pugatchconsilium

AT THE CUTTING EDGE

The Value of Cross-Border Data to Consumers, Companies and Governments

CONTENTS

FIGURES, BOXES AND TABLES

CONTENTS (cont.)

LIST OF ABBREVIATIONS

B2B	Business-to-business
B2C	Business-to-consumer
BRICS	Brazil, Russia, India, China and South Africa
ICT	Information and communications technology
IT	Information technology
ISP	Internet service provider
OECD	Organisation for Economic Co-operation and Development
SME	Small and medium-sized enterprises
UNCTAD	United Nations Conference on Trade and Development
VOD	Video-on-demand

EXECUTIVE SUMMARY

Imagine a day without the free flow of data around the globe. What if data was not allowed to cross borders? It would significantly alter our day-to-day lives. Many of the tasks and activities we take for granted every day would probably become a lot harder, if not impossible.

Limitations on cross-border data would also severely limit the way we conduct business – for start-ups and large multinational firms alike. Moreover, future prospects for a world-class education, enhanced job opportunities, improved health and long and productive lives would suffer for many people.

This report considers the value and applications of cross-border data in different countries around the world today. It analyzes a wide range of personal, social and economic benefits of cross-border data flows as well as enabling and deterrent factors of these flows.

The value of cross-border data to individuals

Cross-border flows of data are ingrained in countless services that people depend on today. Numerous digital, automated and virtual services rely on the movement and storage of data in various locations. As a result, it is much easier, affordable and convenient to conduct daily activities and realize social benefits. The report explores several areas in which individuals gain from cross-border data, including:

- **Convenience and affordability:** Personal services, such as banking, telecommunications, health care and social networking, can be processed and stored in the most convenient and cost-effective manner, making many everyday tasks much easier and communities more accessible.

- **Globalization of services:** People can make digital purchases and access a wide variety of information and services, such as entertainment, insurance and educational courses, from competitive providers around the world.

- **Data-driven innovation:** Data collected from different countries can be an input or basis for new innovations and technologies, such as how mass analysis of health records across countries aids in the development of new medicines.

The role of cross-border data in economic activities

At the microeconomic level, business services that depend on cross-border data, such as cloud computing and online marketplaces, enable the establishing of new firms, streamlining of operations and growth of companies. The report outlines examples of:

- **Business creation:** Start-ups using cloud-based services instead of purchasing physical IT infrastructure significantly reduce their capital investment and streamline their operations.

- **Entry into new markets:** Large and small businesses with cloud-based operations face only marginal costs to expand across borders or access global supply chains. In addition, for small firms, e-commerce platforms simplify the process of exporting their products.

FIGURE 1: The Role of Cross-Border Data in Business Start-Up, Operation and Global Expansion

	Scenario 1 (without cross-border data)	Scenario 2 (with cross-border data)
	1. Cloud computing and global telecommunications have massively reduced the capital investment and time required for starting a business.	
Stage 1: Business Creation		
	2. Cloud computing allows businesses to secure their operational needs from a single service, rather than several different suppliers.	
Stage 2: Business Operation		
	3. Online marketplaces and cloud-based services enable businesses to export their products to previously inaccessible markets.	
Stage 3: Business Growth		

At the macroeconomic level, empirical evidence from the UNCTAD database of international trade statistics indicates that data has become an integral part of global trade flows, and is even driving trade between countries, particularly in services. Based on analysis of figures on trade of ICT-enabled services (which include communications, insurance, financial, and computer and information services) the report finds that:

• close to 90% of India's service exports and over 60% of Brazil's service exports utilize data;

• the growth of ICT-enabled service exports is outpacing the growth of other service exports as well as goods exports in many developed and emerging economies; and

• by facilitating strong global trade flows, the movement of data across borders is also enabling countries to build up competitive domestic industries and boost local jobs.

Impediments to cross-border data flows

In view of the many personal, social and economic benefits that cross-border data flows bring, the implications of limiting these flows are significant and far-reaching. While the movement of data across countries and regions raises legitimate concerns about data privacy it is important not to ignore or jeopardize the ability of individuals, economies and societies to realize the value of cross-border data. The

report outlines several impediments to cross-border data flows that countries should seek to avoid, including policies that:

• do not account for the value obtained from applications of cross-border data to personal, social and business services;

• place undue burdens on providers of data transfer, storage and processing services; and

• discriminate against certain sectors or parties involved in cross-border flows of data.

The way forward

As policymakers chart a path towards safeguarding data, it is critical that they consider the full range of benefits of cross-border data as well as what types of policies would impede these benefits.

Policymakers should take into account how data policies affect the complete "life cycle" of data, from its generation and collection, to its processing and storage, and ultimately to its utilization and its transformation into new applications. It is vital that policy frameworks enable data to move as freely as possible at each phase of this cycle, such as allowing data to be securely transferred and used in different locations and permitting access by end-users worldwide, if people around the globe are to continue to realize the value and benefit from the services that are based on cross-border data today.

1 THE MAGNITUDE OF CROSS-BORDER DATA TODAY

The concrete implications of cross-border flows of data

We tend to take the use of data for granted. But imagine a world in which access to data is significantly restricted.

In such a world, for instance, many people who are currently able to complete a higher education degree would face difficult choices. Today people living in places without access to world-class education can still obtain it through distance learning programs offered by top-ranked universities and available online. Without the ability to access these programs, these individuals would have to physically attend these universities. Mostly likely, they would have to give up their dream of higher education and improved prospects for the future.

For small business owners limitations to the use of data also raise huge challenges. Currently, to manage their data and operations many small business owners rely on cloud computing and e-commerce platforms that do not always have a physical presence in the countries in which the small businesses are located. Without the ability to access these services, these small business owners would invariably be confined to their local markets and to running small enterprises.

Patients too would encounter difficulties in a world where the use of data is greatly reduced. At present, with sophisticated databases linking different health care providers and electronic medical records patients may access their medical history and health information whenever and wherever they need it. If, for instance, a patient is traveling abroad and has to be hospitalized, his or her recent medical history and tests may be easily shared with the local physicians – saving a great deal of time and resources, and most importantly, improving his or her chances of survival. However, without automatic access to this data, it could be much more time-consuming and burdensome to provide the foreign healthcare team with his or her medical chart, delaying the necessary care and treatment.

As these anecdotes illustrate, data is at the heart of a wide array of services we rely on today – from routine tasks and activities to complex business processes. The ability to use data from anywhere in the world, and manage this data where it is most cost-effective has revolutionized the way we live our daily lives, do business and access public services.

The phenomenon of "borderless" data has enabled unprecedented efficiency and economies of scale in key sectors and for a myriad of businesses. The aggregation and mass analysis of data is also driving innovative discoveries that streamline operations and shape new futures across society.

Moreover, global trade flows involving digital data are providing real economic value across the globe, building competitive sectors and creating local jobs. Indeed, developed and emerging economies alike already derive a significant proportion of trade from knowledge-based sectors.

While the movement of data across countries and regions raises legitimate concerns about data privacy and the role of governments in protecting sensitive data, nevertheless in addressing these concerns it is important not to "throw the baby out with the bath water". It is crucial to ensure that data privacy policies and national considerations in this respect do not jeopardize the ability of economies and societies to benefit from cross-border flows of data.

Accordingly, this report outlines a wide range of personal, social and economic benefits of cross-border data, as well as presents a blueprint for shaping environments that enable these benefits to be fully realized while safeguarding data privacy.

Cross-Border Data:

The movement of data as part of commerce, communication, public services, social networking, entertainment and other facets of the economy from one country to other countries.[1]

The global movement of data

Today it is commonplace for people, businesses and other entities to access information and services in different countries from where they are located. In many cases, it does not matter where the data we seek originates from as long as it matches what we need at an affordable cost. Yet at the same time we expect to be able to obtain what we are looking for instantaneously regardless of its physical location.

Global access to data exists through numerous platforms and technologies that link service providers and end-users (whether these users be private individuals, firms, public bodies or non-profit organizations). Take, for example, the world's 5000+ network carriers or Internet service providers that connect various networks and devices around the globe.[2] Significantly, many of the networks that make up the Internet run across countries and continents. Thus, the actual, physical plumbing and infrastructure that makes the Internet possible is inherently borderless and trans-national. A 2013 OECD study finds that on average a given carrier has 33 agreements with other carriers, the majority of which agreements are with carriers in other countries.[3]

What types of data are moving over international networks? Broadly speaking, it is possible to identify several kinds of data flows, including:

- **Web browsing:** such as searching for and viewing websites for the purpose of obtaining information and services;

- **File-sharing:** such as documents, spreadsheets and databases shared within an entity, between entities or between private individuals, whether involving an intermediary or directly transferring files between users;

- **Email:** sending and receiving emails;

- **Chat and messaging:** real-time, text-based conversations using various platforms such as "chat rooms" or instant messaging services;

- **Audio or voice:** such as voice-based conversations and live or recorded broadcasting or performances; and

- **Video:** such as teleconferencing or entertainment, media, advertising or education-based videos.[4]

Different types of data vary in the extent to which they are utilized as well as their size. Video files can be very large in size and take up a larger amount of bandwidth than other types of data.[5] For example, based on a somewhat different categorization, the Cisco Visual Networking Index estimates that two-thirds of all Internet traffic worldwide can be attributed to video usage (by both businesses and private individuals).[6] Moreover, as Figure 2 outlines, according to the Index, file-sharing and web browsing, email and transfer of data not in files represent equally heavy traffic data flows.

