Cross-Border Data Flows Enable Growth in All Industries

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Cross-border data flows are vital to not only technical industries, but traditional industries as well. Countries should avoid protectionist rules that limit data exchange across border because they tend to backfire in the long run.

As the global economy has gone digital, countries around the world have started engaging in new forms of protectionism to restrict the flow of data across borders. Some are implementing policies such as data-residency requirements to buffer domestic technology providers from international competition, among other purposes. Some dismiss data protectionism as a narrow issue affecting only the technology sector; however, its impact is actually far-reaching—and decidedly counterproductive—because companies in nearly every sector of the modern economy depend on data-driven innovations to do business.

Indeed, McKinsey estimates that about 75 percent of the value added by data flows on the Internet accrues to "traditional" industries, especially via increases in global growth, productivity, and employment.[1] Furthermore, the United Nations Conference on Trade and Development (UNCTAD) estimates that about 50 percent of all traded services are enabled by the technology sector, including by cross-border data flows.[2] In the United States, these digitally enabled services grew from $282.1 billion in 2007 to $356.1 billion in 2011, and their value continues to increase.[3] The trend is all the more important for developing economies such as Brazil, Nigeria, and Uruguay, whose industrial bases are more heavily reliant on traditional industries.[4]

Companies of all types and sizes are sharing in the benefits of data innovation. For example, a 2014 survey found that data analytics are important to 60 percent of U.S. and European businesses with fifty or fewer employees.[5] Indeed, there is probably not a single company today with operations, suppliers, or customers in more than one nation that does

not rely on moving data across international borders—whether to gain competitive advantage or as part of normal business operations.

This report illustrates how restrictions on cross-border data flows affect businesses in a wide variety of industries and regions of the world. It provides a series of case studies to highlight companies in traditional industries that are taking advantage of cross-border data flows to streamline their operations, improve their products and services, and provide consumer benefits. Some companies move data internally to aggregate it for analysis and improve operations. Others are based in one country but rely on cloud computing services located in another. This report investigates why countries engage in data protectionism and how such policies inhibit the operations of companies like those highlighted in the case studies. Finally, the report offers a number of recommendations for the United States, its trading partners, and international organizations, to discourage countries from erecting new barriers to restrict the flow of data in the global economy.

MANY INDUSTRIES RELY ON CROSS-BORDER DATA

A vast number of "traditional" industries—from oil and gas companies to manufacturing and retail companies—rely on data from their locations around the world to make routine decisions. To facilitate this decision-making process and provide added value to consumers, data must be allowed to flow freely across international borders. The following section offers several examples of companies from a wide range of industries that rely on cross-border data flows, and it explores when and how companies use cross-border data flows to deliver consumer and economic benefits.

Rio Tinto (Mining)

With operations in over 40 countries across six continents, including a strong presence in Australia and North America, Rio Tinto is a leading mining and metals company.[6] Rio Tinto's major products include copper, aluminum, diamonds, gold, industrial minerals, iron ore, uranium, and thermal and metallurgical coal.[7] To make its mining operations more efficient, Rio Tinto created its "Mine of the Future" program to "identify the size, location and quality of ore" by aggregating the data it collects in real time.[8] Rio Tinto collects this data from both the trucks and the drills that it uses in its mines all around the world.[9] This information is then processed at its Processing Excellence Centre (PEC) in Brisbane, Australia, generating millions of dollars in savings across its international organization by rooting out logistics inefficiencies.[10] PEC analyzes data from five of the company's mines in Australia, as well as mines in both the United States and Mongolia.[11] It receives data about 100 milliseconds after it is produced from the mines and then examines that data with twenty different analytical systems.[12] Each day the PEC sends and receives around thirty gigabytes to and from its operations.[13] It currently stores around five terabytes of this data for analysis.[14] PEC also connects to the data systems at each of its individual operations, forming "a common operational picture between the PEC and partner sites."[15] This process incorporates a variety of data from laboratories, process surveillance cameras, control systems, maintenance system logs, and several other sources.[16]

Rio Tinto is able to use this efficiency to be more environmentally friendly, and to promote safer mining in each of its locations. More efficient mining, in turn, leads to cost benefits

being passed on to manufacturers—who use the raw materials that Rio Tinto mines as inputs to produce manufactured goods—which are then passed on as savings to consumers or other business customers. Rio Tinto must share this data among its sites in multiple countries, and therefore would be harmed by cross-border data flow restrictions in any nation in which it operates.

