2012, on the occasion of the 15th anniversary of ITA-1, a group of WTO members, led by the US, decided that the original agreement should be revisited to expand its product coverage to reflect rapid technical change in the ICT industry. Serious negotiations about a possible substantial expansion of the list of products started in July 2013 in Geneva.

India withdraws from the ITA-2 negotiations

The Indian government decided not to join these negotiations. According to the Commerce and Industry Ministry**,** "India's experience with the ITA-1 has not been encouraging as it has almost wiped out the IT industry from India. After examining the matter in consultation with the nodal Ministry i.e. Department of Electronics and Information Technology and other stakeholders, it has been decided, for the present, not to join the negotiations as it will not be in our national interest."[51] India's government believes that a small group of developed country signatories, led by the US, the EU, and Japan, has designed an expanded list with a focus on products that these countries, especially the US, continue to lead by a wide margin. Behind this nationalist rhetoric, domestic politics looms large. India's refusal to participate in the ITA-2 negotiations may well have reflected the uncertainty before the 2014 election, and a fear of being accused of betraying the nation's strategic interests.

An alternative strategy for India had been proposed by the Associated Chambers of Commerce and Industry of India.[52] ASSOCHAM argued that merely resisting ITA expansion is unlikely to

[48] D'Costa, A., 2015, "Modi's mantra to 'Make in India'", http://www.eastasiaforum.org/2015/10/25/modis-mantra-to-make-in-india/.
[49] "How did 'Make in India' fare in 2015?", *EET India*, December 21,2015
[50] Sender, H., 2015, "Modi's 'Make in India' goals are hampered by woeful infrastructure", *Financial Times*, March 4, 2015
[51] Quoted in "India to Skip Talks on Expanding ITA Scope," *Hindu*, 13 March 2013.
[52] ASSOCHAM National WTO Council, Observations on "Expanding the Information Technology Agreement," based on the deliberations at the roundtable held on 20 Dec 2012, New Delhi,

have positive effects for India's electronics industry. Instead, the Indian government should engage in a smart strategy of co-shaping the consolidated product list of ITA-2. "India needs to address the ITA expansion, weighing carefully its long-term as well as short-term objectives in a strategic manner rather than becoming overly influenced by ad hoc approaches and concerns" (ASSOCHAM National WTO Council: p. 8).

In this view, non-participation in ITA-2 negotiations comes at a heavy cost. India would lose the option of co-shaping the contents of the new expanded ITA product list. Non-participation may also discourage international investors from expanding their presence in India, and it might act as a disincentive for existing FDI manufacturing projects to expand and upgrade their facilities.

The successful conclusion of ITA-2 negotiations in December 2015 shows that India's decision not to participate has been a major strategic blunder. As stated in a note prepared for the World Bank:

> *"India should actively participate in ITA-2 talks in order to co-shape negotiations on the expanded product list. As a first step, India should insist on extending the phased-in implementation period for up to five or seven years. US IT industry now seems to be willing to compromise, in order to bring China on board*[53]*. India should use this opportunity and push for extending the phased-in implementation period. Progress towards zero tariffs on all electronics inputs and outputs is critical for removing barriers to India's electronics manufacturing industry. The extended time period would make it politically feasible for the new Indian government to agree to it.*
>
> *As for implementation of this initiative, India should explore scope for joint action with countries that have joined China in pushing for extended phased-in implementation periods, i.e. Malaysia, Thailand, the Philippines, Turkey, and Costa Rica. India should also exploit the fact that the EU has recently pressed to exclude flat panel displays from tariff cuts in a bid to protect production by Korean and Japanese companies in Europe."*[54]

China's approach again is very different

China's approach to the ITA-2 negotiations, in fact followed precisely such a co-shaping negotiation strategy, in combination with persistent delaying tactics. China bargained hard to get an acceptable solution. In the end, China's approach proved to be highly successful

Before the July 2013 meeting, China presented a list of sensitive products that called for the removal of 106 products rather than asking for an extended implementation period. Under pressure to shorten this list, China on 17 July reduced the list of sensitive products that it did not want to be part of ITA-2 to around 90. However, China's revised list of sensitive products

---

http://view.officeapps.live.com/op/view.aspx?src=http%3A%2F%2Fwww.assocham.org%2Fdocs%2FITA-Roundtable-Observation-Paper_13.2.13.doc.