FIGURE 2: Types of Data as % of Total Global Data Traffic

0.1%

15.7%

17.7%

66.6%

■ Video   ■ Web, email and data   ■ File sharing   ■ Gaming
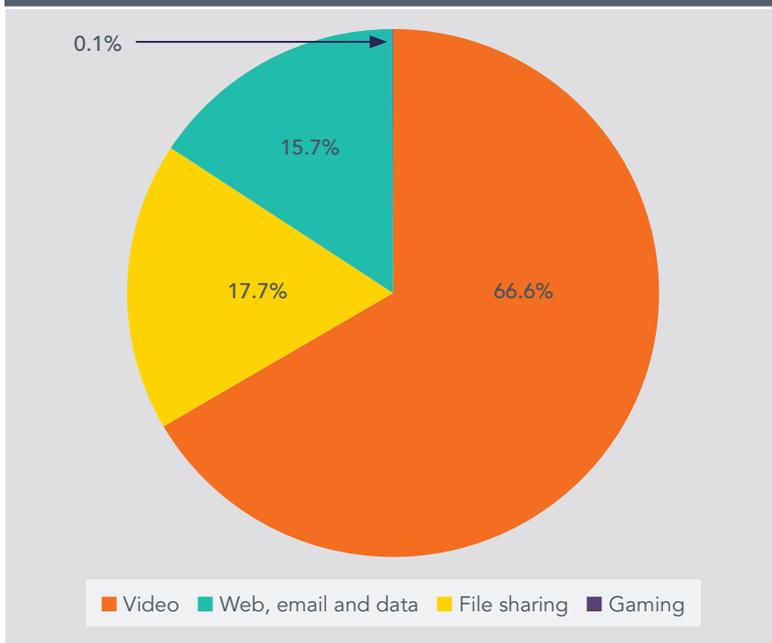
Source: Cisco Visual Networking Index (2013); Pugatch Consilium Analysis

The global processing and storage of data

Today data in its various forms is not only being transferred between users and service providers, but also processed and stored. Massive amounts of computing power and hardware are needed to compute and save all of the data generated to meet the current and future levels of information-based activity. Both the sheer amount and the complexity of data are constantly increasing; this requires corresponding data capacity – to collect, process and store the data.

For example, a computer hardware and software company supplying businesses with desktop computers might have to:

- gather client data (including their business processes and demands, company size, clientele as well as payment information and other pertinent financial information, etc);

- analyze this information in order to design and construct for every client the requested number of desktop computers in line with the needs of each business; and

- store all data on clients (including the above business information and client-specific designs as well as information generated from future interactions with the client such as software licensing agreements and IT support records).

Companies may build and manage their own infrastructure for processing and storing data or they may outsource it to specialized companies with large centers capable of holding, computing, sending and receiving large amounts of data. The virtualization of processing and storing data – also known as "cloud computing" – and the extensive web of networks for moving data around the world today allow companies to run data centers close to their physical operations or a country – even a continent – away.

Due to heavy energy and complex IT infrastructure requirements, it is often more efficient and secure to consolidate data centers into regional operations, with for instance, one data center serving several major countries.[7] To illustrate, Google, rated the most popular website in 62 countries, has only 12 data centers worldwide – 6 in the US, 3 in Europe, 2 in Asia and 1 in Latin America.[8] The data services provided by Google in a given country are therefore not likely to be operated in that country (with the exception of the US).

Demand for cloud computing services and for platforms facilitating the movement of data around the globe have skyrocketed in the last several years.[9] In fact, as the next section will show, businesses and services that rely on the ability to move data globally over the Internet have now become woven into our social fabric – providing day-to-day conveniences, driving our economies and fundamentally changing lives.

2 THE BENEFITS OF CROSS-BORDER DATA

A myriad of services and activities in a wide range of sectors operate using cross-border movement of data. The ways in which we are released from the confines of time and space through the movement of data around the world has introduced unprecedented convenience, efficiency and opportunity.

Using mobile, tablet, laptop, desktop and other computing platforms, we can access a virtual "one-stop shop" for much of our daily tasks, needs and wishes. At the touch of a screen, we can make most purchases, pay bills, listen to music, view our medical charts or submit homework, to name a few activities.

Moreover, in many senses physical location does not represent a barrier to accessing new technologies and social innovations. With some remaining exceptions, the cross-border flow of data has become a social and geographical equalizer. More and more, someone living in a remote or rural part of the world has the possibility of obtaining the same information, services and opportunities as someone living in a metropolis. The mass collection of data from an entire region or across the globe also sharpens our ability to understand the world – we can concentrate our knowledge without being physically concentrated – and brings benefits that would not otherwise be available.

Macroeconomic data validates that these phenomena are increasingly becoming the norm in many developed and emerging economies. The growth and value of competitive sectors, including in the BRICS, are already evident in recent statistical data.[10]

Through a combination of anecdotes and statistics, this section will explore in more depth how cross-border movement of data brings us to the "cutting edge" in different aspects of our lives, regardless of where we live. It will also examine how cross-border data flows are building a foundation for realizing these benefits over the long-term, through fueling the growth of our economies and driving new discoveries and innovations.

In this section, the anecdotes are intended to showcase how much data crosses over borders behind the scenes of so many activities and operations we now take for granted and benefit from daily. By bringing cross-border data "to life", these stories and examples complement the statistical data also discussed in this section, which focuses more on the wider, macroeconomic value generated by cross-border data. It is important to note that the anecdotes discussed are based on actual, published business cases, or created based on publicly available information concerning the way relevant sectors, businesses and services operate.

E-commerce

Online retail sites and marketplaces have tremendously eased the process of shopping, making it possible to make many purchases without leaving our home or office. Most personal, household and small-business items are today available from a wide range of e-commerce sites, from specialty and high-end boutiques to marketplace behemoths like Amazon.com, eBay, Taobao (in China and several nearby countries) and MercadoLibre (in Latin America). It is possible to buy products from businesses as well as from other consumers, such as via online auction sites like eBay. Other sites offer business-to-business services, like the Chinese giant Alibaba.com.

E-commerce involves cross-border data flows in several ways. Though somewhat limited by the costs of shipping (for physical goods) and potentially by customs duties, it is possible to purchase goods from a retailer located in another country and have it delivered to our doorstep by post. Even if the retailer or

distributor of a purchased product is local, the processing of the purchase may be carried out remotely. Particularly multinational e-commerce sites may operate in many different countries, providing local products and using local suppliers, but handle purchases and payments in centralized locations. For example, Amazon. com has local websites in 12 countries across the world, but only 8 data centers. For its operations in Europe, where it serves France, Germany, Italy, Spain and the UK, its data center is located in Ireland. For the Asian market, including its e-commerce websites in Australia, China and India, its data centers are in Tokyo, Singapore and Sydney.[11] Alibaba.com, which serves more than 40 million SMEs globally, is just now starting to build data centers outside of China.[12]

Digital marketplaces are in many ways even less limited by borders than websites selling hard goods. Online delivery of purchased content, such as e-books, digital newspapers, magazines and journals, music, movies and television shows, bypasses costs of packaging and shipping, and is typically carried out moments after being purchased. One of the largest digital e-commerce platforms is Apple's iTunes. Apple products are prolific worldwide and digital content fit for Apple products is in high demand across the globe.[13] Nevertheless, it processes all iTunes purchases as well as stores identification and payment details for its entire global customer base in its four, huge data centers in the US.[14]

Banking and financial services

The movement of data across borders has fundamentally changed many aspects of banking and financial services. Private banking has become as easy as uploading a photo of the check we want to deposit or paying bills with a simple online authorization. For small businesses, banks offer many digital and online services that allow them to manage their costs and revenue more efficiently and cheaply.

As with other services dependent on data, the IT infrastructure to run banking and financial services does not necessarily co-exist with the bank itself. Especially for multinational banks, the infrastructure for transferring, processing and recording clients' personal and financial data can often run across borders.[15]

In addition, cross-border data flows have eased international transfers of money and information on financial instruments. The ability to encode financial data and account information and wire it securely from one country to another has made it much easier to live and work abroad, as well as for companies to conduct business with foreign firms or subsidiaries. The flow of financial information across the world has also enhanced and facilitated the functioning of global financial markets.[16]

BOX 1: Digital Marketplaces – Instant Purchase and Delivery on iTunes

You live in Japan and you want to download the smartphone video game, Candy Crush Saga, from iTunes. You log into iTunes using your Apple ID and password, find the application (app), and with one touch of the screen Candy Crush is downloaded to your phone. You also want to add lighting filters onto the photos you have taken with your iPhone so you go back to iTunes to purchase the photo-editing app, Afterlight. Since your credit card details are already saved in your Apple account, as soon as you select "buy" the app downloads, opens on your iPhone and you can choose the look you want for your photos.

BOX 2: HSBC Works with IBM to Provide Global Financial Services for Businesses

You are a director at a large firm in the UK with several big accounts in the Middle East and Southeast Asia. You use HSBC to manage account transfers and payments from your clients. HSBC's representative in Lebanon, HSBC Bank Middle East Ltd, has also provided your company with a line of credit to set up a distribution center in the country.

