

# Cross-border data flows

Designing a global architecture  
for growth and innovation

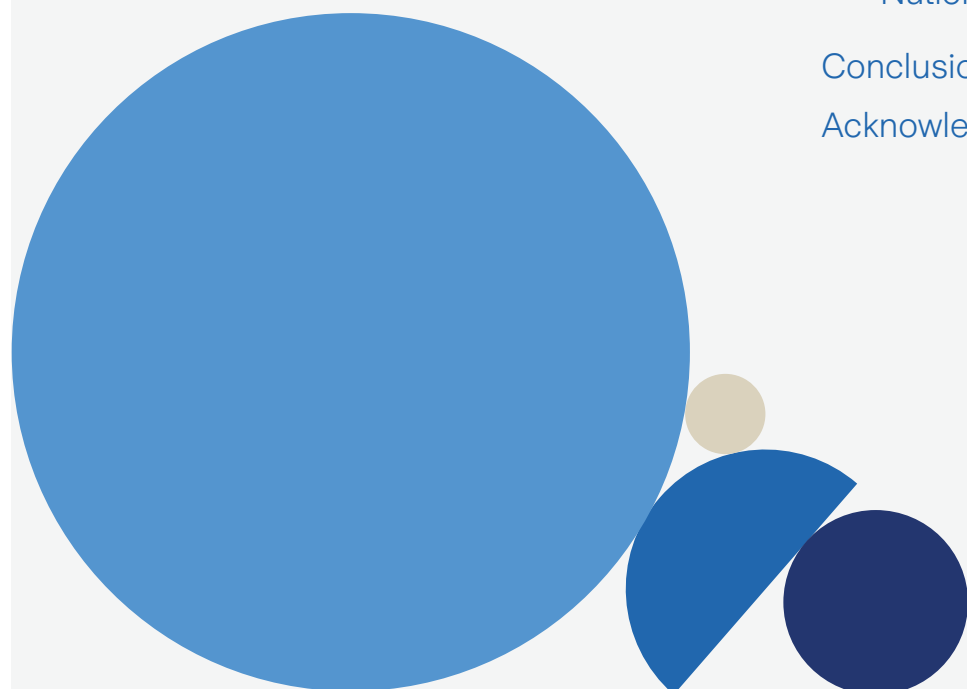


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# Executive summary

Data is central to the increasingly digitalizing global economy. And cross-border data flows are the lifeblood of this new economy, which will continue to grow – it is estimated to reach 65% of global GDP by end of 2022<sup>1</sup> – and holds great promise for businesses and people. However, jurisdictions are increasingly restricting cross-border data flows: the number of countries that have enacted data localization requirements has nearly doubled within four years, from requirements for U.S. government agencies to use U.S.-based cloud services, to the new suite of data regulations passed by China in 2021.

Where regulation poses a risk to the benefits of cross-border data flows



## Productivity

Cross-border data flows enable new and more scalable B2B and B2C business models, new kinds of customer support, and access to new markets around the world with benefits felt especially for micro, small, and medium enterprises (MSMEs) through easier market access and less costly (digital) marketing and distribution. Indeed, digital trade is the fastest-growing area of global trade over the past decade, growing 5.4% per year on average.<sup>2</sup>



## Resilience

Cross-border data flows can strengthen resilience, notably in international supply chains, enabling real-time monitoring and traceability; they can also reduce vulnerability to single points of failure when data is stored locally. The freedom to transfer and store data to optimize cybersecurity also boosts resilience.



## Employment

Cross-border data flows can improve remote learning, give companies access to remote talent, and enable workers to access a global pool of employment opportunities and work from where they live – with benefits especially for women and workers with special needs.



## Innovation

Cross-border data flows enable knowledge and data sharing and collaboration on research and development across all sectors, including in areas such as health tech and pharmaceutical development and in accelerating solutions for climate change mitigation and adaptation.



## Key takeaways

1. International data flows are key to driving growth and innovation in both advanced and emerging economies as well as resilience.
2. The growing number of restrictions suggests increasing fragmentation of international data flows, which would limit benefits.
3. An international architecture for managing cross-border data flows is necessary to future-proof economies and safeguard the benefits of digitalization.

There are legitimate concerns that underlie the expanding set of regulations on international data flows. These concerns center on the risk to individuals from unethical use of their personally identifiable information (PID), and threats to national security such as cyber-espionage and cyberattacks on critical infrastructure. However, data regulations are also driven by protectionist motives – and some regulations are rooted in the wish to protect jobs or national economic interests from competition. The currently observed proliferation of restrictions to data flows poses a risk of fragmentation and increases policy uncertainty that could significantly undermine the gains from digitalization and globalization if unaddressed.

The opportunity cost of such restrictions is often not fully appreciated. In some countries, for example, data localization regulations are estimated to substantially increase computing costs for companies<sup>3</sup>. Lifting restrictions on cross-border data flows would increase trade in services by 5%<sup>4</sup>.

Alignment around a global architecture for data flows is necessary to prevent the rise – and rising cost – of a fragmented regulatory landscape. Such an architecture would need to address legitimate national concerns around protection of private data and national security in ways that control – but do not

constrain – the movement of data. It would need to balance costs and benefits to society, set out standards and norms for countries and organizations to adhere to, provide for regulatory and legal interoperability, and emphasize the importance of education to enable informed choices. The need for such an architecture is clear from a business and consumer perspective. A set of global principles on cross-border data flows would create greater certainty for industries such as Healthcare and Financial Services, enabling them to develop new models, more patient/customer-centric solutions and services.

To future-proof the global and digital economy, countries need to step up efforts to better frame the international exchange of data flows. A global framework seems currently out of reach, yet bilateral and issue-specific multilateral agreements can help reduce data flow frictions and pave the way to the creation of a new global architecture that avoids undermining the benefits of cross-border data flows. This paper examines the evidence for the value of a more global approach and presents some principles and next steps on how to achieve it. Such an architecture should be accompanied by more robust security standards and digital literacy education to enable citizens to make more informed choices.

### Key figures

- The number of countries that have enacted data localization requirements has **nearly doubled within four years**, from 35 in 2017 to 62 in 2021.<sup>5</sup>
- Digital trade is the **fastest-growing area of global trade** over the past decade, growing 5.4% per year on average and contributing more to global growth than trade in goods.<sup>6</sup>
- Lifting restrictions on data flows would increase trade in services by 5%.<sup>7</sup>
- 60% of U.S. and European businesses with 50 or fewer employees indicate that data analytics are important to their operations, and that **collecting data internationally as well as locally can triple the gains in terms of labor productivity**.<sup>8</sup>
- Easing restrictions on data flows could generate **700,000 more jobs**, while **stricter policies could cost 1.3 million jobs** in Europe. Another study finds that **introducing the GDPR cost the EU up to 39,000 jobs, mostly affecting startups**.<sup>9</sup>
- Data localization measures introduced by China between 2013 and 2018 **reduced its trade output by 1.7% and productivity by 0.7%**, and **increased prices in downstream data-dependent businesses by 0.4%**.<sup>10</sup>





# Introduction: Why cross-border data flows matter

Data is central to the increasingly digitalizing global economy. It propels innovation in business models and solutions to challenges. The International Data Corporation forecasts 65% of the world's GDP to be digitalized by the end of 2022, and investments in digital transformation to total USD6.8 trillion from 2020 to 2023, equivalent to the GDP of France and Germany combined.<sup>11</sup>

## 1

### Cross-border data flows – a definition

Cross-border data flows include text, numeric, visual, video and audio information from media, including social media, financial data, services, machine sensors, video streaming, and communications that are transferred, used, analyzed and/or stored in multiple countries.

Adapted from [https://www3.weforum.org/docs/WEF\\_Trade\\_Policy\\_Data\\_Flows\\_Report.pdf](https://www3.weforum.org/docs/WEF_Trade_Policy_Data_Flows_Report.pdf)



Cross-border data flows (data flows hereafter, see Box 1) are the lifeblood of this new digital era. They enabled the rise of the global technology platforms and greater choice, convenience and information for consumers, and they continue to grow quickly as digitalization intensifies across industries. Business models and services enabled or enhanced by data increasingly drive the creation of economic value, growth and prosperity.

