DIGITAL TRADE AND REGULATION IN AN AGE OF DISRUPTION

*Peter F. Cowhey and Jonathan D. Aronson**

ABSTRACT[1]

The Trump Administration stated that its trade policy would focus on trade in goods, prioritizing U.S. production over the overall competiveness of U.S. multinational firms. It objects to regulation and instead will concentrate on unfair behavior by U.S. trading partners, especially currency manipulation, tax system manipulation, and rigging markets by hidden protectionism. But, as goods markets become more information and communication technology

* Peter Cowhey is Dean and Qualcomm Professor Communication and Technology Policy at Global Policy and Strategy Uniersity of California, San Diego. He was Senior Counselor at the United States Trade Representative in 2009-2010.

Jonathan Aronson is Professor at the Annenberg School for Communication and Journalism at the University of Southern California and also Professor of International Relations at USC.

1 This paper draws materially from our new book, *Digital DNA: Disruption and the Challenges for Global Governance* (New York: Oxford University Press, 2017). PETER F. COWHEY & JONATHAN D. ARONSON, DIGITAL DNA: DISRUPTION AND THE CHALLENGES FOR GLOBAL GOVERNANCE (2017).

(ICT) intensive, higher value added and higher wages will rely on the technology for sustainable advantages. American negotiators and their international counterparts will face a series of challenges. U.S. leadership will continue to rest on America's "soft power" advantage: U.S. leadership in ICT architecture. We suggest ways in which a policy platform for quasi-convergence of national policies, facilitated by trade agreements, in conjunction with more detailed decisions, facilitated by trade agreements and multi-stakeholder organizations (MSOs), respectively, could help create a trusted digital environment in which the United States and others could thrive.

The 2016 presidential election featured heated attacks on existing trade policy. Both Hillary Clinton and Donald Trump rejected the Trans-Pacific Partnership (TPP) trade agreement.[2] Trump went beyond rejecting the TPP with his calls to dismantle the North American Free Trade Agreement (NAFTA) and even to reconsider the merits of the World Trade Organization (WTO).[3] Although President Trump's Administration ("Administration") remains strong on rhetorical flourishes to overhaul trade policy, few details over programmatic strategy and choices have surfaced.[4]

Nonetheless, there seem to be four guiding premises. First, the Administration is focused on the trade in goods and perhaps commodities (blue collar strongholds). In particular, it is intent on increasing U.S. production of goods and jobs tied to steel, coal, and other heavy industry sectors. It is quite willing to use presidential jawboning to push for added investment in American manufacturing plants and claims that it may alter tariffs and taxes to provide big financial incentives for U.S. production.[5] The corollary to this premise is that the Administration has paid scant attention to trade in services, even though said trade is approaching 40 percent of all U.S.

---

[2] Editorial, *The Rage Against Trade*, N.Y. TIMES (Aug. 6, 2016), https://www.nytimes.com/2016/08/07/opinion/sunday/the-rage-against-trade.html [https://perma.cc/B9UB-WMEA].

[3] Chad P. Brown, W*hat Is NAFTA, and What Would Happen to U.S. Trade Without It?*, WASH. POST (Feb. 15, 2017), https://www.washingtonpost.com/news/monkey-cage/wp/2017/02/15/what-is-nafta-and-what-would-happen-to-u-s-trade-without-it/?utm_term=.9ed064d6463f [https://perma.cc/7XTA-LEWE]; Damian Paletta & Ana Swanson, *Trump Suggests Ignoring World Trade Organization in Major Trade Policy Shift*, WASH. POST (Mar. 1, 2017), https://www.washingtonpost.com/news/wonk/wp/2017/03/01/trump-may-ignore-wto-in-major-shift-of-u-s-trade-policy/?utm_term=.d8f5f108574d [https://perma.cc/BG3K-B57M].

[4] See the full trade agenda and report at OFFICE OF THE U.S. TRADE REPRESENTATIVE, 2017 TRADE POLICY AGENDA AND 2016 ANNUAL REPORT (2017), https://ustr.gov/sites/default/files/files/reports/2017/AnnualReport/AnnualReport2017.pdf.

[5] This includes revisions in rules of origin for manufactured goods.

trade and generates most American employment.[6] Second, the White House seems particularly focused on three claims about unfair trade conduct—currency manipulation by other countries to lower their cost of exports, tax systems that discriminate against U.S. imports, and assorted claims of hidden trade discrimination against U.S. goods.[7] Third, the Administration has said it will vigorously contest the WTO appellate system and reserve the right to use unilateral sanctions if necessary.[8] Fourth, the Trump rhetoric on trade often seems agnostic about the welfare of America's multinational firms that channel the majority of U.S. exports within their intra-firm global operations. Yet a great deal of U.S. international commercial policy focuses on seeking more consistency in national regulations so that U.S. multinationals can operate in a global marketplace with regulations that are not wildly askew from their U.S. home base.

Elements of the Trump approach won support from every prior presidential administration.[9] In both Democrat and Republican administrations, exchange rates were always on the U.S. economic agenda, as were efforts to challenge hidden "barriers behind the borders," regulatory practices that effectively discriminate against U.S. goods.[10] It is the extraordinary magnitude of the hinted policy responses—such as the dismantling of NAFTA, imposing measures on exchange rates that might backfire on U.S. economic interests, or bypassing WTO dispute resolution—that deeply worry veterans of trade policy.[11]

---

6 *Quarterly International Trade Statistics: Trade in Goods and Services*, ORG. FOR ECON. CO-OPERATION & DEV., https://data.oecd.org/trade/trade-in-goods-and-services.htm [https://perma.cc/TS47-UBFV].

7 OFFICE OF THE U.S. TRADE REPRESENTATIVE, *supra* note 4.

8 Manfred Elsig, Mark Pollack & Gregory Shaffer, *Trump Is Fighting an Open War on Trade. His Stealth War on Trade May Be Even More Important.*, WASH. POST (Sept. 27, 2017), https://www.washingtonpost.com/news/monkey-cage/wp/2017/09/27/trump-is-fighting-an-open-war-on-trade-his-stealth-war-on-trade-may-be-even-more-important/?utm_term=.54ebf15fd6a9 [https://perma.cc/5R47-M228].

9 Peter F. Cowhey, *Crafting Trade Strategy in the Great Recession: The Obama Administration and the Changing Political Economy of the United States*, *in* POLITICS IN NEW HARD TIMES: THE GREAT RECESSION IN COMPARATIVE PERSPECTIVE (Miles Kahler & David Lake eds., 2013) (reviewing the political economy and policy analysis that informed the Obama trade strategy in its first term).

10 Azim M. Sadikov, *Border and Behind-the-Border Trade Barriers and Country Exports* (Int'l Monetary Fund, Working Paper No. 07/292, 2007).

11 Amidst reported disputes over NAFTA among White House staff, President Trump's Administration's ("Administration") initial policy paper fell far short of dismantling NAFTA. *See* Binyamin Appelbaum, *President's Growing Trade Gap: A Gulf Between Talk and Action*, N.Y.

Rather than analyze the full sweep of the possible Trump trade agenda, this paper focuses on one key priority: the effort to promote "good" U.S. jobs by upending U.S. trade policy. We do not attempt to resolve the broad debate over the impact of trade on U.S. manufacturing.[12] Instead, we advance one claim: digital technology is critical to the sustainable success of U.S. manufacturing that must provide higher value added and be more productive than most of its international counterparts if it is to pay wages commensurate with U.S. living standards.[13] A comparative advantage of U.S. firms is that they operate in a rapidly evolving digital infrastructure that is built around the technical architectures and deep talent pools of American information technology (IT) firms.[14] Although this infrastructure, like the architecture of the Internet, benefits all countries, it also provides a home field advantage for U.S. manufacturers. Similarly, Germany boosts its global firms through policies that nurture deep "Mittlestand" manufacturing specialists which in turn boost Germany's global firms.[15]

Understanding the link of digital technology to the success of

---

TIMES (Mar. 31, 2017), https://www.nytimes.com/2017/03/31/us/politics/trump-trade-agreements-actions.html [https://perma.cc/E5D6-VPGB]; Julie Hirschfeld Davis & Alan Rappeport, *After Calling Nafta, 'Worst Trade Deal,' Trump Appears to Soften Stance*, N.Y. TIMES (Mar. 30, 2017), https://www.nytimes.com/2017/03/30/business/nafta-trade-deal-trump.html [https://perma.cc/G6GC-SQUT].

[12] *See generally* Daron Acemoglu et al., *Return of the Solow Paradox? IT, Productivity and Employment in US Manufacturing*, 104 AM. ECON. REV. 394 (2014).

[13] *See* Michael Mandel & Bret Swanson, *The Coming Productivity Boom: Transforming the Physical Economy with Information*, TECH. CEO COUNCIL 1 (Mar. 2017), http://www.techceocouncil.org/clientuploads/reports/TCC%20Productivity%20Boom%20FINAL.pdf [https://perma.cc/B2LL-DMUZ]; James Manyika et al., *Digital Globalization: The New Era of Global Flows*, MCKINSEY GLOBAL INST. (Feb. 2016), http://www.mckinsey.com/business-functions/digital- mckinsey/our-insights/digital-globalization-the-new-era-of-global-flows [https://perma.cc/M8LX-V6AB].