Unilever (Manufacturer)

Unilever, the world's second-largest consumer products producer, has over 400 product lines focused on health and wellbeing, including such notable brands as Dove, Lipton, Hellmann's, Vaseline, and Knorr.[17] As a multinational company, Unilever is co-headquartered in London, the United Kingdom, and Rotterdam, the Netherlands, and has over 174,000 employees. Its products are made or sold in over 190 countries.[18] It has a strong presence in Southeast Asia, including Indonesia, Malaysia, and Vietnam, where data protectionist efforts have gained significant momentum.[19]

In May 2011, Unilever started implementing plans to build a global enterprise data warehouse, consolidating the forty data warehouses it had built over the previous decade.[20] This global data warehouse was designed for two objectives. First, the Unilever team wanted to use consumer analytics from the largest-possible data set reflecting as many of their customers as it could.[21] Second, Unilever wanted to give their business users the ability to use standard reporting from anywhere in the world that carried its products "within three clicks of a mouse."[22] This new system was designed to be completely unified, drawing data that the company collected from all over the globe in real time. By 2013, Unilever extended this infrastructure to consolidate activities outside Europe, covering the Americas, Asia, Middle East, and Turkey.[23] Unilever now has two major global data centers located in the United Kingdom, which contain approximately 4,000 servers.[24] These global data warehouses, as planned, are able to provide many insights into the company's operations, helping it to lower costs and improve business performance, which translates into cheaper products for consumers. Unilever is also able to use these systems to drive revenue to retailers and its other business consumers.

To help maximize the value of the data it collects, Unilever has been experimenting with using artificial intelligence to improve its efforts to market Knorr, its largest food brand, in emerging countries.[25] For example, in India, where most shoppers own regular feature phones instead of smart phones, Unilever's system allows customers to send a Short Message Service (SMS) text message with a list of ingredients and automatically receive back suggested recipe ideas.[26] This pilot program, made possible by data aggregated across borders, not only gives Unilever access to customers who were previously difficult to reach, but directly benefits customers with personalized services. Efforts like this are only in their infancy, and many companies will be exploring how to build personal relationships with their customers through smart uses of data aggregated across borders.

Royal Dutch Shell (Oil and Gas)

Royal Dutch Shell, headquartered in the Netherlands, is one of the world's largest oil and gas companies. Shell employs over 150,000 employees across ninety countries.[27] It has operations on almost every continent, and it is the largest oil operator in Nigeria and the

third-largest oil operator in Brazil.[28] It also has a global computing footprint: three main global data centers supplemented by third-party cloud computing services.[29] Shell uses these computing resources to manage and analyze the data generated by sensors in its wells.[30]

Advances in technology have given Shell new opportunities to use big data to find resources in unexpected places. Shell teamed up with Hewlett-Packard to create remarkably sensitive, low-power sensors—accelerometers that are up to a thousand times more sensitive than other commercial products—to generate high-resolution seismic data.[31] In fact, these ultrasensitive sensors are just 5mm-by-5mm square microchips that can detect a 10^{-15} meter change in position (less than one-billionth the width of a human hair).[32] These devices are so sensitive that Shell believes they can detect resources in wells that were thought to have run dry, or places where past tests originally signaled the region had no oil.[33] Shell's scientists—including geophysicists and drilling engineers—then run models analyzing whether or not these wells still have residual oil. These sensors generate an immense amount of data—one million of them running non-stop would capture twenty petabytes of information in six months (1,000 times the amount of data stored by the Library of Congress, which by its own assertion is the largest library in the world).[34] In 2012, Shell was planning to install the sensors in approximately 10,000 wells throughout the world.[35]

Tesco (Retail)

Tesco is one of the world's largest retailers, just behind Wal-Mart, with stores in twelve countries in Asia, Europe, and North America.[36] In 2011, one in every seven British pounds spent in the United Kingdom went to one of the 3,000-plus Tesco locations in the country.[37] Tesco uses real-time data and analytics to predict when products on its shelves need to be reordered to ensure those shelves never go under-stocked.[38] Tesco can even use data from its electronic shelves to make national pricing changes instantly.[39] This, in turn, affords vast benefits to Tesco's customers, including better service, fresher ingredients, lower prices, boosted convenience, and fully-stocked shelves.

Tesco introduced its loyalty card in 1993 to use big data to understand the consumer experience.[40] By 2014, approximately sixteen million people had a Tesco Clubcard.[41] Tesco uses this data to make decisions in all aspects of its value chain, from supply chain to sales and services.[42] One application can be seen in Tesco's use of customer data to offer targeted coupons to customers. For example, if a customer buys diapers, Tesco may send that customer a voucher for beer, knowing the new father may have less opportunity to go out for drinks.[43] Understanding its customers has also led to strategies that combine use of physical stores, mobile devices, and desktop computers. For example, customers can use their mobile devices to order groceries for home delivery (a trend that has recently gained traction in the United States with services like Peapod Delivery), or customers can use special kiosks located in each store to order an item they can then pick up in that store the following day.[44]

Tesco has also used data to cut costs and inform its operations in many ways. Tesco uses weather forecasts updated for each location several times each day (covering around eighteen million food items) using a web-based system called TescoConnect, because

different foods spoil at different temperatures.[45] Additionally, the retailer reduced its energy costs for refrigeration by 20 percent across 300 of its locations in the United Kingdom and Ireland by installing intelligent technology to ensure its refrigerators stay at proper temperature.[46] This project alone generates seventy million data points in the span of a year. IBM software monitors and remotely diagnoses problems in the system.[47] In 2012, data-driven analyses like these reduced food waste by £6 million ($9.4 million) in the summer months, and optimized Tesco's in-store operations to produce £30 million ($46.7 million) less total food waste overall throughout the year.[48] Because its retail presence extends across multiple countries, Tesco must collect and aggregate data from all of those countries to make its decisions. Tesco can use this efficiency to bring fresher, lower-cost goods to market and provide customized benefits for its loyal customers.

