

B | Global Economy
and Development
at BROOKINGS



DIGITAL AUSTRALIA

AN ECONOMIC AND TRADE AGENDA

Joshua P. Meltzer

B | Global Economy
and Development
at BROOKINGS



Joshua P. Meltzer is a senior fellow in the Global Economy and Development program at the Brookings Institution and leads the Digital Economy and Trade Project.

Acknowledgements:

The Brookings Institution is a nonprofit organization devoted to independent research and policy solutions. Its mission is to conduct high-quality, independent research and, based on that research, to provide innovative, practical recommendations for policymakers and the public. The conclusions and recommendations of any Brookings publication are solely those of its author(s), and do not reflect the views of the Institution, its management, or its other scholars.

Support for this publication was provided by the Australian Department of Innovation, Industry and Science.

Brookings recognizes that the value it provides is in its absolute commitment to quality, independence and impact. Activities supported by its donors reflect this commitment and the analysis and recommendations are not determined or influenced by any donation. A full list of contributors to the Brookings Institution can be found in the Annual Report at <https://www.brookings.edu/about-us/annual-report/>.

The author would like to thank my research assistant Christina M. Constantine for her work on this report. The author would also like to thank everyone in Australia who made the time to meet to discuss the project.

CONTENTS

EXECUTIVE SUMMARY	iii
The Australian Economy: Challenges and Opportunities	1
The Importance of the Internet and Data on Growth, Jobs, Productivity, and Trade	3
Measuring the Digital Economy and Digital Trade	7
A Regulatory Agenda for a Digital Economy	13
Smart Manufacturing	25
Greater Integration into Global Value Chains	30
Digital Platforms and SMEs	34
Australia's Fintech Opportunity	36
Australia as a Center of Blockchain Excellence	41
Developing a Digital Trade Policy	44

LIST OF TABLES

Table ES1: A menu of policy and trade options to foster Australia's digital economy	ix
Table 3.1: Australia was a top 10 producer of ICT services in 2015, but lags as a share of GDP	10
Table 3.2: Ecommerce sales within leading economies	11
Table 10.1: Australia's Digital Trade Commitments	46

LIST OF FIGURES

Figure 1.1: Declining terms of trade underpin an erosion in Australia's income growth	2
Figure 2.1: Internet access in Australia at world standard	3
Figure 3.1: Increasing downloads point to Australia's growing digitization	8
Figure 3.2: Australian businesses are yet to fully embrace key digital tools	9
Figure 3.3: Missing out: Australia falling short of online delivery potential	11
Figure 5.1: Manufacturing is shrinking as an Australian employer... ..	26
Figure 5.2: ...while its decline in value-added has outpaced other nations	26
Figure 5.3: Highlighting the key role of digital services within Australian manufacturing	28
Figure 6.1: Range and breakdown of Australia's linkages to global value chains	31
Figure 6.2: Differentiating forward and backward linkages over the past decade	31
Figure 7.1: Share of SMEs that exported products and services, 2016	35
Figure 8.1: Australia's financial sector and the dominance of its biggest banks	37
Figure 8.2: Australia lags well behind other hubs in financial service exports	40

EXECUTIVE SUMMARY

The capacity of the Australian economy to grow and deliver sustained increases in living standards will require a boost to productivity.¹

The use of digital technologies is a key driver of productivity gains and it will shape the global economy over the next decades. In fact, Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO) has identified increased immersion in a digital world—characterized by data-driven new business models, platforms, and e-commerce, enabled by global supply chains—as one of the global megatrends for the next 20 years.²

For Australia, this will require using the global internet and data flows as drivers of innovation and productivity to underpin further decades of economic growth, jobs, and rising living standards. For instance, in the US, it is estimated that the internet has improved productivity in the digitally-intensive sectors of the economy by 7.8-10.9 percent.³

According to one estimate, taking full advantage of the opportunities presented by the 'internet of things', big data analytics, automation and online talent platforms could increase Australia's gross domestic product (GDP) by an additional A\$140 billion-A\$250 billion by 2025.⁴

Building a digital economy is not merely about transforming physical goods and services into digital products. In a digital economy, data can be the product; it can be used to create digital goods and services and can be a source of information that leads to further action. The digitization of economic growth and trade will be increasingly driven by the use and extraction of value from data.

The expansive use of data will be needed across the economy and within sectors that traditionally have been outside information technology (IT), such as manufacturing, mining, and agriculture.

These digital developments have the following economic implications:

- Access to data and the capacity to turn it into actionable insights will be a growing source of economic value. In turn, the growing value of data-based insights will support new business models and services.
- The global internet and access to information is reducing barriers to commerce and international trade. As these barriers erode, opportunities for participation from small and medium sized enterprises (SMEs) and developing countries will increase.
- Competition pressures should grow as global internet access and digital platforms create opportunities for businesses to compete across industries and across countries.

Global data flows are also transforming the nature of international trade, creating new opportunities for all businesses—including SMEs—to participate in the global economy and to plug into global value chains (GVCs), while also increasing the opportunity and value of exports of digital services. This should also increase competition and raise productivity.

The key developments in digital trade will be in the following areas:

- Businesses can use the internet (i.e., digital platforms) to export goods.

- Services can be purchased and consumed online.
- Data collection and analysis can add value to goods exports.
- Global data flows underpin global value chains, creating new opportunities for participation.⁵

A regulatory agenda for a digital economy

The broad economic impacts of a transition to a digital economy have equally broad regulatory implications.

Australia's approach to regulation of the digital economy should aim to enable the uptake and use of digital technologies. Supporting digital start-ups is also important, but ensuring access to and use of world-class digital technologies as key business inputs across the economy should be the focus for the government. This will require adjusting existing regulation that is no longer salient, and avoiding heavy-handed regulatory reactions to digital disruption. Australia's domestic agenda should focus on building trust in the transition to a digital economy, enabling access to and sharing of data for innovation, and ensuring that regulations in areas such as intellectual property (IP), privacy, and competition policy support digital opportunities.

Designing Australia's regulatory framework for a digital economy should learn from the legal and regulatory systems in other countries, given the global nature of the internet and the accompanying digital trade opportunities. In particular, Australia should look to the US, where the digital economy first emerged and which remains the most successful country in leveraging the internet and data for growth and jobs.

Australia is a well-regulated economy. Yet, the impact

of data and digital technologies can also be disruptive to incumbents, heightening competition and unsettling business models.

Australia has a strong record of supporting an open, competitive economy.⁶ In a recent report, the Harper Competition Policy Review confirmed that this remains the optimal orientation of economic policy, noting that failure to allow digital entrants with lower-cost products and services risks locking in the status quo, leading to Australia falling behind other countries as new approaches and innovations pass it by.⁷

This understanding should guide the government's regulatory agenda for a digital Australia.

That said, building a digital economy is not simply a deregulatory agenda. For instance, protection of personal information is needed to ensure people have trust when living their lives online and for giving businesses access to data that can be used to add value and improve service delivery. There may be a role for more active use of competition policy to create space for new digital businesses.

The following points outline key domestic regulatory reforms addressed in this report.

1. Support competition enabled by digital platforms.

Fintech can challenge the dominance of the large banks; online retailers can increase competition with brick and mortar stores; and Amazon will compete with incumbent supermarkets. The government needs to support opportunities for competition across digital platforms, while ensuring that underlying regulatory goals such as consumer health and safety are maintained.

2. *Develop a framework that supports data sharing and use.*

Building a digital Australia will require greater data collection and use by businesses and government, as this will be central to how they operate and add value. This will require broad community support for such activities. Yet, Australia lacks a broad framework to address the opportunities and risks for sharing data. Instead, privacy laws are the main regulation applicable to data sharing practices. Yet, one of the key challenges for public entities in releasing data sets is determining whether such data when linked with other available data sets will turn otherwise anonymous data into personal data. The challenges of making such assessments underscores the potential that government agencies in particular err on the side of caution and avoid making data sets public. This could lead to underutilization of public data and the opportunities to improve government services, government policy, and related economic benefits.

Addressing limits to data sharing will require various steps. For one, government leaders need to shift the public sector culture away from minimizing risk to being rewarded for better data use and sharing. A framework to guide data collection, use, and sharing that gives due attention to the importance of privacy while also taking account of the economic and social opportunities of data use would also support greater data utilization. In this regard, the productivity commission has recommended that the federal government develop a regulatory risk based framework for data sharing and release.⁸

Meanwhile, the private sector is using data and likely treating this uncertainty as a cost of doing business.

In addition, building and maintaining community support for data use by the public and private sectors will

be crucial. Australia's privacy principles should support and help build such trust as data use grows. Non-government activity to build trust can also help, such as Data Governance Australia's Code of Practice.

3. *Ensure that intellectual property protection provides appropriate protection and opportunity for innovation.*

The IP regime is particularly important for a digital economy. On the one hand, the scope for illegal copying and use of IP-protected work is almost unlimited online. On the other hand, in a digital environment, material cannot be handled without copying;⁹ this aspect is necessary for the effective functioning of the internet.

In addition, digital trade itself increasingly relies on effective IP protection. For instance, trade online in digital content such as software, music, and applications (apps) is often a trade in a license. Additive manufacturing (essentially 3D printing) will also transform trade in goods to trade in designs.

The US approach to balancing these IP needs has been a key building block for the digital economy.¹⁰ It has underpinned the growth of internet companies as well as the development by content providers of online business models that monetize copyright in content using online streaming. Australia should consider adopting some of these legal pillars that have underpinned the development in the US of a digital economy, specifically US-style fair use exceptions to copyright exceptions and extending safe harbor framework to internet intermediaries.

4. *Build smart manufacturing.*

Australia's manufacturing sector is relatively small compared to peers in the Organization for Economic Co-operation and Development (OECD) and has been challenged by high cost of inputs (labor, electricity) and

the strong Australian dollar. Australia's manufacturing productivity growth has also been below benchmarks. Despite these challenges, Australia's manufacturing sector does not appear to have lost its structural competitiveness and could rebound.¹¹

The internet, data, and use of digital technologies have the potential to transform Australian manufacturing into a sector that is connected and networked, uses digital services, and is much better integrated into GVCs. This is about the development of 'smart' manufacturing. Smart manufacturing transformations are already underway in the US, the European Union (EU), China, and Japan.

The government has identified six industry sectors with competitive strength: advanced manufacturing; food and agribusiness; medical technologies and pharmaceuticals; mining equipment, technology and services; and energy. To support these sectors, the government has established six independent and industry-led industry "Growth Centers" with the aim of improving sector competitiveness, their capacity for innovation, and their productivity.

In many respects, the growing importance of connectivity, data, and digital services will be key to any move to smart manufacturing and is a development that could play to Australia's existing services strengths. Digital services are also increasingly key inputs into manufacturing processes. This is underpinning a broader shift in manufacturing value added being derived from services.

Developing smart manufacturing should also create new opportunities for participation in GVCs as digital services are themselves becoming inputs into global manufacturing processes.

Smart manufacturing will also require developing

international standards that enable interoperability amongst software, machines, and processes.

5. Encourage digital platforms and SMEs.

E-commerce is a growing commercial opportunity for Australia businesses. The expansion of the internet globally means that online platforms such as eBay and Alibaba enable business to reach overseas customers and thereby engage in digital trade. In particular for SMEs, digital platforms provide a springboard to a global presence for businesses that otherwise would have remained local.

These opportunities rely on cross-border data flows, access to digital payment mechanisms, and efficient transport and delivery options.

6. Develop Australia's Fintech opportunity.

Financial technology (Fintech) has emerged as an area where Australia could assume a global position. Australia's Fintech strengths include a well-regulated banking sector, with some of the world's largest and safest banks. Compulsory retirement saving has resulted in Australia having the fourth-largest pool of investment fund assets in the world and this will continue to grow as the population ages.

Fintech should also catalyze improvements in financing decisions and resource allocation within the financial sector, providing capital and other financial services to businesses, supporting job creation, and innovation across the economy.

