SEMICONDUCTOR INDUSTRY ASSOCIATION

SEMICONDUCTORS & THE WORLD TRADE ORGANIZATION

How Global Trade Rules Have Spurred Semiconductor Growth & Innovation

NOVEMBER 2020

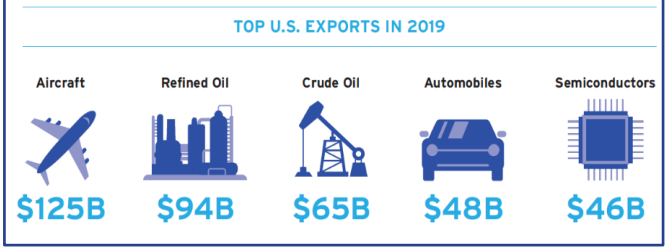
FREE & OPEN ACCESS TO GLOBAL MARKETS HAS BEEN CRITICAL TO SEMICONDUCTOR INDUSTRY SUCCESS & TECHNOLOGY ADVANCEMENT

The steady opening of markets and leveling of the global playing field spearheaded by the World Trade Organization (WTO) over the past 25 years has been critical to the success of the global semiconductor industry. Semiconductors – the brains of all modern electronics – are a highly traded product with an incredibly complex production process and supplier ecosystem that spans many countries. In 2018, more than one trillion semiconductors were sold worldwide, accounting for $1.8 trillion in total global trade.[1] Given the sheer volume and complexity of global semiconductor trade, along with high capital costs and short product life-cycles, the ability to move semiconductor goods and materials freely, fairly, and efficiently across borders has been critical to the industry's success and technological progress. Over the past 25 years, the WTO has helped make this progress possible by opening markets and implementing uniform rules of trade. Landmark WTO agreements like the Information Technology Agreement (ITA) and ITA Expansion, Trade-Related Aspects of Intellectual Property Rights (TRIPS), and the Trade Facilitation Agreement (TFA) have drastically reduced the cost of trade, lowered consumer prices, and expanded access to productivity-enhancing tech products to people around the world. Global sales and the increasingly free flow of goods, ideas, materials, and people have in turn spurred technological progress and innovation in a virtuous circle of innovation.

This paper examines how WTO agreements related to intellectual property protection, reciprocal tariff elimination, disciplines on trade-distorting subsidies, and trade facilitation have benefited the semiconductor industry over the past 25 years. It also examines how further reforms and stronger trade rules that remove market barriers, promote fair competition, and protect IP will enhance those benefits, not just for the semiconductor industry, but for the broader global economy.

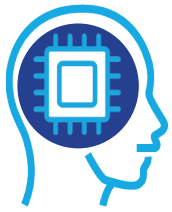
GLOBAL MARKET ACCESS SUPPORTS A VIRTUOUS CYCLE OF INNOVATION

The U.S. semiconductor industry has benefited from a virtuous circle of innovation; sales leadership enables the U.S. industry to invest more into R&D which in turn helps ensure continued U.S. sales leadership. Scale and R&D intensity underpin this circle, both of which depend on global market access. U.S. companies that manufacture semiconductors maintain nearly half of their manufacturing capacity in the United States. Eighty-two percent of the industry's sales are to overseas customers, making semiconductors America's fifth-largest export and a critical sector in which the U.S. maintains a sizable trade surplus, reaching $8.5 billion in 2019.[2] Global product revenues allow U.S. industry to achieve the scale needed to fund large R&D investments that consistently keep U.S. technology ahead of global competitors. Global market access also allows industry to tap into highly specialized resources, inputs, and human talent.

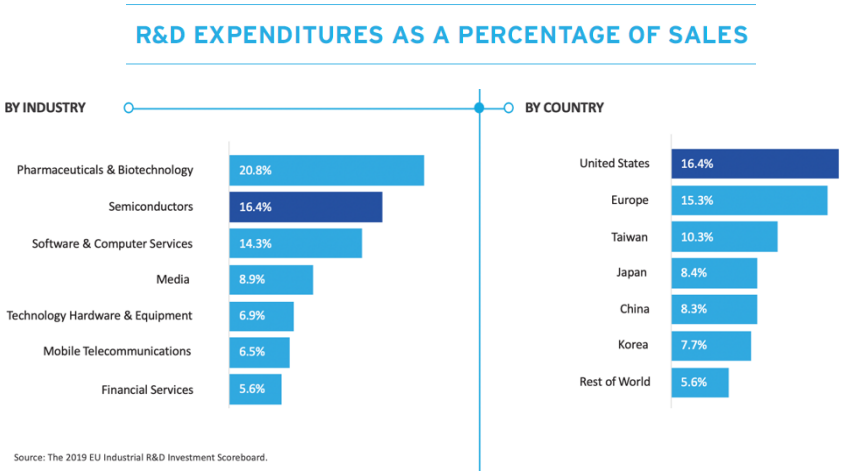


[1] UN Comtrade 2018 Trade Data
[2] SIA Factbook (2020)