ING and ICBC (Banking)

In recent years, banks have begun using data to improve decision-making in a number of ways, including improving the customer experience, developing new products, and informing marketing decisions.[49] For example, the Dutch bank ING, which serves over 48 million individual and institutional clients in more than forty countries—including Argentina, Brazil, India, Malaysia, Russia, and Thailand—has a workforce exceeding 75,000.[50]ING was an early adopter of big data analytics to analyze its financial data, website interactions, customer service calls, user feedback, and other things to segment its consumers and use predictive marketing.[51] ING collects detailed information about how customers interact with the bank in person, online, and over social media, and it then uses that information to inform its marketing strategy, brand development, customer relations, and even the products it offers.[52] This, in turn, allows ING to deliver tailored services to suit an individual consumer's needs, such as personalized bank alerts, more robust cybersecurity, better fraud detection, lower interest rates (due to reduced credit card fraud), and top-quality customer service.[53] To that end, ING has been rebuilding its cloud computing infrastructure to help accommodate the data it collects.[54] ING must move this data across borders to analyze capital flows between its various establishments from its locations in forty countries. ING must also transfer its financial information across borders in order to operate, because the nature of financial markets is now international and consumers often move from place to place. The net result is more convenience for consumers who can make financial transactions in any country in which they are traveling.

To take another example, Industrial and Commercial Bank of China Ltd. (ICBC), ranked by *Forbes* as the world's biggest company in 2013 and 2014, has a large network of 331 institutions in forty countries across Asia, North America, Europe, Africa, Latin America, and Australia.[55] ICBC has over 220 million customers operating 600 million accounts and processes upwards of 200 million transactions daily.[56] By mid-2014, 82 percent of its transactions were online.[57] The bank uses analytics software to comb through the vast amount of online data feeds, social media interactions, and other data it collects.[58] The bank also analyzes various data sets to find potential locations to establish new branches or relocate and renovate old ones.[59] ICBC then uses this analysis to forge stronger customer relationships, make better business decisions, and improve risk management.[60] ICBC must exchange information to and from its disparate locations to optimize its analytics capabilities and streamline the services it offers all over the globe.

Boeing (Airplanes)

Airplanes are designed to transverse borders, and as more and more devices are beginning to gather data, aircraft are no exception. Boeing has pioneered using these tools to reduce delays, midflight turn-backs, and cancellations—all of which directly benefit customers. Boeing sells its airplanes and its services to airlines all over the world, including Air China, Air France, British Airways, and United Airlines.[61] The airplane manufacturer offers an information tool to commercial airlines called Airplane Health Management (AHM), a system that gathers in-flight airplane information and transmits it in real-time to maintenance crews on the ground. [62] A single Boeing 737 engine produces twenty terabytes of data every hour in flight.[63] Therefore, an eight-hour flight from New York to London on an aircraft with two engines can generate 320 terabytes of data.[64] Boeing uses this data to find and diagnose problems mid-flight. The airplane relays any identified problems to airline maintenance personnel waiting at the next airport using the web portal "MyBoeingFleet.com."[65] These crews, located in any nation with an airport, can then be ready with the appropriate airplane parts to make any necessary repairs as soon as the airplane touches down. Intelligent analysis like this provides airline operators with proactive maintenance planning to spot trends, eliminate inefficiencies, save money, and reduce wait times.[66] For airlines that must compete in a world of sudden storms and unexpected delays, better safety and service are essential. Boeing's technology, enabled by the seamless integration of data from all over the world, allows airlines to improve their products so passengers do not face more delayed flights, less reliable trips, higher costs, and potentially more accidents.

Volvo and Scania (Vehicle Manufacturers)

Volvo and Scania are Swedish manufacturers of trucks, buses, construction equipment, and other vehicles capable of transmitting real-time vehicle location data and diagnostic information.[67] These systems are designed to alert the driver to needed repairs or software upgrades, subsequently improving safety for not just the driver, but for everyone else on the road. The system can also locate lost or stolen vehicles during emergencies.

The Volvo Group employs over 115,000 people with production facilities in twenty countries and over 190 markets.[68] This trucking company gathers data on each of its products for real-time monitoring, and to help consumers improve their cargo loading. [69] This process also optimizes the vehicle's fuel efficiency, lessening its environmental impact.[70] Volvo routes all of the data that it collects from the countries where it operates into to a centralized facility in Sweden.[71] Its services and inter-company data flows have been aligned to meet regional data requirements to ensure compliance with rules. Aggregating data from many countries into a central hub allows Scania to diagnose problems sooner, leading to improved vehicle safety and reliability, and likely fewer vehicular accidents.