However, many countries are erecting regulatory barriers to constrain data flows, partly due to security or privacy concerns, for both states and individuals, but also partly due to geo-economic motivations – to protect jobs and national interests. The regulation of data flows has increased dramatically in the last decade (see Figures 1 and 2), as regulators address the gap between regulation designed for an analogue world with the needs of a rapidly evolving digital context. The number of countries that have enacted data localization requirements has nearly doubled within four years, from 35 in 2017 to 62 in 2021.<sup>12</sup> Such a rapid growth in new regulation brings challenges, including the risk of over-regulation to “stay ahead of the curve”. The approaches are fragmented as there is no global consensus on the best way to approach data privacy and protection. The result is a growing lack of regulatory certainty that can slow productivity, innovation and investment, in particular for smaller companies facing growing compliance costs.

Regulations touch on every stage of data flow cycle, as described in Box 2. Some policies concentrate on localization of personal data in areas such as health, government services or finance. Some countries, especially India and in the EU, are also increasingly restricting non-personal data that is labeled as “sensitive” for national security or commercial reasons. Data regulations do not need to aim explicitly for localization to create barriers – for example, the complications of complying with the EU's General Data Protection Regulation (GDPR) have the potential to make it the world's largest de facto localization framework<sup>13</sup>.



#### → Example. Data flows value creation in manufacturing

- Volvo and Scania **aggregate real-time data** on vehicle position and diagnostics to improve safety, environmental impact and supply chain management. Data from all countries is aggregated in Sweden.
- Unilever operates **two data centers** (totaling 4,000 servers) to analyze all its global consumer data.

Source: <http://dx.doi.org/10.1787/b2023a47-en>



#### → Example. Data flows value creation in aviation and maritime sectors

- Boeing planes transmit data in-flight that ground crews can analyze to plan necessary maintenance when the plane arrives, enhancing safety while minimizing turnaround delays.
- Data flows from **transponders on ships** are used to avoid accidents, predict commercial **fishing in real time** and **enforce natural habitat protection**.

Source: <http://dx.doi.org/10.1787/b2023a47-en>



#### → Example. The importance of cross-border data flows in insuring against natural disasters

Insuring against damages caused by natural hazards (such as hurricanes, floods, and wildfires) and accentuated by potential climate change impacts requires a catastrophe modelling process and the buildup of a sufficiently diversified portfolio, which are fundamentally global tasks. At Zurich Insurance, Global Circulation Models and windstorm patterns are combined with hazard maps based on Zurich's own claims experience from around the world. The process is highly data-intensive, drawing from, amongst other sources, very high-resolution satellite imagery.

This paper makes the case that data flow regulations, which do not align with an international framework, can slow growth and innovation. This harms competitiveness and development, and limits access to solutions like Zurich's global travel protection and emergency arrangements that offer firms and citizens greater efficiency, service levels and sustainability. It starts by exploring how cross-border data flows can benefit business and society, then addresses the legitimate concerns that exist over data security and privacy. It concludes by arguing that these concerns would be better addressed by improved global coordination of data flows and standardization of data protection requirements.

**81%** countries have **E-Transaction Laws**

**71%** countries have **Privacy Laws**

**59%** countries have **Consumer Protection Laws**

**80%** countries have **Cybercrime Laws**

Figure 1. Countries with some data protection laws in place<sup>4</sup>

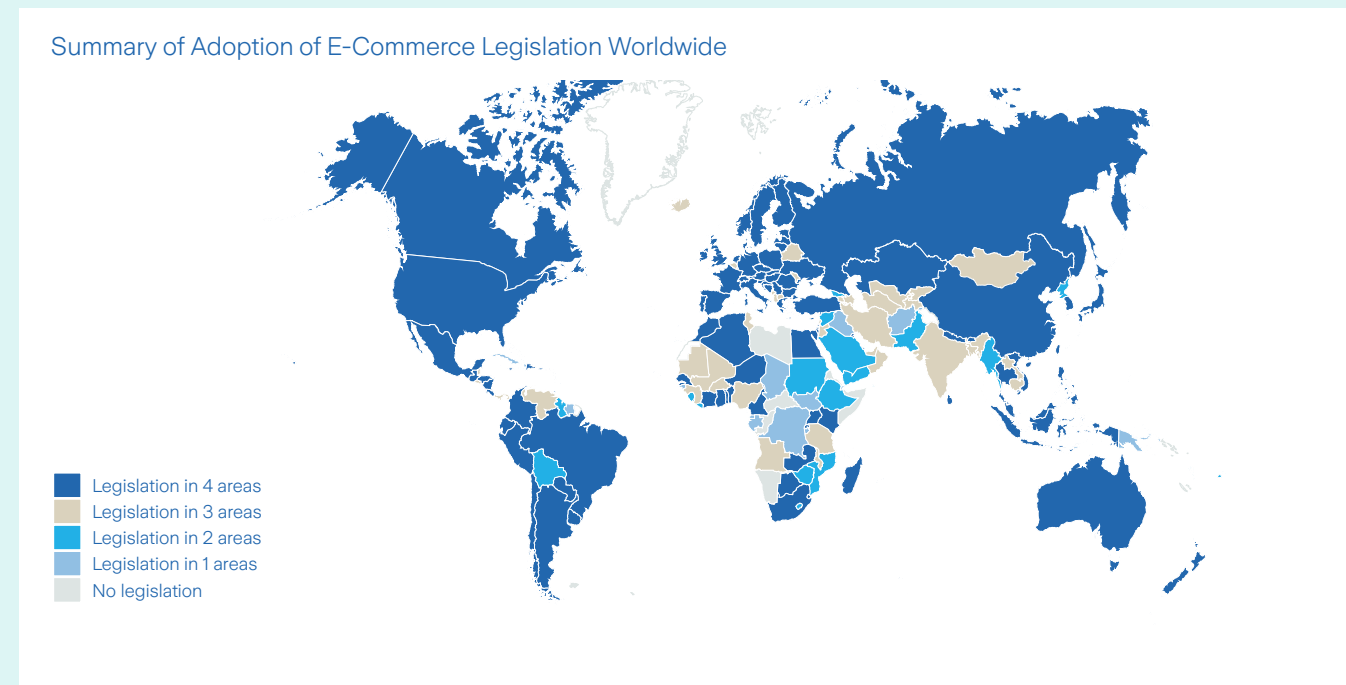
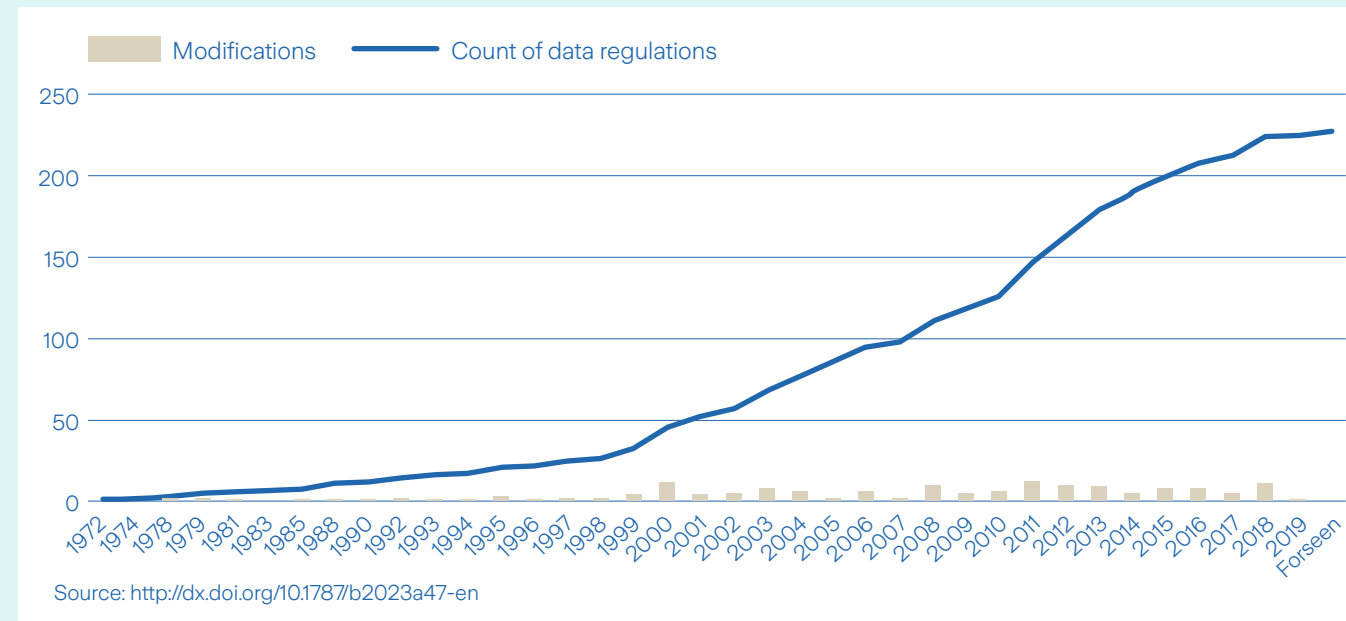


Figure 2. Recent years have seen a sharp rise in data regulation



## Barriers to cross-border data flows

2

The OECD identifies six types of barriers to data flows:

- Local storage and local processing regulations:** requirements to keep and/or process data on servers located within a country.
- Data protection regulation:** laws governing the collection, use and transfer of personal data. The most comprehensive example is GDPR in the European Union, which has been in force since May 2018.
- Competition and antitrust law adapted to digital markets:** economic policies designed to shape exporting conditions faced by digital, data-enabled enterprises, e.g. EU Parliament voting to break up Google operations in the EU.
- Cybersecurity:** technologies, processes and controls designed to protect systems, networks and data from an unauthorized exploitation, e.g. the EU working towards introducing a certification process for IoT devices.
- Intellectual property rights:** e.g. on digital content such as music, movies and books.
- Restrictions on internet use:** censorship and blocks on data transfers.