I. TRIPS LAID THE FOUNDATION OF IP PROTECTION FOR GLOBAL SEMICONDUCTOR INNOVATORS



The 1995 WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) is the world's first international trade agreement to both define multilateral IP rules and standards and mandate minimum national IP enforcement procedures within a single framework.[2] Crucially, it made intellectual property protection subject to WTO dispute settlement and potential trade sanctions in cases of noncompliance. The global legal framework it established for protection of intellectual property has helped allow innovative firms in IP-intensive industries, including the semiconductor industry, to establish new business models centered around licensing and contract manufacturing, and also maintain a competitive edge in research and development. In short, the TRIPS Agreement was a major win for countries at the forefront of developing valuable intellectual property, as well as for consumers around the world who benefit from the end-products of these technological advances.



Strong IP protection and enforcement are an essential foundation to continued technological progress and the future competitiveness of the global semiconductor industry, incentivizing companies and research institutions to invest in R&D and share technology without compromising their returns on investment. Semiconductor companies typically spend around one-fifth of revenue on R&D, making IP protection and enforcement of utmost importance to the U.S. semiconductor industry. In 2019, semiconductor companies in the United States invested nearly $40 billion in R&D, or 18 percent of their total revenue, one of the highest rates of any industry.[3] Additionally, among the top 15 U.S. corporate patent recipients, eight are companies in the semiconductor industry.[4] More generally, IP-intensive industries, such as semiconductors, are estimated to contribute to more than a third of the U.S. GDP, and around 27.9 million U.S. jobs.[5] Such high rates of R&D investment in the semiconductor industry would not be possible without the global IP protections and enforcement standards established by TRIPS. While the TRIPS agreement covers a broad range of IP trade disciplines, there are three areas of critical importance to the semiconductor industry: 1) protection for trade secrets; 2) express protections for IC layout designs; and 3) safeguards against compulsory licensing for semiconductors.

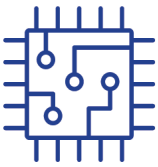
[2] Uruguay Round Agreements. WTO Legal Texts. (Available at: https://www.wto.org/english/docs_e/legal_e/legal_e.htm#TRIPs)
[3] Strengthening the U.S. Semiconductor Industrial Base. SIA, 2020. (Available at: https://www.semiconductors.org/wp-content/uploads/2020/06/Strengthening-the-US-Semiconductor-Industrial-Base.pdf)
[4] Top 300 Organizations Granted U.S. Patents in 2018. Intellectual Property Owners Association, 2019. (Available at: https://ipo.org/wp-content/uploads/2019/07/2018-Top-300-Final.pdf)
[5] Intellectual Property and the U.S. Economy. U.S. Patent and Trademark Office, 2016. (Available at: https://www.uspto.gov/sites/default/files/documents/IPandtheUSEconomySept2016.pdf)

A. TRIPS IS THE FIRST INTERNATIONAL TRADE AGREEMENT TO PROVIDE PROTECTION FOR TRADE SECRETS

TRIPS is the first multilateral trade agreement to expressly recognize trade secrets as a form of IP and obliges members to provide a means for protecting information that is secret.[6] This is extremely important to the semiconductor industry, for which trade secrets are a critical and major business asset. Some studies estimate for highly innovative and knowledge-intensive industries like the semiconductor industry, trade secrets can comprise up to 80 percent of the value of a company's IP portfolio.[7] Semiconductor trade secrets include manufacturing processes and techniques, chemical formulations, circuit designs, software source code, business strategies and customer lists.[8] This form of IP is often more valuable to a semiconductor company than patented legal protections due to the short life-cycle of products owing to the rapid pace of technological development and upgrades. Ultimately, protecting unregistered trade secrets is critical to companies' business models because patented legal protections quickly become obsolete due to rapid advances in semiconductor technologies. The value of the trade secret protections under TRIPS is all the more important for small and medium sized enterprises (SMEs) and start-ups that often cannot afford teams of patent attorneys. Unfortunately, while a company's trade secrets are frequently its most valuable assets, they are also the most vulnerable. The entire economic value of a trade secret stems from the competitive advantage conferred by the confidential nature of the information. If a company's trade secrets are stolen, it could lose its competitive advantage and its market share may be jeopardized.

While TRIPS is important in establishing WTO Members' minimum obligations for protecting trade secrets, more needs to be done to protect this valuable form of IP, which is facing increasing and rampant misappropriation by sophisticated bad actors, including through cyber means.