Scania operates in over 100 countries, with production lines in Argentina, Brazil, France, The Netherlands, and Poland.[72] Scania collects "anonymous performance data" from its vehicles and uses this data, only a small part of which comprises personal information, for analysis and testing.[73] This, in turn, facilitates remote diagnostics and repairs. If one of its customers' vehicles breaks down, data is immediately sent to a regional help desk so that

Scania can help quickly resolve the problem.[74] Because Scania uses a global diagnostics and repairs database to track and solve problems with its customers' vehicles, data flows are essential to effective repairs.[75]

Another service that Scania offers, "ecolution", is an educational and remote driver diagnostics service that measures the driver's habits behind the wheel, analyzes that information, and sells it back to the driver or to his or her employer.[76] This service is designed to help coach the driver to better operate the vehicle in a more efficient, environmentally friendly, and safer manner.[77] Ecolution is operated out of Sweden and involves cross-border data flows if the driver is operating his or her vehicle outside of Sweden.

Alliance Medical and Hermes Medical Solutions (Healthcare)

Over the last decade, a trend has emerged throughout Europe and North America whereby hospitals send medical images—such as x-rays, ultrasounds, or magnetic resonance imaging (MRI) images—to other countries for interpretation and diagnosis.[78] This service reduces wait times and improves the expediency of diagnoses.[79] This report will explore two examples of this type of service with the companies Alliance Medical and Hermes Medical Solutions.

In the 2000s, as the United Kingdom was facing a dearth of radiologists, it turned to outsourcing for help.[80] As a result, in 2004, the United Kingdom's National Health Service (NHS) hired Alliance Medical, a company with over 200 imaging sites throughout Europe, to process over 635,000 MRI scans within five years, interpreting the images and returning them to the doctor for diagnoses.[81] Alliance Medical and other firms outsourced MRI diagnoses to firms in other countries to keep up with the demand.[82] Offshoring these tasks has proved efficient, allowing doctors to spend more time with patients and offering healthcare payers substantial savings.

Similarly, in Sweden, Hermes Medical Solutions is the leading manufacturer of software applications in molecular medical imaging, a process that aims non-invasively to visualize patient patient's basic bodily functions, such as monitoring the patient's heartbeat for arrhythmia.[83] The company develops these tools for the heart, kidney, and liver, and offers advanced solutions that target cancer, such as locating tumors and radiation therapy planning.[84] All of its applications are cloud based and users can perform the same tasks and share medical images with other departments and centers in thirty different countries (including the United States and China). While all patient data is stored in Sweden, 95 percent of Hermes's services are outside of the country.[85] Like Alliance Medical's MRI scans, these images can be sent across borders for interpretation and diagnosis.

Hermes also participates in research projects with over 200 hospitals around the world that upload data related to specific diseases to Hermes's servers, which are then used for clinical studies.[86] Cross-border data transfers whereby the data is shared over a wide swath of countries, are a linchpin in these studies.[87] Bigger, more-complete data sets that represent larger populations of patients for multiple countries can lead to faster development of new treatments, more reliable diagnoses, and better healthcare. By allowing medical companies

to easily share data across borders, countries can help ensure patient access to better, more-affordable healthcare options, including through telehealth services.[88]

Why Nations Engage in Data Protectionism

Despite vast benefits to companies, consumers, and economies that arise from the ability of organizations to easily share data across borders, dozens of countries—in every stage of development—have erected barriers to cross-border data flows, such as data residency requirements that confine data to their borders.[89] These tactics are essentially data protectionism. While the motivations for these actions vary and in some cases are multifaceted, one such motivation is misguided self-interest: countries incorrectly believe that if they restrict data flows they will gain a net economic advantage from companies relocating data-related jobs to their nation.[90] Other nations are motivated by concerns regarding privacy and security of their citizens' data, or at least they assert this as a rationale for data protectionism. But as ITIF has clearly shown in a previous report, there is absolutely no increased privacy or security resulting from mandates that require data to not leave a nation.[91] When it comes to data security, it does not depend on where the data is stored, but rather the means used to store it. A secure server in Laos is no different from a secure server in Brazil. Similarly, voluntary disclosures of data need not be negatively affected by where data is stored since consumers and companies can rely on contracts or laws to limit voluntary data disclosures, even if that data is stored abroad. Where differences may arise is in those governments' mandated disclosures of data, such as for law enforcement purposes.

Countries generally create data localization policies directed at specific types of data, such as government data (e.g. national security data or data related to public institutions) or personal data. Some target all domestic data. Several countries, including Canada and Indonesia, have adopted data localization laws for national security-related data or data from public institutions.[92] For example, two Canadian provinces, British Columbia and Nova Scotia, have enacted laws that require personal information held by public institutions (e.g., schools, universities, hospitals, utilities, etc.) to be stored and only accessed in Canada.[93] Presumably there are no rogue employees at data centers in Canada who would use the data inappropriately.