Source: <https://doi.org/10.1787/6345995e-en>

## Value creation at the company level through data flows

3

An analysis by the Information Technology & Innovation Foundation identifies the main ways in which data flows can create value:

- Automation of supply chains;
- Scalability of software via the cloud;
- Machine-to-machine communication, e.g. sensors, Internet of Things;
- Digital collaboration across global teams, e.g. in R&D, sales, human resources;
- Online procurement;
- Use of mobile apps to deliver products and services;
- Software as a service;
- Use of online platforms as intermediaries;
- Analysis of big data.

Source: <https://s3.amazonaws.com/brt.org/archive/reports/BRT%20PuttingDataToWork.pdf>

Overview of legal/regulatory positions in key blocs and countries

Figure 3. Overview of legal/regulatory positions across the world

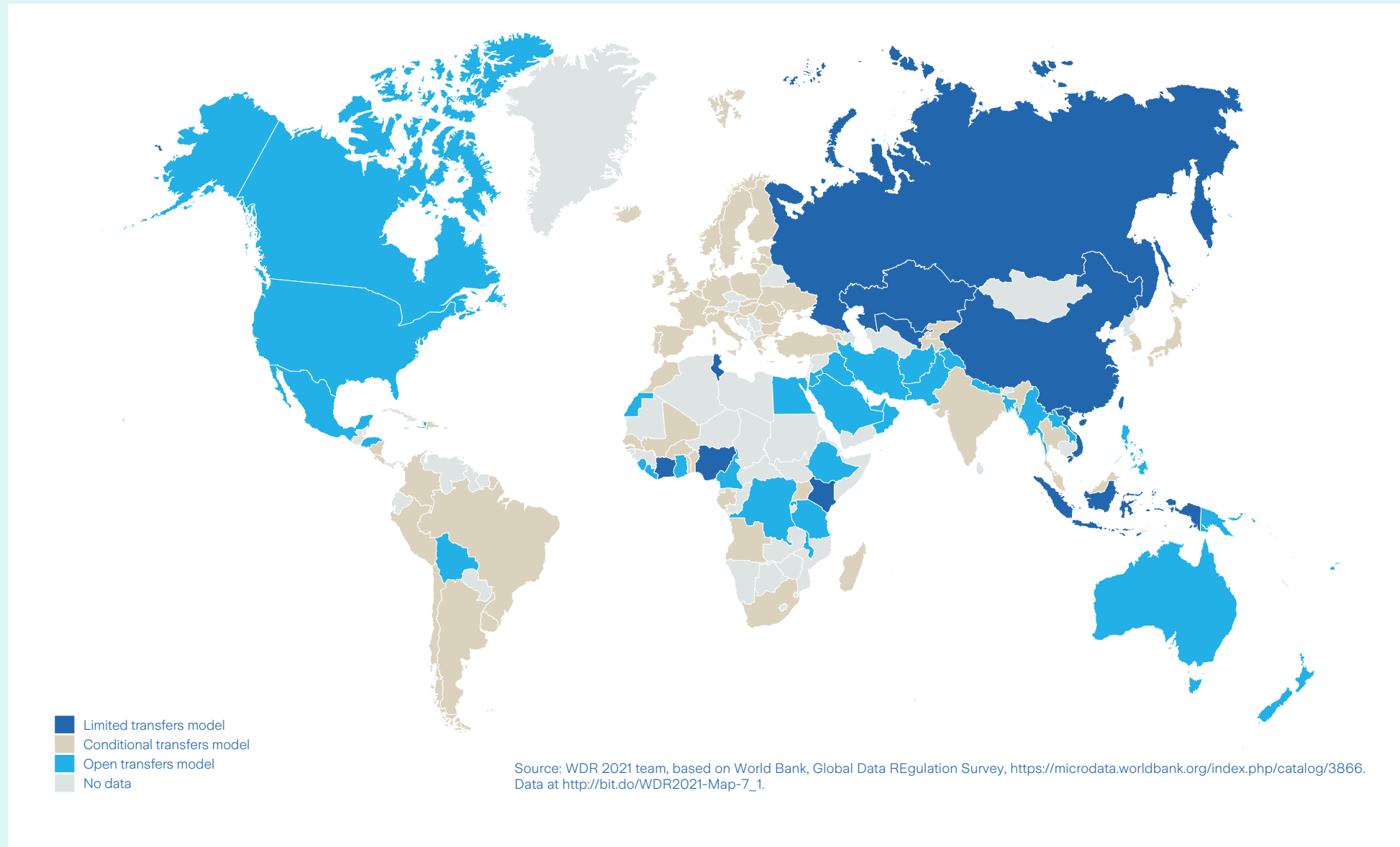






Table 7.1 Policy bases for regulating cross-border personal data

Model	Policy goal	Regulatory costs	Digital trade flows
Limited transfers	Cybersecurity and other security concerns	Higher	Limited by transfer approval or data localization requirements
Conditional transfers	Protection of personal data	Medium	Subject to regulatory conditions
Open transfers	Business freedom	Lower	Largely open

Source: WDR 2021

Table 1. Examples of regulations addressing data privacy and security concerns

Geography/Legislations	Privacy	Security
 <p><b>EU</b> Remains relatively fragmented in terms of rules and regulations. However, the lowest regulatory threshold is set by the <b>General Data Protection Regulation (GDPR)</b>.</p>	<p>Personal data can flow intra-regionally or to non-EEA countries that offer an adequate level of protection according to the European Commission.</p>	<p>In some EU countries, financial and public sector data has to be kept locally. E.g., France is considering developing a “sovereign cloud”.</p>
 <p><b>U.S.</b> <b>Federal Trade Commission Act</b></p> <p>Stricter data protection rules are incorporated in sectoral regulations, such as in finance and health, or in a particular subnational jurisdiction, such as the state of California and its Consumer Protection Act.</p>	<p>Federal Trade Commission takes a judiciary role and can punish companies for not complying with their internal data policy rules or using deceptive marketing techniques.<sup>14</sup></p>	<p>Government agencies are required to use specific U.S. based cloud services and stipulate local data storage in ICT contracts.</p>
 <p><b>China<sup>15</sup></b> <b>Personal Information protection law (PIPL)</b> <b>Cybersecurity law (CSL)</b> <b>Data Security Law (DSL)</b></p>	<p>Under PIPL, to transfer personal information outside of China, companies need an informed consent of the individual, conduct a personal information protection impact assessment, and ensure that the overseas recipients can provide the same level of protection as required under the PIPL.</p>	<p>Data localization is central to China's data governance framework. Mandatory localization requirements affect certain types of data considered “critical information infrastructure,” including financial information, personal data, health and medical data, mapping services, online publishing, and telecom.</p>
 <p><b>India</b> In recent year a number of bills were drafted (including <b>Data Protection Act, 2021</b>; <b>Data Usage Policy, 2022</b>). However as of May 2022 none has been passed and thus legislations in effect remains: <b>Technology Act (IT Act), 2000</b> and amendments in 2009. <b>The Rules, 2011.</b> <b>The Aadhaar Act, 2016</b></p>	<p>IT Act ensures the right to compensation for improper disclosure of personal information.</p> <p>The Rules have imposed additional requirements on commercial and business entities in India relating to the collection and disclosure of sensitive personal data or information which have some similarities with the GDPR.</p> <p>“Aadhaar Act” oblige entities in regulated sectors such as financial services and telecom to keep personal information confidential and use them for prescribed purposes.</p>	<p>The Rules provide that transborder data flows of sensitive personal data or information can be made to any other body in India or abroad if the same levels of data protection are adhered to. In addition, all information pertaining to payments data shall be stored in India.</p> <p>The proposed new regime for cross-border transfer of personal data, would require an explicit consent for outside transfer of sensitive personal data and in compliance with security standard.</p>
 <p><b>South Korea</b> <b>Personal Information Protection Act, 2011</b> (as amended in 2020) (“<b>PIPA</b>”).</p>	<p>PIPA provides some of the strictest personal information protection requirements in the world. More streamlined approach to personal data protection came into effect through 2020 amendments, particularly aimed at introducing the concept of pseudonymised data and opening up its use.</p>	<p>Any transfer of personal information abroad must be preceded by not only consent but also certain technical, managerial and physical protection measures.</p>
 <p><b>Singapore</b> <b>The Personal Data Protection Act, 2012 (“PDPA”).</b></p> <p>In addition, certain sector-specific laws such as the Banking Act (Cap. 19) and the Securities and Futures Act (Cap. 289) include provisions relating to the protection of certain personal data (such as particulars of accounts of customers of a bank).</p>	<p>The collection, use and disclosure of personal data is permitted where: (i) the individual has consented; or (ii) those activities are required by law. Alternatively, the collection, use or disclosure of personal data can be carried out without consent if it necessary for the purpose of legitimate interest or business improvement.</p>	<p>An organisation may only transfer personal data outside Singapore only if: (i) it will comply with the PDPA obligations in respect of the transferred personal data while it remains in its possession or under its control; and (ii) the recipient outside of Singapore is bound by legally enforceable obligations to provide a standard of protection that is comparable to that under the PDPA.</p>