[14] Digital technologies can bolster all economies. However, the United States is particularly data intensive in its economy, including in its manufacturing, even when compared to an advanced country like Germany. This gives the U.S. special motivation to engage in a digital agenda. *See* Paul Hofheinz & Michael Mandel, *Bridging the Data Gap: How Digital Innovation Can Drive Growth and Create Jobs*, PROGRESSIVE POL'Y INST. (2014), http://www.progressivepolicy.org/wpcontent/uploads/2014/04/LISBON_COUNCIL_PPI_Bridging_the_Data_Gap.pdf [https://perma.cc/FHD6-RTQH].

[15] Mittelsand manufacturers in Germany and other German-speaking countries like Austria and Switzerland are the equivalent of what are referred to as small and medium-sized enterprises in English-speaking countries. Most often they are led by *"owner-entrepreneurial families" (Unternehmerfamilien)*. Bernd Venohr, Jeffrey Fear & Alessa Witt, *Best of German* Mittelstand*: The World Market Leaders* (Aug. 24, 2015), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2724609 [https://perma.cc/8P4Z-KGX5].

manufacturing or commodities requires a survey of how innovation is evolving. Digital technologies are increasingly critical to every facet of the world economy. These technologies are the "digital DNA" which unleash dazzling changes in the information, communication, and production capabilities that are transforming how the world works. This information and production disruption (IPD), which is discussed in detail below, is rapidly changing the dynamics of firms, how markets perform, and the potential for stronger economic growth and social prosperity.[16] The IPD is altering national and global patterns of innovation—defined here as the commercialization of new knowledge—that are central to global growth and prosperity.[17]

We call the emerging regional patterns for innovation "digital platform clusters." These clusters extend the dynamics associated with digital platforms (often associated with giant information companies like Google and Microsoft) to smaller specialized technology firms and firms in more traditional, yet as important, industries.[18] The sustainable success of industries close to the heart of the economic agenda of the Administration—such as automobiles, other heavy manufacturing, and commodity markets—depends heavily on how the IPD evolves on a global scale.

The digital DNA of the new innovation model, built on digital platform clusters, entails distinctively global forces.[19] For example, global interactions allow information feedback cycles to speed up the production of initial product designs and continuously refine them to cater to specialized market segments. As a result, the prospects for digital platform clusters to generate robust innovation depend in part on sound global economic governance.[20] These governance choices include traditional issues of market access and competition, but they also require building a trusted digital environment that covers cybersecurity and digital privacy—two hot button concerns for successful national policies everywhere.

Many of the most attractive features of the now discarded TPP addressed the challenges of crafting smart policy governance for a new generation of

---

16 *See* COWHEY & ARONSON, *supra* note 1, at 23–48.

17 ROBERT D. ATKINSON & STEPHEN J. EZELL, INNOVATION ECONOMICS: THE RACE FOR GLOBAL ADVANTAGE (2012).

18 *See, e.g.*, NICHOLAS CARR, THE BIG SWITCH: REWIRING THE WORLD, FROM EDISON TO GOOGLE (2008).

19 See COWHEY & ARONSON, *supra* note 1, at 3–22, which discusses new innovation models.

20 *Id.* at 33–36.

digital technologies.[21] These measures alone would not have created a sound foundation for the global digital industry, but they included many promising starting points. This Article sketches how a new synthesis of trade and regulatory policy could create this foundation, even after the Administration's withdrawal from TPP.

This Article's argument develops in three parts. Part I explains how the next generation of digital technology is changing innovation and the implications it has for economic growth, including traditional industries. Part II identifies key policy challenges that would enable this transformation where neither new tariff initiatives nor taxes suffice to resolve. Part III outlines an approach to constructing a trusted digital environment at the intersection of trade and regulatory policy to advance national policy coordination that is compatible with fair trade and allows for vigorous innovation and growth. This Article emphasizes the use of non-governmental multi-stakeholder organizations (MSOs) to keep regulation less cumbersome and more "bottom up" than approaches that rely on traditional government agencies.[22]

I. DIGITAL DNA AND INNOVATION

A. The Information and Production Disruption

The information disruption has five drivers. First, the "cheap revolution" adds to information value because networked IT is nearly everywhere and incredibly cheap, even compared to 2000.[23] Cloud computing and ubiquitous (especially mobile) broadband are also becoming pervasive at least in wealthier countries. The predicted end of the stunning price/performance

---

[21] *See* Trans-Pacific Partnership Agreement c. 13–14, Feb. 4, 2016 [hereinafter TPP]; *see also Can the TPP Launch a New Era of Governance for Digital Commerce?*, COUNCIL ON FOREIGN REL. (July 28, 2015), https://www.cfr.org/blog/can-tpp-launch-new-era-governance-digital-commerce [perma.cc/8K9Y-SDA4].

[22] Multi-stakeholder organizations (MSOs) bring together government, business, civil society, research institutions, and other non-government organizations to help craft governance or policy-making efforts.

[23] Rich Klitgard of *Forbes* first coined the phrase, "cheap revolution." We expanded on the cheap revolution in PETER F. COWHEY & JONATHAN D. ARONSON, TRANSFORMING GLOBAL INFORMATION AND COMMUNICATION MARKETS (William J. Drake & Ernest J. Wilson III eds., 2009). The cost of 1 million transistors (a standard measure of computing power) was $527 in 1990, $1 in 2004, and $.05 in 2012. The cost of storage of a gigabyte of data dropped from $569 in 1992, to $1 in 2002, and to $.02 in 2012. The bandwidth cost to transmit 1000 megabits per second plunged from $1,245 in 1999, to $100 in 2009, and to $16 in 2013. Mary Meeker, *Internet Trends 2014 – Code Conference*, KLEINER, PERKINS, CAUFIELD, BYERS (May 31, 2017), http://www.kpcb.com/internet-trends [https://perma.cc/EL7H-MYM7].

progress for semiconductors, embodied in Moore's law, may eventually materialize, but other forms of improved performance in IT are already taking hold.[24] Second, the rise of the Internet of Things reinforces this trend. The Internet of Things is the interrelated system of observational capabilities (e.g., sensors), networked information, big data analysis, and the infusion of IT functions into an expanding range of terminals that will vastly outnumber computers and smartphones.[25] For example, the evolution of drones is creating an inexpensive general-purpose platform for easily customized sensing and observation systems tied to novel analytic applications.[26] The third driver is the growth of Big Data, accelerated by the explosion of machine learning (whereby machines improve their analytic algorithms on their own) and the conversion of this learning into applications abetted by elements of artificial intelligence programs.[27] The fourth driver is the continued rise of "modular"—standardized, easy to use—IT interfaces. Like Lego blocks, these modular interfaces make it much easier to "mix and match" digital building blocks to help spread information and add value.[28] A fifth, and complementary, driver is the expansion of open-source software codes[29] that startups can fold into their own IT creations, which lower the cost and increase the speed of innovation. For example, it is estimated that ICT startup costs (hardware, software, and personnel) dropped by 70 to 80 percent between 2000 and 2012, making it easier to aggregate and organize capital using

---

24 *See, e.g.*, *More from Moore*, ECONOMIST (Sept. 5, 2015), http://www.economist.com/news/technology-quarterly/21662644-chipmaking-moores-law-may-be-running-out-steam-chip-costs-will-continue [https://perma.cc/9K4P-T3AK]. The power of transistors doubles every 18 months even as their prices fall sharply.

25 *See* Karen Rose et al., *The Internet of Things: An Overview*, INTERNET SOC'Y 4 (Oct. 2015), https://cdn.prod.internetsociety.org/wp-content/uploads/2017/08/ISOC-IoT-Overview-20151221-en.pdf [https://perma.cc/AM3F-E9X7].

26 FlytBase, Airware, Skycatch, and PrecisionHawk are examples of drone platforms.

27 *See* Darryl K. Taft, *One-Third of Big Data Developers Use Machine Learning: Study*, EWEEK (July 6, 2016), http://www.eweek.com/developer/one-third-of-big-data-developers-use-machine-learning-study.html [perma.cc/66WJ-UNGA].

28 "Containers" are the newest metaphor for packing complex software code into building blocks that can be slipped in and out of different service applications. *See* Quentin Hardy, *Docker, a Software Start-Up Sees a Future in Containers of Code*, N.Y. TIMES (Jan. 13, 2015), https://www.nytimes.com/2015/01/13/business/a-small-software-company-sees-a-future-in-containers-of-code.html [https://perma.cc/KC9A-U5HV]. For the history of modularity, see COWHEY & ARONSON, *supra* note 23.