B. TRIPS PROVIDES UNIQUE LEGAL RIGHTS FOR IC LAYOUT DESIGNS



Article 35 of the TRIPS Agreement provides unique IP protection for the layout designs of integrated circuits (ICs).[9] A semiconductor layout design (also referred to as a "mask work") is the digital topography of the transistors and other circuitry elements on a chip. Prior to 1984, these designs fell through the cracks of existing copyright and patent regimes, and it was not necessarily illegal for a company to produce a competing chip with an identical layout to its competitor's chip. This led to concerns over "chip piracy," in which a company could copy, for example, a chip design for $10,000 that had cost its original manufacturer $100,000 by simply taking negatives of the mask design. The United States was the first nation to pass a law protecting semiconductor layout designs with the Semiconductor Chip Protection Act (1984).[10] Other countries soon followed suit, and in 1989 the "Washington Treaty on Intellectual Property in Respect of Integrated Circuits" ("Washington Treaty" or "IPIC Treaty") was

[6] TRIPS Article 39 calls on members to provide for the protection of "undisclosed information" that is secret and has commercial value, and to protect such information from disclosure, acquisition or use in a manner contrary to "honest commercial practices."
[7] The Value of Corporate Secrets: How Compliance and Collaboration Affect Enterprise Perceptions of Risk. Forrester Consulting, 2010.
[8] Letter to Congress. SIA, 2015. (Available at: http://cdn2.hubspot.net/hubfs/409470/documents/SIA_trade_secrets_letter_oct_2015.docx.pdf)
[9] Standards concerning the availability, scope and use of Intellectual Property Rights. WTO. (Available at: https://www.wto.org/english/docs_e/legal_e/27-trips_04c_e.htm)
[10] Kasch, Steven. "The Semiconductor Chip Protection Act: Past, Present and Future." High Technology Law Journal, Vol. 7, No 1 (Spring 1992).

signed, but never ratified.[11] It wasn't until the TRIPS Agreement that protection for chip layout designs was afforded on a broader global scale.

This protection became increasingly important through the 1990s and 2000s when improvements in automated design tools enabled semiconductor layout designs to be easily copied from protected layout designs. While TRIPS includes a specific exception for copies made in the course of reverse engineering, the implicit assumption for this exception was that reverse engineering would require intellectual effort. In 2004 and 2006, the World Semiconductor Council (WSC) – an international forum comprised of the semiconductor industries in China, Chinese Taipei, EU, Japan, Korea, and the U.S. – advocated that courts and IP policymakers carefully review the existence of intellectual effort, the use of improved automated design tools, and similarity (rather than identicality) to an original protected layout design when adjudicating infringement claims under TRIPS and national layout design protection laws.[12]

While IC layout protection was very important to the industry for several decades, advances in semiconductor technology make trade secrets a more valuable and practical route of IP protection today. Thus, there is a strong need to develop new and stronger multilateral rules to strengthen trade secret protection.

C. TRIPS SAFEGUARDS AGAINST COMPULSORY LICENSING OF SEMICONDUCTORS

Article 31 of the TRIPS Agreement governs "compulsory licensing," a practice in which a government compels a patent holder to allow another entity to produce and sell its patented product or process, which is an exception to typical patent protection rights.[13] While TRIPS allows compulsory licensing, it establishes a number of procedural and substantive safeguards designed to prevent governments from abusing compulsory licensing to enable or create more competitors, or to restrict trade. Specifically, TRIPS: 1) only allows compulsory licensing of patents on a case-by-case basis (not by rule or general guideline); 2) only allows compulsory licensing after there is an effort to obtain authorization from the patent-holder on reasonable commercial terms within a reasonable time-frame; and 3) and only in cases of national emergencies, other "circumstances of extreme urgency" or in cases of "public non-commercial use" will the requirement for negotiation with the patent holder described in section 2 be waived and the government can proceed directly to compulsory licensing.

Critically, TRIPS Article 31(c) provides further protection from compulsory licensing for semiconductor technology by limiting any compulsory licensing to "public non-commercial use." This means semiconductor innovators are only subject to compulsory licensing in situations of use by the government itself or a government contractor (*creating semiconductors solely for government use of the chips or a product only procured by the government)*, and thus a semiconductor company cannot be compelled to transfer valuable intellectual property to indigenous competitors.

---

[11] Treaty on Intellectual Property in Respect of Integrated Circuits. World Intellectual Property Organization, 1989. (Available at: https://wipolex.wipo.int/en/text/294976)

[12] WSC Statement on the Application of Layout Design Laws to Copying of Protected Layout Designs Using Improved Automated Design Tools. World Semiconductor Council, 2006. (Available as Annex to 2007 WSC Joint Statement: http://www.semiconductorcouncil.org/wp-content/uploads/2016/07/geneva.pdf)

[13] Patents bestow exclusive rights on their owners to prevent others from making, selling, using or importing a product or process.

This international rule has been critical in confronting countries that are pursuing expansive compulsory licensing policies to increase their access to foreign IP in: 1) areas where access is deemed to be in the "public interest," i.e. pharmaceutical, biomedical, and environmental technologies; and 2) critical technologies owned by "dominant" companies where access by smaller competitors is allegedly needed to compete. TRIPS obligations also specifically limit compulsory licensing to very narrow circumstances, so as to incentivize successful companies to continue to invest and innovate. Without specific guidance and narrow provisions under which innovations could be subject to compulsory license, major research and development enterprises would be reluctant to make the necessary investments to develop their most valuable innovations.