Countries such as Australia, China, Russia, and India have passed laws to prevent personal information on their citizens from leaving these countries' borders. For example, Australia prohibits storage of electronic health summaries for Australian citizens from being stored abroad.[94] Another example is South Korea's Personal Information Protection Act, which targets data leaving the country and requires companies to obtain consent from "data subjects" (i.e., the individuals associated with particular datasets) prior to exporting that data.[95] This act also requires "data subjects" to be informed of whom receives their data, the recipient's purpose for that information, the period that information will be retained, and the specific personal information to be provided.[96] This is clearly a substantial burden on companies trying to send their data across borders.

Finally, some governments have passed laws that greatly restrict the sharing of all kinds of other data across borders. For example, Kazakhstan created a law in 2005 that forced all

domestically registered domain names of the .kz top level domain (TLD) to run off physical servers located within the country's borders.[97] When the Kazakhstani government began enforcing this regulation in 2010, Google responded by redirecting all traffic from its Google.kz TLD to Google.com. Kazakhstan later backtracked, requiring that localization apply only to TLDs registered after September 7, 2010. As a response, Google—which had registered its name before 2010—restored the Google.kz functionality. However, both domestic and foreign companies that decide to register a .kz TLD (or registered a .kz TLD after the requisite date) will be unable to use global cloud-based services.[98] Likewise, the Taiwanese government has also created rules that tightly restrict international transfers in some industries under certain circumstances.[99]

Some countries have a pattern of using anti-competitive trade practices to give their domestic firms an unfair advantage. For example, Brazil's Petrobras has been required to buy as much as 95 percent of its equipment used in oil and gas field exploration from domestic companies. The fact that these countries are extending similar localization barriers in trade to data is not surprising, but it is still harmful both to their trade partners and to their domestic firms.[100]

Economic Impacts of Data Protectionism

Data protectionism—government-imposed restrictions on cross-border data flows—threatens not just the productivity, innovation, and competiveness of tech companies, but all companies with an international presence.[101] In today's global economy, it is common for businesses to process data from customers, suppliers, and employees outside the company's home country. Data protectionism makes such data processing much more difficult, if not impossible. Moreover, to the extent that data localization policies require businesses to build out physical infrastructure in every jurisdiction in which they operate, these impositions increase costs, raising prices for consumers and reducing the international competiveness of a nation's firms.

While some countries believe these types of trade barriers offer a quick way to bring economic activity within their borders, in reality they cause more harm than good. The supposed benefits of data localization policies are misunderstood. As data centers become more automated, the number of jobs associated with each facility, especially for technical staff, decrease. While data centers contain expensive hardware and create some temporary construction jobs, they employ relatively few full-time staff to operate the equipment, especially as cloud-based technologies have increased automation in data centers.[102] The short-term benefit of these jobs is outweighed by the substantial cost to build unnecessary data centers, a cost which is ultimately passed on to customers.

Furthermore, these protectionist policies unwittingly limit the ability of a country's own firms and industries to innovate by shielding them from international competition. Countries that artificially prop up domestic businesses with protectionist policies set up those businesses to fail because they will be less competitive in the global market than those operating without similar crutches. Similarly, restrictions on cross-border data flows can reduce access to online services not available locally. This can not only deprive citizens of protectionist countries the ability to enjoy online entertainment, it can also harm a

country's productivity and competitiveness. For example, Xero is a New Zealand-based company that specializes in cloud-based accounting software, serving small and medium businesses in over 150 countries.[103] This accounting service provides back-end computing to increase the productivity of its customers, but risks being subjected to crack-downs from countries that restrict the flow of data.[104]

The net impact of these types of policies is decidedly negative. For example, a 2013 report estimated that if cross-border data flows were seriously disrupted in the European Union, the negative impact on its GDP would be between -0.8 to -1.3 percent and EU manufacturing exports to the United States could decrease by approximately 11 percent.[105] Conversely, based on 2014 estimates, decreasing barriers to cross-border data flows would increase GDP in the United States by 0.1 to 0.3 percent.[106] Therefore, placing restrictions on cross-border data flows harm both the global competitiveness of the countries implementing these policies, as well as others in the global economy.[107]

Further impacts to trade and businesses that rely on cross-border data flows can be seen in the above examples of traditional industries. With regard to vehicle manufacturers, Volvo, which routes all of the data that it collects to a central facility in Sweden, must comply with a European Union directive that prohibits sending personal information to any non-E.U. country that lacks adequate protections in the transfer of that data.[108] In response, Volvo has adapted its system not to include sensitive information that may be subject to European data transfer laws; their global solutions and data transfers are in compliance with these laws.[109] Similarly, Scania has experienced regulatory uncertainties regarding cross-border data flows, given the patchwork of data protectionist laws in the many countries in which it operates.[110] These uncertainties have led Scania to reconsider sharing data with its customers in countries like Brazil, which in 2013 put forth a bill that would have required data on Brazilians to be stored locally.[111] This has also made Scania reluctant to outsource part of its IT infrastructure to cloud providers who could provide it better services at a lower cost.[112]