Operating in 85 countries, HSBC has recently consolidated its IT operations (provided and managed by IBM) down to two data centers in each of its four regions. Protected by recently enhanced safeguards, you and your client's account and commercial information move seamlessly from data centers in the UK, Dubai and Hong Kong to you and your client's offices and back again.

Source: HSBC, IBM (2008), Arup (2013)[17]

Multinational insurance services

Insurances services are increasingly global – whether we buy coverage for travels or obtain our general personal or commercial insurance plans from a multinational company. For multinational insurers, having a global customer base expands their capacity to provide coverage; where possible, it can spread the costs and risks of providing insurance over many different policyholders.[18] In turn, this can translate into reduced premiums and fuller coverage for its customers. Moreover, travelling abroad need no longer mean uncertainty as to how to handle the cost of paying for health care or other services if they are needed in another country. Many major insurance companies now provide coverage for policyholders even when they are in other countries.

There are at least two layers to the cross-border nature of multinational insurance provision. First, for their operations and risk calculation, global or regional insurers must collect, process and store a great deal of personal, medical and financial information on policyholders – much of the time, in digital form. This data often originates from different countries – both data

on a single individual who requires coverage in multiple countries (for instance, in the case of travel insurance) and data on different individuals spread across the various countries in which the insurer operates.

Second, large or global insurers often concentrate their IT infrastructure into regional data centers in order to streamline costs, improve service and ensure consistency across their operations. The latter is particularly important in the insurance industry, where slight modifications to data can affect risk calculations and pass on considerable costs to the company and to its customers. For example, one major multinational insurer, which operates in 20 countries, has four regional data centers globally.[19]

Obtaining affordable and adequate insurance coverage, especially if we rely on large companies or those that provide cross-border coverage, is due in part to their ability to concentrate and analyze large bodies of digital data in centralized locations – that may or may not be in our country – and to send and receive data from various countries.

BOX 3: Travel Insurance and the Process of Reimbursement for Health Care Obtained Abroad

You are from the Netherlands but contract appendicitis when you are travelling in India and must have an emergency appendectomy in Mumbai. Once back home, your local health insurer requires the hospital in Mumbai to send it the records from

your surgery and hospital stay and the proof of your payment for the care in order to process your claim. The hospital emails your insurer a copy of your records in a secure attachment, and you are reimbursed soon after.

Telecommunications

Telecommunication companies, or telecoms, capture, handle and store massive amounts of data. Often multi-functional businesses, those that act as ISPs come in contact with all of the data traversing the Internet on their networks. As providers of a host of other services including data processing, computing and storage, they also collect typical data involved in financial transactions, i.e. name, address, billing information, etc. In addition, telecoms capture phone, video, email and text messaging records as well as where our connection to networks is located – hence, where we are located.

In order to maximize their services and coverage, telecoms in a given country, particularly mobile network operators, are often consolidated and owned by a small number of multinational companies. For example, India's Airtel, which has close to 500 million subscribers, serves not only India but also Bangladesh, Sri Lanka and a wide range of African countries.[20] The British telecom, Vodafone, which has over 450 million subscribers, serves the UK, several European countries and a number of countries in Africa, Asia and North and South America.[21]

It follows that much of the time the data transmitted and generated over telecommunications channels is moving across borders. This is certainly the case for businesses that are increasingly relying on third party telecoms and IT companies to run key elements of their operations.

Restrictions on telecoms' ability to collect and instantly move data across borders would add costs to local customers and could hurt investment and footprint expansion by global carriers, increasing the digital divide.

Small business services

Enabling the creation of firms
A multitude of business operations today – from communicating internally and with clients to managing global supply chains, infrastructure and financial accounts – are digitalized and remotely operated. What is more, businesses' core products often involve software or interactive, customizable services, or are offered over the Internet. As such, a huge market exists for managing companies' business processes, customer interfaces and online presence, particularly for start-ups. Many vendors of web and virtual businesses services, which are sometimes known as "cloud-based services", run huge data centers where companies can "rent space" in the cloud, or access various virtual services.[22]

For small firms in particular, the ability to pool resources and share costs among many users of cloud-based services across a region delivers huge savings. In some cases, if firms had to invest in their own physical IT infrastructure to run applications, store data and handle messaging/conferencing, the cost of establishing the company would be prohibitive.[23] Accessing cloud services often enables small firms to utilize the same web and business services that Internet and IT giants like Amazon and Microsoft use for their businesses. Globally cloud-based services are facilitating the creation and growth of new companies that offer a wide range of products and services to enhance our daily lives and solve cross-border challenges.[24] These products and services include completely new technologies, such as smart meters that facilitate more cost-effective energy use in homes and businesses, as well as innovative spins on existing industries, such as "crowdsourcing" lodging, transportation or pet care from specialized social networking services.

BOX 4: The Ease of Start-Up Creation Using Cloud-Based Services

Where entrepreneurs previously faced a huge investment in infrastructure and personnel in order to start a new business, using cloud companies reduces the cost, time and risk involved significantly. From a single cloud company, start-ups can access platforms for hosting their services and computing power for running their operations, no matter where they are located. Cloud companies can also equip start-ups with software programming or tools for creating websites and applications, as well as for testing new products in the market. What is more, all of these services may be scaled up relatively easily and inexpensively.

Compare the process of starting a new firm 15 years ago to today. Take, for example, a consumer review website founded in 1999 that required $8 million in start-up funding. These expenses included purchasing of its own computers, servers and database software, as well as the programming manpower to create and run the site. The process of getting the website up and running took six months. In contrast, a social networking site created in 2012 cost under $100,000. The firm contracted its storage and processing power and programming technologies from a cloud computing company. With little infrastructure to acquire and an expedited development process, the website was ready to go in under a month.

Source: Adapted from The Economist (2014)[25]

Facilitating the operation, growth and global trade of small businesses

Beyond the creation of businesses, cloud-based companies enable SMEs to run their businesses efficiently and to scale up rapidly at little added cost. It is possible to simply rent more server space or purchase an additional service or technology provided by a cloud-based company, such as teleconferencing or programming tools.

SMEs that seek to expand internationally may be able to utilize their cloud service provider's data centers closest to the countries they wish to target. Web services are made available in many corners of the globe, often provided by multinational companies (including telecoms) or companies that operate across borders. In fact, many cloud computing sites or data centers exist in distinct countries from where the businesses that access their services are located. It is quite common for large portions of small firms' virtual businesses – computing, storage, conferencing and more – to be operated on data centers far from where the company is incorporated.[26]

Cloud-based services and web companies have also made it possible for SMEs to access global supply chains and to export products far more easily than in the past. Web service providers can provide marketing, sales and payment platforms that help small businesses reach customers globally (or wherever the web service provider operates). Enabling small businesses to enter new markets in turn helps create new jobs and generates economic growth in the countries where these businesses are based. As an example, small retailers in Australia, for which the cost of reaching international markets has prohibited them from exporting their products, are using the online marketplace eBay to enhance their customer base beyond the local market.[28] Today, 78% of commercial sellers on eBay's Australia site with sales below AUD$100,000, and close to all companies with sales above that figure, are selling their products abroad.[29] Moreover, it is estimated that these retailers contribute about 50,000 jobs to the local economy.[30]

BOX 5: Microsoft Cloud-Based Services Supporting the Growth of a German Start-Up

Agheera, a small German start-up, created software that enables global tracking of shipments, including for the German courier company, DHL. Agheera's product allows courier companies and their customers to follow and monitor shipments in real-time – a crucial service for ensuring the prompt delivery of time-sensitive packages. Given its size, rather than invest in its own physical servers, Agheera relies on a Microsoft cloud-based package to communicate internally and with clients, and to share files. With its messaging, conferencing and storage run through Microsoft's servers in Ireland, the Netherlands or the US, Agheera has considerably streamlined its business operations, allowing it to move into other countries.

Source: Adapted from Microsoft (2013)[27]

Large and multinational business services

Seeking to streamline their costs and capital investments in order to provide innovative and affordable products and services to their customers, it is common practice for large and multinational companies to operate company-wide IT services in a centralized location. In addition, companies operating in different vertical spaces from web or IT services will sometimes enlist specialized companies to run their multinational IT operations.

Particularly for multinational companies with large scale operations across several countries, outsourcing these processes or partnering with IT companies allows them to manage the flow of this not insignificant amount of data and ensure their products are delivered to consumers effectively and speedily.

BOX 6: Nikon South Africa and Dell Partner to Provide Cloud-Based Photo Services across the African Continent

In addition to equipment, such as cameras, lenses and measurement instruments, the Japanese optics and imaging multinational, Nikon, also offers its customers cloud-based services linked to its equipment. For instance, customers can access photo-editing software, store their photos in the cloud and share them easily.

In order to aggregate and upload all of its customers' photos, process modifications made to their photos, save the photos indefinitely and provide a platform where customers can send them to other parties – as well as manage its comprehensive business operations – Nikon has to handle and store a huge amount of data drawn from all over the world. This data includes customer information and property, designs and trade secrets related to its proprietary technologies, and business and financial records. Nikon partners with IT companies to create efficient and secure data centers capable of managing this data across its regional operations.

Take, for example, Nikon's operations in Africa. Instead of running servers in every African country where its customers reside, Nikon South Africa hosts operations for the entire African continent using a data center run by Dell. This means that files uploaded by customers in one country are hosted on servers in South Africa, and it is from these servers that they are edited and sent to others.