II. ITA AND ITA EXPANSION HAS ACCELERATED ICT DEMAND, LOWERED CONSUMER PRICES, AND STRENGTHENED THE SEMICONDUCTOR ECOSYSTEM

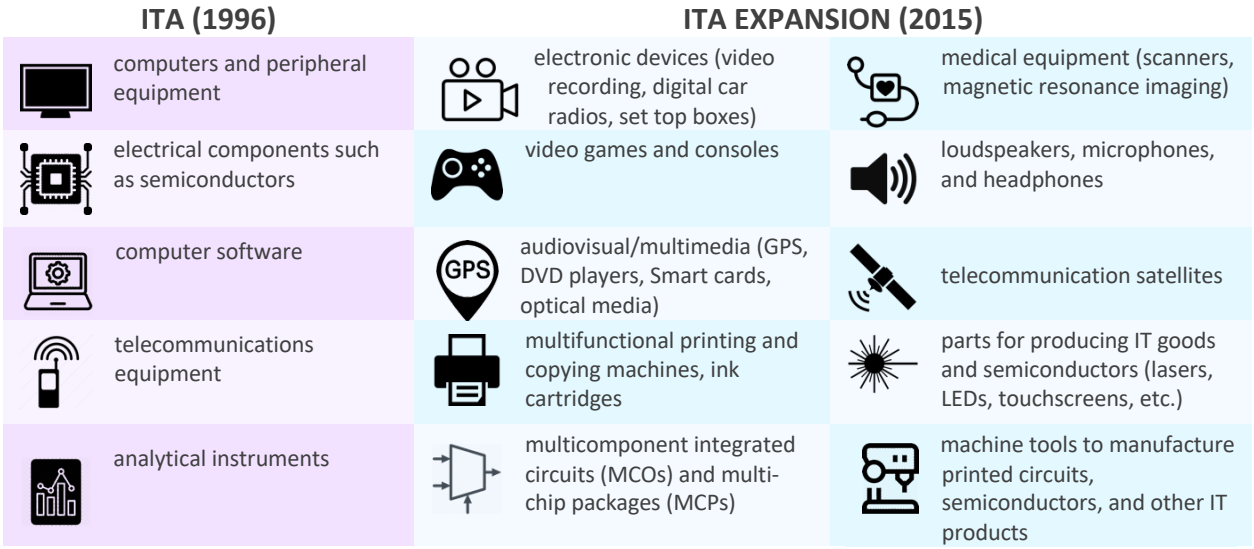
Over 80 industry associations representing both high- and low-tech companies from around the world have declared the Information Technology Agreement (ITA) to be one of the most meaningful and successful trade agreements in the history of the World Trade Organization.[14] Originally signed in 1996, the ITA and its expansion in 2015 eliminated tariffs on approximately $3 trillion of information communication technology (ICT) goods traded globally every year.[15] The signatories of the ITA and its expansion, which account for more than 97 percent of trade in these products, agreed to eliminate tariffs on the covered products on a reciprocal basis. The 2015 expansion rendered annual global tariff savings of $13.8 billion – without accounting for increased economic activity.[16]

The semiconductor industry is perhaps the greatest beneficiary of the ITA and its expansion. Semiconductors are the largest ITA product category, accounting for 32 percent of global trade of ITA products in 2015.[17] The ITA expansion resolved non-uniform tariff classification of advanced semiconductors known as multi-component ICs (MCOs), which before 2015 were typically classified as parts of other equipment rather than as a semiconductor and subject to tariffs as high as 25 percent. The elimination of tariffs on MCOs alone provides roughly $150-300 million a year in tariff savings for U.S. companies.[18] The most significant benefit to the semiconductor industry, however, is the growth in global demand for semiconductor-enabled ICT products accelerated by the pioneering trade pact. Tariff elimination "decreases the cost of innovation-and productivity-enhancing ICT capital goods, which spurs their adoption and consumption among businesses and consumers alike."[19] Between 1996 and 2015, world exports of ICT products covered by the ITA tripled to $1.7 trillion. This is especially

[14] Global Industry Statement of Support for Expansion of the Information Technology Agreement. October 2012.
[15] The 1996 Agreement eliminated tariffs on $1.7 trillion of goods, and the 2015 ITA expansion covered an additional $1.3 trillion. "20 Years of the WTO," WTO Publication, 2017
[16] Trade in ICT – An Important Pillar for Economic Growth and Prosperity. BDI, 2019. (Available at: https://english.bdi.eu/article/news/trade-in-ict-an-important-pillar-for-economic-growth-and-prosperity/)
[17] 20 Years of the WTO. WTO, 2017. (Available at: https://www.wto.org/english/res_e/publications_e/ita20years2017_e.htm)
[18] The Benefits of Including Multi-Component Semiconductors in an Expanded Information Technology Agreement. SIA, 2014. (Available at: https://www.semiconductors.org/the-benefits-of-including-multi-component-semiconductors-in-an-expanded-information-technology-agreement/)
[19] Assessing the Benefits of Full ITA Participation for Indonesia, Laos, Sri Lanka, and Vietnam. Information Technology and Innovation Foundation, 2017. (Available at: https://itif.org/publications/2017/09/28/assessing-benefits-full-ita-participation-indonesia-laos-sri-lanka-and)

significant considering that the price of ICT products has also declined dramatically during the same period. The U.S. Bureau of Labor and Statistics estimates that the import price level for "computers, peripherals and semiconductors" has dropped 96 percent between 1996 and 2015.[20] The increased demand for ICT products driven by lower costs and greater technology diffusion has significantly boosted demand for semiconductors. Between 2015 and 2018, global semiconductor sales jumped from about $330 billion to $468 billion.[21]