[53] "U.S. Tech Industry Mulls Longer Tariff Phase-Outs To Spark ITA Progress", http://insidetrade.com/Inside-US-Trade/Inside-U.S.-Trade-04/18/2014/us-tech-industry-mulls-longer-tariff-phase-outs-to-spark-ita-progress/menu-id-710.html .

[54] Ernst, D., 2014, *Fast-Tracking India's Electronics Manufacturing Industry – Trade Policy Related Action Points*, Note prepared for the World Bank New Delhi Office, May 19: p.1.

continued to include product groups that are among US priorities for ITA-2, i.e. multi-component integrated circuits (MCOs) [55], light-emitting diodes (LEDs) and medical devices. While some sources believed that China's long list of sensitive products "…indicated a lack of coordinated domestic consultation … others said Beijing … has industrial policy goals in mind.[56]

China faces a fundamental challenge. If ITA-2 would indeed broaden the product list to include zero tariffs for MCOs, LEDs, and medical equipment, this may well have reduced any realistic chances for China to develop significant domestic manufacturing and innovation capabilities in these important ICT subsectors that China's government considers to be essential for its industrial upgrading efforts[57].

During a second round of ITA-2 negotiations, started in October 2013, the impasse continued, culminating in the suspension of talks on 21 November 2013. Only 58 of the 78 current ITA members were participating, with India and Indonesia remaining on the sidelines. This time, China was joined by Malaysia, Thailand, the Philippines, Costa Rica and Turkey who "also want many products removed from the negotiation."[58] In a sign of the growing complexity of ITA negotiations, the EU has requested to exclude flat panel displays from tariff cuts in a bid to protect production by Korean and Japanese companies in Europe.

China presented a slightly shortened revised list of sensitive products, leaving "59 items it still wants to exclude from the scope of an expanded ITA deal altogether, and around 80 … for which it is requesting tariff staging" to be extended, sometimes beyond five years.[59] But the real sticking point remained advanced semiconductors, the so-called MCOs, where China was adamant "that it will not accept tariff cuts."[60] For the US, this position was unacceptable. Talks broke down in November when the US publicly stated that China's request to join the Trade in

[55] MCOs are used in a wide variety of products, including smartphones, tablets, medical devices, household appliances, and car parts such as braking, steering and air bag systems. Until the conclusion of ITA-2, MCOs thus can be classified under a wide range of HS subheadings. As a result, no one really knows for sure how important MCOs are for US exports. US-ITC estimates that in 2011, sales of MCOs accounted for between 1.5% and 3.0% of global semiconductor sales, or an estimated US$1.2 billion to US$2.4 billion. A report of the USITC for the USTR identified five priority subsectors of the consolidated draft product list for ITA-2: medical devices; relay and industrial control equipment; optical media, including LED; loudspeakers and handsets; and, most importantly, MCOs. The USITC selected these subsectors to illustrate "the potential for increased market access opportunities for USA firms as a result of ITA expansion" (USITC, The Information Technology Agreement, Advice and Information on the Proposed Expansion: Part 2: p. VI, http://www.usitc.gov/publications/332/pub4382.pdf .)

[56] "US, Others Suspend ITA Talks to Pressure China to Soften its Stance." 2013. *Inside US Trade.* 29 July, p. 2.

[57] For developments since 2015 in China's push to upgrade its semiconductor industry, see Ernst, D., 2016, Ernst, D., 2016, China's Bold Strategy for Semiconductors—Zero-Sum Game or Catalyst for Cooperation?, East-West Center Working Papers: Innovation and Economic Growth Series, no. 9, September 2016, http://www.eastwestcenter.org/node/35798 and http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2836331. See also Ernst, D., 2016, "A New Grand Strategy For Semiconductors", *China Economic Quarterly*, September: pages 15-22.

[58] Palmer, D. 2013. "US Seeks Expanded Information-Technology Pact. *Politico*. 11 Nov, http://www.politico.com/story/2013/11/us-pact-trade-info-technology-99631.html .

[59] "ITA Talks Extended as China Holds Firm to 'Sensitivities' List." 2013. *China Trade Extra*. 20 Nov, http://chinatradeextra.com.