Source: Nikon, Dell[31]

BOX 7: Sony and Telefónica Partner to Provide Video-on-Demand Services

Big brands offering digital products and services, such as games, music and movies, may rely on third parties, such as telecoms and cloud-based services, to manage the platforms on which their products are delivered and actually accessed by consumers.

This means that as part of their service cloud-based companies access both the business information of their clients as well as the personal information of their clients' customers.

Spanish telecom giant Telefónica has partnered with Sony, the Japanese electronic and entertainment firm, to provide video-on-demand services offering Sony Pictures' movie and television content across Latin America. The content is delivered via both pay-per-view and subscription programs. Telefónica operates the VOD platform (including all of the IT infrastructure) from its regional data center in Miami and relies on its telecommunications networks to send and direct data – the video content as well as customers' user identification and payment details – to and from the data center.

The Sony-Telefónica partnership shows how global strategic business partnerships can involve the flow of data across borders: a Spanish company supports Latin American customers of a Japanese company using infrastructure located in the US.

Source: Telefónica (2012)[32]

BOX 8: Cross-Border E-health – Disease Surveillance and Control in the Mekong Basin

When the H1N1 influenza pandemic broke out in 2009 countries in the Mekong Basin region of Southeast Asia tested a new regional disease surveillance cooperation program introduced a few years before. Participating countries – Cambodia, Lao People's Democratic Republic, Myanmar, Thailand, Vietnam and the Yunnan and Guangxi provinces of China – shared information on the spread and impact of the virus in their countries, including patients' records and responsiveness to antiviral drugs and other treatment protocols.

Electronic reporting and sharing of information across

the countries represented a heavily relied upon aspect of the cooperation. In particular, cross-border distribution of digital health data relating to the virus was seen as a key driver to what were considered to be effective efforts to control the virus in the region.

Data-sharing between countries occurred through several channels. The program coordinator located in Bangkok, Thailand processed and shared participating countries' data across the program. Participating countries also processed and shared data with the other member countries independently.

Source: Moore & Dausey (2011)[33]

E-health, pharmaceutical innovation and Big Data

Cross-border data also facilitates solutions to global challenges – phenomena such as diseases, effects of climate change and water pollution that are not restricted to borders. Initiatives that rely on the movement of data between countries, such as efforts to improve access to health care and treatments for diseases and making higher education more available, may be able to help address these challenges and lay the foundation for us to lead longer and more productive lives, no matter where we live.

E-health
The shift to electronic records of our health and medical information has greatly enhanced our ability to understand our health situation, made it much easier to engage with health care providers and improved communication and care across entire health care teams attending to us. It has also streamlined sharing of clinical

experiences and data among clinicians and researchers, allowing for greater coordination and response to diseases. In this light, the ability to share digital medical and health data across borders has strengthened countries' responses to regional and global outbreaks, in comparison to countries independently dealing with a disease.

Pharmaceutical innovation
Similarly, the development of new biopharmaceutical treatments benefits greatly from the ability to collect, consolidate and analyze data on the performance of a drug and its potential side effects in patients in multiple countries. Particularly the later phases of clinical testing of a new drug or health technology require studies in various countries to capture a wide range and large number of patients; in some cases cross-border clinical studies are mandatory for obtaining market authorization of a drug in a given country. Moreover, cross-border studies allow drug developers and health care providers to understand how drugs perform in a given population, ethnic group or climate.

BOX 9: Cross-Border Clinical Trials Facilitating Pharmaceutical Innovation

In order to study the effects of a once-weekly injection of an anti-diabetes treatment, dulaglutide, the pharmaceutical company Eli Lilly ran a study involving over 1,500 patients in 13 countries. The study tested patients in the US, Canada, France, Germany, India, Mexico, Poland, Puerto Rico, Romania, Russia, Spain, South Korea and Taiwan.[34] Eli Lilly and

its study partners processed the data collected in the trial, including in facilities located in the US. With such a wide body of knowledge on the drug from diverse patient groups and ethnic backgrounds, the study was able to collect substantial evidence on the drug's ability to provide improvement over existing treatments for controlling blood glucose levels.

Source: Clinicaltrials.gov, Lilly (2012)

Clinical trial coordinators in different countries must be able to securely send medical records and other clinical evidence on anonymized clinical trial volunteers to the trial organizer for large-scale analysis of the drug. Hence, in order to develop safe and effective drugs that can obtain approval and become accessible to us, in many cases it is crucial to be able to send health records across borders so that cross-country clinical data can be generated.

Big Data and rare disease research and development

The Big Data industry

Today we generate massive quantities of data – the way we use a technology, the time, the place, the webpages we browse, who we communicate with and what we buy. The mass collection and analysis of this data – sometimes labeled as "Big Data" – using pioneering algorithms and computing programs is allowing us to extract valuable and transformative insights in many different spheres.

The Big Data and analytics industry is a rapidly expanding, high-value industry. It is projected to grow 27% annually over the next few years to a value of $32.4 billion in 2017, a figure that is six times the rate of growth expected in the general ICT sector.[35]

For example, in the health sector, medical records, whether from annual check-ups or collected for a specific condition or concern, are a fount of information on disease processes and responsiveness to treatments, and can be applied to analysis in many different directions.

The use of Big Data to improve medicine in the area of rare diseases

One application of Big Data in the health sector is toward rare, complex diseases for which the need for controlling and treating them has not yet been met. By definition, there are not many cases of such diseases in a given country, and our understanding and development of treatments for a rare disease can greatly benefit from merging digital data sets of patients with the disease from different countries. It is possible to create large pools of raw data that, using analytics technologies, can allow researchers to find answers to the unknown elements of the disease, pinpoint its cause, map out the disease in its different forms and identify and test potential treatments.

FIGURE 3: Cross-Border Flow of Data in the Development and Production of Medicines
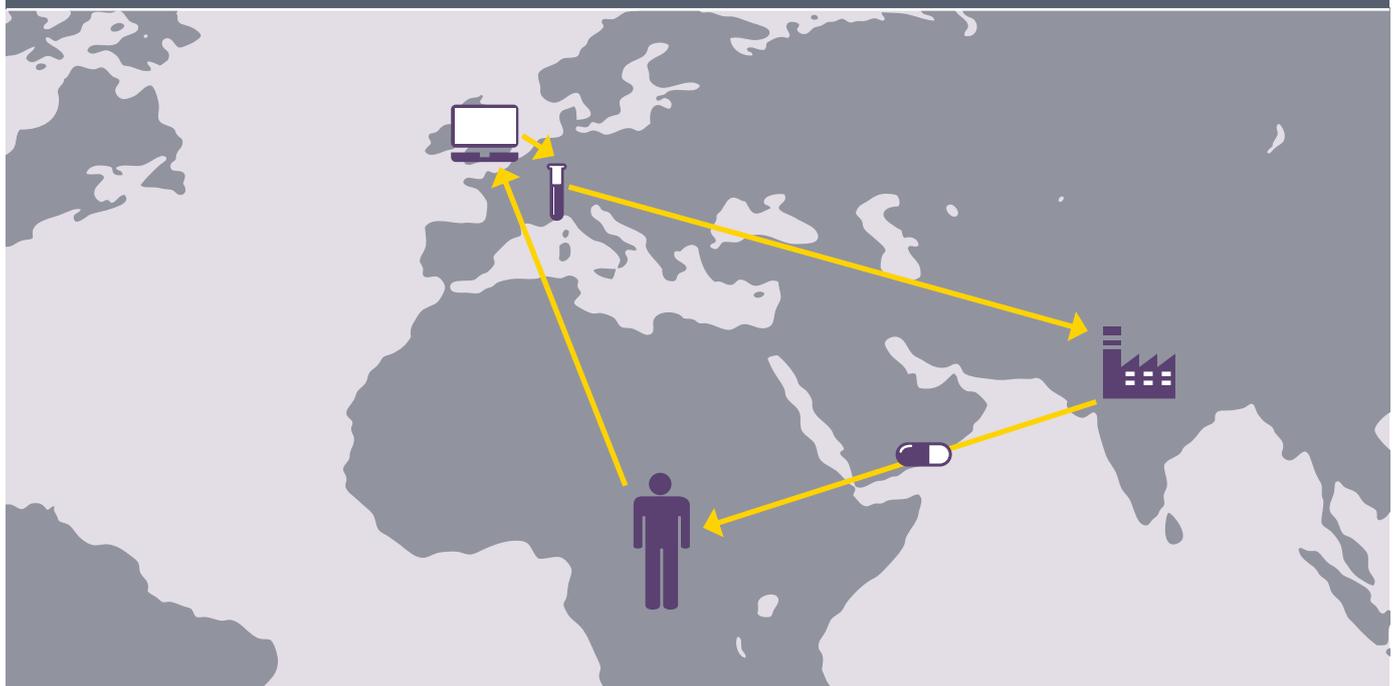
BOX 10: The Role of Big Data in Improving Knowledge on Rare Diseases, FSGS and NASH

In the case of rare diseases, aggregating data across multiple countries can greatly accelerate research into potential cures by providing a much larger sample size than would be possible if data were limited to a single country.

As an example, the collection of cross-country data sets is being applied to spot gene mutations that lead to a disease called focal segmental glomerulosclerosis (FSGS). FSGS, which manifests with impaired kidney function, has a rate of incidence of 5-24 cases per million population, depending on ethnic background.