With regard to retail, if countries continue to erect barriers to the sharing of data across borders, multinational retailers may find themselves unable to utilize the potential this data offers to streamline costs in their supply chain, reduce food waste, and provide equal benefits to customers in every country in which that retailer is located. This is where Tesco may run into barriers, especially with the information it collects from its millions of loyalty card customers who shop outside of the United Kingdom (where it is based). If Tesco can no longer use the information volunteered by its customers, it can no longer deliver targeted rewards, or could be forced to build additional data centers in each country in which it operates—the costs of which would be placed on its customers. Similarly, because Unilever aggregates its data into a central hub, barriers to cross-border data flows could hinder its ability to deliver targeted rewards and services to its customers in protectionist countries such as Indonesia, where it was the third-largest company a at the end of 2013.[113] Customers in protectionist countries would be forced to endure costlier products, and business customers would be unable to reap the benefits of Unilever's analytics system to drive revenue to their stores.

Furthermore, forced data localization would affect many mining, oil, and gas companies seeking to send their own information across borders. For example, data localization laws could prevent Shell from transmitting data from a site in one country to another, thereby barring it from using the massive amount of information it collects in its wells to paint a complete picture of its operations, information which can lower costs for consumers and reduce environmental impact. As Shell continues to embrace big data in its "Smart Fields," it may face data localization laws that focus on information that may be sensitive on national security grounds.[114] In 2011, Shell moved its cloud storage from a U.S. provider to a Germany provider due to concerns about the U.S. Patriot Act.[115] As a result of security fears stemming from U.S. surveillance, European countries such as Germany and the Netherlands have considered rules to prevent U.S. companies from offering their services domestically.[116] This would have severed Shell's relationship with Microsoft at the time. By creating barriers to cross-border data flows of international oil and gas companies like Shell, countries lose benefits such as better environmental monitoring, more efficient drilling, increased revenue from oil production, greater recoverable reserves, and increased local jobs due to expanded oil production. Similarly, if barriers to data flows were created in any of the territories in which Rio Tinto operates, then the company would no longer be able to capture the efficiency that a central data center is able to offer. Not only would Rio Tinto be forced to build data centers in its other countries, it could no longer seamlessly monitor and coordinate its operations. The costs of this would need to go somewhere, hurting Rio Tinto's competitiveness and its customers' pocketbooks.

Finally, barriers to the exchange of personal medical data, such as those on the books in Canada, Australia, Russia, and India, could prevent companies like Hermes or Alliance Medical from outsourcing MRI scans, thereby increasing healthcare costs and time demands on doctors. These barriers can also impede important medical research and large international medical studies. By erecting barriers to the exchange of medical information, even anonymous data, countries' protectionist policies harm not only their own citizens but people around the world, all of whom benefits from the advancement of medical science.

RECOMMENDATIONS TO ROLL BACK DATA PROTECTIONISM

As this report shows, the onset of cloud computing and data innovation has dramatically transformed how goods and services are delivered and how traditional industries operate. Moreover, the use of data analytics in virtually all industries has streamlined business practices and increased efficiency. In the United States, digital trade has raised U.S. GDP by 3.4 to 4.8 percent by increasing productivity and lowering the costs of trade; it has also increased wages and likely contributed to as many as 2.4 million new jobs.[117] Benefits such as these often make it impractical and expensive to restrict data to smaller data centers located in different countries. Just as economic nationalism inevitably leads to lower productivity for firms and higher costs for consumers, data protectionism will similarly lead to poor economic outcomes, limiting both online and traditional industries.[118] But all too often, countries continue to promote these anti-competitive policies instead of unlocking the potential of data-driven innovation by reducing barriers to the flow of data.

In an effort to continue to promote data-driven innovation in traditional industry, countries should not restrict the flow of data across borders. To address this problem, we recommend the following:

International Organizations Should Further Develop Mechanisms to Track Data-Related Localization Barriers to Trade

Localization barriers to trade (LBTs) are policies designed to protect domestic industries from foreign competitors. In order to properly assess the damage that data-related LBTs have on the global economy, policymakers should develop better mechanisms to track them. At the moment, the best source for tracking LBTs is the Office of the United States Trade Representative (USTR) in its 1377 Review, an annual review that determines whether practices by foreign governments deny "mutually advantageous market opportunities to telecommunications products and services of U.S. firms in that country."[119] While this review is useful, additional action can bring attention to this problem and further establish legitimacy on the international stage. Another database that does this reasonably well is the Organisation for Economic Co-operation and Development's (OECD) Services Trade Restrictiveness Index (STRI), which helps identify whether policy measures put forth by countries restrict trade.[120]