Source: <https://itif.org/global-view-barriers-cross-border-data-flows>; <https://www.linklaters.com/>; <https://www.dataguidance.com/>



# Part I. Realizing the benefits of cross-border data flows

The digital economy, enabled by data flows generates economic value across many sectors and areas of economic activity, mainly by boosting innovation, enabling trade (new forms of trade and more efficient trade) and strengthening competitiveness, and supporting MSMEs and entrepreneurship, employment and user connection.

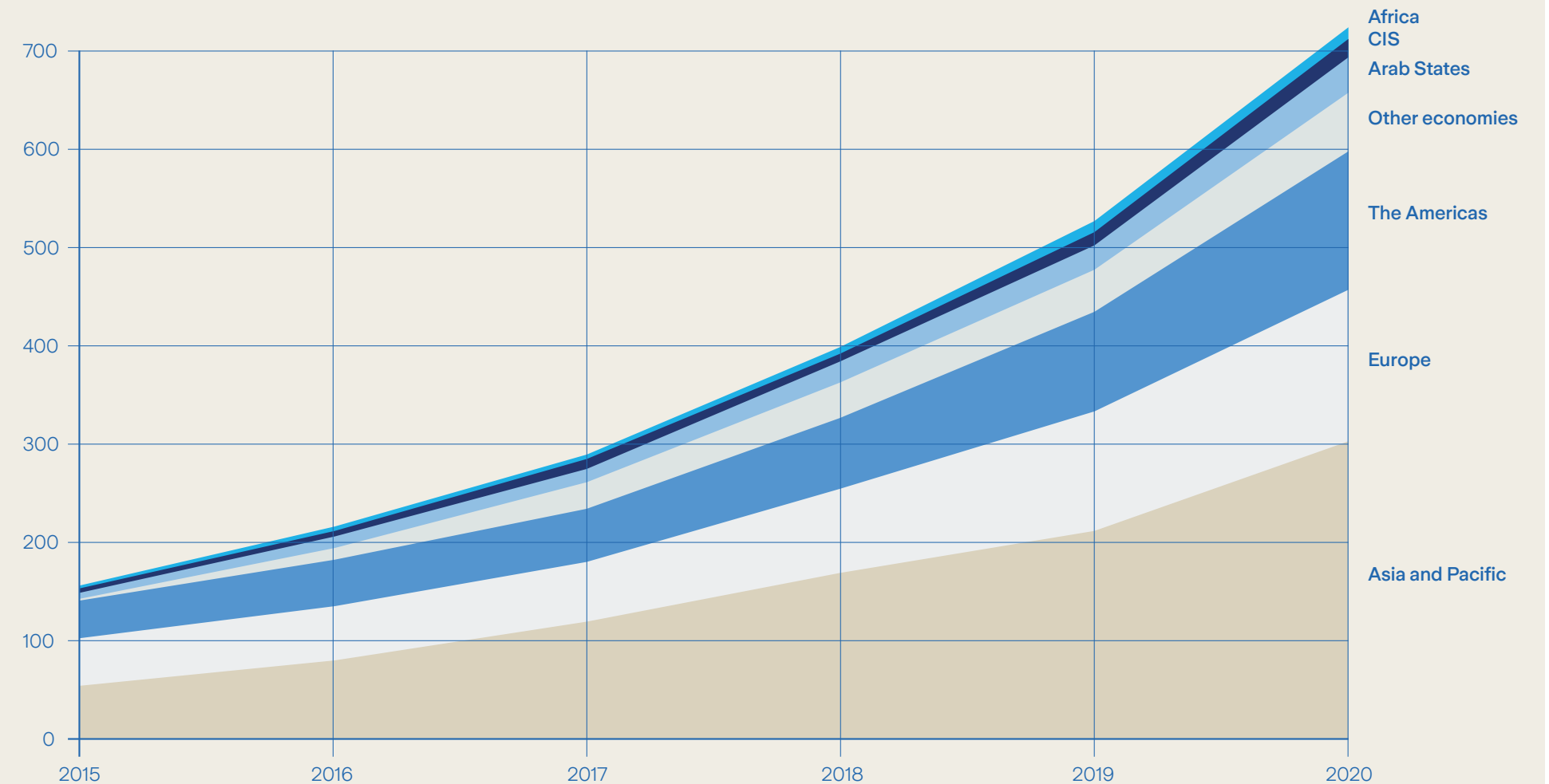
## ← Example. Data flows value creation in financial services

SWIFT Scope for Central Banks allows central banks to collect and analyze cross-border payment data more quickly and cost effectively, with customers benefiting from quicker response times.

Source: <http://dx.doi.org/10.1787/b2023a47-en>



Figure 3. Globally, total use of cross-border bandwidth is rising exponentially (Terabits per second)<sup>6</sup>



Source: UNCTAD calculations, based on ITU (2020) and ITU interactive report Measuring Digital Development, Facts and Figures 2020, available at [www.itu.int/en/ITU-D/Statistics/Pages/ff2020interactive.aspx](http://www.itu.int/en/ITU-D/Statistics/Pages/ff2020interactive.aspx).  
Note: Country groups are those of the source. Data for 2020 are ITU estimates.

## Enabling innovation and solutions to global challenges

Arguably the largest benefit of data flows is supporting innovation (see Figure 4), technological advances and digitization, which drive productivity and efficiency across areas ranging from healthcare to sustainability to public policy.

Data flows facilitate the creation of new products, services and business models and data-driven innovation within established business and operating models. Insurers can collate real-time data from travel providers or meteorological services to offer innovative tailor-made solutions to their customers when and where they most need them. Scientific advances rely on access to global datasets and advanced data-mining practices: for example, machine analysis of anonymized health datasets can speed up diagnosis and decision making for treatments e.g. cancer therapies, improve patient engagement and adherence;<sup>17</sup> it can speed up biomedical research, enabling faster delivery of life saving-solutions, as with COVID-19 vaccines.<sup>18</sup> Larger and more diverse datasets enable healthcare solutions to be more inclusive and accurate and necessitate the development of personalized medicine.