29 Open source software relies on source code that everyone can inspect, modify, and enhance. Source code is the code that computer programmers manipulate to change how a software program or application works.

alternative models.[30] This occurred even as the IT value added of many categories of products rose.[31]

The production disruption complements the information disruption and shares some overlapping drivers of digital technology. The major drivers are additive manufacturing (popularly called 3D (three-dimensional) printing), robotics, and new "smart" materials combined with sensors. Collectively, these changes are sometimes described as "advanced manufacturing," which alter the speed and cost of product development and scale economies.[32] Germany and China, for example, launched major programs to anchor innovation around these capabilities.[33]

Today, 3D printers and other new production tools change the dynamics of specialized products. Making new product prototypes and producing specialized orders with short production runs is becoming routine. Striking examples include the National Aeronautics and Space Administration's ("NASA") ability to email a wrench to the international space station, where it was printed on a 3D printer,[34] and a Danish company's efforts to print a 49-foot bridge in one shot instead of printing it in prefabricated sections and assembling it later.[35] 3D printers are already producing biological products, including prototypes of artificial livers.[36] Moreover, additive manufacturing is improving rapidly, facilitating the customization of parts of traditional

---

30 For an illustration of these falling costs, see Karen A. Frenkel, *Crowdsourced in the U.S.A.*, BLOOMBERG BUSINESSWEEK (June 29, 2012, 10:55 AM), https://www.bloomberg.com/news/articles/2012-06-29/crowdsourced-in-the-u-s-a- [https://perma.cc/6ZYW-DYV8].

31 *Id.*

32 *See* Olivier L. de Weck & Darci Reed, *Trends in Advanced Manufacturing Technology Innovation*, *in* PRODUCTION IN THE INNOVATION ECONOMY 235, 235–241 (Richard M. Locke & Rachel L. Wellhausen eds., 2014).

33 *See* Scott Kennedy, *Made in China 2025*, CTR. FOR STRATEGIC & INT'L STUD.: CRITICAL QUESTIONS (June 1, 2015), http://csis.org/publication/made-china-2025 [https://perma.cc/9U8R-D833].

34 Janet Fang, *NASA Just Emailed a Wrench to the International Space Station*, IFLSCIENCE (Dec. 19, 2014), http://www.iflscience.com/space/how-nasa-emailed-wrench-space [https://perma.cc/E2UK-PAT6].

35 *A Bridge to the Future*, ECONOMIST (Sep. 3, 2015), http://www.economist.com/news/technology-quarterly/21662647-civil-engineering-3d-printing-technologies-are-being-adapted-use [https://perma.cc/2ES5-MYTK].

36 Janet Fang, *3D Printed Device Detoxifies Blood Like a Liver*, IFLSCIENCE (May 17, 2014), http://www.iflscience.com/health-and-medicine/3d-printed-device-detoxifies- blood-liver/ [https://perma.cc/ELX6-972R].

manufactured products.[37] Feetz, a startup shoe manufacturer in Tennessee, began selling customized shoes in 2016 using digital images of the foot and additive printing to generate the product.[38]

Additive manufacturing is more than small-scale production. For example, General Electric (GE) uses additive manufacturing to produce jet nozzles for a new line of engines for smaller jets, like the Boeing 737.[39] GE does this because advanced manufacturing prioritizes the combination of multiple components into a single manufactured piece ("parts consolidation"). Traditional manufacturing techniques required multiple parts to form the shape of a nozzle, whereas a 3D printer could produce the nozzle as a single piece, thereby saving on both materials and labor costs. The role of printers will likely continue to expand as technology advances—by involving lasers, new printers can use an expanding array of metal oxides.[40]

As robots become smaller, cheaper, smarter, and more mobile, robotics reinforces disruptive production possibilities for large economies of scale,[41] as well as for smaller "batch" operations.[42] Moreover, robots are evolving to

---

[37] This is also happening at the household level. Press Release, Hewlett Packard, HP Unveils Future of 3D Printing and Immersive Computing as Part of Blended Reality Vision (Oct. 29, 2014), *available at* http://www8.hp.com/pr/es/hp-news/press-release.html?id=1556805#.Wkgxh1Q-eRs [https://perma.cc/SRW5-2TJ7].

[38] FEETZ, https://feetz.com/ [https://perma.cc/8L9X-4DYP]; *see also* J.D. Harrison, *SXSW Start-Up Snapshot: Shoes Built by iPhones and 3D Printers*, WASH. POST (Mar. 16, 2015), https://www.washingtonpost.com/news/on-small-business/wp/2015/03/16/sxsw-start-up-snapshot-shoes-built-by-iphones-and-3d-printers/?utm_term=.a80a6d034d7e [https://perma.cc/U5SL-GT8S].

[39] Tomas Kellner, *Jet Engine with 3D-Printed Parts Powers Next-Gen Boeing 737 MAX for the First Time*, GE REP. (Feb. 2, 2016), https://www.ge.com/reports/jet-engine-with-3d-printed-parts-powers-next-gen-boeing-737-max-for-the-first-time/ [https://perma.cc/F7AQ-CC2H].

[40] We thank David Michael for his insights. On DARPA's initiative in this space, see Brian Krassenstein, *DARPA to Propel 3D Printing Manufacturing by Improving the Understanding of the Processes and Materials Involved*, 3D PRINT (May 31, 2015), https://3dprint.com/69674/darpa-3d-printing/ [https://perma.cc/NB8A-ZVDD].

[41] Tesla robots, for example, use IT to multitask in ways that other manufacturers cannot match. *See* Tech Talker, *Tesla's Highly Scalable Model*, SEEKING ALPHA (Oct. 28, 2014), https://seekingalpha.com/article/2604485-teslas-highly-scalable-model [https://perma.cc/2EKV-EGHB].

[42] *See generally* ERIK BRYNJOLFSSON & ANDREW MCAFEE, THE SECOND MACHINE AGE: WORK, PROGRESS, AND PROSPERITY IN A TIME OF BRILLIANT TECHNOLOGIES (2014); JEREMY RIFKIN, THE ZERO MARGINAL COST SOCIETY (2014); ALEC ROSS, THE INDUSTRIES OF THE FUTURE 15–43 (2016); *A Third Industrial Revolution*, ECONOMIST (Apr, 21, 2012), http://www.economist.com/node/21552901 [https://perma.cc/M8EA-CQUY].

become platforms where multiple specialized applications and manipulators, from independent firms, can be performed by the same robot.[43]

The synthesis of new materials in response to product design goals, including whole new classes of synthetic materials such as bioengineered silk, is also transforming production.[44] "Smart materials," such as piezocomposite materials used in actuators and sensors, are already the basis for sensors that activate automobile airbags in a crash.[45] Many new materials will include networked monitoring sensors to report, for example, deficiencies in the manufacturing process. Similarly, self-regulating, or "homeostatic," nano materials and nano robots may have the capacity to regulate glucose or carbon dioxide levels in the bloodstream.[46]

Production tools complement the digital information array. For example, new "shared facilities incubators" that have popped up ubiquitously feature production workshops ("maker spaces").[47] Their infrastructure ranges from 3D printers to robotics, as part of new "design districts" for entrepreneurs experimenting with the full range of IPD capabilities.

B. Implications of Digital Platform Clusters

The IPD opens the way to an evolution of the current dominant model for innovation in the United States and elsewhere. Innovation is the product of a system where the relationships among inputs, the environment, and planned

---

43 Lamont Wood, *Service Robots: The Next Big Productivity Platform*, PwC (Sept. 8, 2016), http://usblogs.pwc.com/emerging-technology/service-robots-the-next-big-productivity-platform/ [http://perma.cc/36NP-3FF8].

44 *See* De Weck & Reed, *supra* note 32, at 254; Brad Stone, *A Bay Area Startup Spins Lab-Grown Silk*, BLOOMBERG BUSINESSWEEK (June 3, 2015), https://www.bloomberg.com/news/articles/2015-06-03/a-bay-area-startup-spins-lab-grown-silk [https://perma.cc/E2T8-ZXEY].

45 Auto manufacturers believe a combination of smart materials and information systems will soon allow cars to adapt dynamically to changing conditions, such as sunlight, heat, speed, and wind. Qualcomm, *How New Cars Will Adapt to Our Tech-Immersed Lives*, QUARTZ (Dec. 23, 2017), https://qz.com/415517/how-new-cars-will-adapt-to-our-tech-immersed-lives/ [https://perma.cc/9ULE-JMKX].

46 On the growth of nanorobotic systems to support nanomanufacturing that may change lithography, see Michael Berger, *A Nanorobotics Platform for Nanomanufacturing*, NANOWERK (Oct. 28, 2014), http://www.nanowerk.com/spotlight/spotid=37884.php [https://perma.cc/M3AS-R6LC].