[60] "ITA Expansion Talks Suspended Again; No Timeline for Resumption Set." 2013. *Inside US Trade*. 21 Nov, http://insidetrade.com/Inside-US-Trade/Inside-U.S.-Trade-11/22/2013/ita-expansion-talks-suspended-again-no-timeline-for-resumption-set/menu-id-172.html .

Services Agreement (TISA) negotiations would only succeed if it provided "an improved offer in the ITA expansion talks …. Other TISA participants have criticized the US stance on China's participation as setting preconditions that were not applied to other members before they joined. The strongest pressure to include China came from Australia, whose services industry depends on the Chinese market for growth, according to informed sources."[61]

Until the very last moment before the final ITA-2 agreement on December 16, 2015, China successfully used a combination of delay tactics and a strategy of co-shaping the design of an expanded ITA. This reflects China's over-riding concern to upgrade its electronics industry through innovation and the development of generic technology platforms like MCOs. The new Chinese leadership has clearly stated, especially since the Comprehensive Reform Blueprint of the Third Plenum,[62] that it is serious about pushing forward the Strategic Emerging Industry (SEI) initiative and R&D in advanced manufacturing technologies.[63]

China's negotiation strategy was based on the assumption that ITA-2 without China would have been an oxymoron. Not only is China the world's biggest smartphone market, it is also by far the most important market for US semiconductor firms. As John Neuffer, a former senior vice-president of global policy at the Information Technology Industry Council (ITIC) pointed out in November 2013, "China has got to be part of this. They are too big a player. You can't have an outcome without the Chinese."[64]

A successful conclusion of ITA-2 negotiations thus required first and foremost an agreement between the United States and China on how to resolve the tariff treatment of MCOs. That bilateral agreement was reached in November 2014, when President Obama announced success in negotiations with China. However, the agreement prompted fresh opposition from South Korea (about LCD display panels and lithium ion batteries), the EU (about analog car radios), and Taiwan (about flat-panel displays). As the United States agreed to further small concessions to China to help South Korea and the EU secure their own deals with China, it seemed that an expanded ITA-2 deal had been reached on July 27, 2015.[65]

However, additional hurdles emerged when China insisted, in late October, on seven-year phase outs on roughly 20 items (including LEDs), and five-year phase outs on another 70 items

[61] "China Categorically Rejects US Preconditions To Participate in TISA." 2013. *Inside US Trade.* 22 Nov, http://insidetrade.com/Inside-US-Trade/Inside-U.S.-Trade-11/22/2013/china-categorically-rejects-us-preconditions-to-participation-in-tisa/menu-id-710.html .

[62] US-China Economic and Security Commission. 2013. "Third Plenum Economic Reform Proposals: A Scoreboard." 19 Nov, http://origin.www.uscc.gov/sites/default/files/Research/Backgrounder_Third%20Plenum%20Economic%20Reform%20Proposals--A%20Scorecard%20(2).pdf .

[63] For instance, and the Ministry of Industry and Information Technology (MIIT) and the National Development and Reform Commission (NDRC) have created a USD 20 billion national investment fund for developing the indigenous semiconductor industry in Beijing, Shenzhen, and Chengdu. This fund is supposed to cover the whole industry value chain (design, manufacturing, R&D, and industry consolidation/overseas M&A). Such massive public investments are quite unheard of anywhere. (See Ernst, 2015, for details)

[64] As quoted in S. Donnan, "Negotiators Nervously Eye China's Resistance in IT Trade Talks," *Financial Times*, November 19, 2013.

[65] "Taiwan Caves, Says It Will Accept ITA Deal without Flat-Panel Displays," *China Trade Extra*, July 27, 2015.