Data flows can accelerate international action on global challenges that require international cooperation, such as climate change and managing ecological systems.<sup>19</sup> For example, Ship Emissions Tracker uses open-source data to estimate the greenhouse gas footprint of merchant vessels.<sup>20</sup> Data flows improve transparency along supply chains, enabling better ESG monitoring as well as traceability to help with issues such as food safety.<sup>21</sup> Such data are critical to determine carbon emitted throughout value chains, as well as sector specific emissions. Police and security agencies rely on data flows to detect criminal activity and terrorist threats.<sup>22</sup>

Another example is agriculture: the recent innovations in AgTech, such as the deployment of sensors that connect agricultural machines to global data pools can enable farming practices to adapt more precisely to weather or soil conditions, increasing productivity and limiting negative social (e.g. food price volatility) and environmental impacts of food production such as pollution from fertilizers and pressure on freshwater supplies.<sup>23</sup>

Finally, startups, which are important drivers of innovation and a catalyst for growth, are usually created as digitally native companies and rely on data flows for their very existence and operations. A good example is Zesty, silver winner of the first Zurich Insurance Innovation Championship, which developed artificial intelligence-powered solutions, using cloud computing and very high-resolution satellite imagery, to help insurers better analyze climate change related risks such as wildfires and floods. Startups created USD 3 trillion of value globally during the first half of 2019, equivalent to a G7 economy.<sup>24</sup>



### → Example. Data flows value creation in Agriculture

- John Deere uses AI and the IoT to offer data-driven agritech solutions alongside the agricultural equipment it manufactures.
- Zurich's crop insurance business, which allows farmers to insure against risks such as lack of precipitation, depends on data availability.

Source: <https://insights.zurichna.com/featured-content?item=50>



### → Example. Data flows value creation in healthcare

- The UK's NHS outsources **MRI scan analysis** to Alliance Medical, which operates 200 sites across Europe.
- Hermes Medical Solutions offers **cloud-based medical image sharing solutions** in 30 countries, storing 95% of patient data in Sweden.

Source: <http://dx.doi.org/10.1787/b2023a47-en>



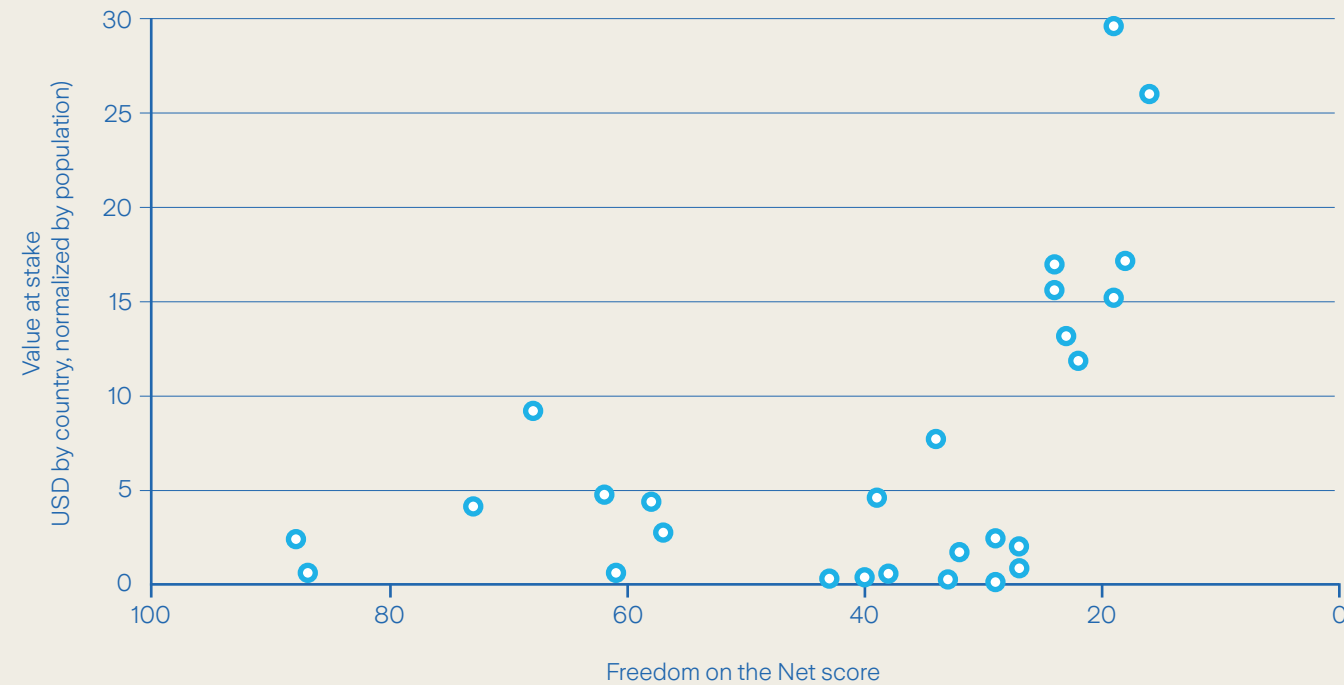
### → Example. Data flows value creation in the energy sector

- Shell's cloud-enabled global data centers aggregate data from around 10,000 sensors, co-developed with HP, that are placed in oil wells to provide seismic data that enable the company to locate new resources.
- Wind turbine manufacturers gather data from their installations around the world to optimize performance and minimize outages.

Source: <http://dx.doi.org/10.1787/b2023a47-en>

### Enabling innovation and solutions to global challenges continued

**Figure 4.** The relationship between a country's Freedom on the Net score and value that can be generated by the digital economy<sup>25</sup>



Sources: Authors' calculation; Barbier et al. 2016; Freedom House 2015; IMF 2015.  
 Note: Freedom on the Net scores range from 0 to 100, where 0 = most free, 100 = least free.

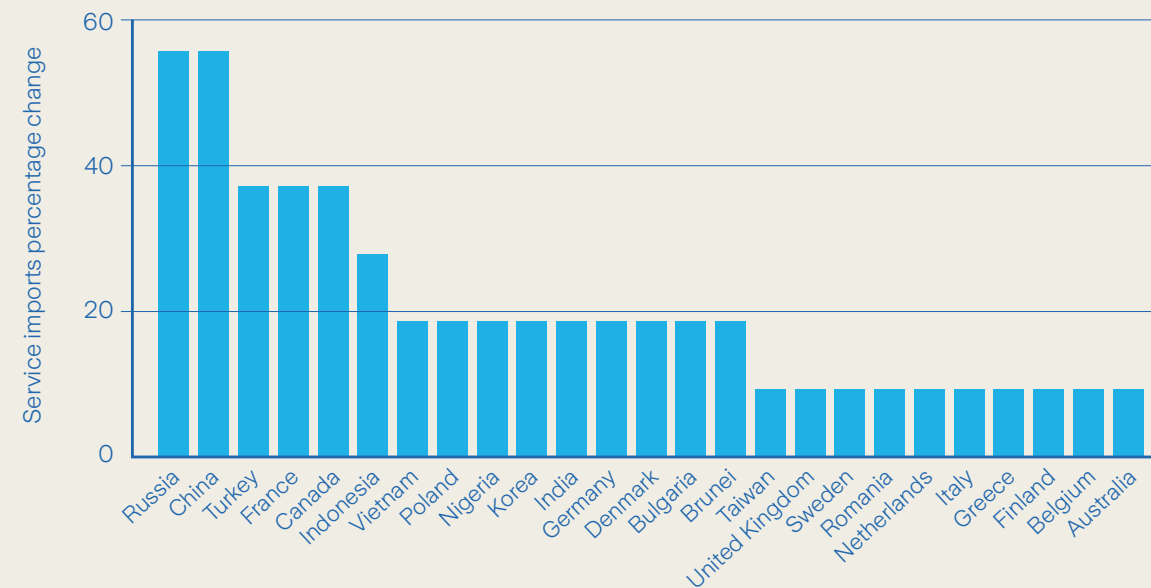


### Enabling new and improved forms of trade

The digital economy has supported globalization to a great extent over the past decades and is today an integral part of many countries' exports. In 2019, the U.S. exported USD 167 billion of digitally-enabled services to the EU and imported USD 130 billion in return.<sup>26</sup> Digital trade is the **fastest-growing area of global trade** over the past decade, growing 5.4% per year on average<sup>27</sup> and contributing more to global growth than trade in goods.<sup>28</sup>

Lifting restrictions on data flows would **increase trade in services by 5%**<sup>29</sup> (see Figure 5). While most data-enabled trade gains are reported in data-intensive sectors such as computer services, finance, insurance, telecoms and R&D,<sup>30</sup> harder-to-quantify gains in other industries include enabling the "servitization" of business models (see Box 4 for definition) – adding value for consumers of goods through data-driven service elements – along with efficiency gains in value chains, and new opportunities for economies of scale.<sup>31</sup> In insurance, which in the past had been predominantly focused on simply mitigating damages by ensuring replacement funding, there is a particular potential. By better capturing evolving circumstances in real time through expanded measurements, data-driven insights enable a reorientation towards prevention or limiting protection to when and where it is really needed.