Quantitative Tissue Assessment, analysis of huge medical imaging datasets is crucial for better understanding non-alcoholic steato-hepatitis (NASH), a rare disease that causes a build up of fat in the liver and can lead to liver cancer. Technologies that scan large numbers of images from around the world and can identify changes in the size and nature of muscle, liver and spleen tissue are being used by global clinical research organizations and public research institutes in the US to evaluate the effect of treatments on the condition.

Source: Novartis (2013), Orpha.net, BioClinica (2013)[36]

Experts also say that analysis of large pools of digital patient data could be a key to identifying and understanding suspected genetic factors of autism and rheumatoid arthritis.[37]

Higher education

The movement of curriculum and teaching to the virtual sphere has made post-secondary education available no matter where we live.

Both established universities and colleges, and newer institutions that operate solely in a virtual space, are now offering degree programs partially or wholly online. This means that students living in remote or rural parts of different countries are able to obtain higher education degrees without leaving their villages or towns.

Virtual universities and learning platforms can run on cloud-based services that provide access to teaching content including textbooks, lecture slides and videos; process student submissions such as homework, papers and exams; and manage interactive learning sessions like online seminars and "study rooms".

As accredited institutions, virtual learning programs not only collect, store and process this information but also personal information related to students and faculty, such as names, identification numbers, addresses, phone numbers and payment details. As with other services relying on cloud-based companies, the data centers managing the learning platforms are not necessarily located in the same country or countries as where the learning platforms operate. Cloud-based companies ensure that student and faculty data is safeguarded as it moves back and forth from their data centers. Prohibitions on cross-border data flows would cut off many potential students from access to world-class education and improved job opportunities. It could also greatly restrict the analysis of data gathered from virtual universities, limiting understanding of the value provided via online learning as well as areas for improvement.

BOX 11: Access to Higher Education – India's Classle Platform and MIT and Harvard's edX Program

Classle is an online learning platform providing certification and degree programs to almost 200,000 engineering students through close to 100 colleges in India. Classle particularly serves rural regions in India. The Classle system, which involves video and digital courses, interactive learning hubs and exam platforms, runs on Amazon Web Services, mainly the Elastic Compute Cloud program. The entire Classle system, including student and faculty data, is hosted in one of Amazon's regional data centers in Singapore, Tokyo or Sydney.

On a wider scale, MIT and Harvard, as well as several of the world's highest ranked universities, have partnered to offer edX – "massive open online courses" and certificate programs – that can

be accessed by students worldwide. edX offers courses in a range of fields, including science, art and technology, as well as peer-to-peer networks for engaging with and learning from other edX users around the globe. In Harvard's edX program alone, during the first year of operation (2012-13) over half of enrolled students were from outside the US, with the highest enrolled countries including Nigeria (among African countries), India (among Asian countries), Brazil (among Latin American countries) and Spain (among European countries). Considering the entire edX program, it involves a massive, global web of connections between students and universities in which educational material and students' contributions and information flow back and forth.

Source: Classle.net, Amazon.com[38]; edX[39]

Social networking and personalized applications

Over the last decade the adoption of social networks as a leading platform for communicating and interacting with one another has exploded. Among OECD countries, over half of people today say that social networks such as Facebook, Twitter and LinkedIn are the main way they meet and engage with people who share their interests or to whom they are connected.[40] Social networks allow us to feel connected to friends and get to know acquaintances, regardless of whether we live in the same city or halfway across the world from one another.

Consider all the information we eagerly place online via our social networking activities. Our identities – names, nicknames or pseudonyms, education and employment information – and others' identities – our families, friends, or whomever we discuss on the network. Photos, videos, how we feel, what we like, where we go, other sites we view – the list is endless. All of our data is packaged and safeguarded using personalized user IDs, passwords and encryption technologies, with social networking sites ensuring the data we do not want shared with the public is only accessible by those we designate.

Social networks are also being used to personalize and stylize users' experience of many websites, programs and applications.[41] By using our social network log-in information, we are able to consolidate all of the user names and passwords required for the various sites we access into a single, secure platform. Moreover, website and app providers can access the publicly available information on our social networks to enrich our experience, such as tailoring content to our tastes and allowing us to interact with our social network "friends" within the website or app.[42]

In order to handle this massive amount of data, social networking sites manage the flow of this data through their sites and third party architecture providers they contract with (such as data centers and network carriers). In other words, while it is secure the data shared and generated on online social networks is moved through different channels and stored on physical infrastructure that may not necessarily be located in the same country as the social network user.[43]

Entertainment

Virtually every movie, television show, song and game released in the past 20 years is now available online, and a significant number of those from previous years are also at our disposal.

Given the enormous offering as well as the size of files (particularly videos), content providers and file-sharing platforms have extensive data storage demands. Beyond storing and transferring the actual content, they often process and store log-in information and, for many, credit card details. This is partly because many providers and platforms increasingly tailor their services to individual users. By creating personal accounts, we can curate lists of our favorite songs, movies and television shows and access them on multiple devices. In addition, while some content providers operate on a free model, many are moving towards a full or partial paid model. In order to enjoy many features, such as saving our playlists or having unlimited access to content we may pay, for example, an equivalent of $10 per month.[44]

Although there are some challenges, such as negotiating licenses in different countries and jurisdictions, multinational content providers are on the rise. Many of these providers serve not only the country and/or region where they are based but an increasing number of other countries. Deezer, a French music streaming service operates in 182 countries; the majority of its servers are located in France, although it is expanding into several regional data centers.[45] Spotify, a Swedish music service has spread from Europe into North America, Latin America and Asia,[46] and runs 5,000 servers in only 4 data centers: one in Sweden, one in the UK and two in the US.[47]

This means that more and more, no matter where we reside we can stream or download our favorite music, film or television shows to our device of choice. In other words global connectivity and cross-border flows of data, such as our log-in information and payment details, enable us to simply and conveniently access numerous options for entertainment.

BOX 12: Music Streaming and Curating through Spotify

You live in Chile and using Spotify you've created a playlist of top tunes for your daily gym workout. Your paid subscription allows you to download your playlist so you can listen wherever you are, regardless of your Internet connection. Your workouts are becoming mundane, though, and you want to add some new life into your music playlist. You log on to your Spotify app (using your Facebook Login information) on your mobile phone. Based on your existing playlist, Spotify suggests new artists and songs; you browse through them and select some popular songs to add to your playlist. You also get some ideas from workout playlists created by users across the Spotify network. You're ready to hit the treadmill again. And behind the scenes Spotify stores your playlist, credit card information and all its music you listen to in its data centers in North America or Europe. It also connects you with endless playlists generated by users in all of the countries served by Spotify.

Source: Spotify.com (2014)

FIGURE 4: Cross-Border Data Eases Daily Tasks and Brings the World Close to Home

Personalize Playlists **Foreign**
Unlimited selection Variety
Store Tailor Stylize **Remember**
Video Music **Suggest** Television
Instant Television Movies Games

Meet **Share** Like **Connected**
Status Friends I'm feeling **Second degree**
Recommendations **Network** Update
Up to date Stay in touch Travels
Advertising Photos **Interact** Videos
Global Viral Hashtag Tweet **Storage**

Convenience Deposits
Transfer money **Check balance**
Secure **Anywhere** Instantaneously
Pay bills Ease **Online banking**

Variety **Affordable**
C2C Low-cost **One-stop shop**
International Ease
Access Doorstep delivery B2C
One-click purchase

Electronic records **Global**
More information **Fast response**
More effective **Regional** Consistent
Better care Improved communication
Disease understanding **Coordination**
New treatments Safer

Available anywhere Web services
Villages Interactive learning sessions
World-class education
Single platform **Future** Job opportunities
Town **Remote study** Online seminars
Regional servers Rural Online study rooms

Macroeconomic benefits of cross-border data

Using trade statistics to quantify the economic value of cross-border data

Another way of looking at the value provided by cross-border data is to zoom out to a macroeconomic perspective, and examine how cross-border data flows benefit people across entire countries by leading to increased rates of economic activity.

The value of cross-border flows of data is inherently difficult to quantify. Data itself is an abstract concept and generally speaking, it is not possible to isolate it from the processes or systems in which it is embedded. For instance, the value of aggregating huge sets of data for analysis, such as health records on a given disease, is not mainly in the data on its own, but in, for instance, the medicines that are developed and sold based on the insight gained from that analysis.

If in many applications, data is moving across borders – as this report has thus far shown – then one way of measuring its value is by measuring the cross-border movement of information-based activities and services.[48]

The economic value of international trade is both in the trade balance (i.e. the net revenue derived from trade) as well as in the knock-on effects of trade on the economy. Specifically, importing of services that utilize data can provide inputs needed by key sectors in the economy. In turn, importing these services may enable these sectors to produce their own exports and generate revenue globally. In an overall environment that supports economic growth, increasing trade openness has been shown to lead to several positive economic effects.[49] These effects include: strengthening these sectors' competitive advantage, raising demand for human capital and expanding the number of local jobs, increasing public and private revenue, enabling better public services and driving investment in research and development.[50] Altogether, these economic benefits improve our ability to enjoy healthy, productive lives over the long-term.