47 Drew Hendricks, *5 Creative Ways Business Incubators Are Helping Their Startups Succeed*, FORBES (Jan. 23, 2015), https://www.forbes.com/sites/drewhendricks/2015/01/23/5-creative-ways-business-incubators-are-helping-their-startups-succeed/#2f801ae17659 [https://perma.cc/KKE2-8RKU].

output mesh in typical patterns of interaction. Performance trade-offs exist in every organizational form, as the American experience since 1945 shows.[48] The economics of agglomeration of skilled workers, social institutions to network them, shared assets (whether universities or skilled machine shops), and appropriate financial systems and government policies are quite well understood but their specific makeup shifts. Hence, the way innovation is organized changes periodically as the environment for innovation evolves and the characteristics of technological possibilities shift. In addition, over time business models that mesh innovation with commerce will evolve. Indeed, an enduring part of U.S. leadership in innovation was the significant degree that its market system, including its governance system, could accommodate radical shifts in business models. American commercial innovation after 1945 initially relied heavily on vertically integrated companies that did everything from basic research through production, marketing, and service. The Japanese challenge of the 1970s and 1980s forced changes in the established commercial innovation model. The revamped approach, anchored by the Silicon Valley model, relied on specialized startups, venture capital, and the use of global production chains. This newer model focused more on ventures tied to information and communication technology as well as biotechnology. Vertical integration did not disappear but even the largest old-guard firms infused their operations with elements of the new models.[49]

Today, the IPD is inducing a further evolution of the Silicon Valley model. Emerging digital platform clusters are more geographically extensive than the Silicon Valley model, in part because they are transforming older traditional markets into sectors whose value added is driven by the IPD.[50] Significantly, supplementing ICT with new production technology opens paths to growth that rely on traditional clusters built on incremental innovation and organized around mechanical and material inputs (such as improvements

---

48 This discussion draws on Dan Breznitz & Peter Cowhey, *America's Two Systems of Innovation: Innovation for Production in Fostering U.S. Growth*, 7 INNOVATIONS 127 (2012). On the economics of innovation and clusters, see Gerald Carlino & William R. Kerr, *Agglomeration and Innovation* 14–26 (Nat'l Bureau of Econ. Research, Working Paper No. 20367, 2014), http://www.nber.org/papers/w20367.pdf. Richard Baldwin has linked this literature to changes in global production networks. RICHARD E. BALDWIN, THE GREAT CONVERGENCE: INFORMATION TECHNOLOGY AND THE NEW GLOBALIZATION (2016).

49 *See* COWHEY & ARONSON, *supra* note 1, at 3–22.

50 *2017 State of Entrepreneurship Address*, KAUFFMAN FOUND. (Feb. 26, 2017), http://www.kauffman.org/what-we-do/resources/state-of-entrepreneurship-addresses/2017-state-of-entrepreneurship-address [https://perma.cc/D6UZ-ZY2B].

in automobile brakes).[51] New types of regional startup clusters that cover a more diverse range of industries, expertise, and locations are also emerging.[52]

These digital platform clusters provide "a gateway between consumers and many diverse applications well beyond the specific product or service that constitutes the platform itself."[53] Underlying the platform are digital tools, such as a software operating systems and common capabilities provided to diverse pools of customers and related product suppliers, that vary in their complexity and cost to duplicate. The tools can be continuously updated because they are digitally intensive and rely on user feedback (often on a global scale) and other information drivers that are part of the information disruption. The online store—exemplified by Amazon and Apple—is one such tool. It serves as a digital transaction facility that rests on a complex digital infrastructure that evolved through significant experimentation.[54] The store opens new ways to organize global markets for both specialized information applications and physical goods, such as a German platform for global trading in German steel products.[55] Digital tools also enable new forms of financing. For example, the advent of crowdsourcing first required networking and transaction costs to fall. Crowdsourced project funding is less geographically biased than traditional venture capital funding.[56]

---

51 "[B]y 2020 cars will apply the brakes even if the driver has the gas pedal floored. The rapid increase in sensor technology will force a shift in priority, giving the car final say." Karl Brauer, *Top 10 Advanced Car Technologies by 2020*, FORBES (Jan. 19, 2015, 4:00 AM), https://www.forbes.com/sites/kbrauer/2015/01/19/top-10-advanced-car-technologies-by-2020/#6d74ce3f6705 [https://perma.cc/CNL2-KNKX].

52 Examples even in traditional sectors like agriculture are abundant. For example, winners of Iowa's AgriTech accelerator 2017 class of startups included Hintech, which developed a cornstalk remover and crusher for use by farmers who practice no-till farming; Phenomics Labs, which builds portable growing labs with inexpensive data-collection sensors and cameras that test experiments; FarrPro, a provider of efficient, effective piglet hearting solutions; and Rabbit Tractors, which produces miniature farm equipment. Laurie Bedord, *Iowa AgriTech Accelerator Chooses Class of 2017*, SUCCESSFUL FARMING (July 27, 2017), http://www.agriculture.com/technology/iowa-agritech-accelerator-chooses-class-of-2017 [https://perma.cc/Z3YX-CHUA].

53 This definition of a platform is from Howard A. Shelanski, *Information, Innovation, and Competition Policy for the Internet*, 161 U. PA. L. REV. 1663, 1664–1706 (2013). *See also* GEOFFREY G. PARKER, MARSHALL W. VAN ALSTYNE & SANGEET PAUL CHOUDARY, PLATFORM REVOLUTION: HOW NETWORKED MARKETS ARE TRANSFORMING THE ECONOMY—AND HOW TO MAKE THEM WORK (2016).

54 *See generally* BRAD STONE, THE EVERYTHING STORE: JEFF BEZOS AND THE AGE OF AMAZON (2013).

55 *See* KLÖCKNER & CO, http://www.kloeckner.com/en/ [https://perma.cc/3Y8F-LYFK].

56 Before 2015, no project ever raised more than a few million dollars. However, it is

There are at least four important implications of the emergence of these platforms:

1. *Market disruption due to digital ubiquity and diversity*: The intermingling of traditional goods with information enabled by new services and new production technologies disrupts traditional markets. The growing strategic—and value-added—role of information means that some markets are increasingly acting like IT markets, and sustained competitiveness at the higher end requires continuous digital innovation. More complicated divisions of labor and value are emerging, not just a few dominant digital solutions. Companies as different as Qualcomm and Monsanto show how the distinctions between high-tech and other industries, such as agriculture and heavy manufacturing, continue to narrow.[57]

Major manufactured goods have started to rely on ICT and services with networked effects to maintain market shares and drastically redefine or create new end markets.[58] This is a variant on a well-worn strategy—Gillette, for example, makes money on razor blades, not razors.[59] In this spirit, to create smarter building management, IBM created real-time sensor and data analysis systems to manage climate control for existing large commercial buildings.[60] Similarly, GE is investing heavily in Predix, its cloud-based Platform-as-a-Service platform for the industrial Internet of Things.[61] GE believes that sensors and big data analysis will allow them to predict problems in equipment infrastructures, thus creating a market for services that reduce maintenance

complemented by growing pools of "angel investor" funds. JOSHUA LERNER, THE ARCHITECTURE OF INNOVATION: THE ECONOMICS OF CREATIVE ORGANIZATIONS 68 (2012); Ethan Mollick, *The Dynamics of Crowdfunding: Determinants of Success and Failure*, 29 J. BUS. VENTURING 1, 1–16 (2014). Block chain technology may further lower the cost and increase the network effects of crowdsourced models.

[57] *See* COWHEY & ARONSON, *supra* note 1, at 49–70.

[58] *See generally* THE THIRD GLOBALIZATION: CAN WEALTHY NATIONS STAY RICH IN THE TWENTY-FIRST CENTURY? (Dan Breznitz & John Zysman eds., 2013) (providing a deft analysis of ICT enabled services).

[59] *See* Mark Muro, *The Wrong Lesson Companies Learn from Silicon Valley*, WALL ST. J.: THE EXPERTS (May 13, 2015, 6:00 AM), https://blogs.wsj.com/experts/2015/05/13/the-wrong-lesson-companies-learn-from-silicon-valley/ [https://perma.cc/RDB6-5FC5]. McAfee and Brynjolfsson dub this effect the "recombinant innovation" properties of digital technology.

[60] Robert L. Biocchi & Joseph M. Phillips, *IBM Smarter Building Management*, IBM (Jan. 2015), https://www.ibm.com/industries/government/smarter-building-management-paper/ [https://perma.cc/B2PK-H9TE].

[61] Dan Weeds, *What is GE Predix Really Building?*, FORBES (Sept. 28, 2016, 6:20 AM), https://www.forbes.com/sites/danwoods/2016/09/28/what-is-ge-predix-really-building/#238d87bd3c5b [https://perma.cc/6WNB-784G].

costs and optimize the use of its capital assets.[62] Even Germany's Fraunhoefer Institute is advocating "Industrie 4.0" as the German manufacturing Mittelstand's formula for embracing this change.[63]

Change has not been restricted to manufacturing; agriculture and other commodity markets, such as oil production, are also in flux. Traditional knowledge experts, such as farmers, are becoming global information service consumers as their reliance on big data analysis grows.[64] Similarly, the cost of fracking for oil production has dropped by about 25 percent in the past few years due to IT and robotics, thereby allowing the restoration of production despite much lower prices.[65]

2. *Easier entry*: Significantly, platform strategies are increasingly available to smaller specialist firms as well as large ones. The integration of sophisticated physical goods with analytics also opens the expansion of once small, new markets like medical monitoring. For example, X2 Biosystems offers a new biomedical diagnostic technology product system to monitor concussions and head injuries, mainly in football and other contact sports. X2 charges $120 per monitoring device. Each user also is charged a fee of $1 per month, which provides a dependable, long-term stream of data.[66] Thus, the long-term advantage of X2's physical product is built on its data-monitoring and predictive modeling service for risk management.

Moreover, digital information services can bolster the business case for product innovation. Information derived from products can generate collateral revenues and analytic learning because firms rely on "data that is 'non-

---

[62] Steve Lohr, *Weak Results at IBM as Its Strategy Shifts*, N.Y. TIMES (Oct. 21, 2014), https://nyti.ms/2k2SsQo [https://perma.cc/8K88-MAL5]. IBM foresaw a huge upside to data analytics, but struggled to establish high-margin business models comparable to those once earned by the software, services, and storage associated with mainframe computing.