Proximity to Asia, including free-trade agreements with China, Japan, Korea, and other countries within the Association of Southeast Asian Nations (ASEAN), makes Australia an attractive hub for Fintech exports. Exports will be needed to give Fintech startups in Australia the opportunity to scale their operations.

The government has already undertaken a number of regulatory reforms and other support for Fintech development but more needs to be done. This includes promoting access to data, which will be needed to realize Fintech possibilities. Additionally, the government will need to address a range of domestic and international issues regarding Fintech governance.

7. *Build Australia as a center of blockchain excellence.*

Blockchains are a digital technology that—combined with cryptographic data management, networking, and incentive mechanisms—support the checking, execution, and recording of transactions between parties.¹² A key benefit of blockchain is the ability to build trust among disparate parties. By providing trust in a ledger based on distributed consensus, the blockchain can replace reliance on third parties that traditionally have performed an intermediating role.

Blockchains also provide scope for so-called smart contracts that use computer programs incorporated into a blockchain to automatically execute an action based on specified conditions or events. For instance, a blockchain could be created to automatically transfer payments upon receipt of goods. This allows blockchains to become more than just a distributed database and increases the range of potential uses.

International trade is one area where blockchain technology could add value for Australian exports in terms of supply chain management and provenance, increased efficiency, and reduced cost. For instance, supply chains stretching across countries and involving multiple parties could use a blockchain to confirm the movement of goods through each stage in the chain

Blockchains can also be used to record the provenance of agriculture products, determining the particular farm

or even the single paddock that high-quality beef came from, potentially adding value and creating new market opportunities for Australian agricultural exports.

Developing a digital trade policy

The global nature of the internet and the digital trade opportunities will require international cooperation, new trade rules, and international standards.

Governments are still learning the steps needed (particularly developing ones) to nurture their digital economy and engage in digital trade. The Australian government could play a leadership role and support dialogue, capacity building, and the sharing of experiences of regulating for a digital economy.

The government has recently taken important steps to develop a digital trade policy, most recently outlined in Australia's International Cyber Engagement Strategy. This includes pursuing digital trade commitments in future trade agreements as well as engaging on digital trade issues in international forum such as the Asia Pacific Economic Conference (APEC), the Organization for Economic Cooperation and Development (OECD), and the Group of 20 (G20).

This report builds on the government's digital trade policy—it reaffirms much of what the government is doing and expands on it in some areas. This report also clearly links Australia's digital trade policy to recommendations for a domestic digital agenda (see table ES1).

Australia's digital trade policy should be developed with the following goals in mind:

- Maximizing access to data and digital services
- Reducing barriers to exports of digital products

- Developing international standards consistent with Australia's interests
- Addressing other countries regulatory barriers including restrictions on data flows that affect Australia's digital exports
- Engaging other countries on the regulatory agenda needed to support digital economic growth and digital trade

Australia should develop a multifaceted international agenda with respect to digital trade that includes engagement at the World Trade Organization (WTO) and through free trade agreements. It should also look to influence the agendas at the G20, APEC, the OECD, and international standards organizations. Table ES.1 outlines the key elements of this approach and ties it into domestic opportunities for building a digital Australia.

Table ES1: A menu of policy and trade options to foster Australia’s digital economy

Domestic Policy	International Trade Agenda
Enable competition	
<ul style="list-style-type: none"> • Ensure that regulation does not limit opportunities for competition from digital entrants, taking into account underlying regulatory goals. • While the impact of large internet companies on competition remains unsettled, regulators should monitor and be cautious about overreaching and risk stifling innovation. 	<ul style="list-style-type: none"> • Use G20 discussion on competition and the digital economy to focus on the opportunities that arise from increased competition. • Within APEC develop a dialogue on best practices for regulating the digital economy. • Support the continued inclusion in free trade agreements (FTAs) of competition chapters.
Expand data access and use while ensuring strong privacy protection	
<ul style="list-style-type: none"> • Build and sustain social license and support for data collection and use. This includes with respect to cross-border data flows. • Develop a framework for data use which supports robust privacy outcomes as well as the economic and trade opportunities. The Productivity Commission recommendation for a Data Sharing and Release Act provides one way forward. • Government and public sector leaders need to encourage data use and sharing by the public sector. • Government should develop a vision for using data to improve government services and reduce costs. • Businesses should engage with stakeholders to ensure their practices for data collection and use sustain community trust and license for such activities. 	<ul style="list-style-type: none"> • Expand work of the APEC Electronic Commerce Steering Group on interoperability beyond the EU GDPR. • The G20 Roadmap for Digitization provides an opportunity to work on interoperability amongst privacy regimes. • Australia should finalize its participation in the APEC cross-border privacy rules (CBPRs). • Use APEC to develop a dialogue around regulation and digital trade. This could include workshops, dialogue, and best practices among regulators in areas such as telecoms, privacy, health, and consumer welfare. • Use the digital trade commitment in the Comprehensive and Progressive Trans-Pacific Partnership (CPTPP) as a basis for engaging other CPTPP parties on how to regulate data for a digital economy that minimizes restrictions on cross-border data flows. • Amongst parties to CPTPP, work towards the CPTPP goal of interoperability amongst privacy regimes. Using the CPTPP in this way could also empower trade/economic officials within CPTPP parties to make the case domestically for the link between privacy regulation and digital trade. • Reflect similar language on interoperability among privacy regimes in future FTAs, including with the EU.
Undertake intellectual property protection reforms	
<ul style="list-style-type: none"> • Australia should ensure it has adequate copyright protection that also provides access to information and innovation. • Consider adopting US-style fair use exceptions to copyright protection. • Consider extending safe harbor protections to include internet intermediaries. 	<ul style="list-style-type: none"> • The government’s trade position on copyright protection should reflect domestic reforms, including whether to implement safe harbor and fair use exceptions clauses in future FTAs. • Continue to support intellectual property chapters in FTAs.

Domestic Policy	International Trade Agenda
Build smart manufacturing	
<ul style="list-style-type: none"> • Use Australia's six industry growth centers as a basis to develop smart manufacturing capacities, focused on connectivity, data flows, and intensive use of digital services. 	<ul style="list-style-type: none"> • Use the G20 Blueprint on Innovative Growth and G20 new Industrial Revolution Action Plan to discuss the development of smart manufacturing standards. This includes engaging China and avoiding regional/country specific standards. • Participate and support development of international standards, including developing a reference architecture for smart manufacturing. • Use FTAs and the WTO Technical Barriers to Trade (TBT) Agreement as a legal basis to promote the development of international standards and base domestic standards on international standards where they exist. • Engage on standards development with Germany Platform Industry 4.0 and the U.S. Industrial Internet Coalition. • Use the CPTPP commitments on cross-border data flows and data localization to support Australia's smart manufacturing export opportunities. • Include the CPTPP digital trade commitment to data flows and avoid data localization in future FTAs. • Use FTA negotiations to address barriers to services being used in smart manufacturing. • Determine which WTO GATS commitments are relevant for smart manufacturing exports and where market access barriers exist consider addressing at the WTO.
Increase participation in global value chains	
<ul style="list-style-type: none"> • Support access to and use of data and digital services as key drivers of manufacturing value add. 	<ul style="list-style-type: none"> • Determine whether there are existing WTO GATS commitments that apply and consider using the WTO to address market access barriers. • Lower tariffs on manufactured goods exports and imports, particularly in the context of global value chains. • Use FTAs and the WTO Trade Facilitation Agreement to improve the efficiency of customs procedures in other countries.

Domestic Policy	International Trade Agenda
Develop Australia's Fintech opportunity	
<ul style="list-style-type: none"> • Keep monitoring the regulatory framework applicable to Fintech and ensure it does not unnecessarily stifle growth. • Assess the potential for financial risks from Fintech, including prudential and cyber risks. • Position Australia as a Fintech hub for servicing Asia and globally. 	<ul style="list-style-type: none"> • The G20 Fintech agenda is focused on financial inclusion, including the G20 High-level Principles for Digital Financial Inclusion. Consider promoting discussions in the G20 on trade in Fintech, regulation of Fintech, Fintech and privacy, and the development of digital identities. • Australia should work with APEC to improve Fintech regulation and expand Fintech export opportunities. This could be under the APEC Agenda on Economic Financial and Social Inclusion or APEC's action agenda on financial inclusion which includes developing a regulatory agenda to support Fintech. • Use FTAs to expand market access for Fintech exports. • Use FTA transparency commitments to monitor regulatory developments that might affect Fintech opportunities in other FTA countries. • Assess whether the WTO discussions on ecommerce can include Fintech. • Use existing trade agreement and FTA negotiations to address services and regulatory barriers to Fintech, including a focus on recognition of Australia's regulatory regime for Fintech. • Commitments to cross-border data flows in FTAs supports Fintech development and exports should be included in future FTAs. The CPTPP does not apply to financial services, which outcome should be avoided in future FTAs. • Avoid data localization requirements which can raise the cost of Fintech exports, particularly for SMEs.
Build Australia as a center of blockchain excellence	
<ul style="list-style-type: none"> • The government should articulate a vision for using blockchain technology to improve the delivery of government services, reduce costs, and improve security and trust. • Support research to better understand the technological and legal risk of blockchain. • Develop partnerships with the private sector to test blockchain in areas such as Fintech, supply chain management, and international trade. 	<ul style="list-style-type: none"> • As chair of the International Standards Blockchain Committee, Standards Australia should develop blockchain standards that support open markets. • Develop ASX experience in blockchain for clearing and settlements for other financial markets.
Measure the digital economy and digital trade	
<ul style="list-style-type: none"> • Like all other countries, Australia has limited data on the importance of the internet and data for economic growth and trade. Australia should develop its domestic capacity to better measure these impacts. 	<ul style="list-style-type: none"> • Better measurement of digital trade is a G20 priority which the government should support. • The government should support work underway in international organizations (OECD, UN Conference on Trade and Development, WTO) to better measure digital trade. • The government should help other countries in the region develop their own capacity to measure their digital economies and engagement in digital trade.

DIGITAL AUSTRALIA

AN ECONOMIC AND TRADE AGENDA

Joshua P. Meltzer

THE AUSTRALIAN ECONOMY: CHALLENGES AND OPPORTUNITIES

The capacity of the Australian economy to grow and deliver sustained increases in living standards will require boosting productivity. Income growth rates over the last two decades were underpinned by significant productivity growth in the 1990s and in 2000-2013 by improvements in Australia's terms of trade. Figure 1.1 shows that since then, declines in Australia's terms of trade are subtracting from income growth. While there has been recent improvement in the terms of trade, labor productivity is not expected to grow above trend.¹³ Moreover, multifactor productivity growth remains low and is unlikely to rebound. Yet as shown in figure 1.1, Australia needs to boost productivity to avoid declining living standards.¹⁴

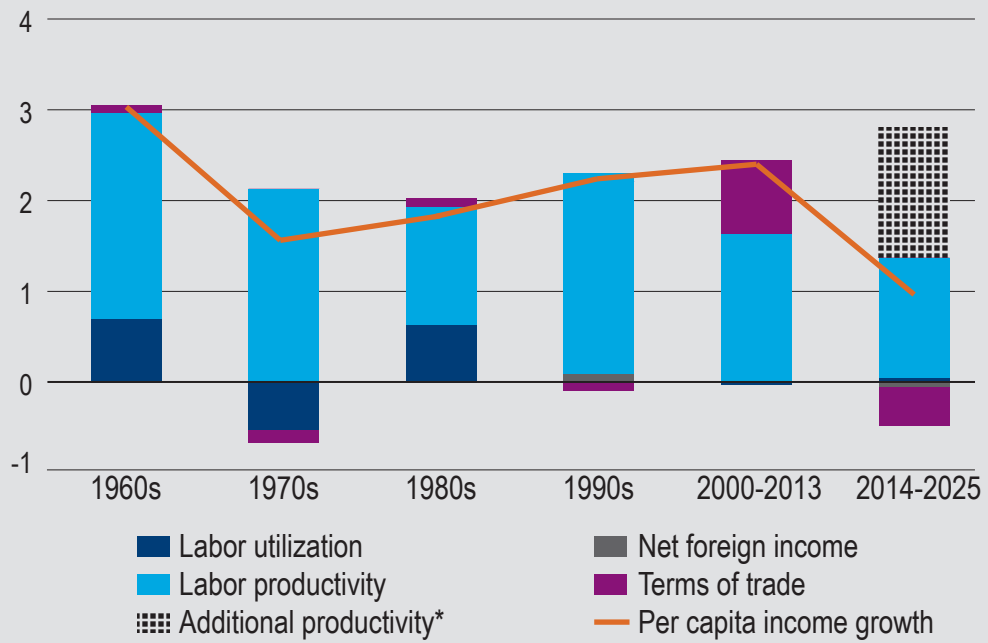
The world is experiencing unprecedented increases in connectivity and global data flows. This is underpinning the so-called fourth industrial revolution which

describes end-to-end digitization of all assets and integration into a digital ecosystem.¹⁵ It describes the fourth major upheaval in modern manufacturing—the lean revolution of the 1970s, outsourcing in the 1990s, and automation in the 2000s.¹⁶