However, currently the International Monetary Fund (IMF), the World Bank, the World Trade Organization (WTO), and their respective trade statistics databases do not explicitly track barriers to cross-border data flows.[121] This makes it difficult to quantify the economic impact of barriers to data flows on national economies and the global marketplace. For example, the World Bank's World Integrated Trade Solution database lists "non-tariff" measures but does not specify what those non-tariff measures are for the purposes of identifying the problem (e.g., data residency requirements, forced technology transfer, etc.).[122] Therefore, these organizations should clarify and explicitly track barriers to cross-border data flows in order to document the extent of their use and to contribute to further analysis of how they impact the global growth and development of not just information technology sectors but traditional sectors as well. By doing this, these organizations will add international legitimacy to the efforts of the USTR to discourage the use of LBTs, including barriers to cross-border data flows.

International Organizations Should Push Back Against Data Protectionism

International organizations, such as the United Nations Conference on Trade and Development (UNCTAD), the IMF, multilateral development banks (e.g., the Inter-American Development Bank group), and the World Bank, should advocate for the free flow of data across borders and push back against countries that force data localization within their borders. These organizations should recognize that forced data localization hurts not only nations that process large amounts of data, but can be extremely detrimental to budding data-processing markets as well. Therefore, recognizing and pushing back against countries that create these undesirable policies should be in the purview of these international organizations. The World Bank has long advocated that developing nations invest in their data processing industries, and many nations have experienced economic growth as a result.[123] To be clear, this refers to the full-fledged growth of industries powered by innovative IT-based services rather than the short-term job gains brought on

by the construction of data centers (as discussed earlier). For example, the Philippines have created a vibrant market for data processing, and as it exports these services abroad, it too will encounter LBTs such as data protectionism.[124] Therefore, the viability of data processing as a development tool is threatened if data protectionism continues to grow. Indeed, every time one country erects barriers to data flows, another country that is vying to be a data processer could be economically harmed.

International financial institutions should be mindful of this issue and make financial assistance contingent on countries eliminating these practices. For example, the World Bank could allocate its non-humanitarian aid funding to countries that do not enact data protectionism. The World Bank is composed of two organizations, the International Bank of Reconstruction and Development (IBRD) and the International Development Association (IDA). Unlike the IDA which raises its money from country donations, IBRD raises money primarily from international markers and issuing bonds, and allocates that money to countries for development projects rather than military or humanitarian aid.[125] Therefore, the IBRD could push back on infringing countries by favoring other developing countries that do not engage in LBTs when allocating these loans. Because IBRD funds are generated primarily without member country assistance, these funds have come with fewer conditions than those of the IDA. This would also allow the IBRD to concentrate its funding in developing countries that are practicing policies designed to spur economic growth.[126]

The United States Should Complete Trade Agreements That Eliminate These Barriers

Countries should not wait for actions by the WTO and other international organizations to act. The United States should engage with its trade partners and other like-minded economies to craft high-standard, free trade agreements that reduce barriers to cross-border data flows. These efforts could start with the Trans-Pacific Partnership (TPP) Agreement, the Trans-Atlantic Trade and Investment Partnership (T-TIP) agreement, and the Trade in Services Agreement (TISA).

Unfortunately, several would-be TPP partners have introduced localization barriers to digital trade, particularly regarding laws mandating use of local information technology infrastructure such as data centers or laws mandating local data storage. For instance, several potential TPP partners—including Canada, Malaysia, New Zealand, Australia, Brunei, and Vietnam—either have already introduced or are considering the introduction of local data storage requirements, as well as data security and data privacy regulations that would restrict where companies are allowed to store and process data.[127] Similarly, the T-TIP agreement should seek to stymie the local data center requirements that are being enacted in several countries that could potentially sign on to the agreement. For example, one potential T-TIP partner, Denmark, issued rulings to prevent the use of cloud computing services when servers are located outside of those countries.[128]

The United States and other like-minded, would-be trade partners should push back on these countries in their trade agreements and seek for the TPP and T-TIP agreements to allow for the uninhibited flow of information technology products and services across borders. Unlike TPP and T-TIP, the Geneva-based TISA negotiations are led by countries'

ambassadors to the WTO, and the benefits of this agreement would be shared by the countries that sign onto the agreement.[129] So far, the United States and fifty other countries are involved in TISA negotiations. The United States should continue the efforts, outlined in a proposal by the USTR in regard to the TISA negotiations that leaked in 2014, to focus negotiations on advancing e-commerce by guaranteeing unrestricted cross-border data flows and removing data protectionist rules.[130]

The optimal outcome of these agreements should be to create an alliance against other bad actors, forcing these countries to the sidelines of the global trade arena if they continue to perpetrate harmful trade practices.[131] On the other hand, countries that agree to internationally-accepted standards for data exchange will benefit from growth opportunities brought by these regional and bilateral trade agreements. These agreements could draw language from other similar agreements, such as the EU-US Trade Principles for Information and Communication Technology Services, which outlines proposals for protecting cross-border data flows and states that governments should not require IT service suppliers "to use local infrastructure, or establish a local presence, as a condition of supplying services."[132] If the United States and its allies push for reduced LBTs in each of their trade negotiations, these efforts can help stem the tide of digital protectionism.