EXAMPLES OF PRODUCTS COVERED UNDER ITA & ITA EXPANSION



The "zero-in, zero-out" trading environment facilitated by the ITA has been a huge boon to intermediate products like semiconductors, which have complex global production chains. A typical semiconductor crosses borders many times throughout its production cycle and before its eventual integration into an end-product. A tariff-free environment eliminates not just the tariff, but also the costly, burdensome and often time-consuming administrative customs procedures for goods crossing borders. Thus, the ITA has also greatly strengthened the semiconductor ecosystem and all the players in it, including designers, manufacturers, assembly and test operations, downstream electronics industries, and customers.

By lowering the cost of semiconductors and boosting greater ICT trade, the ITA has been a win-win-win for countries, companies, and consumers. For countries, it promotes more affordable ICT infrastructure and greater connectivity, spurs economic growth and productivity, and increases employment, investment and export opportunities. For companies, it increases efficiency and allows companies to channel funds that otherwise would have been spent on tariffs into R&D for future innovations (as mentioned above, semiconductor companies on average re-invest one-fifth of sales revenues back into R&D). For consumers, it has lowered prices of key consumer goods, and increased access to life-

[20] Long-term price trends for computers, TVs, and related items. U.S. Bureau of Labor Statistics, 2015. (Available at: https://www.bls.gov/opub/ted/2015/long-term-price-trends-for-computers-tvs-and-related-items.htm)
[21] 2020 State of the U.S. Semiconductor Industry. SIA, 2020. (Available at: https://www.semiconductors.org/2020-state-of-the-u-s-semiconductor-industry/)

changing technologies in areas such as telecommunications, computing, energy efficiency, transportation, health care, medical technology, artificial intelligence, automation, and more.

McKinsey & Company has reported that if the automobile industry had similar improvements in price and performance to semiconductors over three decades, "a Rolls-Royce would cost only US $40 and could circle the globe eight times on one gallon of gas - with a top speed of 2.4 million miles per hour."[22] The ability to access and freely move products, talent, materials, resources, and knowledge across borders has been a key driver of this extraordinary growth and cost reduction.

25 YEARS OF SEMICONDUCTOR INDUSTRY ADVANCEMENT [23]

Semiconductor Growth Metric	1996	2019	% Change
Total Semiconductor Trade[1]	$294 billion*	$1.655 trillion*	463%
Cell Phone Subscriptions (Per 100 People)[2]	3.022*	104.9*	3,371%
Internet Users (Per 100 People)[3]	1.19*	49.7*	4,076%
Global Semiconductor Market (Total Revenue)[4]	$132 billion	$412 billion	212%
Semiconductor Units Produced (Total Number)[5]	215 billion	932 billion	333%
Transistors Produced (Estimated Total Number)[6]	29.1 quadrillion (29.1×10^{14})	262 sextillion (2.62×10^{21})	900,343,543%
Transistors per Semiconductor (Average Number)[7]	135,237	2,809,901,908	2,077,661%
PC Processor Speeds[8]	133 MHz Single Core	2,300 MHz Quad Core	1,629%
Total Worldwide IC Wafer Capacity (200 mm Equivalents)[9]	51.9 million	230.5 million	344%
Worldwide Semiconductor Industry R&D Spending[10]	$15.7 billion	$64.5 billion	311%
Process Technology Node[11]	350 nanometers	7 nanometers	-98%
Semiconductor Content per Electronic System (Average Share)[12]	18.8%	26.3%	40%

[22] Creating Value in the Semiconductor Industry. McKinsey on Semiconductors, Autumn 2011. (Available at: https://www.mckinsey.com/~/media/McKinsey/dotcom/client_service/Semiconductors/PDFs/MOSC_1_Value_creation.ashx)

[23] Note: Value amounts ($) expressed in US dollars.