Indeed, Australia's CSIRO has identified increased immersion in a digital world—characterized by data-driven new business models, platforms, and e-commerce, enabled by global supply chains—as one of the global megatrends for the next 20 years.¹⁷

As such, the use of digital technologies is one the key forces that will shape the global economy over the next decades.¹⁸ For Australia, this will require using the global internet and data flows as drivers of innovation and productivity to underpin further decades of economic growth, jobs, and rising living standards. For instance, in the US, it is estimated that the internet has improved productivity in the digitally-intensive sectors of the economy by 7.8-10.9 percent.¹⁹

Figure 1.1: Declining terms of trade underpin an erosion in Australia's income growth



*The hatched area represents the additional labor productivity required to achieve long run average growth in real gross national income per capita.
 Source: Australian Bureau of Statistics (ABS), Australian Treasury .

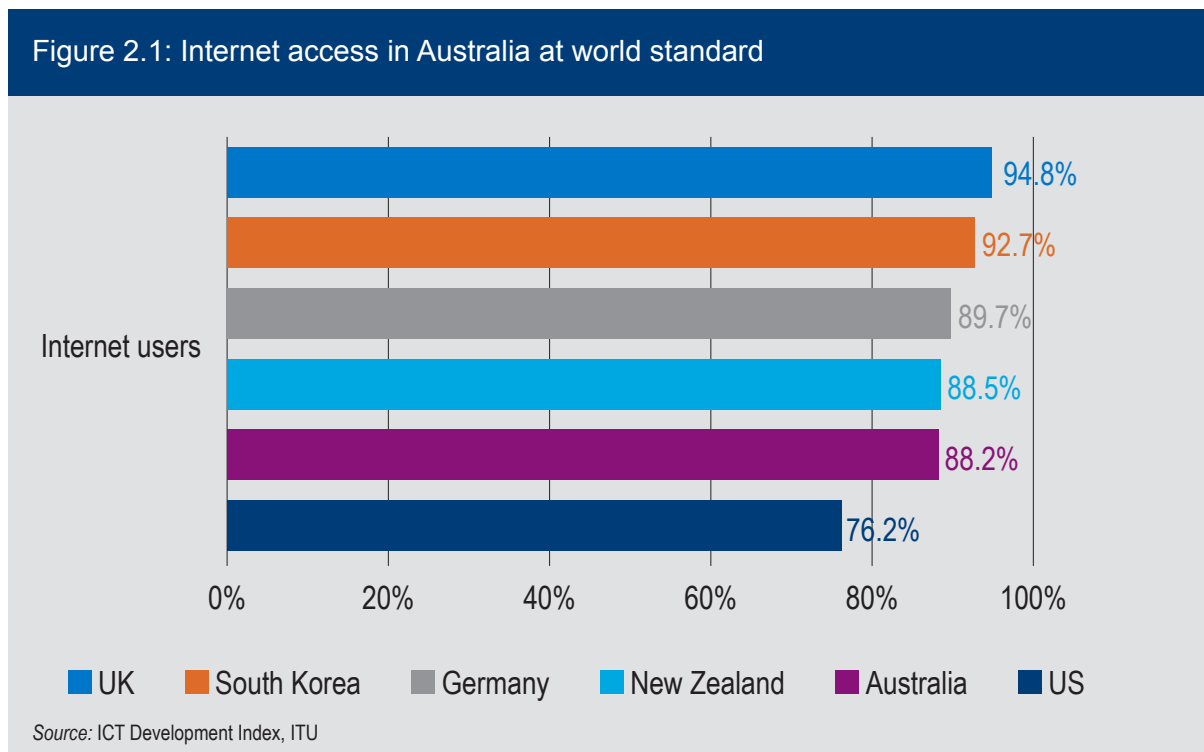
THE IMPORTANCE OF THE INTERNET AND DATA ON GROWTH, JOBS, PRODUCTIVITY, AND TRADE

The digitization of economic growth and trade is driven by the use and extraction of value from data, which has been described as the “oil of the digital era”. As with oil, data now supports an expanding range of economic activity and international trade.

Understanding the role of data in a digital economy requires expanding horizons as to how data can be used and what their value could be. Building a digital economy is not merely about transforming physical goods and services into digital products. In a digital economy, data can be the product; they can be used to create digital goods and services and can be a source of information that leads to further action.

The importance of the internet and data for growth and trade has been underpinned by growing global connectivity and mobility. Currently, approximately half of the world is online.

The following figure shows Australia’s internet access compared with other developed countries. Approximately 88.2% of the population has internet access, which is comparable to other developed countries such as New Zealand and Germany but below UK internet penetration that reaches almost 95 percent. Australia is rolling out its national broadband network which by 2020 plans for 8 million homes and businesses to be connected to fast broadband.²⁰ Such connectivity is a key building block for developing Australia’s digital economy.



The importance of internet access and use of data is not confined to the IT sector but is economy wide, as traditionally non-IT sectors such as manufacturing, mining, and agriculture become digital. The US International Trade Commission (USITC) has estimated that in the United States 75 percent of economic gains from internet and data use have accrued to non-IT sectors.²¹

Global data flows are also transforming the nature of international trade, creating new opportunities for SMEs to participate in the global economy and for businesses to plug into global value chains, while also increasing the opportunity and value of exports of digital services. This should also increase competition and provide another channel to raise productivity.

According to one estimate, taking full advantage of the opportunities presented by the 'internet of things', big data analytics, automation, and online talent platforms could increase Australia's gross domestic product (GDP) by an additional A\$140 billion-A\$250 billion by 2025.²²

The development of a digital economy for Australia brings with it challenges and opportunities. Business has an important role here, but creating the foundations for an innovative economy largely rests with the government.²³

Defining the digital economy and digital trade?

This paper employs a broad definition of the digital economy and digital trade in order to fully capture the cross-cutting and transformational impact of the internet and data.

The digital economy refers to a connected economy, one that relies on enhanced interconnectivity of networks, use of data, and the interoperability of digital

platforms across all sectors of the economy and of society to offer convergent services.

There is no specific definition of what is digital trade. The WTO Work Program on Electronic Commerce limited its consideration to "the production, distribution, marketing, sale or delivery of goods and services by electronic means."²⁴ The USITC developed a broader definition of digital trade as "U.S. domestic commerce and international trade in which the internet and internet-based technologies play a particularly significant role in ordering, producing, or delivering products and services."²⁵ An even broader definition includes how cross-border data flows enable digital trade, either through the cross-border movement of data flows themselves as a form of trade or through productivity gains from using digital services that make firms more competitive domestically and overseas.²⁶

This paper adopts a broad definition of digital trade and includes how internet access and cross-border data flows enable digital trade, either through the cross-border movement of data flows themselves as a form of trade or through productivity gains from using digital services that make firms more competitive domestically and overseas.

Data, economic growth and international trade

At its simplest, some physical goods and services now also take digital forms, such as film, music, and books and news. This has led to ecommerce as a growing way that consumers and businesses transact. In fact, the UN Conference on Trade and Development (UNCTAD) estimates that in 2015 Australia's business-to-consumer (B2C) ecommerce market was worth \$US22 billion, but business-to-business (B2B) ecommerce was over 6 times larger at \$188 billion.

However, this is only the beginning. Data are used to create new digital services—such as cloud computing, Fintech and blockchain applications—and to improve businesses’ awareness and understanding of their customers, which itself allows for the delivery of better better-targeted services. In addition, for some businesses, such as social networking, data itself is the product.

The digitization of things (turning things into data, such as photos, books, maps, books, social networks, and information) is driving exponential growth in data flows. According to Cisco, between 2005-2021, global internet traffic will increase 127-fold and devices connected to the internet will triple the global population by the end of that period.

Moreover, digital data are non-rival in the sense that the use of data by one person does not reduce its availability to others. Data is also almost costless to reproduce. Digital information does not deplete when used and is very cheap to replicate.²⁷ These features of data point to the potential value of data for economic growth.²⁸

Another development is the ongoing doubling of computing power every two years; the fulfillment of Moore’s law. This is catalyzing rapid improvements in the ability to analyze data and turn it into useful insights. The combination of growth in data and computational capacity is underpinning innovations in areas such as cloud computing, the internet of things, artificial intelligence, driverless cars, and increasingly sophisticated robotics.

These digital developments have the following economic implications:

- Access to data and the capacity to turn it into actionable insights will be a growing source of economic

value. In turn, the growing value of data-based insights will support new business models and services.

- The global internet and access to information is reducing barriers to commerce and international trade. As these barriers erode, opportunities for participation from SMEs and developing countries will increase.
- Competition pressures should grow as global internet access and digital platforms create opportunities for businesses to compete across industries and across countries.

Digital trade

The globalization of the internet and the role of data in economic growth will also affect the nature and scope of international trade. McKinsey & Company estimates that global data flows raised global GDP by approximately 3.5 percent over what would have occurred without any flows, equivalent to US\$2.8 trillion dollars in 2014.²⁹

The key developments in digital trade will be in the following areas:

- Businesses can use the internet (i.e., digital platforms) to export goods. This is about purchasing online and having the good delivered offline. It is a particular opportunity for SMEs that can use digital platforms to reach customers globally. The ancillary services that these platforms provide, such as consumer ratings and online payments, build trust and facilitate international transactions. Already, around 12 percent of global goods trade is via international ecommerce.³⁰ Some trade in goods could decline as three-dimensional (3D) printing becomes more widely used.

- Services can be purchased and consumed online. This is particularly true for IT, professional, financial, retail, and education services. New digital services, such as cloud computing, have also been developed and are becoming crucial business inputs. Moreover, some goods that were imported are now being consumed as digital products; e.g., software, books, and movies. Platforms are also expanding the range of services that can be traded.
- Data collection and analysis is adding value to goods exports. For example, data collected from sensors on mining and farming equipment allows business to improve their operation and thereby the value from their use. Distributed ledgers provide further opportunities to add value to Australia's goods exports (see discussion of blockchain applications).
- Global data flows underpin GVCs, creating new opportunities for participation.³¹ The global internet and data flows enable businesses to plug into these GVCs to offer their own specific service. Digital technologies, such as 3D printing, could also lead to some re-localizing of production.³²

MEASURING THE DIGITAL ECONOMY AND DIGITAL TRADE

A number of studies highlight the scale and importance of the internet and data for growth and trade.³³ One set of reports has created global indexes that give some sense of Australia's relative capacity to benefit from digital technologies. For instance, according to the World Economic Forum, Australia ranked 21 in global competitiveness in 2016, well behind leaders like Switzerland (first), the US (second), Germany (fifth), New Zealand (twelfth), and Canada (thirteenth).³⁴ Digging deeper, the data reveals that Australia's ranking would have been even lower if not for its high rankings on education and training (ninth), financial market development (sixth), and health and primary education (twelfth). Australia's technological readiness was ranked twenty-seventh, its capacity for innovation twenty-seven, and business sophistication twenty-eighth. These indexes are subject to measurement glitches, including problems arising from aggregation. But collectively, they do paint a picture of a country not performing at the global digital frontier.