**Figure 5.** Free data flows would increase services trade if countries lifted restrictions to their data-based services imports<sup>34</sup>



### Servitization – a definition

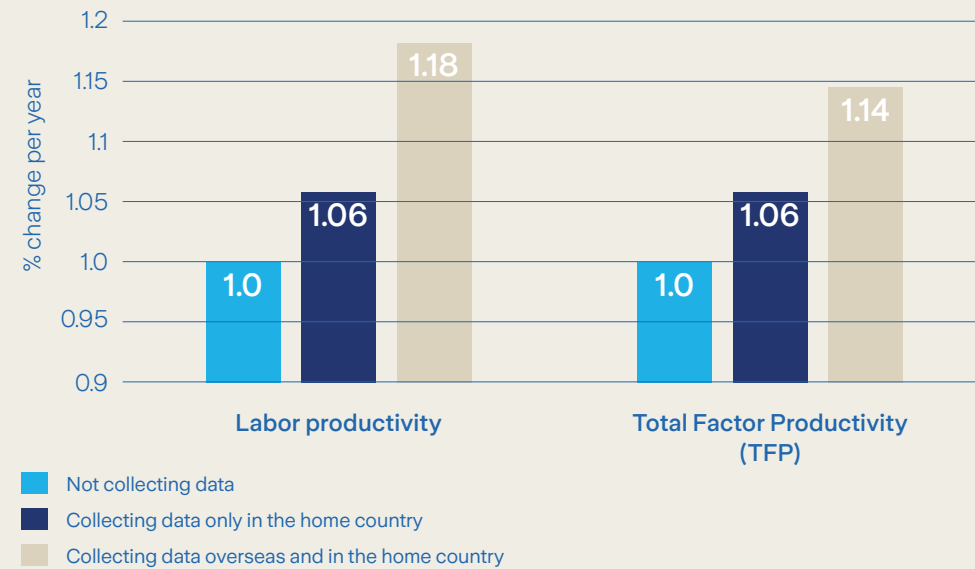
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Servitization refers to business models that sell a product as a service, rather than as a one-off sale. E.g., music streaming services versus record companies. It also covers add-value services offered by manufacturers post-sale, e.g., software add-ons offered by car makers.

Importantly, by reducing barriers to overseas markets, data flows enable more groups in society markets to benefit from trade, such as MSMEs (which we discuss in the next section) or female entrepreneurs.<sup>32</sup>

In future, the increased development and deployment of technologies built on data flows (e.g., following from distributed ledger<sup>33</sup>, such as blockchain, and similar technologies) will enable better monitoring of companies' global supply chains, reducing the environmental footprint of international trade and improving compliance with social and governance standards for traded goods and services. This will likely contribute to making trade more environmentally friendly and inclusive.

Figure 6. Firm productivity and data collection<sup>40</sup>



Employment

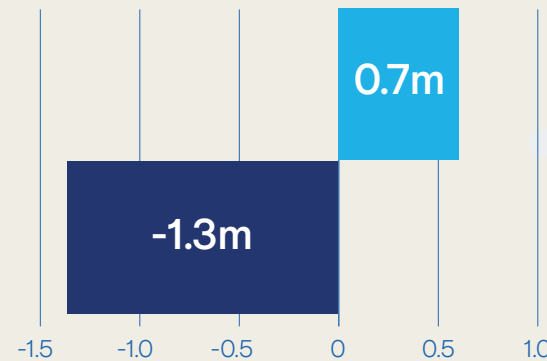
While automation is usually associated with displacing jobs, data flows can enable new employment opportunities. Digital Europe estimates that easing restrictions on data flows could generate 700,000 more jobs, while stricter policies could cost 1.3 million jobs (Figure 7) in Europe. Another study by the U.S. National Bureau of Economic Research finds that introducing the GDPR cost the EU up to 39,000 jobs, mostly affecting start-ups.<sup>41</sup>

The potential of data flows to create employment opportunities, notably in rural areas or in emerging markets has been enhanced by the pandemic, which accelerated the decoupling of employment from geographic constraints.<sup>42</sup>

A moderately restrictive scenario costs the EU 1.3 million high-value jobs – 1 in 7 of Europe’s high-tech employees

Number of employees gained or lost as a result of different scenarios (in millions)

Figure 7. Impact of data flows’ barriers on employment<sup>43</sup>



Data flows: A game changer for SMEs and entrepreneurship

While data flows are often associated with large multinationals, in many ways they put MSMEs on an equal footing with larger enterprises.<sup>35</sup>

One study finds that 60% of U.S. and European businesses with 50 or fewer employees indicate that data analytics are important to their operations, and that collecting data internationally as well as locally can triple the gains in terms of labor productivity (see Figure 6).<sup>36</sup> Data flows reduce MSMEs’ barriers to entry into new markets, enabling economies of scale, improving efficiency, and providing scope for further data-driven improvements in products and services. A survey of more

than 3,000 small business in developing countries finds that those selling online are much more likely to export.<sup>37</sup>

Data flows lower investment barriers for MSMEs, allowing them to access cloud services, knowledge platforms, CRM systems, skilled workers and customers globally at lower cost.<sup>38</sup> They facilitate access to know-how and market information that improves their ability to specialize and compete with larger firms. They have enabled the emergence of **new forms of “micro-multinationals”** – innovative MSMEs that set out to serve global markets from the outset.<sup>39</sup>



Example. Data flows value creation in education

New York-based learning platform Knewton uses an algorithm to adapt learning content to a student’s needs in real time, based on data about the learning patterns of its 10 million students across 190 countries.

Source: <https://teachnet.ie/2016/01/adaptive-learning-platforms/>



### Deep and broad gains from data flows

Gains from **data flows increasingly go beyond the traditional data-intense sectors** operating with internationally accepted, common data standards, such as finance and telecommunications. As the global economy becomes more connected, data flows are becoming more integral in all sectors.<sup>44</sup>

As shown in Figure 8, analysis of the impacts of free versus firewalled data flow scenarios for EU exports indicate that the most-affected sectors in proportional terms are IT, media and culture. However, the biggest costs and benefits in absolute terms are found in the manufacturing

sector. In part this reflects the potential for data to enable **servitization** and in part as data collection creates more potential to innovate, reduce costs and improve productivity.<sup>45</sup>

Servitization is spreading to other industries, not least the insurance sector; cross-border data flows enable insurers to offer preventive solutions, on demand and structured as fee-based models to protect property, plant or people. This shift to preventing harm as well as insuring loss creates greater economic and social benefits for both the insurer and the insured.

Critical EU industries are in the line of fire. Manufacturing is hardest hit in absolute terms, while ICT, media, culture, business services finance and telecoms each lose 10% of their exports.



#### Example: Data flows value creation in construction

A large cement manufacturer has a data center in Denmark that collects and analyzes data from the 50+ countries where it operates to inform its development of cement types.

Source: <http://dx.doi.org/10.1787/b2023a47-en>

It is important to recognize that metrics of data flows are still under development and not harmonized making it difficult to assess and leverage the many and diverse types of valuable insights created (see Box 5).



#### Example: Data flows value creation through insurance

Zurich's **Freely** combines mobile GPS location, flight and customer data to offer overseas travel insurance coverage in real-time.



#### Example. Data flows value creation through servitization

BMW offers "CarData," a set of individually tailored customer services based on car-generated telematics.

Source: <http://dx.doi.org/10.1787/b2023a47-en>

**Figure 8.** Comparing free vs. firewalled scenarios for cross-border data flows in the EU<sup>46</sup> % of decrease/increase of sector exports for negative and optimistic scenarios<sup>47</sup>

	Negative	Optimistic
IT	-12.4%	6.9%
Media	-11.5%	6.0%
Culture	-10.3%	5.6%
Other business service	-8.7%	4.4%
Finance	-8.3%	4.3%
Telecoms	-8.2%	5.4%
Manufacturing	-5.1%	2.7%
Transport	-2.5%	1.2%
Construction	-2.4%	1.2%
Wholesale and retail	-2.3%	1.2%

Absolute € value of increase/decrease of sector exports for negative and optimistic scenarios

	Negative	Optimistic
Manufacturing	-61,137	32,975
Other business service	-17,421	8,814
IT	-9,926	5,476
Finance	-8,725	4,530
Wholesale and retail	-6,657	3,428
Transport	-6,573	3,288
Media	-1,758	1,004
Culture	-1,693	919
Telecoms	-1,692	1,119
Construction	-125	64

5

### The metrics challenge: how to measure value creation through cross-border data flows

The concept of a “data value chain” is helpful for thinking about how economic value is derived from data: i) collection, ii) aggregation, iii) analysis, and iv) use and monetization. However, measuring that value is a challenge. Many sectors lack the kind of standard nomenclature for data that exists in areas such as international finance. Official data on data flows is often limited. And valuable exchanges are often invisible: it is intrinsically hard, for example, to measure how firms use data to inform improvements in their operations and innovation in products and services.