Sources: 1. UN Comtrade (excl. LED) 2. World Bank, ITU 3. World Bank, ITU 4. WSTS 5. WSTS 6. SIA 7. SIA & WSTS 8. IC Insights, McClean Report 2020 9. IC Insights, McClean Report 2020 10. IC Insights, McClean Report 2020 11. IC Insights, McClean Report 2020 12. IC Insights, McClean Report 2020 *Where 1996/2019 data is not available, estimates are based on most recent year available

III. SCM AGREEMENT WAS A SIGNIFICANT STEP TOWARD FAIR, MARKET-BASED COMPETITION AMONG COMPANIES

The Agreement on Subsidies and Countervailing Measures ("ASCM" or "SCM Agreement") was designed to address trade-distorting subsidies governments use to give their firms an unfair competitive advantage. Because of the semiconductor industry's high capital and innovation costs, government investment has been a prominent contributor to the development of semiconductor production since the early days of the industry. While market-based government support can help fuel innovation and technological diffusion, non-transparent and discriminatory subsidies can lead to unfair competitive conditions and create major market distortions. Although government subsidies continue to present major challenges in the trading system, the SCM Agreement represents an important first step toward establishing rules and enforcement tools intended to curb market-distorting subsidies so that the competitiveness of companies and their products, not government intervention, is the principal driver of industry success.

Specifically, the SCM Agreement has played an important role in defining and differentiating between appropriate and inappropriate government support for industry. The original 1995 agreement prohibited two types of blatantly discriminatory subsidies ("prohibited subsidies"): export promotion and import substitution (i.e. use of domestic products). Additionally, the agreement allowed members to take countervailing duty (CVD) actions against subsidies that cause "material injury" to their own domestic industry ("actionable subsidies"), and it established rules and procedures allowing WTO members to challenge trade-distorting domestic subsidies that cause "adverse effects." Lastly, the original agreement permitted subsidies in certain areas like R&D activity ("non-actionable subsidies").[24] Part VII of the SCM Agreement also obliges members to notify other members of all specific subsidies granted or maintained within their territories. This notification mechanism was intended to introduce greater transparency to government support to allow other members to evaluate the trade effects and understand the operation of subsidy programs.

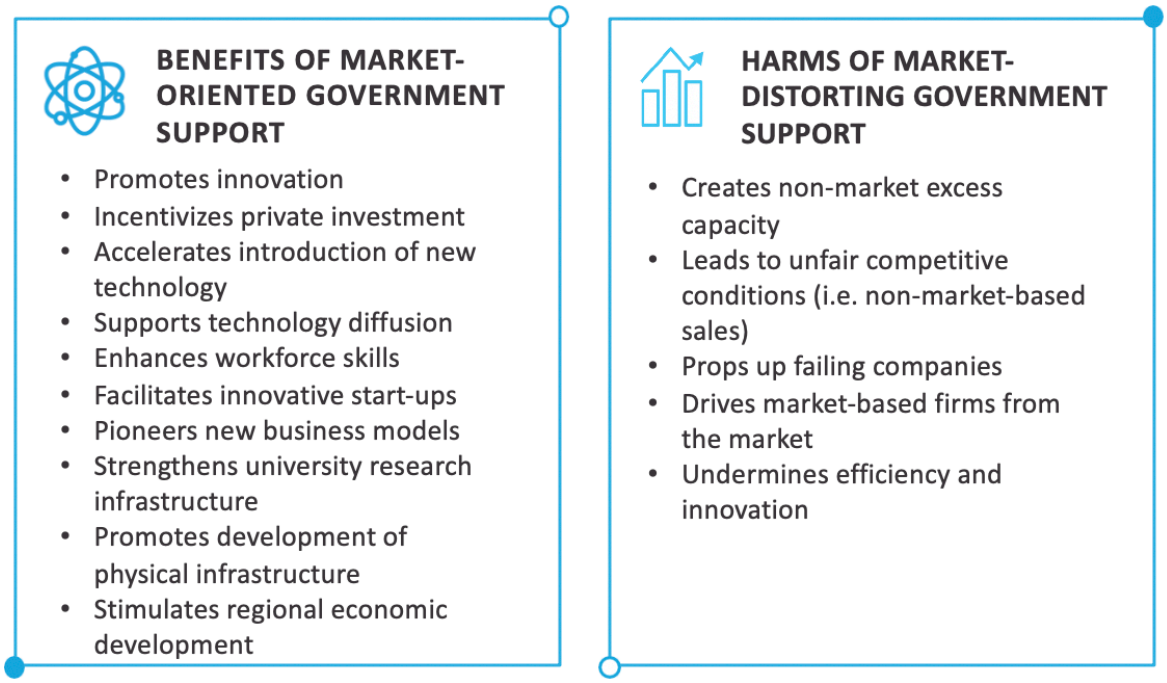
The WTO rules on prohibited export and import substitution subsidies have been somewhat effective. In fact, the first WTO case filed against China involved import substitution in the semiconductor industry. In 2004, the U.S. government successfully challenged a major Chinese tax subsidy contingent on local ICT production. As a result of the WTO challenge, China agreed to cease granting a discriminatory VAT rebate amounting to 14 to 17 percentage points that was granted to only to domestic semiconductors. The U.S. government has also successfully challenged a wide array of other prohibited subsidies provided by China and other countries.[25]

It has become apparent, however, that the SCM disciplines regarding trade-distorting domestic subsidies are limited in effect and have failed to account for different economic systems that blur the lines between public and private funding. For example, most foreign subsidies for semiconductors are