This is also borne out in the McKinsey Global Institute (MGI) Connectedness Index, which assesses countries' connectedness in terms of goods, services, finance, and data, where Australia ranks twenty-seventh out of 118 countries. Moreover, in the subcomponents of this index, Australia languishes at thirty-third in terms of global data flows, below Turkey, Brazil, and Russia, ranking just above Ukraine.³⁵

In terms of digitization across sectors in Australia, knowledge-intensive sectors (e.g., professional services and information, media, and telecommunications) are successfully managing the transition to digital. In contrast, sectors such as agriculture, mining, retail, transport, healthcare, and utilities exhibit low lev-

els of digital update and use, pointing to opportunity for improvement.³⁶

There are also studies that seek to evaluate the economic importance of the internet and data for economic growth and trade. This includes estimating the contribution of cross-border data flows to GDP; employment growth and productivity; the value of international trade in digital services; e-commerce; and consumption of data-related products and data traffic.³⁷ Key findings include:

- A 2011 study by the McKinsey Global Institute estimated that the internet accounted for 3.4 percent of overall GDP in 13 select developed countries and accounted for 21 percent of the growth in GDP in these mature countries (over five years). The study further estimated that the internet created 2.4 jobs for every job destroyed.³⁸
- In 2014, the free flow of data was estimated to have contributed US\$2.8 trillion to the global economy,³⁹ a figure that could reach US\$11 trillion by 2025.⁴⁰ Over the past decade, data flows are estimated to have increased world GDP by 10.1 percent.⁴¹
- In 2014, the OECD measured the digital economy, defined as being the information communications technology (ICT) sector, as accounting "for 6 percent of total value added, 4 percent of employment and 12 percent of total fixed investment in the OECD area."⁴²
- The USITC undertook an extensive study of the US digital economy using survey and modelling. The ITC found that in the US in 2014, digital trade (within the US and globally) raised US GDP by 3.4 to 4.8 percent by increasing productivity and lowering the costs of trade; it has also increased wages and likely contributed to as many as 2.4 million new jobs.⁴³

Australia's digital economy

There is no single metric that shows the size of Australia's digital economy or engagement in digital trade. Instead, various data points can be used to give a sense of Australia's evolution in terms of digitization and trade.

Figure 3.1 shows growth in data downloaded via fixed line broadband (which accounts for over 97 percent of all internet downloads in Australia). As can be seen, while the number of subscribers has trended up slightly, data downloads have grown exponentially—up 43 percent in the year between June 2016 and June 2017. This points to the growing use of data in the Australia economy. However, the quantity of data downloaded does not necessarily correlate with economic value, as large amounts of data are used to download videos,

for example. Moreover, even deflating for telecom revenues using data flows only provides a partial estimate of economic value derived from data, mainly from advertising, and fails to capture the consumer surplus of internet access and free digital services.

Figure 3.2 indicates that Australian businesses use a range of digital technologies. However, as can be seen, while a majority of businesses reported using the internet and mobile devices, there is low uptake by businesses of key digital technologies such as cloud computing (over 40 percent not at all), ecommerce (60 percent not at all), data analytics (over 70 percent not at all), and radio frequency identification (almost 90 percent not at all).

Figure 3.1: Increasing downloads point to Australia's growing digitization

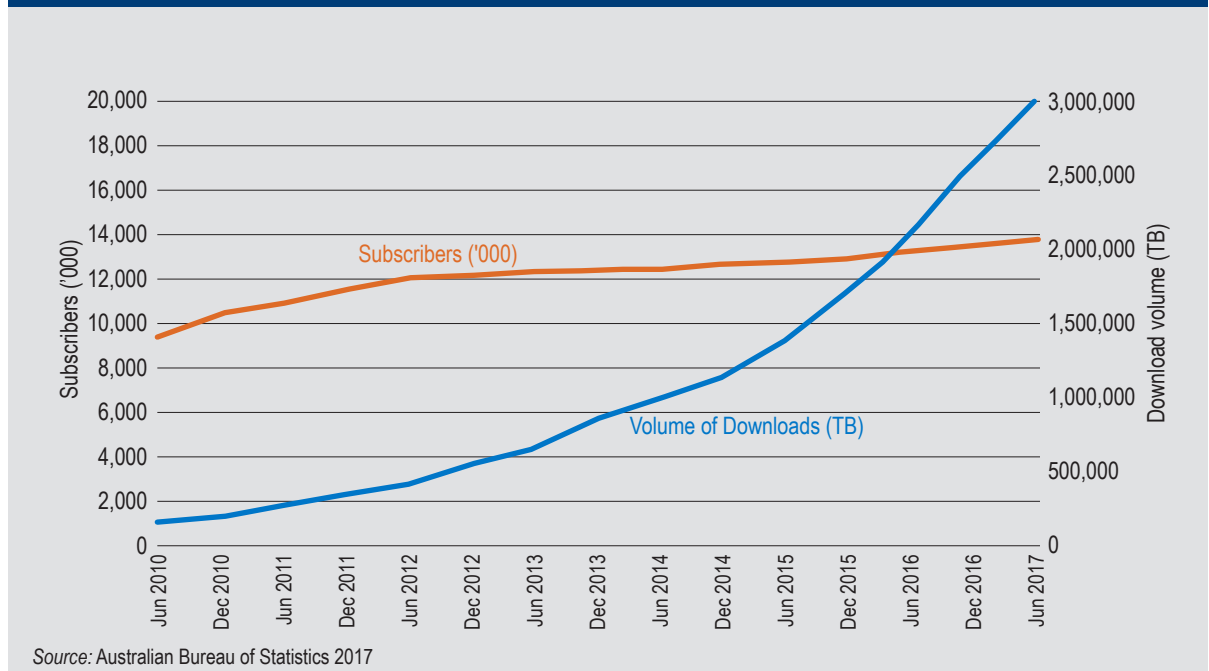
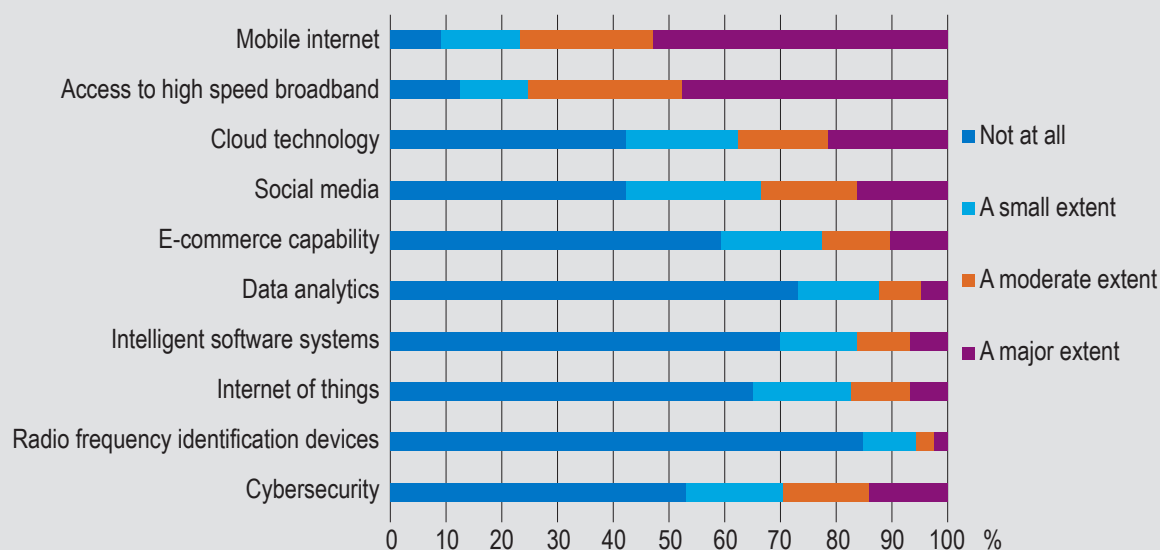


Figure 3.2: Australian businesses are yet to fully embrace key digital technologies



(a) Proportions are of business that reported internet access.
 (b) Businesses could select either; not at all, a small extent, a moderate extent or a major extent.
 Source: Australia Bureau of Statistics

Australian business also have low uptake of technology compared with firms in other OECD countries.⁴⁴ This is true also for a range of metrics for assessing Australia’s digital economy and trade position, including business use of ICT, business expenditure on R&D, and exports of ICT services. In all cases, Australia ranks average to below average compared to other OECD countries.⁴⁵

There are also various studies that have sought to measure the size of Australia’s digital economy. The key findings are that:

- McKinsey and Company estimates that digitization could contribute between \$A140 billion and A\$250 billion to Australia’s GDP by 2025.⁴⁶
- Deloitte estimated value-added from the economic contribution of the internet and digital technologies in 2013-2014 was A\$78.8 billion or 5.1 percent of GDP.

Australia’s digital economy could be worth A\$139 billion or 7.3 percent of GDP by 2020.⁴⁷ This calculation includes the economic contribution of the internet from information, media and telecommunications, the rest of the market (outside information, media, and technology), and from the non-market sector (education, health and government).

- According to Accenture, Australia’s digital share of GDP in 2015 was 30 percent and this could grow to 34 percent by 2020.⁴⁸ This measure is based on a model that, in addition to including how digital is adding value in the information, media, and technology, considered digital skills, equipment, and intermediate goods and services.

The McKinsey report sheds some light on which sectors in Australia are lagging in terms of their uptake of the internet and use of data. In particular, the mining,

oil and gas, and utilities sectors spent significant less (at least 20 percent less) on digitization (i.e., spending on computer systems, internet and telecommunications, and stock of ICT assets) than the US.⁴⁹

Table 3.1 provides another perspective on the relative position of Australia's development of elements of a digital economy. The table shows the value added of ICT services to economic growth across the top 10 economies. While Australia is the tenth-largest producer of ICT services, as a share of GDP the value add of ICT services is well below global leaders, such as the US, the EU, and Japan. This points to scope for significant deepening of the use of digital services across the economy.

Measuring digital trade

The contribution of the internet and data flows to digital trade is poorly measured globally. One approach is to focus on cross-border goods and services e-commerce.

Table 3.2 shows that global e-commerce sales in 2015 were worth approximately US\$25 trillion. Australia was among the top 10 participants in e-commerce. However, at 16 percent of GDP, e-commerce was well below the GDP shares seen in all other top-10 countries.

Another measure of digital trade is the value of services that could be exported online; i.e., digitally deliverable services. This includes telecommunication services, insurance, financial, and business and professional services.