[63] Stefan Heng, *Industry 4.0: Huge Potential for Value Creation Waiting to Be Tapped*, DEUTSCHE BANK RES. (May 23, 2014), https://www.i40.de/wp/wp-content/uploads/2015/04/Industry-4.0-Huge-potential-for-value-creation-waiting-to-be-tapped.pdf [https://perma.cc/WB94-TJPN].

[64] Lauren Manning, *What is Ag Big Data? How 8 Companies are approaching it*, AGFUNDER NEWS (Nov. 12, 2015), https://agfundernews.com/what-is-ag-big-data5041.html [https://perma.cc/4YYP-TXGH].

[65] Clifford Krauss, *Texas Oil Fields Rebound From Price Lull, but Jobs Are Left Behind*, N.Y. TIMES (Feb. 19, 2017), https://www.nytimes.com/2017/02/19/business/energy-environment/oil-jobs-technology.html [https://perma.cc/V9KA-VK62].

[66] Liz Gannes, *Wearable Sensors Could Be an Antidote to Football's Concussion Problem*, ALL THINGS D (Nov. 25, 2013, 1:53 PM), http://allthingsd.com/20131125/wearable-sensors-could-be-an-antidote-to-footballs-concussion-problem/ [https://perma.cc/AP3M-WED7].

rivalrous.'"[67] Once information is used, it is available for infinite reuse.[68] Big Data can spin off additional products or be sold to third parties who want to combine it with other data. This drives firms, even those that offer only specialized products, to emphasize investments in platform tools.

3. *Manufacturing as a service*: Products and services are combining in novel business models on a global scale. More startups, especially for consumer products,[69] are substitutiting the traditional development and marketing model with an experimentation and discovery model.[70] From the start, they use IT platforms to interact with potential and, ultimately actual users, to refine product designs and marketing.[71] Growing numbers of large market incumbents are also relying on co-invention.[72] The network economics of digital platforms make technology more valuable as the number of users climbs and a global "ecosystem" of co-suppliers grows around it. As Apple's success attests, the platform and its anchor products increase in value as more co-suppliers extend complementary offerings. Digital platforms also increase the significance of "user interaction," including user co-invention, which is propelling firms to go global quickly in order to gather data to differentiate products according to local patterns of use. Together, these changes permit greater customization of products and allow more cost-effective alteration of product specifications, including local customization, even with larger-scale production.

4. *Changes in the size and geographic focus of clusters*: Core geographic clusters of talent for advanced technology will likely persist because commercializing innovation involves betting on people. Clusters thrive on a larger talent pool and typically develop informal ways to measure reputations, beyond resumes, that may be vital for commercializing knowledge. However,

---

[67] VIKTOR MAYER-SCHÖNBERGER & KENNETH CUKIER, BIG DATA: A REVOLUTION THAT WILL TRANSFORM HOW WE LIVE, WORK, AND THINK 101 (2013).

[68] Either public policies, like privacy protection, or corporate strategies may limit reuse.

[69] JAMES MCQUIVEY, DIGITAL DISRUPTION: UNLEASHING THE NEXT WAVE OF INNOVATION 101 (2013).

[70] The survey results of Ashish Arora, Wesley M. Cohen, & John P. Walsh, *The Acquisition and Commercialization of Invention in American Manufacturing: Incidence and Impact* (Nat'l Bureau of Econ. Research, Working Paper No. 20264, 2014), echo our point that firms are becoming more reliant on open co-invention.

[71] *See* STEVE BLANK & BOB DORF, THE STARTUP OWNER'S MANUAL: THE STEP-BY-STEP GUIDE FOR BUILDING A GREAT COMPANY (2012); PARKER, *supra* note 53.

[72] Co-invention is not a new phenomenon. *See* Timothy Bresnahan & Shane Greenstein, *Technical Progress and Co-invention in Computing and in the Uses of Computers*, BROOKINGS PAPERS ON ECON. ACTIVITY: MICROECONOMICS (1996), https://www.brookings.edu/wp-content/uploads/1996/01/1996_bpeamicro_bresnahan.pdf [https://perma.cc/VUH6-FRHX].

as IPD platform dynamics become more accessible, they drive more markets, including traditional markets not commonly associated with ICT. Traditional industries will be restructured in a world of IPD-enabled digital platform clusters. Technologically infused clusters can be built around "craft" knowledge.[73] They can build on virtual ICT platforms, such as the cloud and its ecosystem of services, or on specialized batch production.

II. KEY GOVERNANCE CHALLENGES

Traditional trade policies never addressed possibilities raised by the new innovation model. For example, going forward it will be important to consider ways to approach regulations that may discourage learning, discovery, and flexibility, such as the use of competition policy as a barrier, the use of industrial policies to block global data flows and transnational access to cloud infrastructure, or the use of privacy and security issues as barriers or enablers of new pools of demand.

Further, as the United States's ability to get its way in negotiations erodes, it will be important to build credible coalitions to pursue solutions. Such solutions are likely to be anchored in a flexible package of approaches. For example, traditional trade pacts can address some items in order to discourage and remove barriers to novel products and business models. Thus, WTO agreements on IT and services could be the simplest route forward, despite the Administration's aversion to multilateral deals. Serial or parallel bilateral negotiations would almost certainly be slower to yield results, but they may be the only politically feasible vehicles for U.S. initiatives for the next few years. The tougher problem of promoting a trusted digital environment by addressing privacy and security issues could begin with bilateral regulatory agreements, but eventually, the Administration may conclude that trade can still be a complementary vehicle at a later date and more propitious for achieving a wider trade deal. At that time, existing conventions and regulatory pacts could be converted into "additional commitments" in a trade deal on market integration. This precedent evolved into the TPP—especially in Chapter 20, which covers the environment—where adherence to the Convention on International Trade in Endangered Species of Wild Fauna and Flora became an additional commitment.[74]

---

[73] "Innovative industries" go beyond traditional high-tech industries that Atkinson and Ezell argue are characterized by high, fixed initial research and capital costs usually dispersed over large volumes of output at low marginal costs. *See* ATKINSON, *supra* note 17.

[74] The TPP built on such precedents as the Annex on Forest Sector Governance in the U.S.–Peru FTA. The U.S. Trade Representative argues that the Peru FTA "includes concrete steps

New and different challenges now are arising from the expansion of market access for novel products and business models. Although some initiatives may not be feasible in the short-run, it is better to be clear about where policy could reasonably aspire in the medium-run. We are addressing a 20-year challenge, not a four-year policy maze.

Three initial challenges and responses are straightforward. First, it would be prudent to extend the WTO International Technology Agreement (ITA) to further cover innovation-intensive industries. Since the IPD introduces more technology-like behavior even in traditional industries, every industry cannot be treated as high-tech. However, even after the progress in the revision of the ITA in 2015, the pace of major innovation will further increase and the economics of innovation-intensive industries (such as network effects) will extend beyond IT. For example, wireless health is one industry to expand the list of products in an ITA.[75] Second, it would help to negotiate the highest possible standards of liberalization for products that cross the traditional boundaries between goods and services. Going forward, Small and Medium-Sized Enterprises (SMEs) should be able to deliver specialized manufactured products produced by a 3D printer in their home office and then ship it abroad using DHL. Or, SMEs could transmit a digital design of a product to a 3D printer at a local subsidiary, directly to a customer, or to a DHL office in another country.[76] However, trade rules and market access obligations, such as service access or national tariff schedule commitments, may not make such decisions entirely based on efficiency choices. Choices driven by incompatibilities between forms of market access need consideration, as well.[77] Third, it also would be a good idea to use solutions packages to

---

the Parties will take to strengthen forest sector governance and combat illegal logging and illegal trade in timber and wildlife products." OFFICE OF THE U.S. TRADE REPRESENTATIVE, UNITED STATES-PERU TRADE PROMOTION AGREEMENT: STRENGTHENING FOREST SECTOR GOVERNANCE IN PERU (2009).

[75] Michelle A. Wein & Stephen J. Ezell, *Concluding a High-Standard, Innovation-Maximizing TPP Agreement*, INFO. TECH. & INNOVATION FOUND. 1 (Dec. 2013), http://www2.itif.org/2013-concluding-innovation-maximizing-tpp.pdf [https://perma.cc/8LSM-HK9P]; Michelle A. Wein & Stephen J. Ezell, *How to Craft an Innovation Maximizing T-TIP Agreement*, INFO. TECH. & INNOVATION FOUND. 1 (Oct. 2013), http://www2.itif.org/2013-innovation-maximizing-ttip-agreement.pdf [https://perma.cc/Y7B3-CVQR] [hereinafter Wein, *How to Craft an Innovation Maximizing T-TIP Agreement*].

[76] Initially, when fax machines were large and expensive, delivery services such as FedEx installed them in their offices so small businesses could get "instant delivery" of documents via a FedEx office fax. Today, firms like UPS run manufacturing support facilities near their transport hubs.