Source: <https://www.oecd-ilibrary.org/docserver/6345995e-en.pdf?expires=1651776321&id=id&accname=guest&checksum=83CC494BD13BA0996BCFB63BD1F2CC16>



# Part II. Data flows: managing country concerns in an increasingly digital world – governance challenges

Many countries are implementing or advocating stricter regulations on data, for multiple reasons: privacy, which is often considered a human right (e.g., India, EU), consumer protection (e.g., U.S., EU) or information security (e.g., China). In some cases, restrictions are used to ensure states can enforce access to data they deem important to foster innovation (e.g., EU).<sup>48</sup>

The underlying concerns are often legitimate: individuals and consumers are at risk from unethical use of their personal data, while some national security needs (notably cybersecurity) and coordination at the international level also require intervention. However, there is a risk that these justifications are used as a cover for protectionist motives. Given the complexity of data flow regulations and their considerable impact on the economy, these can be easily used to protect narrow interests at the detriment of the society. In many areas, the challenge is that a blanket approach is taken. Cyber risks to critical infrastructure are real, but a refined regulatory response does not treat data from smart meters in the same way as data concerning large utility facilities.

## Recognizing the legitimacy of privacy concerns

The most sensitive type of data is sensitive personal data (SPD), or personally identifiable information (PII, see definitions in Box 6) as per the EU and U.S. definitions respectively. As shown by Figure 9, it is also the most widely regulated type of data involved in data flows. In some sectors, it is a challenge to separate PII from the kind of non-personal data needed to maintain and improve operations, products or services – but meeting this challenge is pivotal to any successful data governance framework.

Individuals can reap many benefits from choosing to share their personal data: it can enable companies to deliver a better consumer experience, provide more personalized services (e.g., in healthcare and education), and create social benefit (e.g., through improved real-time data on traffic). A growing number of industries are integrating personal data to expand their service and product offerings, and over 99% of businesses agree that protecting their customers' privacy is a key element in building trust.<sup>49</sup>

## 6 Sensitive Personal Data (SPD) and Personally Identifiable Information (PII)

SPD – “personal data revealing racial or ethnic origin, political opinions, religious or philosophical beliefs, or trade union membership, and the processing of genetic data, biometric data for the purpose of uniquely identifying a natural person, data concerning health or data concerning a natural person's sex life or sexual orientation.”

PII – Information that can be used to distinguish or trace an individual's identity, either alone or when combined with other information that is linked or linkable to a specific individual.

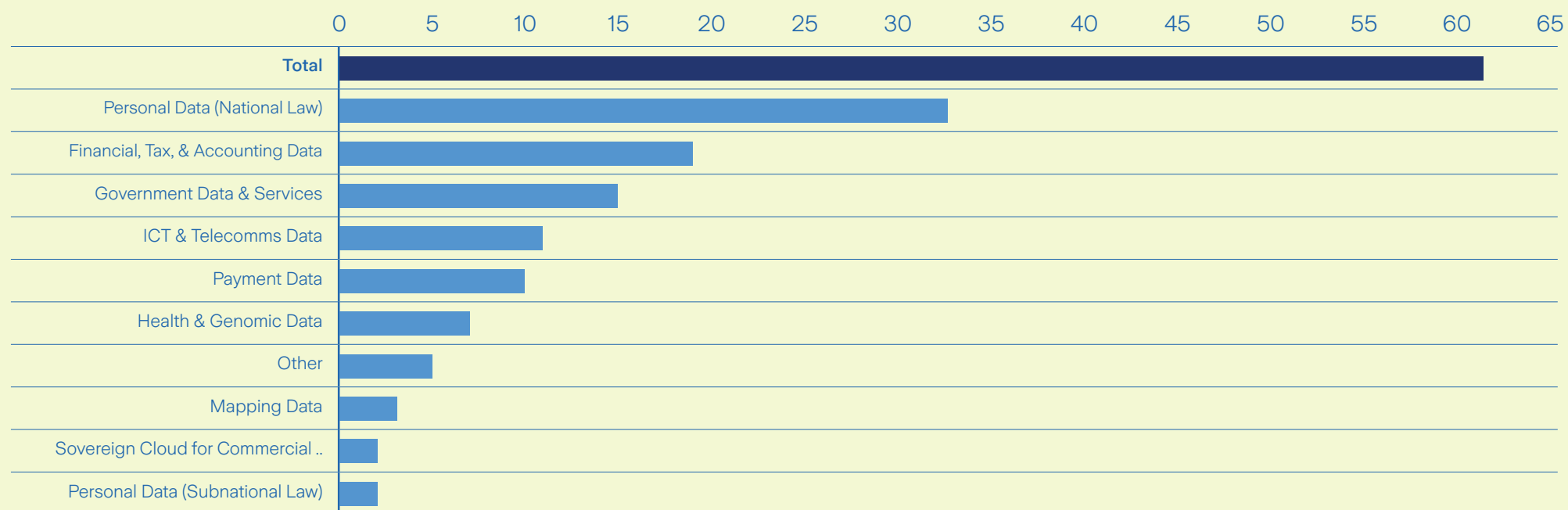
Sources:  
<https://gdpr-info.eu/art-9-gdpr/> and  
<https://csrc.nist.gov/glossary/term/PII>



However, individuals are also increasingly giving away their data without realizing the extent of the impacts it can have on their life. In particular, online marketing and CRM tools across multiple platforms are increasingly used not just to target information but to actively influence the preferences and decision-making of users.<sup>50</sup> Even within jurisdictions, the scope for linking data across various aspects of an individual's habits – as a consumer, at work and socially – can raise the risk of potential harms such as financial fraud and identity theft.



**Figure 9.** Number of countries imposing barriers to International data flows by type of data.<sup>51</sup>



Altogether, there were 144 data-localization measures in force around the world as of July 2021. Some of these enacted policies affect more than one type of data, so the total count of barriers by data type is greater than the sum of the enacted barriers.

Governments need to balance competing considerations: the principle of data sovereignty, or the individual's right to take ownership of how much of their lives they want to share publicly,<sup>52</sup> the difficulty individuals face in fully appreciating the consequences of data sharing; and the economic case for responsible data-driven innovation. Many, however, have imposed regulations that override individual preferences, rather than seeking to enable individuals to make more informed decisions by equipping people with better data literacy skills and encouraging more transparency in data processing.<sup>53</sup>

Companies can and should guarantee control and transparency for customers through dynamic consent models and easy-to-use proxy systems that give individuals authority to channel data flows as they prefer.<sup>54</sup> Companies and organizations working with sensitive health and genetic data often use dynamic consent models.



← **Example. Creating trust with dynamic consent**

The rare diseases research programme, RUDY, at the University of Oxford uses technology to enable participants to decide how much data they share, with whom and for what purpose.

Source: [https://rudystudy.org/what\\_is\\_rudy](https://rudystudy.org/what_is_rudy)

**Zurich data commitment**

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In September 2019, Zurich announced an industry-leading global data commitment. The four promises made to our customers are to:

- Keep their data safe
- Never sell their personal data
- Not share their personal data without being transparent about it
- Put their data to work so Zurich can better protect them, and so they can get the most out of life.

More info on our [website](#)







### National security: Legitimate concerns versus misapprehensions

Another frequently articulated reason to regulate data flows is national security concerns, which often is the key concern behind data localization measures.<sup>55</sup> Common risks that countries want to protect themselves from by introducing data localization requirements include:

- **Cyber espionage:** restricting data from leaving national borders makes it harder for other countries to monitor communications considered of national security interest.
- **Cyberattacks on critical infrastructure:** restricting data flows can help to protect critical infrastructure from cyberattacks that originate in other countries.
- **Terrorist threats:** keeping data local improves a government's ability to identify possible terrorist threats and prevent attacks.
- **Monitoring systemically important entities or activities:** central banks and regulators need oversight of banks and payment systems to safeguard financial systems.