With this in mind, the UNCTAD found that some 50 percent of all traded services are enabled by the technology sector, including cross-border data flows.⁵⁰ Somewhat similarly, the USITC estimated that, by the early part of this decade, US exports globally of digitally-deliverable services were already 61 percent of total US services exports and 53 percent of services imports.⁵¹ EU exports and imports of digitally-deliverable services were at similar levels.⁵²

Table 3.1: Australia was a top 10 producer of ICT services in 2015, but lags as a share of GDP

The top 10 economies by value added of ICT services, 2015				
		Value added (\$bn)	Share in top 10 (percent)	Share in GDP (percent)
1	United States	1,106	42	6.2
2	European Union	697	26	4.3
3	China	284	11	2.6
4	Japan	223	8	5.4
5	India	92	3	4.5
6	Canada	65	2	4.2
7	Brazil	54	2	3
8	Republic of Korea	48	2	3.5
9	Australia	32	1	2.4
10	Indonesia	30	1	3.5
Total for top 10				

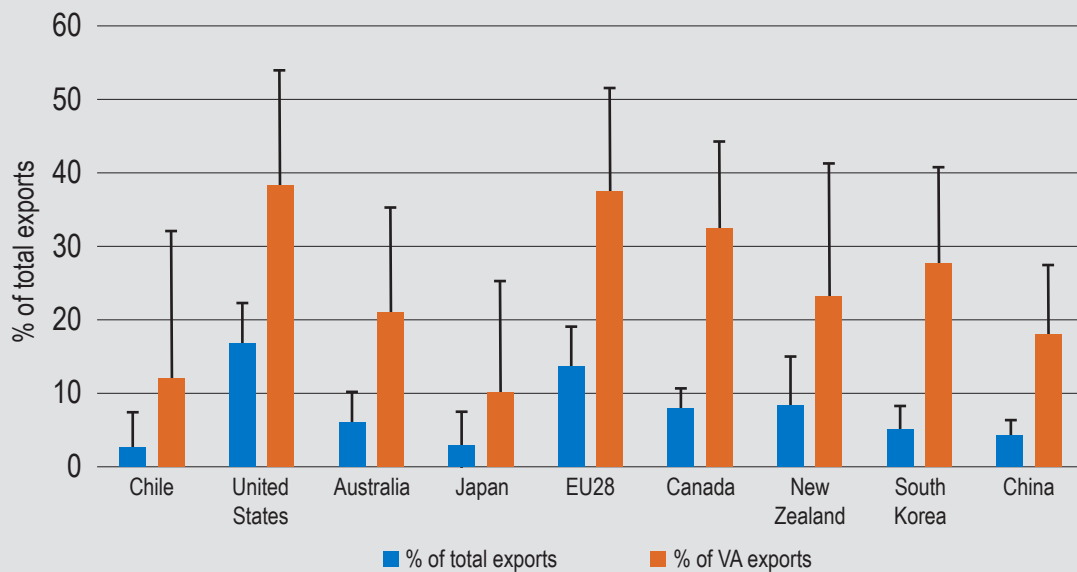
Source: UNCTAD, based on data from United Nations Statistics division and national statistics

Table 3.2: Ecommerce Sales within leading economies (US dollars, where “\$” indicated)

Economy	Total		B2B		B2C
	\$ bn	Share in GDP (percent)	\$ bn	Share in total e-commerce (percent)	\$ bn
1 United States	7,055	39	6,443	91	612
2 Japan	2,495	60	2,382	96	114
3 China	1,991	18	1,374	69	617
4 South Korea	1,161	84	1,113	96	48
5 Germany (2014)	1,037	27	944	91	93
6 United Kingdom	845	30	645	76	200
7 France (2014)	661	23	588	89	73
8 Canada (2014)	470	26	422	90	48
9 Spain	242	20	217	90	25
10 Australia	216	16	188	87	28
Total for top 10	16,174	34	14,317	89	1,857
World	25,293		22,389		2,904

Source: UNCTAD, based on data from the United States Census Bureau; Japan Ministry of Economy, Trade and Industry; China Bureau of Statistics; KOSTAT (Republic of Korea); Eurostat (for Germany); United Kingdom Office of National Statistics; National Institute of Statistics and Economic Studies (INSEE, France); Statistics Canada; Australian Bureau of Statistics and National Statistics Institute (INE, Spain).

Figure 3.3: Missing out: Australia falling short of online delivery potential



Source: OECD TIVA, own calculations

Figure 3.3 shows the importance of digitally-deliverable services (DDS) for Australia. The orange bar shows value added in DDS, which includes those embodied in goods exports. As can be seen, in 2011 between 21-35 percent of Australia's services exports could be delivered online.⁵³ This underscores the importance of

DDS as inputs into goods exports. Moreover, by 2017, Australia's DDS exports had grown to 38-43 percent of total exports. However, the US, the EU, and Canada have higher shares of DDS exports, pointing to room to grow Australia's DDS exports.

Box 3.1. Challenges in measuring the digital economy and trade

Measurement of the internet and data flows is complicated by their general and transformational economic character.⁵⁴ With the internet now a 'horizontal' enabler, it is hard to delineate and quantify its economic benefits. This speaks to some digital mismeasurement, particularly concerning the impact on productivity. However, this appears to be only a partial explanation.

Governments and international organizations do not collect regular and comprehensive data on the impact of the internet and data on growth, jobs, and trade. Official statistics that do capture cross-border data flows are often limited to tech-related sectors of the economy. The lack of statistics also reflects a range of measurement challenges.

A key challenge is measuring the value of free digital services, such as email, communication, and navigation. One approach is to value such services ac-

cording to their advertising revenue—an approach originally developed to measure the value of radio and television. This approach has always had its limits, but this is particularly so for digital services given the scope for significant consumer value (i.e., willingness to pay).

There is also the challenge of quantifying the role of data in trade given that many cross-border data transfers do not involve money changing hands as information moves from one country to another. Movement of data from Country A to Country B is usually accomplished by copying the data rather than by the physical transfer of a good (i.e., exporting from Country A and importing by Country B).⁵⁵ This makes cross-border data flows hard to count in traditional trade statistics based on imports and exports.⁵⁶ Even in situations where statistics may implicitly capture the economic value generated by cross-border data transactions, it is difficult to attribute gains in productivity or GDP to these flows.⁵⁷

A REGULATORY AGENDA FOR A DIGITAL ECONOMY

The broad economic impacts of a transition to a digital economy have equally broad regulatory implications. As President Bill Clinton and Vice President Al Gore said in their 1996 Framework for Global Electronic Commerce, “governments can have a profound effect on the growth of commerce on the internet. By their actions, they can facilitate electronic trade or inhibit it. Knowing when to act—at least as important as knowing when not to act—will be crucial to the development of electronic commerce.”⁵⁸

This observation remains valid today. Australia’s approach to regulation of the digital economy should aim to enable the uptake and use of digital technologies, adjust existing regulation that is no longer salient, and avoid heavy-handed regulatory reactions to digital disruption. More specifically, Australia’s domestic agenda should focus on building trust in the transition to a digital economy, enabling access to and sharing of data for innovation, and ensuring that regulations in areas such as IP, privacy, and competition policy support these digital opportunities.

When thinking about Australia’s domestic regulatory framework it is also crucial to consider the legal and regulatory systems in other countries, given the global nature of the internet and the accompanying digital trade opportunities. In particular, Australia should look to the US, where the digital economy first emerged and which remains the most successful country in leveraging the internet and data for growth and jobs.

For instance, laws such as the Digital Millennium Copyright Act and fair use exceptions to copyright were instrumental in the development of the digital economy in the US.⁵⁹ These are relevant benchmarks for Australia to the extent that the nation is competing

globally for capital and talent to build its digital economy. Laws in Australia that increase legal risk without offsetting compensation (e.g., a more stable business environment, a larger, more lucrative market) put Australia at a competitive disadvantage.

Regulating for a digital economy

Australia is a well-regulated economy. Developing a digital economy implicates a range of regulation in areas such as intellectual property, competition policy, and data privacy. The impact of data and digital technologies can also be disruptive to incumbents, heightening competition and unsettling business models. The predictable response is lobbying for regulatory and other forms of protection.

Australia has a strong record demonstrating that an open, competitive economy, is in the country’s long-term interests.⁶⁰ As the Harper Competition Policy Review noted, failure to allow digital entrants with lower-cost products and services risks locking in the status quo, leading to Australia falling behind other countries as new approaches and innovations pass it by.⁶¹

This understanding should guide the government’s regulatory agenda for a digital Australia.

That said, building a digital economy is not simply a deregulatory agenda. For instance, protection of personal information is needed to ensure people have trust when living their lives online and for giving businesses access to data that can be used to add value and improve service delivery. There may be a role for more active use of competition policy to create space for new digital businesses.

The challenge here is what to do with existing regulation that is pre-digital and outmoded. In some areas,

the government needs to reform regulation that affects opportunities for digital growth and yet still achieve the underlying regulatory goals. The following outlines the key regulatory reform agenda for a digital Australia.

Enable competition over digital platforms

Data use and digital platforms have the potential to enable new forms of competition across the economy, raising productivity and economic growth. At the same time, there are concerns as to whether large technology companies are dominant in ways that can stifle competition.

These issues can be particularly pressing for smaller open economies like Australia's, where competitive pressures from digital competition can be intense.

The impact of large technology firms on competition is unclear. On the one hand, Google for instance does have high levels of market share in search in Australia at around 95 percent.⁶² Such a market profile would typically raise competition concerns. However, it is contested whether such concentration does in fact lead to the types of outcomes that competition law seeks to prevent, such as higher prices to consumers, lack of choice, and less innovation. For instance, one view is that the digital space remains characterized by low barriers, making concentration more ephemeral than it appears.⁶³ The argument is that there remains a real threat of competition, which continues to drive innovation and increases in consumer welfare.⁶⁴

A related question is whether competition concerns arise from large tech firms' collection and use of data. It has been argued that 'big data' itself does not confer strategic advantages. Instead, it is the ability to generate actionable insights from the data that matters.⁶⁵ Moreover, generating big data and the ability to collect big data is

not itself costly. In support of this view are those companies which succeeded not through their possession or use of big data, but by offering a superior proposition to consumers. For example, Uber disrupted the taxi market not with any trove of big data but by offering a cheaper and better user experience than taxis. Kayak has become a successful travel search engine without any initial big data holdings, whereas Google's purchase of ITA Software, along with its flight data and data processing capabilities, did not lead to Google establishing a significant presence in the flight search market.⁶⁶

Another question is whether big data and network effects makes switching costs high enough to give incumbents significant market power.⁶⁷ There is evidence of firms with large amounts of data not being protected from disruption, such as the success of Myspace over Friendster, which was subsequently eclipsed by Facebook. An alternative view is that a company such as Facebook presents exactly these network effects and switching costs, as moving to another social networking site would require not only uploading new photos and re-authenticating sites that use a Facebook login, but perhaps—most importantly—convincing a critical mass of friends to follow to the new social networking site.⁶⁸

A related concern is that companies can use big data and business insights to exercise market power acquired in one market to extend dominance in ancillary markets. For example, Google's dominance in internet search could allow it to also dominate the market for broadband networked-delivered advertising.⁶⁹

The aim here is not to draw specific conclusions about the impact of large technology firms on competition, but to underscore that the market is dynamic and that technology is changing rapidly. For instance, while Google dominates search, its biggest competitor may

not be Bing but Amazon as consumers increasingly use Amazon to compare prices, read reviews, and purchase online.⁷⁰ This underscores how forces of technological convergence can generate competition from new sources. From a regulatory perspective, it suggests regulators should be cautious about overreaching and risk stifling innovation.

As outlined, the other dimension of the competition issue is the scope for digital platforms to increase competition. This focuses on harnessing digital technologies to increase competition in the Australian economy.

Digital platforms create opportunities for competition across sectors. For instance, innovation in financial technology services (Fintech; see page 38) could challenge big bank dominance in some areas, online retailers can increase competition with brick and mortar stores, and Amazon will compete with incumbent supermarkets. The regulatory challenge is to ensure these opportunities for competition across digital platforms is not stifled by regulatory requirements while ensuring that underlying regulatory goals such as consumer health and safety are maintained.

In some cases, competition law may be best suited to opening markets, and in other cases regulatory relief such as reducing financial licensing requirements for Fintech or avoiding the need for Uber drivers to have a taxi license to operate, might be enough to enable competition.

As digital technologies allow for competition across markets, regulation needs to be assessed to ensure that it is achieving its primary aims—protecting consumer health and safety, reducing information asymmetries, limiting abuse of market, and addressing externalities.⁷¹ As such, the laws should be examined to determine whether automatic application to emerg-

ing digital businesses is always appropriate. For instance, it needs to be asked whether the social and other regulatory goals that underpin such regulation would be compromised in the absence of full or partial application, also taking into account the missed opportunities in terms of competition, lower prices, and greater choice should full application of regulation in effect prevent these businesses from forming.

Box 4.1: Regulating disruption? The full application of all taxi regulation to Uber is likely unnecessary, creating rents for the taxi industry at the expense of consumers. Certainly, requirements of criminal background checks for drivers, insurance, and protection of privacy should apply to Uber. However, requiring a taxi license to operate, effectively would make Uber illegal and appear unnecessary.