[77] Other discrepancies in trade rules speak to these choices. For example, technical barriers

liberalize the intermingling of goods and services. Negotiators should work out accommodations of issues such as the growth of "smart fields" that combine elements of hardware, sensors, and data analytics—used to guide planting and insurance packages and to deal with weather risks. Also, negotiators should seek trade liberalization to better address the integration of services and goods.[78] Because the closest thing to protection in current trade proposals is the attempt to build off the established principle of technology neutrality, it will be a challenge to find ways to ensure that this principle is applied successfully.[79]

Countries will also need to expand the domestic regulatory framework for services along the lines set out in the TPP to include both services and digital economy goods. They must ensure that administrative rule-making is transparent and uses timely, objective criteria. Nondiscrimination among member country firms based on national origin should prevail, policies should be technologically neutral, and a least restrictive trade requirement should be adopted when designing a policy. Policies also should be designed to recognize the work of competent non-governmental organizations (NGOs) in some policy issues, including technical certifications and setting standards.[80]

Next, negotiators should work to clarify trade-related obligations on interoperability requirements. Trade negotiators should explore how to deal with the trade implications of requirements that, for example, data should be portable among different services. This is a legitimate policy objective, but it is open to policy mischief.[81] Some possible abuses might be curbed by

---

to trade disciplines of the WTO only apply to goods, a major gap for the IPD. WTO, *Technical Barriers to Trade*, WTO AGREEMENT SERIES (2010), https://www.wto.org/english/res_e/publications_e/tbttotrade_e.pdf [https://perma.cc/P6EC-KU48].

[78] A GPS unit unable to access geographic information services cannot function. This was a hindrance for Uber in China because its system relied on Google Maps, but direct access to Google Maps were blocked in China.

[79] A WTO dispute ruling endorsed the potential for overlap of goods and services obligations, but using a contingent, case-by-case approach. We seek a broader principle. Appellate Body Report, *European Communities–Regime for the Importation, Sale and Distribution of Bananas*, WTO Doc. WT/DS27/AB/R (adopted September 25, 1997).

[80] For an endorsement of such horizontal disciplines, see European Services Forum & Coalition of Service Industries, *Regulatory Cooperation Component in the Services Sectors to an EU–US Economic Agreement*, (Nov. 12, 2012), http://www.esf.be/new/wp-content/uploads/2012/11/ESF-CSI-Joint-Statement-on-Regulatory-Cooperation-Component-of-EU-US-Agreement-Final-12-Nov-2012.pdf [https://perma.cc/S62T-X2JE].

[81] For an example of a concern, even within the boundaries of the EU data directives, see David Meyer, *European DPAs Mull Strategy for Tackling Uber's Data Catastrophe*, INT'L

specifying that interoperability requirements must be the least trade restrictive. Governments can legitimately regulate for valid reasons, including competition policy, but should do so in a way that does the least damage to market access obligations. Clarifying the underlying principles in negotiating and assuring that they are least trade restrictive and nondiscriminatory would reduce risks. They also would set a foundation for letting MSOs assist in implementation.

Another improvement would be to strengthen the intellectual property (IP) protection for certain forms of craft knowledge.[82] The IPD opens the way for new, innovative "clusters" to emerge in smaller markets and in traditional industries that have global market ambitions. Many of these clusters will marry IPD technologies to traditional craft knowledge. Trade agreements have extensive, sometimes controversial coverage of IP in the form of firmware, software, copyrights, and patents. However, craft knowledge may focus more on trade secrets, a domain long protected by national laws, but largely neglected by trade agreements. Negotiators could also build on the TPP and develop additional approaches to deal with trade secrets for trade-related purposes and then ask how it fits into the logic of trade-related investment practices.[83] They could also build on the TPP's protection of industrial design secrets and soft laws calling for protection against theft of craft knowledge that is stored digitally.[84]

Finally, it is important for countries to guarantee four sets of rights and

---

ASS'N PRIVACY PROFS. (Nov. 28, 2017), https://iapp.org/news/a/european-commission-experts-uneasy-over-wp29-data-portability-interpretation/ [http://perma.cc/XJ3W-LBVS].

[82] Competitiveness in information services (including hybrid combinations of goods and services) depends on flexible business models to monetize the service and their applications, like games that begin as "free" and then seek ways to earn revenues using "add ons" (e.g., money messaging services or the purchase of gaming resources). In contrast, ads depend on recycling data from interaction on users and then selling the analysis to help advertisers place ads. The policy implication is that when public policies block the ability to combine/experiment with the integration of payment systems with information services, this effectively hinders market access for the basic service. Trade strategy should target regulatory barriers to flexible integration of payment systems.

[83] Wein and Ezell make the recommendation on trade secrets. The logic linking this to the IPD is our responsibility. Piracy cases are likely to be less frequent with the advent of the cloud because content is more often downloaded directly from the cloud. Wein, *How to Craft an Innovation Maximizing T-TIP Agreement*, *supra* note 75.

[84] TPP's Article 18.56 on "Improving Industrial Design Systems" states that "The Parties recognise the importance of improving the quality and efficiency of their respective industrial design registration systems, as well as facilitating the process of cross-border acquisition of rights in their respective industrial design systems . . . ." TPP, *supra* note 21, at art. 18.56.

freedoms to support a competitive global market for information services and the cloud computing infrastructure that enables these services.[85] First, agreements should guarantee the freedom of cross-border information flows, affirm the freedom to choose where infrastructure for the cloud ecosystem of services is located,[86] and affirm the right of a foreign company to provide a service by accessing its own business data across national borders. Second, agreements should affirm the freedom to locate infrastructure wherever a supplier wishes, without requiring a local presence. The freedom to locate cloud infrastructure implies the ability to move the services enabled by the cloud across borders. Specifically, it means that discrimination against electronic delivery of services, including software, and quantitative limits on the number or volume of services delivered should be banned. As a corollary, cross-border payments for services, subject to prudential regulation, should be permissible.[87] When public policies block the ability to combine or experiment with the integration of payment systems with information services, market access for the basic service is hindered. International governance should target unduly restrictive regulatory barriers to ensure flexible integration of payment systems. Third, the right of customers to use extraterritorial suppliers of services via public telecommunications networks should be affirmed. Fourth, government policy should also respect technological neutrality in the delivery of the service, affirm the use of international standards for encryption technology, and recognize the right of any firm that qualifies as a "data controller" within a trusted digital environment (as discussed next) to use encryption for commercial purposes.[88]

---

[85] For similar points, see Anupam Chander & Ulyen P. Le, *Breaking the Web: Data Localization vs. The Global Internet* (Univ. Cal. Davis Law Sch., Working Paper No. 2014-1, 2014), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2407858 [http://perma.cc/Q64G-BPK5]. *See also* ANUPAM CHANDER, THE ELECTRONIC SILK ROAD (2013). Some analysts urge efforts to tackle data flow issues through the use of existing AATS commitments on services and investment. This might have technical legal merits but, as was the case with telecommunications in the 1990s, this sector has become too prominent to rely on hopeful interpretations. The political and legal bolstering of a governance framework is vital. Andrew D. Mitchell & Jarrod Hepburn, *Don't Fence Me In: Reforming Trade and Investment Law to Better Facilitate Cross-Border Data Transfer*, 19 YALE J.L. & TECH. 182, 185–237 (2017).

[86] *See* COWHEY & ARONSON, *supra* note 1, at 125–66. Chapter 6 of *Digital DNA* spells out the specifics of this principle. It derives from a joint U.S.–EU position paper.

[87] TPP countries could have "scheduled" this commitment with exceptions for specific services that could not be expanded once the agreement was ratified. Competitiveness in information services depends on flexible business models, such as games that begin as free and then seek ways to earn revenues by selling add-ons (e.g., the purchase of gaming resources).

[88] *See* TPP, *supra* note 21, at art. 8 Annex 8-B §A.

III. CREATING A TRUSTED DIGITAL ENVIRONMENT

Underlying efforts to create a robust digital environment is the need to create trust among governments, firms, and NGOs. At a minimum, a trusted digital environment should rest on the following four key elements.

First, a "club" of important core countries is needed to provide sufficient heft to overcome the threshold challenge for international action. Whatever the negotiating platform, a crucial consideration is that regimes always must overcome a threshold problem. Participants in such a coalition need to have something at stake, significant influence on the world market, and sufficiently compatible interests to pull together and serve as the foundation for an effective regime. This club would need to address market access and competition issues—the classic domain of trade policy. The club would also need to deal with digital privacy and security issues involved in building a trusted digital environment. Member countries of the Organisation for Economic Co-operation and Development (OECD) and TPP participants together likely would constitute a large enough share of the world economy to be a credible club. This group covers the Pacific more extensively than the OECD countries alone. It also would have a favorable set of initial incentives for members.[89] OECD diplomats could focus on using bilateral or regional free trade agreements (FTAs) as building blocks for the club because they precisely target the initial core participants without obligating FTA members to extend similar market access and trusted digital environment benefits to nonmembers. These conditions reduce fears of free riding by countries that seek market access without making commitments—a risk under the most-favored-nation rules of the WTO—and provide a basis to allow FTA groups to negotiate tailored accession conditions with countries that wish to join them later.[90] In the case of the TPP, for example, it was considered likely that Korea, Indonesia, and Colombia (or even the United Kingdom after Brexit) would seek early accession. The larger question in the long term would have been the interest of China, Thailand, and others to meet the requirements to join the TPP. As is quite normal in these clubs, wider membership was an ultimate goal, not a starting point.[91]

---

[89] In the IPD, more sophisticated economies had much at stake and strong incentives to explore better governance measures. Other TPP participants, like some small members, initially cared less about the IPD, but wanted to demonstrate that they were serious players who were eager to participate in the global innovation transition.