[24] See WTO Agreement on Subsidies and Countervailing Measures, WTO. The "non-actionable" subsidy provision expired in 1999. See here for a sampling of such cases:

[25] See here for a sampling of such cases: https://ustr.gov/about-us/policy-offices/press-office/press-releases/archives/2007/february/united-states-files-wto-caseagainst-chi and https://ustr.gov/about-us/policy-offices/press-office/press-releases/2015/february/united-states-launches-challenge and https://ustr.gov/about-us/policyoffices/press-office/press-releases/2016/april/chinese-export-subsidies-under

being provided by state-owned banks or government-guided investment funds that may not possess "government authority" or perform a "government function," but are directly or indirectly controlled by the government through minority or majority ownership interests. The current WTO rules are undermined by the lack of clear guidance on the definitions of what constitutes a "public body," the difficulties surrounding proving "adverse effects," the lack of rules that effectively discipline subsidies that may create excess capacity and third-country market displacement, and lack of enforcement of the transparency and notification obligations. Stronger rules are needed to avoid the harmful effects of non-market and non-transparent government support in the semiconductor sector that discriminates against foreign competitors, generates excess capacity, or distorts trade.



IV. TFA HAS LOWERED COSTS OF SEMICONDUCTOR TRADE

Semiconductors are a highly traded product that have a complex manufacturing supply chain. Overly complicated customs and trade procedures, obligations, and practices have the potential to significantly disrupt semiconductor supply chains, creating costly impediments that impair companies and consumers. The 2017 ratification of the WTO's Trade Facilitation Agreement (TFA) was lauded by the global semiconductor industry for lowering trade costs as goods move across borders by: 1) expediting import, export and in-country transit; 2) removing bureaucratic red tape and corruption; 3) making border processes more efficient and transparent; and 4) focusing on technological advances to achieve such objectives.[26] The WTO estimates that removing burdensome regulations and simplifying customs processes lowers trade costs by the equivalent of a 134 percent *ad valorem* tariff.[27] Critically, because 82 percent of U.S. semiconductor sales are to overseas customers

[26] Trade Facilitation. WTO. (Available at: https://www.wto.org/english/tratop_e/tradfa_e/tradfa_e.htm)
[27] Trade facilitation — Cutting "red tape" at the border. WTO. (Available at: https://www.wto.org/english/tratop_e/tradfa_e/tradfa_introduction_e.htm)

and semiconductors are the fifth-largest U.S. export, the U.S. directly benefits from the TFA's lowering of international barriers to trade.[28]

V. TBT AGREEMENT HAS PROMOTED GLOBAL INTEROPERABILITY

The Agreement on Technical Barriers to Trade (TBT) aims to ensure that technical regulations, standards, and conformity assessment procedures are non-discriminatory and do not create unnecessary obstacles to trade. This agreement has been incredibly important to the semiconductor industry, and to the information and communications technology (ICT) industry more broadly, in promoting global standards and interoperability. Interoperability is a basic requirement for the widespread, global adoption of U.S. technology products. There are many barriers to interoperability, including unique country standards, technology mandates, discriminatory regulations, and burdensome conformity assessment procedures. The TBT agreement has been critical in promoting global interoperability by prohibiting policies and technical measures that discriminate between foreign and domestic products or create "unnecessary" obstacles to trade, as well as by requiring the use of international standards over unique domestic standards as the basis for technical regulations, except in narrow circumstances. The TBT Agreement's transparency provisions regarding consultation and notice also has helped create a more predictable trading environment. The TBT Agreement Code of Good Practice requires, among other things, notification to the public and to the WTO TBT Committee of any and all technical measures that may have a significant effect on trade, and a 60-day comment period and mandatory reply to all comments received by domestic and international stakeholders.

VI. WTO REFORMS AND MODERNIZED TRADE RULES WILL FURTHER ENHANCE BENEFITS OF GLOBAL TRADE

Despite its many benefits over the past 25 years, the WTO has many areas in need of reform and improvement to combat discriminatory and market-distorting practices in the ICT sector. Current global trade tensions underscore the importance of establishing more robust global fair-trade disciplines that protect and strengthen the semiconductor industry and the broader global economy. Examples of areas in which the semiconductor industry could benefit from stronger and modernized global trade rules can be found below. These reforms should be advocated on multiple fronts including the WTO, regional trade blocs, as well as bilateral agreements.

1. STRENGTHEN LEGAL PROTECTIONS TO ENHANCE TRADE SECRETS PROTECTION

Trade secrets are a critical and major asset for nearly all semiconductor companies. Yet despite their tremendous importance and the inclusion of certain protections in TRIPS, trade secrets remain extremely vulnerable, especially in jurisdictions with weak laws and/or enforcement practices. More problematic is the wholesale misappropriation of trade secrets enabled or encouraged as result of government industrial policy. Modern trade agreements should require criminal penalties for trade

[28] 2020 State of the U.S. Semiconductor Industry. SIA, 2020. (Available at: https://www.semiconductors.org/2020-state-of-the-u-s-semiconductor-industry/, p. 3)

secret theft, including theft by governments or theft by means of cyber intrusion, and strengthened procedures to protect trade secrets during conformity assessment procedures, such as banning forced disclosure of software source code or other sensitive IP in certification/regulatory schemes.