Privacy and data sharing

Currently, people are still learning the extent that their personal information is online and how to manage online privacy. Indeed, 69 percent of Australians are more concerned about their privacy online than was the case five years ago.⁷² Moreover, over 80 percent see privacy risks as greater when online than offline.

Yet, such attitudes toward privacy should not be taken as static. For instance, when it comes to sharing data overseas (discussed below) only 42 percent of those aged 18-34 said they were concerned while 77 percent of people aged over 55 were very concerned about this.⁷³ Actual privacy as revealed by the willingness to place personal information online suggests even less concern about privacy.

Protecting online privacy while promoting data access requires a clear assessment of the costs (i.e., risks to

privacy) and benefits, such as improved services from any number of public and private actors across government, health, finance, education, and so on.

One of the regulatory challenges is that the collection of personal information is often regarded as creating immediate costs in terms of loss of privacy, whereas the benefits are often only realized subsequent to the use of the data.⁷⁴ Rapid innovation around data use increases the difficulty of anticipating and defining the benefits of data collection and use.

Another challenge is determining whether data collection encompasses personal information. The creation of ever larger data sets and the capacity to apply analytics to yield actionable insights requires the capacity to collect and share data. Yet, combining datasets can cause otherwise anonymous information to be capable of identifying a person. In Australia, the collection, storage, and use of personal information is addressed in the Privacy Act 1988 and the Privacy Amendment (Enhancing Privacy Protection) Act 2012. Federal government departments, agencies and businesses with a turnover greater than A\$3 million are covered by the Privacy Act.

In March 2014, Australia implemented 13 Australian Privacy Principles that apply to organizations and Australian government agencies and that govern the collection, use, and storage of personal data. Some key Principles include:

- entities must have a privacy policy that is made publicly available and that states how entities will collect, hold, and use personal information (principle 1);
- entities can collect personal information only if directly related to the entities' functions or activities (principle 2).

- entities are required to notify or make individuals aware of the collection of their personal information, including disclosure to overseas recipients (principle 5).

- entities cannot use data for other than a primary stated purpose unless the individual consents or a person would reasonably expect the entity to use the personal information for a secondary purpose (principle 6).⁷⁵

- entities disclosing personal information to an overseas entity are responsible for ensuring the information is protected consistent with the Australian Privacy Principles, or the disclosing entity reasonably believes that the recipient is subject to laws that have the effect overall of protecting personal information in a way that is at least substantially similar to the Australia Privacy Principles and there are mechanisms for enforcing such protection (principle 8).

Australia's privacy law takes a different approach to data privacy than both the EU and the US. For instance, the EU distinguishes between data controllers and data processors, whereas Australia's Privacy Act applies to entities that collect, hold, use, and disclose personal information.

The Privacy Principles also do not require consent for the collection of personal information that is not regarded as sensitive. Sensitive information includes information about an individual's racial or ethnic origin, political opinions, religious belief, sexual orientation, and criminal history.⁷⁶ Instead, personal information can be collected if it is reasonably necessary or directly relates to one of the entity functions or activities. However, having collected personal information, there is a requirement for the collecting entity to take reasonable steps to notify the individual as to who holds the

personal information, purposes for the collection, and whether the entity is likely to disclose the information to overseas recipients.⁷⁷

Privacy and cross-border data flows

Australia's Approach

Over 90 percent of Australians report being concerned about organizations sending their personal data overseas.⁷⁸ This concern raises a tension between cross-border data flows and privacy—that domestic privacy standards are being undermined when personal information is sent to jurisdictions with lower privacy standards.

As noted, the eighth Australian Privacy Principle deals with disclosure of personal information to a person not in Australia. Under this stricture, the disclosing entity must take reasonable steps to ensure that the recipient treats the personal information consistent with Australia's Privacy Principles or it must rean entity believe that the recipient is subject to a law or framework that affords protections similar to the Australian Privacy Principles. The Privacy Act Section 16C makes the entity disclosing personal information to an overseas entity accountable for use of the information that is inconsistent with the privacy principles.

In the event that an overseas entity breaches the Australian Privacy Principles, the disclosing entity is liable, unless subject to an exception.⁷⁹ There is a distinction made between disclosure and use of personal information. By contrast, EU and US regulations focus on the transfer of data.

What constitutes disclosure is not defined in the Privacy Act. Disclosure could arise, for instance, where personal information is published online. The provision of personal information to an overseas contractor for provision of services would also likely constitute a disclosure.

Guidelines established under the Office of the Australian Information Commissioner (OAIC) suggest that provision of cloud services using data servers outside of Australia might constitute a use (rather than a disclosure) when the cloud provider is only storing the data and the entity retains control over the personal information. However, affording access to this data to an overseas third party that provides additional services (e.g., payroll processing, data analytics, etc.), would constitute a disclosure.

The following are key developments of global and regional privacy principles that are guiding the interaction between privacy and cross-border data flows.

The OECD Privacy Guidelines

In 2013, the OECD released *Guidelines Governing the Protection of Privacy and Trans-Border Flows of Personal Data*. The Guidelines were produced in response to the significant changes in personal data collection since the rise of a global internet, and the opportunities and risks of harm from online data collection and processing (OECD 2013). They are an update of the OECD's 1980 Privacy Guidelines and based on the Fair Information Practices Principles (FIPPS) developed in the United States. They also build on other OECD internet-related work such as the OECD Recommendation on Principles for Internet Policy Making 2011.

The Privacy Guidelines are a minimum set of principles governing the collection, storage, and use of personal data to guide the development by members of domestic privacy protection regimes. Many of these principles are reflected in the EU Data Directive, including:

- data are to be obtained by lawful means and where appropriate with the consent of the data subject;

- personal data should be accurate, complete, and up-to-date;
- the purpose for collecting the data should be specified and the use of the data limited to fulfilling that purpose;
- personal data should not be disclosed within the consent of the data subject; and
- individuals have the right to obtain personal data from the data controller.

The Privacy Guidelines also expand on the so-called accountability principle as it applies to the data controller. Specifically, it requires the data controller to have in place a privacy management program that gives effect to these principles. The Guidelines require that privacy management programs are tailored according to the sensitivity of the information and safeguards implemented based on a privacy risk assessment.

The Privacy Guidelines specify two ways in which data can be transferred across borders. One of these reflects the accountability approach where the data controller remains accountable for personal data under its control without regard to the location of the data. The other approach allows data flows to another country that “substantially observes the Guidelines” or where “sufficient safeguards exist”, that would include mechanisms that ensure ongoing protection consistent with the Guidelines. According to the Supplementary explanatory memorandum to the Privacy Guidelines, these two principles on cross-border data transfer exist independently of each other (OECD 2013). These two approaches reflect the differing approaches among OECD members to cross-border transfers—the EU Directive and the General Data Protection Regulation (GDPR) approaches, which limit transfers to

countries providing adequate protection, and the Asia Pacific Economic Cooperation (APEC) approach that allows data transfers and makes the data controller liable for any breaches of that data that arise for its use by third parties in other countries.

As outlined above, the OECD Privacy Guidelines also encourage “the development of international arrangement that promote interoperability among privacy frameworks that give practice effect to these Guidelines” (OECD 2013).

EU General Data Protection Regulation

The 1995 EU’s Data Privacy Directive is being replaced by the GDPR in May 2018. The GDPR makes it illegal to transfer personal data outside the EU unless the importing country provides an adequate protection of privacy. In the absence of an adequacy finding, the EU allows data to be transferred internationally using contracts that effectively bind the recipient of personal data to providing privacy protection equivalent to what would be the case if the data had remained in the EU. International companies can also enter into binding corporate rules (BCR) under which they commit to protecting data transferred within the company consistently with the GDPR.

The E.U.-U.S. Privacy Shield

In 2016, the United States and the EU concluded the Privacy Shield—an arrangement that the EU Commission has deemed “adequate” under the Data Directive—thereby enabling the transfer of personal information from the EU to businesses in the United States participating in the Privacy Shield (EC 2016). The Privacy Shield replaced the EU-US Safe Harbor framework, which in 2015 the Court of Justice for the EU (CJEU) found did not provide an

adequate level of privacy protection (Schrems v. Data Protection Commissioner 2015).

Asia Pacific Economic Cooperation (APEC)

The APEC Privacy Framework endorsed by APEC economies in 2004 is a set of principles to guide members and businesses on privacy issues. The Framework is a guide for APEC economies on the development of their privacy laws, thus providing a baseline set of principles. APEC does not require or expect countries to adopt top-down privacy laws. Instead, the emphasis is on flexibility in implementation, which could include industry self-regulation in addition to legislation.

The APEC Framework is explicit about the need to “balance and promote both effective information privacy protection and the free flow of information in the Asia Pacific region” (APEC Privacy Framework 2004). The APEC Framework outlines the economic and social benefits of access to and storage of information and expresses concern that regulatory systems that unnecessarily restrict or place burdens on data flows will have adverse implications for global businesses and economies.

The APEC Framework includes a set of information privacy principles similar to those found in the OECD Guidelines. The APEC Framework departs from the OECD Guidelines and from the EU Data Directive and GDPR in terms of the role of consent in the collection of data and when cross-border data transfers are allowed. For instance, consent or notice of the collection of data is only required “where appropriate.” Additionally, data can be used for purposes other than the purpose of its collection with the consent of the data subject or where necessary to provide a service or product requested by the data subject.

Accountability is a key principle in the APEC Framework. It resides primarily with the business collecting the data to ensure that it complies with the APEC principles. This approach is similar to that in the EU Data Directive and GDPR use of contracts and BCRs to transfer data to third parties or within conglomerates (Article 29 Working Party and APEC 2005). But it does stand in contrast to the Data Directive’s focus on whether countries have adequate privacy laws. And when transferring personal data to another person or organization whether in the same country or another jurisdiction, the person who collected the personal data is required to either obtain the consent of the data subject or to “exercise due diligence and take reasonable steps to ensure that the recipient person or organization will protect the information consistently with these Principles.”

APEC Cross-Border Privacy Rules

The APEC Cross-Border Privacy Rules (CBPRs), endorsed by APEC in 2014 is a mechanism to facilitate the transfer of personal information amongst APEC members. The CBPRs were developed to address the key challenge outlined in this paper—how to facilitate transfers of personal data among countries with different privacy laws.

The CBPR requires businesses to develop privacy policies based on the APEC privacy principles and which meet the CBPR program requirements (CBPRs 2015). APEC Accountability Agents assess consistency of businesses’ privacy policy and practice with the APEC CBPR requirements. Businesses that meet the CBPR requirements and are subject to the laws of an APEC CBPR participating economy can then be certified as compliant. Currently, the United States, Mexico, Japan, Canada, and Korea are participating economies, and Australia is finalizing its participation..

APEC Accountability Agents and Privacy Enforcement Authorities are responsible for enforcing compliance by business with APEC CBPR requirements.⁸⁰

The Australian Privacy Principles approach to cross border flows of personal information is consistent with APEC's Cross-Border Privacy Rules. It is also similar to the US approach to privacy in that it places responsibility on the entity sharing the data to use contractual means to protect personal information consistent with Australia's domestic privacy standards.

Data sharing and use among government agencies

A key area of potential reform is access to and sharing of data collected by the public sector, a subject the Productivity Commission examined in a recent report.⁸¹

The Federal and State governments are some of the key collectors of data. Data can be used to improve government policy and service delivery, and it can be used by the private sector to support new businesses. The opportunities presented by data collection to improve government policy and service delivery appears well understood by the government. The Federal government has committed A\$130.8 million (as part of the Commonwealth Data Integration Partnership for Australia) to maximize government data assets and develop "cost effective and timely insights into data that is already available."⁸²

There is a backdrop of considerable public unease on the issue. Almost 50 percent of Australians surveyed have stated that they are very uncomfortable or somewhat uncomfortable with government agencies sharing data.⁸³ Currently, however, public access to and use of Australia government data is limited, certainly when compared for instance to the US and the UK. The Productivity

Commission in its data report concluded that most data collected by the public sector is not released and shared.⁸⁴

The government has sought to address the limited use of government data. For instance, the Australia Government Public Data Policy Statement 2015 notes that data held by the Australia government is a strategic national resource that holds considerable value for growing the economy, committing to "release of non-sensitive data as open by default."