The United States Should Propose A Data Services Agreement

Short of expanding the WTO definition of LBTs to include barriers to data flows and forced localization of data centers—a feat that would require all WTO signatory nations to approve a new agreement—there are a number of things the WTO can do to reduce its member states' incentive to pursue these negative economic outcomes. In the Singapore Ministerial Conference in 1996, twenty-nine countries signed on to the Ministerial Declaration on Trade in Information Technology Products (ITA).[133] This agreement allowed participants to hold one another accountable in many areas of digital trade. As of 2015, the number of WTO participants signed on to the ITA had increased to eighty, representing 97 percent of the global information technology products marketplace.[134] Similarly, the United States and like-minded countries should propose a "Data Services Agreement" to WTO participating countries to protect cross-border data flows and prevent signatory countries from creating barriers to them. This agreement could augment other agreements currently being negotiated at the WTO, such as the TISA (discussed in more detail above), and in no way should take precedence over those negotiations.

The current WTO laws on LBTs (e.g., General Agreement on Trade in Services, or GATS) offer limited effectiveness in curbing forced localization of data centers or other barriers to data flows.[135] Therefore, by signing an agreement for the protection of data flows, countries can expand the sphere of influence of the WTO and hold each other accountable for positive data practices. This would allow for companies to bring more WTO cases against participant nations that violate the agreement and would provide a disincentive for signatory countries considering these trade-distorting practices. But most importantly, signatory nations can band together to support these positive practices by putting pressure on other countries in the WTO to sign onto the new agreement.

Future U.S. Trade Promotion Authority Legislation Should Push Back Against Data Protectionism

As the U.S. Congress weighs future trade promotion authority legislation, it should include directives for negotiators that all future U.S. trade agreements include prohibitions against barriers to cross-border data flows. This type of legislation would further enforce the United States' stance that these barriers obstruct the free flow of data in the global economy. Similar legislation has been introduced in the U.S. Congress before. For example, in December 2013, Senators John Thune (R-SD) and Ron Wyden (D-OR) introduced the Digital Trade Act of 2013, legislation that would establish negotiating principles designed to guide U.S. negotiators in addressing key digital trade issues in future bilateral and multilateral trade agreements and in multi-stakeholder settings.[136] This act upheld key principles, such as preventing or eliminating barriers to cross-border data flows and prohibiting localization requirements for computing infrastructure.[137]

Legislation such as the Digital Trade Act of 2013 would help the United States articulate a consistent message against data protectionism as it negotiates its trade agreements. As future U.S. Congressional leaders consider trade promotion authority legislation, they should consider the roles that the United States can play in shaping the rules that guide trade over digital platforms.

The United States Should Call For A "Geneva Convention On The Status of Data"

The importance of trade in digital goods and services in our global economy suggests that there is an increasing need for clarity on jurisdictional questions about data, particularly regarding government access to that data. However, the need for transparency and consistency in how countries treat that data has become paramount in the wake of recent revelations about the extent to which several governments were involved in mass surveillance of electronic data and communications. The uncertainty surrounding the extent of this surveillance further compounds this problem and limits companies' ability to do business abroad.

Therefore, the United States should engage its trading partners in creating a "Geneva Convention on the Status of Data".[138] The purpose of this convention would be to establish international legal standards for government access to data and multilateral agreements for questions of jurisdiction and transparency.[139] This convention would not only address the issues of localization and barriers to data flows, but could also limit unnecessary access by governments to data on citizens of other countries and improve mutual legal assistance treaties (MLATs)—agreements that create cooperation between legitimate law enforcement agencies in different countries. MLATs have come under fire recently for operating too slowly, and thus causing governments to find other avenues within their means to access data stored in other countries.[140] A multilateral agreement could also clarify which country's laws take precedence when companies encounter conflicting rules. If the United States and its allies work to create a global pact on issues of government access to data, localization, and data flows, countries can encourage economic development in traditional industries, establish jurisdictions for data collection by law enforcement, and promote transparency.

CONCLUSION

In our increasingly connected world, access to information is becoming more and more important, not just for businesses that solely operate on the Internet, but for traditional companies as well. But all too often, countries are pursuing mercantilist barriers to trade and innovation because it is advantageous to do so in the short term, despite the long-term negative economic effects, often at the expense of foreign nations.[141] This strategy ignores the harmful effects that barriers to the free flow of data have on the global economy. It is time for the international community to recognize the importance of cross-border data flows, and for the United States to lead efforts to establish multilateral agreements with other countries on the storage of and access to data. Only by creating multilateral trade agreements and global pacts on these issues can countries encourage economic development in both information and traditional industries, as well as hold each other accountable in the future.

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