[90] This was how China (2001), Saudi Arabia (2005), Vietnam (2007), and ultimately Russia (2012) negotiated to join the WTO.

[91] Interviews with officials involved in the TPP negotiations, 2016.

The WTO could ultimately anchor two additional building blocks: the Information Technology Agreement and the Trade in Services Agreement (TiSA).[92] The Information Technology Agreement, originally concluded in 1996, was updated in 2015 but requires additional expansion to fully capture the IPD, as this Article will discuss below.[93] A third revision to the agreement might cover additional items flowing from IPD. TiSA, a global plurilateral pact launched in 2013, is still being negotiated at the WTO. Twenty-three countries, including the European Union ("EU"), representing approximately 70 percent of the world's trade in services, are participating.[94] Unlike the 1997 Basic Telecom Agreement (BTA), TiSA does not extend most-favored-nation (MFN) benefits to WTO countries that do not participate in the agreement.[95] This is crucial because large economies such as Brazil, India, Russia, and China—none of which participate in TiSA[96]—should not benefit from a club in which they do not pay for admission and their performance is not assessed. This is especially true because a critical benefit would be to bring quasi-convergence to national regulatory practices.

A second element needed to create a trusted digital environment is a quasi- convergence of authoritative rules based on common principles and norms that emphasize flexible mixes of binding (hard) and non-binding (soft) rules and policies within a common governance regime. The governance mix features some specific hard policy rules; it relies particularly on binding agreements requiring the embrace of policy capabilities based on key principles that frame the parameters of specific national rules.[97] The political

---

92 The Trade in Services Agreement (TiSA) is an international trade treaty between 23 Parties, including the EU and the United States. TiSA is meant to liberalize the trade of services such as banking, healthcare, and transport. *Trade in Services Agreement*, EUR. COMMISSION, http://ec.europa.eu/trade/policy/in-focus/tisa/ [https://perma.cc/2BJR-TRRS].

93 The ITA's 82 members (as of 2017) represent 97 percent of the world's trade in IT products. An ITA Expansion in 2015 added 24 members, including China, Chinese Taipei, Israel, and the OECD membership. World Trade Organization, *Briefing Note: The Expansion of Trade in Information Technology Products (ITA Expansion)*, (Dec. 16, 2015), https://www.wto.org/english/news_e/news15_e/itabriefingnotes161215_e.pdf [https://perma.cc/SN5G-F5QZ].

94 Twenty-three WTO members are participating in the TiSA talks: Australia, Canada, Chile, Chinese Taipei, Colombia, Costa Rica, the EU, Hong Kong China, Iceland, Israel, Japan, Korea, Liechtenstein, Mauritius, Mexico, New Zealand, Norway, Pakistan, Panama, Peru, Switzerland, Turkey, and the United States.

95 *Trade in Services Agreement*, *supra* note 92.

96 OFFICE OF THE U.S. TRADE REPRESENTATIVE, *Trade in Services Agreement List of Participants*, https://ustr.gov/TiSA/Participant-List [https://perma.cc/M8ZH-DK4Y].

97 *See* COWHEY & ARONSON, *supra* note 1, at 94–124. Chapter 5 of *Digital DNA* explains

dynamics digital privacy and security, important elements of a trusted digital environment, are distinctive and difficult to manage. However, many of the governance elements needed for a solution are analogous to issues tackled successfully in the WTO's 1997 Agreement on Basic Telecommunications Services.[98] Authoritative soft rules can anchor quasi-harmonization of national rules. The best way is to move much of the governance action to MSOs, while retaining an explicit role for the soft trade rules that frame the regime to complement hard trade rules. Some policy practices would be forbidden to reduce certain market risks for companies, such as the TPP rule forbidding a government from demanding a company's software source code as a condition for market entry. The soft trade rules give countries direction on how to achieve certain policies. Moreover, existing trade agreements already contain many rules that would complement any such new policies. For example, the parties could agree to implement the pact on the trusted digital environment in a manner consistent with basic trade obligations, such as nondiscrimination and least trade restrictive regulations.[99] Together, the hard and soft trade rules provide the framework of checks and balances that reduce the cooperation risks that can paralyze efforts of coordination. Various solutions may arise from coordination between national-level regulators and transnational MSOs within the checks and balances created by soft trade rules.

The third element of a trusted digital environment is reciprocity. A plurilateral pact should feature what is known as conditional MFN clauses. This approach confines the benefits of the plurilateral pact only to its signatories. Many of the key challenges for this regime will be in interpreting soft rules through the MSO process. Which companies can be involved and benefit? The answer is an important factor in charting the course forward. If Chinese firms, through, for example a U.S. or Australian subsidiary, can benefit from privacy and security certifications without China being a member

---

that in the trade context, soft rules are binding obligations on countries to create particular capabilities, whether for making and enforcing rules or for creating rules to achieve certain agreed-on "purposes." The specific mechanisms or policies are up to the individual nation so long as they fulfill the intent of the obligation. APEC Principles, in contrast, are not binding. For a similar approach on trade, see CHRIS BRUMMER, MINILATERALISM: HOW TRADE ALLIANCES, SOFT LAW AND FINANCIAL ENGINEERING ARE REDEFINING ECONOMIC STATECRAFT (2014).

98 *The WTO Negotiations on Basic Telecommunication,* WTO (Mar. 6, 1997), https://www.wto.org/english/news_e/pres97_e/summary.htm [https://perma.cc/6TCG-Q7VV].

99 Least trade restrictive does not equate to weak regulation. It is a condition that governments can do what is necessary, but should be prepared to justify how the rules do not significantly harm market access for reasons unrelated to the purpose of the rules. Drug safety rules are both strong and consistent with trade policy obligations.

or signatory, technocratic implementation of the soft rules and the politics will be complicated. The text of the TPP agreement went a long way toward establishing a precedent for such discretion.[100]

The TPP provisions on services suggest some useful starting points on conditionality.[101] The provisions permitted TPP members to create a system for mutual recognition of MSO certifications of companies for privacy and security practices without granting MFN status to non-TPP countries. The provisions also stipulated that a TPP company that was a shell for a non-TPP company could be denied these benefits.[102] For example, an Indian company with a subsidiary office in Tokyo could have been denied certification benefits because India did not belong to the TPP. If the TiSA had provisions on a trusted digital environment, then it would have to make choices on how to handle this issue of selective benefits. For now, WTO experts agree that plurilateral agreements do not impose general MFN obligations. However, a request for accession to the TiSA by China, for instance, would raise important questions about what guarantees to require. The accession negotiation would impose some degree of conditionality on benefits.

If new states accede to either agreement, questions would arise about whether equivalency must be reaffirmed every time a new member joins the club. We say yes. Answering the question is a difficult task, but a necessary one. It is a positive sign if there is enough interest from other major players who might eventually promote a digital economy agenda. This could motivate countries to consider ways to expand it, such as by creating WTO plurilateral agreements to bolster the emerging regime. Overall, soft rules about a trusted digital environment will require serious reconsideration of national policies by China, India, Indonesia, and other players[103]—which would be a welcome development.

A fourth pillar of a trusted digital environment is the use of MSOs to improve governance. Civil society practices show promise as a way to tackle complex technology dynamics. Some policy problems will atrophy in importance as a result of market innovations offering plausible fixes; others will require ongoing policy experimentation and adjustment. MSOs, which usually emerge from bottom-up collective efforts, provide a way of harnessing

---

[100] We thank Don Abelson for his observations on most-favored-nation treatment.

TPP, *supra* note 21, at art. 10.3–10.4.

[102] Interviews with an official involved in the TPP negotiations, 2016.

[103] This could be especially sensitive for China, which might have joined the TPP at a later date. Experts from Indonesia told us in August 2016 that an active conversation on how to conform its national laws to the TPP had begun.

invaluable bottom-up expertise. Although the organization of MSOs varies depending on the nature of the particular issue, a common set of evaluative guidelines can identify whether they qualify as legitimate players in regard to implementing trade obligations. Such guidelines already exist regarding, among others, standards-setting organizations. Both governments and MSOs are more credible if they are intertwined. Ultimately, governments bear the final measure of democratic accountability. Substantial transparency is needed to operate in a world with strong civil society dynamics, including policy implementation.

Soft rules also help operationalize the governance of privacy and establish more recognized roles for MSOs in crafting applications for industries or process requirements for operations by data controllers. We propose that negotiators develop language that allows the Federal Trade Commission (FTC) and other national privacy authorities to accept MSOs as auditors and reviewers of privacy guidelines. Soft rules should also outline conditions for membership. The guidelines will require thoughtful construction. The Bildt Commission, for example, urged a requirement that an MSO in internet governance be open to all, but not dominated by any one faction.[104] The WTO characterizes international standards organizations, one important form of MSOs, as adhering to the following principles for developing standards: transparency, openness, impartiality and consensus, effectiveness and relevance, and coherence.[105] An additional presumptive guideline for recognition could be that the MSO membership is expert and self-organizing, as was the case with the Internet Engineering Task Force (IETF).[106] Such a

---

[104] CTR. FOR INT'L GOVERNANCE INNOVATION & THE ROYAL INST. FOR INT'L AFFAIRS, GLOBAL COMMISSION ON INTERNET GOVERNANCE: ONE INTERNET (2016), https://www.cigionline.org/sites/default/files/gcig_final_report_-_with_cover.pdf [https://perma.cc/ZDY7-JX74].