Yet, challenges remain arising from uncertainty over determining when the release of otherwise anonymous data could be combined with other available data sets and lead to a person being "reasonably identifiable", as defined in the Privacy Act. The Privacy Act Explanatory Memorandum explains, "whether an individual is reasonably identifiable from certain information requires a consideration of the cost, difficulty, practicality and likelihood that the information will be linked in such a way as to identify him or her."⁸⁵ This underscores that such an inquiry is context-specific and includes having regard to other available data sets and whether that data, when combined with the released data, could lead to personal identification.⁸⁶

According to OAIC Australian Privacy Principles Guidelines, where it is unclear whether an individual is reasonably identifiable, an entity should err on the side of caution and treat the information as personal information.⁸⁷ The challenge of determining what other data is available, taking into account cost and practicality of combining data sets, will, in the absence of leadership that actively promotes sharing of data, create a culture amongst government agencies of not sharing government data or making it publically available.

The OAIC Guidelines on Data Matching in Australian Government Administration provides an example

of how risk aversion to data sharing is being implemented. These Guidelines aim to help government agencies share data in a manner consistent with the Australian Privacy Principles.⁸⁸

The Guidelines presume, correctly, that combining data carries a risk to individual privacy (Guideline Two). Extensive assessment of costs and benefits of proposed data matching are therefore required. While cost-benefit analyses are appropriate tools for assessing proposed policy, in the data context, the challenge is that there are unknown risks of sharing data but great benefits from large datasets and what insights might be gleaned from them are difficult to assess in advance.

This frames the broader need for government agencies to see data collection as an opportunity to improve the delivery of government services and lead to better policy making.

More generally, there is a role for government leaders to change a culture that seeks to minimize risk and avoid sharing data to one where officials are rewarded for better data use. Much of the risk aversion seems to reflect perceived reputational and other personal risks rather than actual legal risk.

The Productivity Commission, in its inquiry into data sharing and use, noted the lack of an overarching commonwealth (and for most states) legislation. The Productivity Commission recommended legislation in the form a Data Sharing and Release Act that would create a principles-based and outcomes-focused framework to guide data sharing. Such a law would focus on risk management around data release and sharing, rather than the current focus on risk avoidance.⁸⁹

As will be discussed, a robust regime for data use also needs to acknowledge the importance of cross border data flows for innovation and digital trade.

Data use in the private sector

In the private sector in Australia, some sectors such as finance, energy, and telecommunications have additional specific regulation governing collection and use of personal information.⁹⁰ Business may also have to comply with the Privacy Act. The private sector also faces the challenges identifying when combining data sets could make information personally identifiable. Some business are treating such uncertainty as a cost of doing business. Others are likely being discouraged from maximizing the opportunities that data can provide.

Building Social License

In addition to encourage data sharing and use, building and maintaining community support for such activity by the public and private sectors will be crucial. In this regard, Australia's privacy regulations are an important part of this mix.

Non-government activity to build trust can also help. For instance, Data Governance Australia has developed a Code of Practice that sets industry standards and benchmarks for the collection, use, and disclosure of data by the private sector.⁹¹ The Code is non-binding and compliance is in addition to obligations at law, including with respect to privacy. The Code supplements the privacy principles and helps increase trust in how business collect and use personal data.

In New Zealand, the Data Future Partnership has developed another approach to building such social license. It uses guidelines that consist of eight questions to guide how business should use data, and to help people determine their level of comfort and trust with how their data is used.⁹² These Guidelines go further than the Code of Practice. For instance, Principle 3 in the Code asks that business only collect data for "actual or anticipated legitimate business purposes", whereas the NZ

Guidelines require that data use be explained in “specific and detailed terms, which includes ensuring that data is collected on if necessary to deliver the service the business offers, and no more.”

Both the Code and Guidelines underscore that a key challenge is achieving strong levels of privacy, building social license or trust in data collection and use, while creating appropriate opportunities for business to use data for commercial and innovative purposes. Industry needs to continue to review the Code of Practice to ensure that data practice is consistent with community expectations.

Intellectual property protection for a digital Australia

The IP regime is particularly important for a digital economy. On the one hand, the scope for illegal copying and use of IP-protected work is almost unlimited as, once in a digital form, works like movies, books, and others can be copied and distributed globally over the internet at little to no cost. On the other hand, in a digital environment, material cannot be handled without copying;⁹³ this aspect is necessary for the effective functioning of the internet.

In addition, digital trade itself increasingly relies on effective IP protection. For instance, trade online in digital content such as software, music, and apps is in many cases trade in a license. Additive manufacturing (essentially 3D printing) will also transform trade in goods to trade in designs, which relies on IP protection.

The rationale for granting IP protection is to incentivize a socially optimal level of creativity and innovation. The absence of IP protection would stifle innovation as creators would be unable to fully benefit from their work due to copying. However, IP rules also can have social costs if set too high, in that they provide monopoly

rents to the creator and limit innovation by preventing access to and use of new ideas.

As the OECD has noted, IP policy “can discourage innovation if pursued too strongly or too weakly.” For example, “in an era of routine copying of text, data and images, copyright law may hinder the emergence of new kinds of Internet-based firms. It may also make scientists and other researchers reluctant to use text- and data-mining techniques”.⁹⁴ As such, it is important to strike a balance between IP protection that encourages innovation and maintaining competition and the diffusion of ideas over the internet.

In the US, the development of a legal regime that effectively addressed and balanced these challenges was key to the development of internet companies as well as online business models that enabled access to content, all of which became the building blocks for the broader digital economy.⁹⁵ In the US, the most important aspects of this legal environment are:

- The Communication and Decency Act 1996, section 230
- The Digital Millennium Copyright Act 1998
- The Freedom and Innovation Revitalizing United States Entrepreneurship (FAIR USE) Act of 2007 (exceptions were also important and are discussed in more detail below)

The Communications and Decency Act

Section 230 of this legislation immunized online publishers from torts, such as defamation that arose from the material on their site.⁹⁶ This had the effect of treating online publishers differently from publishers in print, radio, and TV.

The Communications and Decency Act did not, however, exclude websites from claims of breach of copyright. Here, the Digital Millennium Copyright Act's section 512 was needed to provide safe harbor to internet service providers from claims of infringement for hosting copyright-infringing material posted online by third parties.

The Digital Millennium Copyright Act 1998

As noted, section 512 of the Digital Millennium Act is a compromise that gives online service providers (OSPs) safe harbor from secondary liability for their user's copyright infringement and, in return, OSPs are required to take down infringing material from their website upon receipt of a takedown notice.⁹⁷ The US courts' interpretation of both this Act and the Communications Decency Act also expanded the application of these rules.⁹⁸

Operation of the Digital Millennium Copyright Act in the US has evolved. In some cases, large numbers of takedown notices have led OSP's to automate their responses, which has raised questions about the accuracy of notices and the costs of automation. Yet, the Act's notice and takedown provisions continue to be central to managing copyright online, giving rights-holders an enforcement alternative cheaper and easier than lawsuits while also providing a legal framework that "remains central to OSPs sense of their freedom to operate".⁹⁹

The government in December 2017 expanded Australia's safe harbor provisions to include organizations assisting persons with a disability or administering a library and other cultural and educational institution, in addition to pre-existing safe harbor for telecoms providers such as Telstra and Optus.¹⁰⁰

However, Australia still does not provide safe harbor protection to internet intermediaries, such as Google and Facebook.¹⁰¹ Yet there is no meaningful economic distinction here in a digital environment. As a result, Australia's copyright regime—as it applies to internet activity (i.e., hosting user created content and running a search engine) provides greater legal risk compared to copyright regimes in not only the US but also the EU, Canada, the UK, and New Zealand.¹⁰² Australia should consider extending its safe harbor framework.

U.S. Fair Use copyright exceptions

The limitations on copyright set by the US fair use exception to copyright protection have been important in promoting the growth of the digital economy.

Currently, Australia relies on fair dealing exceptions in the Copyright Act 1905. There are five fair dealing exceptions for the following purposes:

- Research or study
- Criticism or review
- Parody or satire
- Reporting news
- Professional advice provided by a legal practitioner, registered patent attorney, or registered trademarks attorney

Compared with US fair use exceptions, Australia's exceptions differ in that they are fixed for the purposes outlined above. For this reason, Australia's fair dealing exceptions have failed to keep up and adapt to the needs of a digital economy. As a result, under Australian fair dealing laws key digital activities could

be illegal, including internet searches that copy text and, using algorithms, categorize and respond to search query. Cloud computing—which copies and stores data could also infringe Australia copyright rules for example by reproducing or communicating copyrighted material on servers uploaded by their customers.¹⁰³

The Australian Law Reform Commission and the Productivity Commission investigated whether Australia should adopt US-style fair use exceptions, and both concluded that it should.¹⁰⁴

Research shows that when a country adopts balanced copyright rules and other limitations, such as fair use, companies in these countries generate higher revenues, create more jobs, and spend more on research and development when compared to countries with more limited copyright exceptions.¹⁰⁵

A key reason for Australia to adopt fair use exceptions would be to move to technology-neutral open

standards that would be sufficiently flexible to accommodate new technologies and the use of data than the current prescriptive fair dealing exceptions. This should support more transformative uses of data; using copyright material for a different purpose than the use for which the material was created. This form of innovation includes ‘recombinative innovation’—the piecing together of existing information to create new ideas.¹⁰⁶ Such innovation leads to new uses that should be permitted without a license and which do not harm rights holders, as they are being used for a different purpose than the original copyrighted work and have larger public benefits.

In the US, the fair use exceptions have demonstrated a good capacity to adapt to technological change.¹⁰⁷ A principles-based approach would also seem to provide predictability, possibly more than Australia’s current prescriptive approach to assessing fair dealing.¹⁰⁸

SMART MANUFACTURING

Australia's manufacturing sector is relatively small compared to the OECD and has been challenged by high cost of inputs (labor, electricity) and the strong Australian dollar. Remoteness from markets and the country's small population are also barriers to this sector's growth.

From 2004/05-2014/15, manufacturing's share of GDP fell to 6.1 percent from 8.5 percent and employment in the sector fell by 120,000. As can be seen in figures 5.1 and 5.2, Australia's experience with the decline in the share of employment in manufacturing has followed a global trend. Yet, Australia's manufacturing value-added is lower than other comparable countries even though there have been similar declining trends in other major industrial centers.

Australia's manufacturing productivity growth has also been below benchmarks. Between 1989-2014, manufacturing total-factor productivity (TFP) was zero in Australia and 1.6 percent in the US. However, a lot of this difference was caused by strong TFP in the US high-tech sector.¹⁰⁹

Despite these challenges, Australia's manufacturing sector does not appear to have lost its structural competitiveness and could rebound with assistance from supportive government policies.¹¹⁰ In particular, the shift to digital and the development of 'smart' manufacturing provides new opportunities to rejuvenate manufacturing, participate in global value chains, and create new export opportunities.¹¹¹

Developing 'smart' manufacturing

Standards Australia describes smart manufacturing as merging production and communications technologies to allow components and machines to autonomously manage production in a flexible, efficient, and resource-saving manner.¹¹²

These manufacturing transformations are already underway in the US, the EU, China, and Japan. The EU effort is led by Germany's "Plattform Industrie 4.0", which focuses on cyberphysical systems and the interface they provide between manufacturing data and end-to-end visual representation, and the digital control of manufacturing production systems.