In this light, we can quantify one aspect of the economic value of cross-border data by looking at figures on the share of a country's exports and imports of services that are enabled by information and communication technology. The United Nations Conference on Trade and Development has compiled statistics on global trade of "ICT-enabled services" for a wide range of countries. Box 12 outlines what types of traded services UNCTAD considers to rely on data or information and communication technologies.[51]

BOX 13: Defining ICT-Enabled Services

Communications services: including telecommunications services such as mobile phones, email and video conversations used by a person in one country to communicate with persons in other countries;

Insurance services: such as the premiums charged for insurance plans or money deposited in pension funds in another country or sold to persons in other countries;

Financial services: such as banks, lenders or funds from abroad that provide services to persons living in a country or local institutions that provide services to persons in other countries;

Computer and information services: including hardware and software-related services, as well as data processing, storage and circulation, provided by foreign companies to local residents or by local companies to persons in other countries;

Royalties and license fees: payments for the use of proprietary assets such as patents, trademarks and copyrights made from abroad to local rights holders or by local residents to foreign rights holders;

Other business services: includes wholesale services and professional and technical services, such as legal or accounting services, provided to persons living in a country by foreign companies or by local companies to persons living in other countries; and

Personal, cultural and recreational services: includes education and health services, the production of movies, videos, songs and broadcasts, and sporting events, theater programs, museums, libraries – either purchased abroad by local residents or purchased domestically by foreigners.

Source: UNCTADstat

Many of these services are data-driven or data-reliant. Indeed, most of the anecdotes discussed above that involve cross-border data flows are represented in these categories. The extent to which economies rely on data in the international trade of services can thus reflect, albeit indirectly, the extent as well as the benefits of cross-border data flows to national economies.

Specifically, a whole host of sectors, both those that produce goods and those that provide services, benefit from importing ICT-enabled services. Companies may source telecommunications, financial and technical services, or purchase wholesale the components they need to run their businesses or manufacture their products, from other countries. The ability to secure the most efficient and affordable service on offer globally is a huge advantage and cost-saving measure for companies, allowing them to re-direct funds to scaling up their businesses and growing competitive sectors.

In addition, in many different sectors today data flows connect domestic industries with regional and global markets, which also helps to build up local competitive sectors and create jobs domestically. As mentioned, cloud-based services facilitate rapid expansion by multinationals. B2B and B2C websites are providing new, convenient and cost-effective platforms for SMEs to operate both locally and

export their products and services abroad. Cross-border online marketplaces or social networks are even enabling people in many parts of the world to take on second jobs or supplement their incomes by, for instance, providing freelance services.

## Information-reliant service exports among fastest growing exports

Looking specifically at statistics from UNCTAD's database on exports, it appears that those sectors that are likely to depend on data to export services are growing faster than other export segments in many leading economies. In comparison to services for which data is not considered to play a significant role – such as construction, transportation and travel – as well as to goods, exports of ICT-enabled services are growing at a faster rate. In some cases, exports of ICT-enabled services are growing at more than double the rate of other export segments. Figures 5 and 6 show the extent of these trends over the period 2001-2011 for key developed and emerging economies.

FIGURE 5: Annual Average Growth Rates of Export Segments, BRICS (2001-2011)

Legend:
- Total exports
- Total goods exports
- ICT-enabled service exports
- Non-ICT-enabled service exports
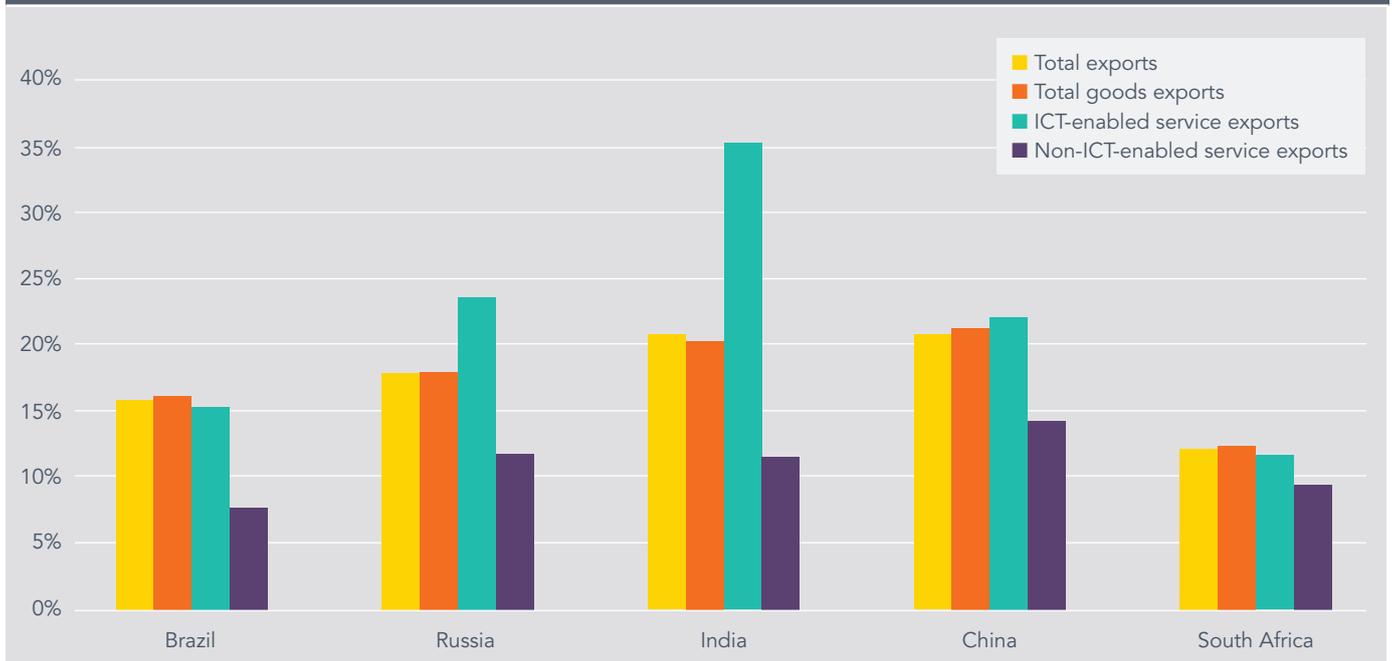
Source:UNCTADstat (2013), Pugatch Consilium Analysis

FIGURE 6: Annual Average Growth Rates of Export Segments, Selected Developed Countries (2001-2011)

Legend:
- Total exports
- Total goods exports
- ICT-enabled service exports
- Non-ICT-enabled service exports
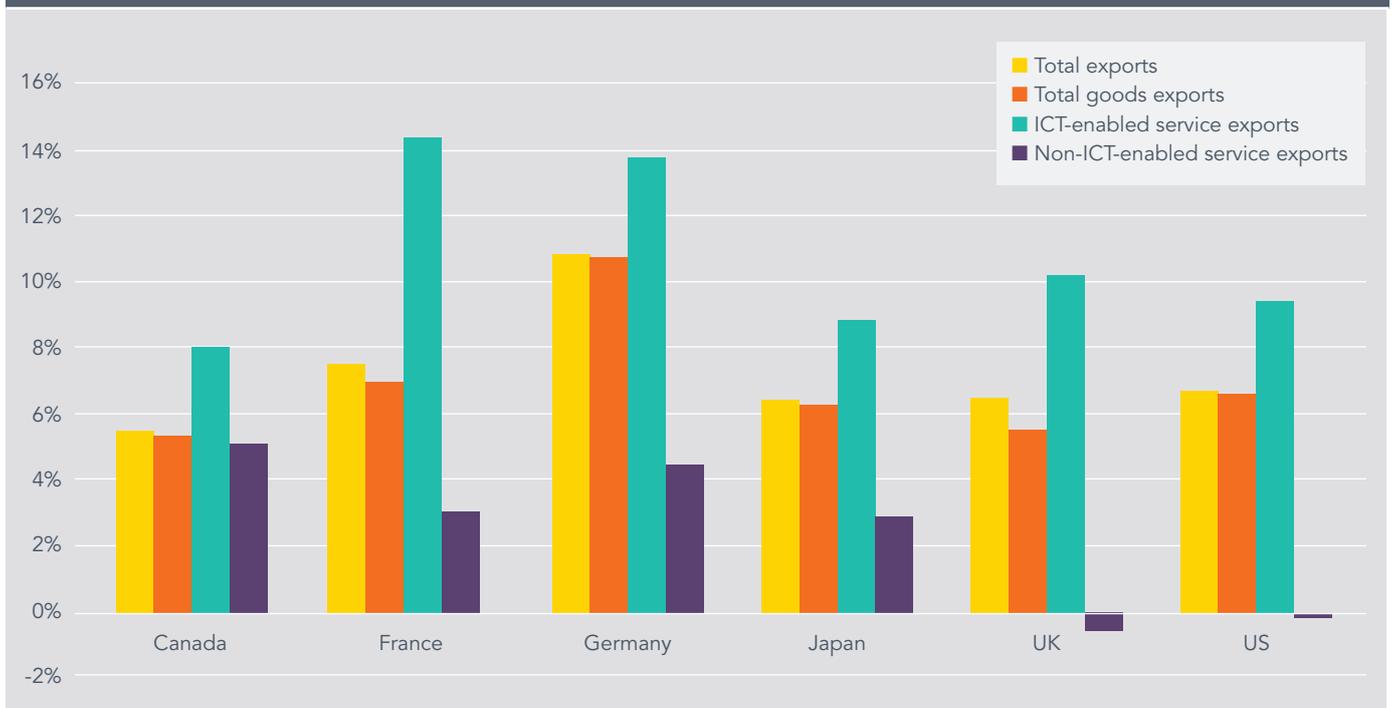
Source:UNCTADstat (2013), Pugatch Consilium Analysis

Among major developed countries, the annual average rate of growth for ICT-enabled services is significantly faster – at least 2% and up to 7% faster – than growth rates of any other export segment.