[105] ACP-EU TBT PROGRAMME, STRENGTHENING THE QUALITY INFRASTRUCTURE INSTITUTIONS OF ETHIOPIA (2016), https://europa.eu/capacity4dev/file/50029/download?token=UUMcZ2df [https://perma.cc/26XD-4PGX].

[106] One illustrative effort to apply such criteria is playing out during the transition of ICANN's IANA from U.S. control to a more independent form of global MSO. The U.S. government participated in the negotiations and announced criteria by which it would judge the acceptability of the final proposal, but the MSO community took the lead. For the U.S. criteria, see Lawrence E. Strickling, *Stakeholder Proposals to Come Together at ICANN Meeting in Argentina*, NAT'L TELECOMM. & INFO. ADMIN. (June 16, 2015), http://www.ntia.doc.gov/blog/2015/stakeholder-proposals-come-together-icann-meeting-argentina [https://perma.cc/MQ4R-7TBV]; Joe Waz & Phil Weiser, *Internet Governance: The Role of Multistakeholder Organizations*, 10 J. TELECOMM. & HIGH TECH. L. 331, 333–50 (2013).

guideline would be a safeguard against governments organizing the MSOs from the top down as a general rule. At the same time, it would recognize that the membership parameters of an MSO like the Society for Worldwide Interbank Financial Telecommunication (SWIFT)[107] would necessarily differ substantially from that of other MSOs. It also reinforces the link between expertise and willingness to delegate authority to an MSO.

The soft rules should resemble the WTO BTA obligations to create core regulatory capacities for telecommunications markets that still permitted substantial discretion on the specifics of the rules. The model soft rules for a trusted digital environment would be the existing OECD and Asia-Pacific Economic Cooperation (APEC), principles to creating a baseline for privacy protection with a light touch. As with the APEC and OECD principles, they should oblige members to develop the capacity to cooperate with other signatories on issues related to enforcement measures to promote a trusted digital environment. As part of the policy process, the soft rule capabilities should include mechanisms to recognize and to certify MSOs among the signatories. (APEC is attempting to craft something like this.) Successful support for a system of certifications crossing national borders would greatly facilitate the IPD.

These soft rules should mandate: (1) policy capabilities at the national level to safeguard privacy; (2) cooperation on enforcement of privacy safeguards among Digital Economy Agreement (DEA) members; (3) cooperation by all member states in the creation of a system for the certification of MSOs that can assist in the implementation of privacy codes;[108] (4) a guarantee that signatories have the right to establish additional privacy safeguards beyond the baselines, where such safeguards should be least trade restrictive and nondiscriminatory with regard to the national origin of business enterprises from members of the club, consistent with technology neutrality trade, and as transparent as possible within the constraints of national security policies; and (5) privacy and security safeguards, requiring cooperation among club members to create third-party mechanisms that facilitate verification of commitments made in various privacy agreements among members.[109]

On MSOs, see JESSICA F. GREEN, RETHINKING PRIVATE AUTHORITY, AGENTS AND ENTREPRENEURS IN GLOBAL ENVIRONMENTAL GOVERNANCE (2014).

107 *See* COWHEY & ARONSON, *supra* note 1, at 167–93.

108 This is analogous to the role of standards organizations in regard to technical barriers to trade codes in trade pacts.

109 *See* COWHEY & ARONSON, *supra* note 1, at 167–93. This is how the U.S.–EU dispute over SWIFT was resolved.

What would be the best achievable set of principles to embrace? This Article suggests melding the OECD and APEC privacy principles. The EU endorsed the OECD principles because they are consistent with the problem-solving logic of the EU policies. The basic logic marries contract law to a set of consumer protections to address market problems created because personal information is nonrivalrous in its use, and knowledge of its use and value is asymmetrically distributed. The information service supplier knows more than the individual user. For example, the growing pool of information that will be collected on drivers by their automobiles, such as typical driving speeds and fuel efficiency, in order to improve maintenance has more uses and values than the vehicle owner may anticipate.

These principles could serve as the basis for drafting soft rules as an annex of additional commitments on a trusted digital environment.[110] Such an annex would be analogous to the commitments on procompetitive regulatory principles for telecommunication markets that provided an additional commitment in the WTO Agreement on Basic Telecommunications Services. Even if these commitments are ultimately adopted, states could still impose additional safeguards for privacy and security. However, such rules would need to be developed in accordance with the "horizontal trade disciplines."[111]

Table 1 summarizes the foregoing analytic narrative.

Table 1: Twelve Important Privacy Principles

Principles	Objective
1. Consent	Base personal data collection on the consent of the user
2. Identifiable accountable agent	Specify who deals with user questions and can address and redress data complaints
3. Appropriate data security protection	Base corporate risk management on risk assessment that can be audited

[110] *See* CTR. INT'L GOVERNANCE INNOVATION, *supra* note 104 (endorsing the OECD Principles).

[111] Horizontal trade commitments apply to all scheduled service sectors unless otherwise specified. Scheduled trade commitments are split into two sections: first, "horizontal" commitments which stipulate limitations that apply to all of the sectors included in the schedule. Any evaluation of sector-specific commitments must therefore take the horizontal entries into account. In the second section of the schedule, commitments, which apply to trade in services in a particular sector or subsector are listed. *Guide to Reading the GATS Schedules of Specific Commitments and the List of Article II (MFN) Exemptions*, WTO, https://www.wto.org/english/tratop_e/serv_e/guide1_e.htm [https://perma.cc/D9SV-BXM4].

4. Transparency in governance practices	Data collectors must use policies that are transparent to users
5. No restrictions on transborder data flows	Countries that host data will observe OECD principles or have a data controller do so
6. Appropriate national governance	Members should pass, protect, and enforce national laws and cooperate with others
7. Equal treatment of data privacy	Data privacy should be maintained, regardless of medium and where it is stored
8. Privacy cross-border enforcement	Members should share information and assist in investigation and enforcement actions, including deference to mutual law enforcement procedures in most cases
9. Multi-stakeholder organizations are mutually recognized for certification	Embrace transparency and mutually accept findings of data controllers certified by other member states; including guidelines for multi-stakeholder organization recognition
10. Develop collective review mechanisms for disputes over national certifications	Includes procedures for third-party monitoring by consent of parties
11. Commercial encryption for privacy	Accept commercial encryption by certified companies of member states
12. Affirm horizontal trade disciplines	Rulemaking is transparent, nondiscriminatory by national origin, and least burdensome for trade

At the same time, the principles can play out under an interplay of broad trade disciplines and detailed regulatory side agreements abetted by MSO arrangements. Such a complex variation occurred when the EU and the United States crafted the Privacy Shield for trans-Atlantic data flows.[112]

---

[112] EUROPEAN COMMISSION, GUIDE TO THE EU-U.S. PRIVACY SHIELD, https://publications.europa.eu/en/publication-detail/-/publication/b0555243-bfc2-41a5-985b-9435d29063ca [https://perma.cc/H8U7-BTRP].

Under a set of joint principles, the EU announced a bilateral regulatory agreement to accept U.S. government guarantees of its enforcement of corporate declarations of compliance with the agreed upon principles. The EU has the option to withdraw acceptance if annual reviews reveal significant compliance issues.[113] Within this bilateral review mechanism, the long-term question is what systematic role MSOs will play in figuring out the practical implementation of the privacy guidelines.

CONCLUSION

Any effort to expand market access and conduct rules to tap the full potential of the digital DNA that is transforming global innovation—and therefore, global growth—faces choppy waters in a time of backlash against globalization in leading countries. Yet if we are correct about the underlying economic dynamics, even die-hard believers in the priority for traditional manufacturing and commodity industries and their workers face few choices if they wish for competitive viability and future jobs. Functional necessity does not inevitably lead to political and diplomatic success. The Article's authors believe that a better alternative within the realm of political-diplomatic feasibility is possible over time. Thus, this Article lays out an approach for pushing forward global negotiations on market access tied to the IPD while building a trusted digital environment. This Article does so by linking a pact on privacy—as a precedent and model for one on cybersecurity—to a trade pact addressing IPD issues. This Article argues that trade can bolster measures building a trusted digital environment while advancing that a trusted environment is essential to getting trade and competition issues right. Whether by bilateral or plurilateral trade pacts or by regulatory initiatives leading to trade pacts as consolidating mechanisms, the building blocks for the global framework of our digital economic future are not impossible to imagine and implement.

---

[113] *See* Cowhey & Aronson, *supra* note 1, at 194–232. The Privacy Shield featured far more government micromanagement at the front end than would meet our aspirations for flexibility and experimentation. But much of the implementation will, over time, look closer to the MSO model, especially because of sector-specific agreements on privacy management.