2. STRENGTHEN SUBSIDY & SOE DISCIPLINES SO COMPANIES CAN COMPETE FAIRLY BASED ON MARKET CONSIDERATIONS

The efforts by some governments to provide unprecedented levels of subsidization to develop their domestic semiconductor capabilities has the potential to seriously distort semiconductor markets and generate excess capacity and dumping. WTO disciplines on subsidies and state-owned enterprises (SOEs) should be strengthened to ensure that the competitiveness of companies and their products, not government intervention, is the principal driver of industry success. Key areas of subsidy reform should include:

1) Restoring the "dark amber" category for certain types of highly trade-distorting domestic subsidies that are deemed to cause "serious prejudice" under SCM Article 6;
2) Improving enforcement by establishing a presumption of serious prejudice for programs that governments fail to notify;
3) Addressing subsidies provided by and to SOEs by defining "public body" based on an objective control standard;
4) Expanding prohibited assistance (non-commercial assistance) to more effectively capture government assistance that creates excess capacity or leads to market displacement;[29] and
5) Clarifying the provisions of the SCM Agreement in Footnote 13 regarding "threat" of serious prejudice to cover situations in which government subsidies are likely to cause future adverse effects or future injury to a targeted industry.

3. PREVENT FORCED LOCALIZATION OF DIGITAL INFRASTRUCTURE & FORCED TECHNOLOGY TRANSFERS

Governments are increasingly using "forced localization" tactics to unfairly advantage domestic companies and/or force foreign investors to use domestic technology, transfer their own technology, localize data storage and processing, or build expensive infrastructure in a region as a condition of market access. These rules raise costs, distort markets, reduce global interoperability, increase the risk of unauthorized disclosure or theft of IP, and represent a thinly disguised form of import substitution, which is already prohibited by WTO rules. Establishing new trade rules that prevent WTO members from requiring companies to build technology infrastructure in their market or requiring companies to purchase or use local technology will help ensure fair trade, data efficiency, cost efficiency, global interoperability and technology choice.

4. ENSURE MARKET ACCESS FOR INNOVATIVE ENCRYPTION PRODUCTS

With semiconductor-enabled encryption now used in nearly all commonly used and globally traded ICT products, the adoption of restrictive policies (i.e. import bans, technology mandates or requirements to transfer or provide access to proprietary information) would erect a major market access barrier and threaten the exportation of semiconductors and other ICT products on the scale of hundreds of billions

[29] As reported by the WTO's Working Party on the Ascension of China, China's WTO ascension agreement requires any business "decisions by state-owned and state-invested enterprises had to be based on commercial considerations as provided in the WTO Agreement." (Available at: https://www.wto.org/english/thewto_e/acc_e/wp_acc_china_e.doc, p. 9)

of dollars. WTO negotiators should agree on new rules that prevent countries from taking actions that block or place discriminatory restrictions on commercial foreign products with encryption, or that block companies from using the strongest available security technologies in the marketplace.

5. ELIMINATE DUTIES ON SEMICONDUCTOR-RICH PRODUCTS, ELECTRONIC TRANSMISSIONS

Reciprocal duty-free treatment for both tangible and intangible ICT goods has lowered consumer prices, facilitated trade, and spurred demand for ICT and digital products, to the benefit of goods and services exporters of all sizes. To further enhance these benefits and promote technology innovation and adoption, all WTO members should be encouraged to join both the ITA and ITA expansion and make permanent the WTO's existing moratorium on the imposition of customs duties on trade in electronic transmissions.

VI. CONCLUSION

The steady opening of markets, leveling of the global playing field, and establishment of multilateral disciplines on IP, subsidies, and other government policies spearheaded by the General Agreement on Tariffs and Trade (GATT) and World Trade Organization (WTO) over the past 25 years have been critical to the success of the global semiconductor industry. Landmark agreements, such as TRIPS, ITA, ITA Expansion, SCM, and TFA, have also broken down protectionist barriers and allowed semiconductor companies to expand their businesses and reach new markets without fear of losing their hard-won innovations. Certainly, discriminatory and market-distorting practices persist in the ICT sector and beyond, and these practices need to be addressed. Governments can best tackle these challenges, however, by strengthening the WTO's negotiating function and updating global trade rules to ensure relevance for modern trade issues. As one of the world's most widely traded products, semiconductors can best continue powering the world's economy and employing workers if we ensure the global marketplace is free, open, and fair to all.[30]

[30] Semiconductor Devices. OEC. (Available at: https://oec.world/en/profile/hs92/semiconductor-devices#:~:text=Semiconductor%20Devices%20are%20the%20world's,and%20Malaysia%20(%246.59B))