Information-reliant service exports are growing even more rapidly in the BRICS economies – in most cases, at least double the rate experienced among leading developed countries. In relation to other export segments, ICT-enabled services are the fastest growing segments in India, Russia and China; in India, ICT-enabled services are increasing at a 15% higher rate than total exports and exports of goods. The growth rate for ICT-enabled service exports in South Africa and Brazil is more on par with other export segments, but still much higher than the rate of growth of services that do not rely on information.

In other words, information-reliant services are driving the international competitiveness of many economies today – both developed and developing – and are only likely to become more integral to global trade.

The scope of trade in information-reliant services

Drawing on statistics from UNCTAD's database the following figures examine the importance of information-reliant services to economies from a different angle – looking at the extent to which these services play a role in international trade among key countries. They also reveal the types of ICT-enabled services that different countries are trading across borders.

Figures 7 and 8 show the percentage of total exports and imports that involve services reliant on ICT among eight leading developed and emerging countries during the period 2000-2011.

FIGURE 7: ICT-Enabled Service Exports as a % of Total Service Exports, Selected Countries (2000-2011)
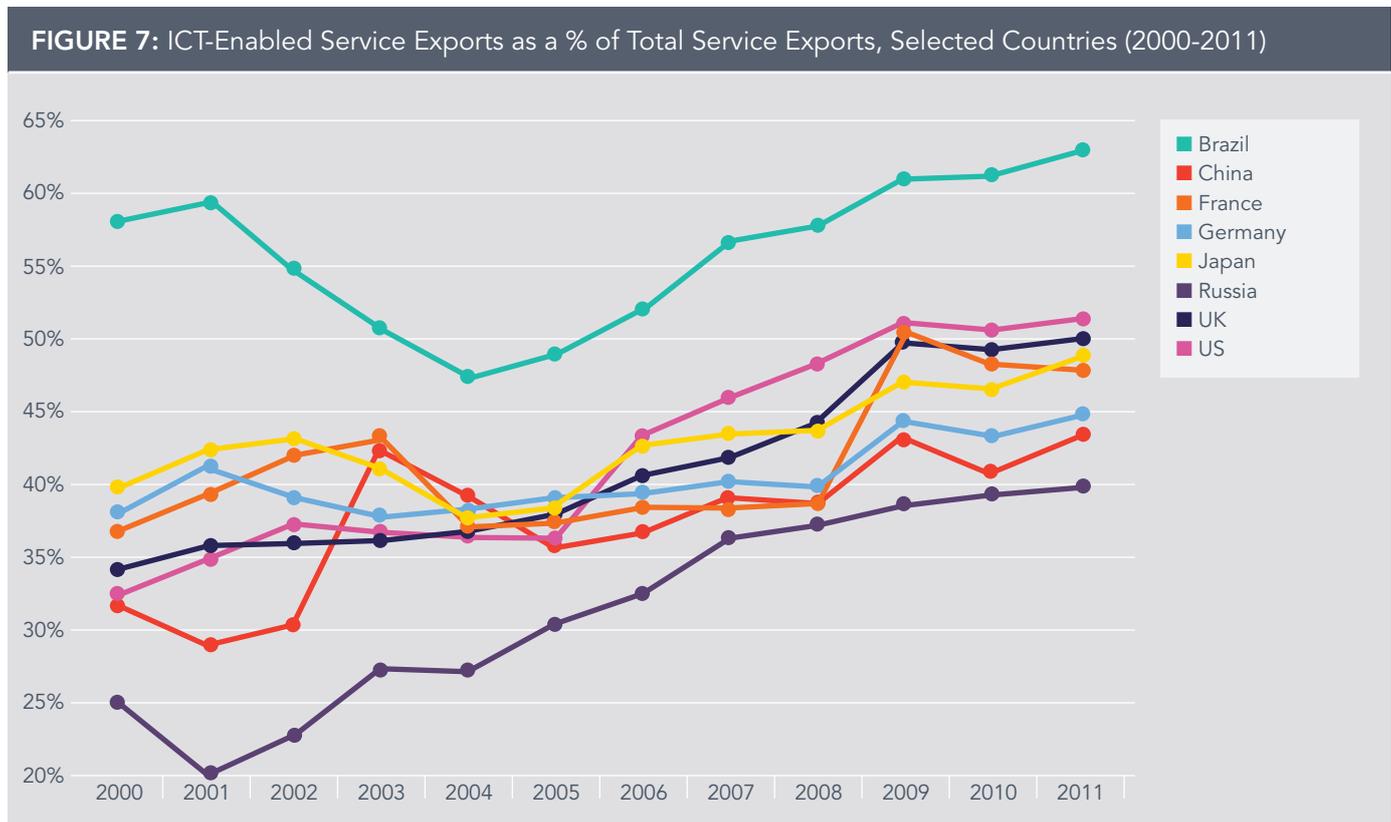
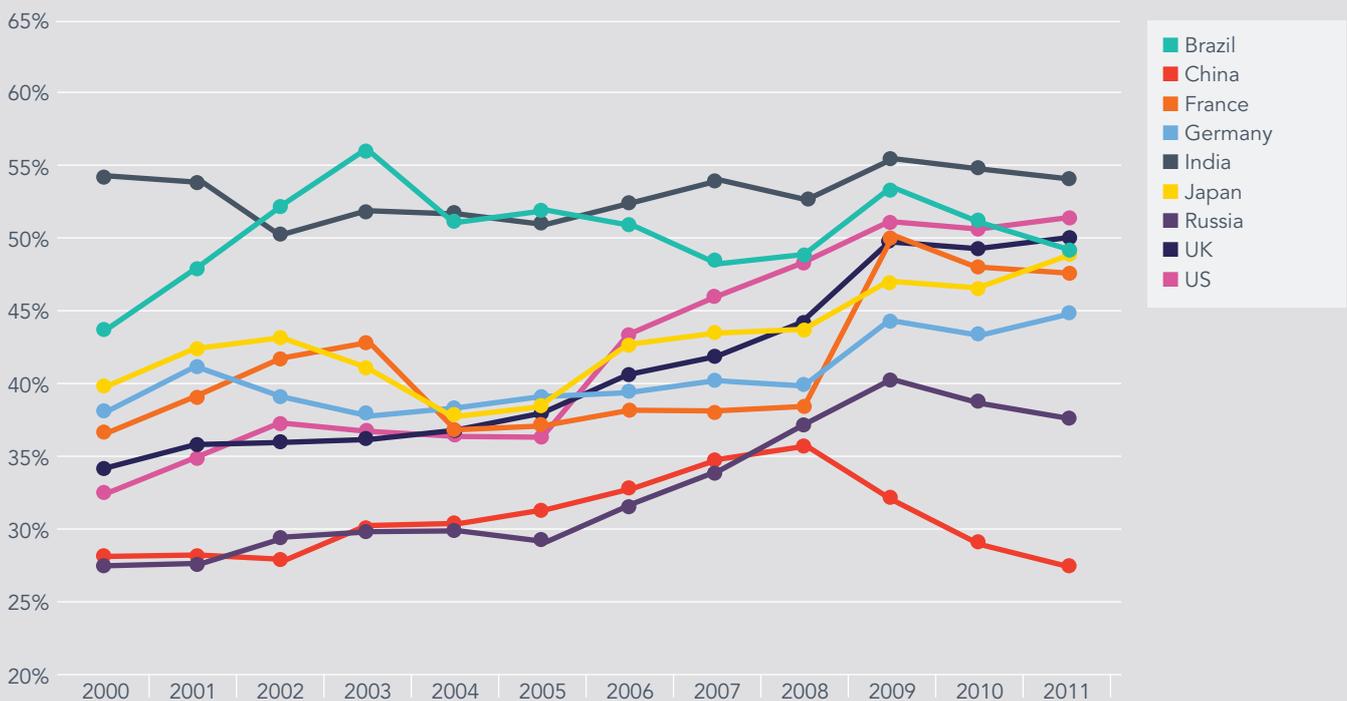Source: UNCTADstat (2013), Pugatch Consilium Analysis

What do these figures show us? Among other things, today cross-border data-reliant sectors represent a significant portion of the value that trade provides to our economies. For all of the countries in Figure 7, exports of ICT-enabled services make up close to half or more of their total service exports today. In Figure 8, the share of ICT-enabled services is at least 40% of the total amount of service imports for the majority of countries. In other words, a great deal of cross-border services are likely to involve cross-border data flows, and these services represent an important factor in realizing the benefits of trade to the economy.

The relative contribution of different types of data-reliant services to countries' trade balance depends on the strengths of each country. Figures 9 and 10 look at a breakdown of the types of services most traded among select countries with the greatest portion of traded services enabled by ICT. Figure 9 indicates that, for instance, Indian computer and information

companies have a great deal of clients outside the country, while wholesale as well as professional services provided by Swedish and Brazilian companies are often relied on by foreign companies. In the UK, financial services are also a key driver of exports.