In reality, data localization does not solve any of those issues – in fact, it can make them worse.<sup>56</sup> Only a complete ban on data exiting a country might significantly affect the likelihood of espionage. International data infrastructure providers may have better security than local providers, resulting in better protection for critical infrastructure against cyberattack – and cross-border cloud storage can make systems more resilient to targeted physical attacks on local data storage centers. When local police analyze only local data, they may miss out on criminal activities that increasingly have an international dimension, such as terrorism.

Ultimately, if a country is connected to the web, no regulation will be able to safeguard it fully from cyberattacks<sup>57</sup> – and diverging laws in different countries can compromise

cybersecurity efforts. While insurance solutions for cyber-risks exist, widespread cybersecurity incidents can result in cumulative losses that far surpass premium policies, so private risk transfer mechanisms are not sufficient. A rise in such cyber-incidents will require some form of government policy response. Studies show that more effective ways to strengthen national cybersecurity include robust security standards, multifactor authentication and encryption techniques.<sup>58</sup>

More broadly, cybersecurity necessitates ongoing investment in technologies and expertise and active efforts to instill cybersecurity awareness and behavior, i.e., good “cyber hygiene,” among users, clients and citizens. Several jurisdictions already promote higher standards of cybersecurity behavior in their legislation, e.g. the EU's Digital Operational Resilience Act (DORA) or the U.S. Cyber Incident Reporting for Critical Infrastructure Act.



### Geo-economic realities and data flows

Governments may cite geo-economic pressures as a reason for data localization regulations: some believe that keeping control of data in the hands of domestic companies can safeguard local labor markets by giving local firms the time and opportunity to catch up with more advanced international competitors.

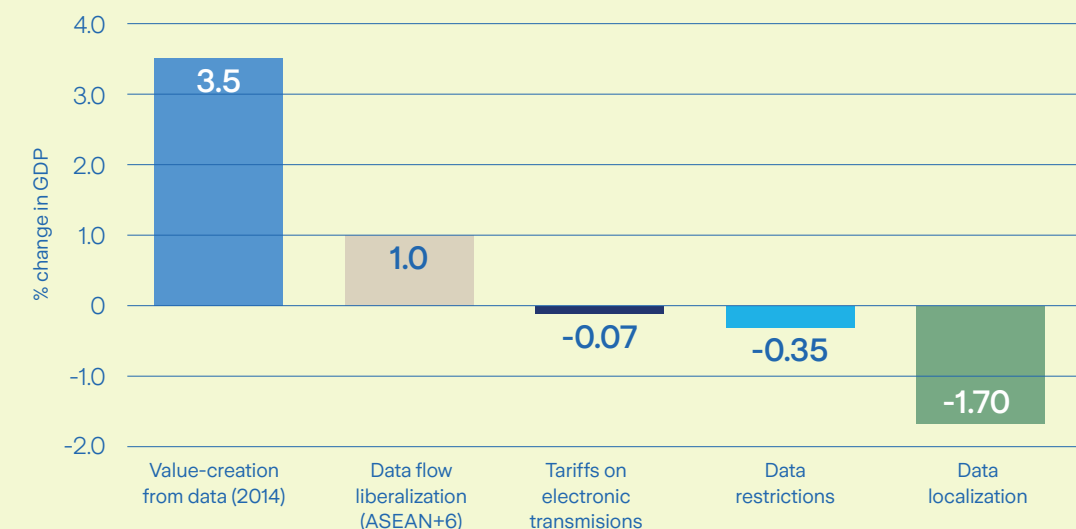
However, this belief tends to ignore the opportunity cost of restricting data flows: any benefit that initially accrues to local businesses is likely to be outweighed by missing out on the opportunities outlined above to reach new markets and improve products and services (see Figure 10). The International Technology and Innovation Foundation estimates that data localization measures introduced by China between 2013 and 2018 reduced its trade output by 1.7% and productivity by 0.7%, and increased prices in downstream data-dependent businesses by 0.4%.<sup>59</sup>

Data localization regulations can increase computing costs for companies – in some countries, by an estimated 30-60%.<sup>60</sup> Studies also question the assumption that restrictions on data flows protect local jobs. Data centers are becoming more automated and

employing fewer people, and gains are limited when weighed against missed opportunities from being part of a more globally connected market.<sup>61</sup> Countries would be better advised to focus on improving competitiveness through investments in digital education and infrastructure.<sup>62</sup>

Governments sometimes argue that localization improves lawmakers' oversight of national data. However, as noted by the Global Financial Markets Association, financial institutions can ensure government access to data regardless of where the data is located.<sup>19</sup> The Financial Stability Board has warned that restrictions on data transfers may actually undermine regulators' ability to perform their supervisory role. When hyper-localization is explicitly aimed at enabling surveillance, it can also raise the risk of abuses of power – and when democratic states enact such regulations, it legitimizes their use in autocratic states.<sup>63</sup>

Figure 10. GDP impact of liberalization vs restrictive policies on cross-border data flows



Source: McKinsey Global Institute, Digital globalization: The new era of global flows, 2016, using data provided by Telegraphy; U.S. International Trade Commission, Digital Trade in the U.S. and Global Economies, Part 2, 2014; Forthcoming study by S. Evenett and H. Lee-Makiyama, “The Costs of Data Localization”, ECIPE, 2014; H. Lee-Makiyama and B. Narayanan, “The Economic Losses from Ending the WTO Moratorium on Electronic Transmissions”, ECIPE, 2019.



# Conclusion: Space for a new global architecture

A global agreement, for example under the auspices of the World Trade Organization (WTO), seems currently out of reach, nevertheless there is an opportunity to create a forward-looking global architecture for data flows. Some multilateral efforts are under way to make compliance more manageable, to reap the benefits of cross-border data flows.

The U.S.'s Trans-Atlantic Data Privacy Framework focuses on personal data. Under this framework, the U.S., Canada, Japan, Singapore, Taiwan and South Korea are creating a Global Cross-Border Privacy Rules (CBPR) Forum. The EU's Data Governance Act covers any data, facts, information or personal data, and aims to boost data sharing among the public sector bodies of member states. Switzerland and Singapore have issued a forward-looking Joint Statement of Intent covering three principles: (i) enable cross-border data-flows for the conduct of licensed/authorized business; (ii) support the free choice of location for data storage and processing; and (iii) protect confidentiality and privacy of customers.<sup>64</sup>

These and other initiatives share characteristics that can inform not just bilateral or multilateral efforts but also a global framework. In brief, such a framework could be shaped around the following principles.



## Principles of global architecture for cross-border data flows

- **Data flows by default** – limit data localization to defined/specific circumstances.<sup>65</sup>
- **Consent and transparency** – the rights and responsibilities of individuals to share, retract and protect their data, particularly personally identifiable information (PII).
- **Data portability and integrity** – standards to improve data portability and ensure data integrity.
- **Cybersecurity and systems resilience** – best practices for security protocols, data protection, and shared cyber risk-monitoring/responses.
- **Current and future interoperability** – common technical standards, future-readiness for novel technologies/solutions.
- **Accountability and trust** – accountability of data providers, controllers and processors for security and confidentiality.
- **Education and awareness** – the importance of personal cyber behavior and data literacy in a digital world.

The full potential of data flows is still far from being realized, and the increasingly complex and fragmented regulatory landscape creates the risk that it may never be realized. There is a need to establish trust across stakeholders, to provide greater legal certainty for firms and to improve the interoperability of regulatory frameworks. More effective measurement to better understand how data flows contribute to growth and prosperity would help to clarify the need for a coordinated dialogue about how to safeguard privacy and security while reaping the economic and societal benefits of sharing data within and across borders.

Multilateral agreements, such as Singapore's Digital Economy Agreements (DEAs)<sup>66</sup> with Australia and the UK, address some of the risks and costs of a highly fragmented regulatory environment but everyone – countries, companies and citizens and consumers would all benefit from an overarching set of global principles around a common understanding of how to regulate such an important area for the future.

Establishing such a global architecture requires a concerted effort from governments, regulators and business. These efforts must be orchestrated for speed. The foundation is a dialogue around these principles to build a common understanding of what is at stake, where standards are required, and the solutions available to address ideological, privacy, security and technical concerns. Existing forums, such as the G20 and B20, the G7, and organizations such as the OECD, International Chambers of Commerce or the World Economic Forum, all offer platforms for discussion.

Aligning a workstream and discussion series around existing structures could speed up the process to design and agree on a global architecture that captures the economic and social benefits of smoother cross-border data flows. Advances in data-driven productivity and innovation wait for no one.





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