(including most importantly MCOs)[66]. By December 11, during an ambassador-level ITA-2 meeting, it became clear that "WTO members have essentially capitulated to China's demand that it be allowed to phase out tariffs on dozens of ITA products …[including MCOs and LEDs] …over five or seven years."[67]

Under the agreed package that was finally reached in Nairobi on December 16, 2015, WTO estimates that more than 65% of tariff lines, accounting for 88% of imports, will be immediately eliminated by 1 July 2016[68]. By 2019, WTO estimates that almost 90% of the tariff lines and 95% of imports will be reached. China's successful negotiation strategy is hidden in the following terse sentence of the WTO Briefing Note: "For a very limited number of sensitive products, tariffs will be progressively eliminated over a period of 5 years, and 7 years for the most exceptional cases." It so happens that these delays concern some of the most sensitive products for both the US and China. As for the implementation of ITA-2, The Committee on the Information Technology Agreement (ITA), at a meeting on 18 April 2016 established that the first set of tariff cuts were to be implemented on 1 July 2016 and the second set no later than 1 July 2017, with successive reductions taking place on 1 July 2018 and effective elimination no later than 1 July 2019.

Conclusions

This analysis of the contrasting experiences of China and India with ITA demonstrates that the success or failure of trade liberalization is determined by the *domestic determinants* of their ICT industry– i.e. its stage of development, its growth model and policies, its market size and sophistication, the institutional framework, and the managerial and technological capabilities of its firms. Equally important are the country's position in GPNs and GINs of the ICT industry. These parameters shape the gains from trade for industrial manufacturing and innovation that both countries were able to reap from ITA.

The outcome of the ITA-2 negotiations shows that China needed a successful ITA-2 as much as the United States needed it. A viable agreement was impossible without China's participation. India's absence hardly matters, given its insignificant role in the global electronics industry.[69]

The agreement reached in the final ITA-2 package demonstrates that neither the US alone, nor with its main allies, can dictate any longer the outcome of pluri-lateral agreements.[70] On the other hand, China's trade negotiators seem to have learned how to compromise without undermining the scope for upgrading the country's semiconductor and solid-state lighting industries. As China remains by far the largest market for US semiconductor firms, Chinese policy makers also knew that they had a strong hand of cards to play, strong enough to cope with

[66] "China stands firm in resisting calls to shorten phase outs under ITA deal", *China Trade Extra*, October 28, 2015
[67] "China's lack of final tariff offer pushes ITA expansion talks to Nairobi", *China Trade Extra*, December 11, 2015.
[68] WTO, Briefing Note: The Expansion of Trade in Information Products (ITA Expansion), December 16, 2015 https://www.wto.org/english/news_e/news15_e/itabriefingnotes161215_e.pdf
[69] A particularly telling sign is that India does not even show up in McKinsey's list of top-10 countries in the global value-added electronics industry, http://www.slideshare.net/morellimarc/mckinsey-manufacturing-future-2013-22958651 .
[70] It is an as yet unresolved empirical question whether a similar erosion in the power of the US to shape results is to be expected once the Trans-Pacific Partnership Agreement (TPP) will be implemented.

a possible stalemate or breakdown of ITA-2 negotiations. In contrast, India didn't hold anything comparable to China's trump card.

It is necessary, however, to broaden the analysis. Mega-developing countries such as China and India have enough resources to cope with the contingent outcomes of international trade negotiations. For the majority of developing countries, however, a failure to capture the potential gains for innovation from ITA and other pluri-lateral and mega-regional trade agreements could have quite serious consequences, and deprive these countries from speedy access to critical learning opportunities and productivity-enhancing generic technologies.

Bold action is required to avoid zero-sum game or even negative-sum game outcomes and resultant trade conflicts. Thus far, policy debates on the distribution of trade gains and costs have focused on negotiating "special and differential" (SD) arrangements (delays, phase-outs for product coverage, and so on). However, there seems to be limited scope for expanding such SD arrangements.

For future research, this raises questions like: What changes are necessary in domestic regulations as well as in industrial and innovation policies to reap the potential benefits of ITA trade liberalization? And, equally important, how does a country's innovation capacity in a particular industry affect its approach to and its position in pluri-lateral and mega-regional trade agreements? Most immediately, econometric research and case studies are needed to examine whether participation in ITA-2 might help to accelerate industrial manufacturing and innovation in different types of developing countries, as well as to narrow the gap in productivity and income relative to leading industrialized countries.

In the end, a broad portfolio of diverse policy approaches is required to enable developing countries to increase the gains that they can reap from ITA participation. The mix of policies will differ across countries and sectors. And the appropriate mix will evolve over time. Hence, flexibility in policy implementation is of the essence.