Figure 10 suggests that consumers and companies often engage foreign or multinational services in order to purchase products wholesale or secure professional and technical services. In addition, people and businesses in Ireland and New Zealand, for instance, tend to rely on global or regional telecom companies, while in Spain financial services are frequently obtained from foreign institutions. In India, services relating to areas such as education and health care may oftentimes be secured from external entities.

FIGURE 8: ICT-Enabled Service Imports as a % of Total Service Imports, Selected Countries (2000-2011)

Source:UNCTADstat (2013), Pugatch Consilium Analysis

FIGURE 9: Service Type as a Portion of Total ICT-Enabled Service Exports, Select Top Exporters of ICT-Enabled Services (2011)

Brazil   India   UK

- Communication services
- "Other" business services
- Insurance
- Royalties and license fees
- Financial services
- Personal, cultural and recreational services
- Computer and information services

Source: UNCTADstat (2013), Pugatch Consilium Analysis[52]

FIGURE 10: Service Type as a Portion of Total ICT-Enabled Service Imports, Select Top Importers of ICT-Enabled Services (2011)

India   New Zealand   Spain

- Communication services
- "Other" business services
- Insurance
- Royalties and license fees
- Financial services
- Personal, cultural and recreational services
- Computer and information services

Source: UNCTADstat (2013), Pugatch Consilium Analysis

Altogether, what these figures and the UNCTAD data show is how much cross-border flows of data are embedded in economies around the world and are principal fuels of their global competitiveness. In many countries, information-reliant exports, particularly service exports, are growing at a dizzying speed, and significantly outpacing other types of exports.

In addition, data is a core component of competitive service sectors in these countries, even in emerging economies. For instance, the large majority (close to 90%) of India's service exports utilize data, particularly those in the IT industry. In Brazil, where over 60% of service exports rely on data, wholesale, professional and technical services are significant drivers of the economy. Similar trends are visible in imports of services by emerging economies, with at least half of service imports utilizing data in some form or another.

It is evident that the flow of data across borders is an integral and strategic economic driver in many developed and emerging economies. Moreover, the service industries (typical of advanced economies) that emerging economies are building are concentrated in data-reliant sectors. As such, a crucial factor of the growth of domestic industries in emerging economies and the ability of these economies to transition into developed ones is the continued movement of data around the globe. To limit global and regional movement of data with policies restricting the flow of cross-border data would be to suspend key factors of global competitiveness and domestic economic growth.

This section has discussed the value of cross-border data flows in a wide range of sectors and areas. The movement of data around the world can lead to many positive outcomes. For instance, these benefits can be scientific, i.e. leading to completely new discoveries. They can be technological; cross-border aggregation of data can enable technological advances and innovations that would not have been possible if only individual units or portions of data were available. These benefits can also be psychological in nature; they can ease tasks or link people with previously unavailable opportunities. Table 1 captures several key benefits of cross-border data.

TABLE 1: The Functional Benefits of Cross-Border Data	
Functional area	**Key outcomes**
Scientific	Knowledge creation
Technological	Network effects leading to or enabling the generation of new technologies
Economic	Macro – benefits to the larger economy such as trade balance, investment and employment
	Micro – benefits to businesses (such as reducing costs, streamlining operations or opening up new markets) and individuals (such as making products or services more accessible and affordable for consumers)
Cultural	Shared experiences and knowledge
	Improved awareness of the wider, international community
Social/Psychological	Linking individuals to opportunities and people that were previously distant or out of reach
	Easing daily tasks
Health Care	Improved health outcomes, allowing people to live longer and more productive lives

3 CREATING POLICY ENVIRONMENTS THAT ENABLE THE BENEFITS OF CROSS-BORDER DATA TO BE REALIZED

The cross-border movement of data and the multitude of benefits that are derived from it rely on a range of enabling factors. These factors target various impetuses behind cross-border data flows.

In this light, it is possible to identify a "life cycle" of data flows, i.e. the step-wise application of data beginning from its generation all the way to its implementation by end-users. In many sectors and countries, it is likely that at one or more points in its life cycle data move from one country, region or continent to another.

The life cycle of cross-border data flows may include:

- data generation;
- data collection;
- data storage;
- data analysis and processing;
- transformation of data into new applications; and
- data utilization.

It should be noted that these phases or applications of data do not necessarily take place in this order, nor do all cross-border data flows involve each of these phases. These merely serve as an illustration of key elements or platforms that are needed in order to realize the flow of data across borders.

Table 2 outlines a blueprint for facilitating data flows and benefitting from the value that these flows provide, including several examples of key enabling factors as well as barriers to the life cycle of data flows that countries should seek to avoid.

Environments that enable the life cycle of data flows to occur may include the presence of the structural and technical architecture on which each phase can actually be carried out cost-effectively and securely. If the most cost-effective infrastructure or service provider is not located in the country where the data

originates, it is also important that a framework be provided for relevant parts of the life cycle to take place safely in other countries.

In contrast, the life cycle of data flows may be hindered if certain stumbling blocks are introduced by countries (including those mentioned in Table 2). Conditions that limit access to or construction of the technologies needed for the movement, storage and processing of data, such as networks, servers or software, and the absence of the human capital to operate these technologies may impede cross-border data flows.

Moreover, it is imperative to find a balance between providing appropriate protection for personal data in response to consumer demand, but also recognizing that restrictions on the movement of certain types of data can represent barriers to consumers and companies realizing the value of cross-border information flows. Some policies may require that companies use only local web services or infrastructure when they handle certain types of data or for entire sectors, such as ISPs. Policies may also target the data itself, mandating that it be routed within the country or only be sent outside the country to very specific parties, such as subsidiaries or affiliates of local companies. Other policies add costs to the movement of data outside the country, requiring parties handling the cross-border movement of the data to obtain the consent of individuals to whom the data is related. In some cases these policies appear to be aimed at building up a country's own IT infrastructure, including networks and data centers, in order to strengthen related industries there.

TABLE 2: Blueprint for Enabling Data Flows and Pitfalls to Avoid[53]

Life cycle of cross-border data	Enablers	Barriers
Data generation	Policies facilitating the availability of a wide range of technologies and platforms that generate data, such as user IDs, passwords, account numbers, tax records, photos, videos, etc	Limitations to the creation and application of technologies enabling data generation
Data collection	Policies that allow for the recording, uploading and saving of data	Limitations to the creation and application of technologies enabling data collection
Data transfer	Policies allowing movement of data over networks wholly or partially in distinct countries from the location of data collection as long as all parties contacting the data uphold industry security standards	Policies that: • limit ability of citizens to share data knowingly • hinder the movement of data based on the location of networks • discriminate against certain sectors or parties involved in data transfer • unduly burden parties involved in data transfer • restrict automatic transfer of data to individuals Absence of international standards for secure data transfer
Data storage	Policies allowing remote data storage as long as all parties contacting the data uphold industry security standards	Policies that: • restrict the storage of data based on the location of storage facilities • unduly burden parties involved in data storage Absence of international standards for secure data storage
Data analysis and processing	Policies allowing remote data processing as long as all parties contacting the data uphold industry security standards	Policies that: • restrict the processing and analysis of data based on the location of computing facilities • discriminate against certain sectors or parties involved in data analysis and processing • hinder the control of data analysis and processing by individual service providers
Transformation of data into new applications	Policies facilitating the creation of innovative applications of knowledge derived from data analysis	Policies that do not account for the value of new applications of data in relation to the social and economic costs of sharing data (e.g. personal data) across borders
Data utilization	Policies supporting the ability of users across the globe to view, access and apply data sourced from other countries	Policies that discriminate against users of data based on location (e.g. policies that require certain types of data to only be accessed within a country)

These and other barriers to the free flow of data around the world can add burdens and costs that may result in reduced availability of data-dependent goods and services in a country, with knock-on social and economic effects that impact people in the country in one way or another. Given the global, or at least regional, spread of many companies sending and receiving data – the way in which so much of their data passes over global networks and is stored remotely from the source – barriers such as those listed in Table 2 raise concerns as to the costs of compliance and what effect that might have on the availability of their services. Companies have to handle adhering to the laws of every country their data traffics through. With the collection of data having become so automated, even to isolate personal data and to obtain users' consent anytime the data travels over foreign networks is a huge and costly task. In addition, measures that require certain types of data to stay within a country could require companies to spend more on local storage, and if insufficient infrastructure exists, they may have to invest in building their own. Where the cost is prohibitive, that may mean

companies may have to limit their operations in the country or terminate them entirely, at least in the short-term.

Widespread application of strict controls of cross-border data, such as requiring companies to store part or all of their data locally, could put a halt to the benefits described in the previous section. It could mean far fewer of the conveniences we are now accustomed to and more importantly, the blocking of initiatives for addressing global challenges. This could also have knock-on macroeconomic effects for countries with strong trade in services dependent on data, developed and emerging economies alike.

In view of the many benefits that cross-border data flows bring to individuals, businesses, communities and economies discussed in this report, the implications of limiting these flows are significant and far-reaching. Careful and strategic consideration, including seeking to afford the enabling factors of data flows while avoiding the pitfalls identified in the blueprint, is needed in order to chart a path towards safeguarding data in a way that still enables us to realize these benefits.

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