The US approach is based upon the concept of smart manufacturing systems. Similar to Plattform Industrie 4.0, it builds on ICT and combines features of earlier manufacturing paradigms. Key features include:

- Digitization of the entire manufacturing enterprise
- Connected devices and distributed intelligence for real-time control, flexible production, and small batch products
- Collaborative supply chain management
- Integrated and optimal decision making
- Advanced sensors and big data analytics through product lifecycle to achieve fast innovation lifecycle.¹¹³

The smart manufacturing systems concept also envisions the connection between three manufacturing dimensions:

- Product lifecycle: information flows and controls from the early product design and through to end-of-life
- Production lifecycle: the design, deployment, and operation and entire production facility
- Business cycle: functions of supplier and customer interactions¹¹⁴

Figure 5.1: Manufacturing is shrinking as an Australian employer...

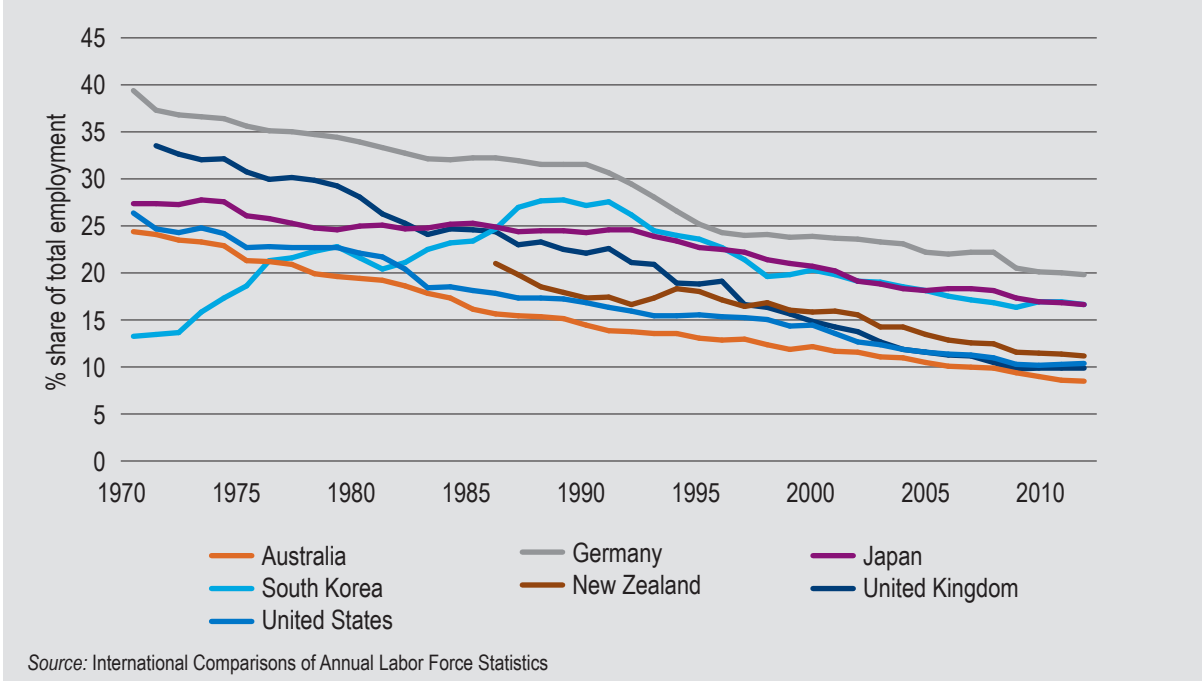
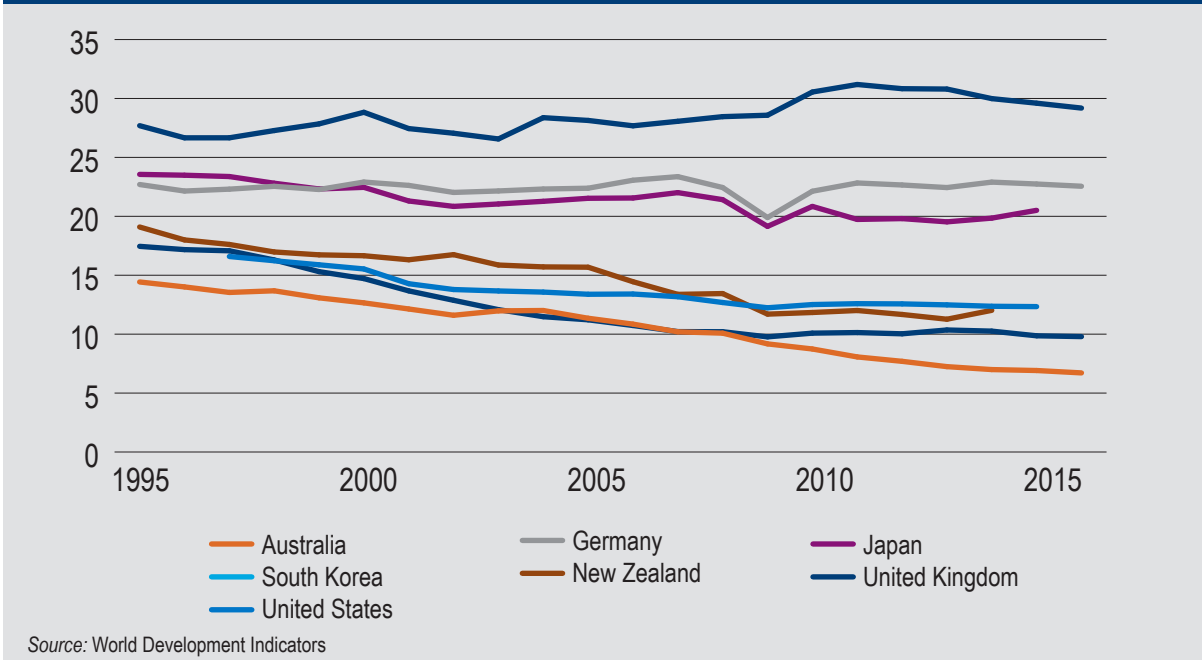


Figure 5.2: ...while its decline in value-added has outpaced other nations



In the US, the Industrial Internet Consortium (founded by General Electric, IBM, Cisco Systems, Intel, and AT&T) is the closest US analogue to Industrie 4.0 in that it is concerned with how things can be connected to the internet, with big data analytics, and with rising efficiency. However, it is broader in scope in that it also addresses implications of these digital technologies for healthcare, energy, and other infrastructure.¹¹⁵

The US smart manufacturing systems approach to connecting the three manufacturing dimensions also expands on areas of opportunity for Australia as it does not rely as much on manufacturing itself compared with Plattform Industrie 4.0. It also incorporates services-related aspects, such as product- and production-facility design and supplier-customer interactions.

The government has identified six industry sectors with competitive strength: advanced manufacturing; food and agribusiness; medical technologies and pharmaceuticals; mining equipment, technology and services; and energy. To support these sectors the government has established six independent and industry-led “Growth Centers” with the aim of improving sector competitiveness, their capacity for innovation, and their productivity.

Data capture, analytics, and application are common themes for each of these industry growth centers.¹¹⁶ McKinsey and Company makes a similar point, referring to data, computational power, and connectivity as driving industry 4.0.¹¹⁷ This underscores the broader point that getting the framework right around data access, sharing, and use is an important enabling condition for broader digital opportunities across the Australian economy.

Box. 5.1. Using data to add value to exports

Australia exports tractors and agriculture machinery. The companies making these goods could gain a competitive edge by offering monitoring services using sensors embedded in the machines that sense and track their use. The companies could then provide complete operation reports about how the machine is used, recommending maintenance schedules based on actual usage. So instead of selling, for example, a tractor with a warranty, companies could sell a complete diagnostics package about the tractor’s use and behavior.

Such an evolution requires integration of the internet of things with cloud computing, which together would allow data collection and subsequent analysis. For exports, the data would need to be collected in the country of receipt, but these could be analyzed in Australia, creating high-skill jobs and new data centers to store the data. When data is not allowed to be collected and flow freely across the border, the exporting company in Australia would be forced to develop this analytical capacity in the destination country instead. For SMEs, this may be too costly, leading to foregone opportunities to increasing competitiveness and grow the business.

The growing value of services in manufacturing

In many respects, the growing importance of connectivity, data, and digital services will be key to any move to smart manufacturing and is a development which could play to Australia’s existing services strengths.

In fact, digital services are increasingly like manufactured goods—they are often capital intensive, large consumers of energy (e.g., data centers), are innovative, and have productivity growth comparable to manufacturing.¹¹⁸ This underscores that distinguishing between manufacturing and services is increasingly blurred, as services play a growing role in manufacturing production.¹¹⁹

Digital services are also increasingly key inputs into manufacturing processes. This includes commercial services such as research and development (R&D), design, marketing, and sales. A 2016 PricewaterhouseCoopers survey of more than 2,000 companies identified data and data analytics as the key for successful transformation to smart manufacturing.¹²⁰

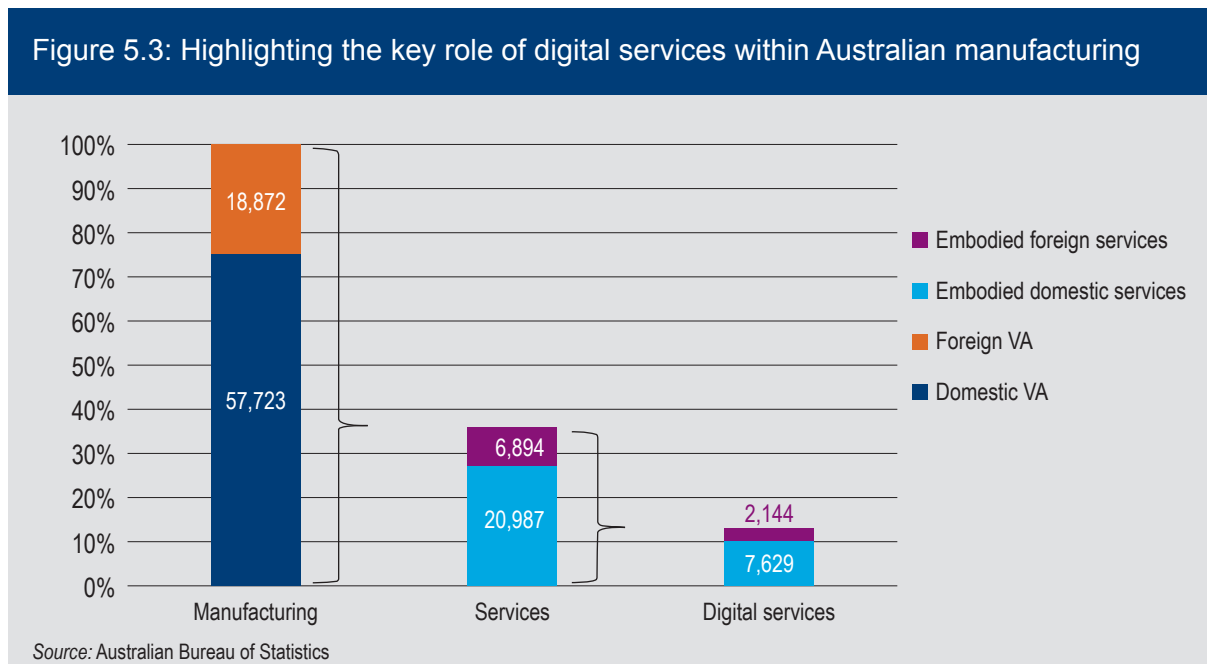
Figure 5.3 shows the importance of services as well as digital services within Australia’s manufacturing sector. Over one-third of Australia’s manufacturing

output is derived from services inputs and around 13 percent of total output relies on digital services. The table also shows the importance of services imports for Australia’s manufacturing sector.

These digital services are also increasingly innovative as they use open source platforms in the case of R&D and design that allows for collaboration across borders while drawing on big data to better understand and provide marketing and sales support. In these cases, access to the service as well as the development of the service relies on cross border data flows.¹²¹

Smart manufacturing also reflects a shift in value away from the production of goods to services. Take additive manufacturing, where actual production shifts to the design and sale of specifications and plans for final products that are 3D-printed by retailers or consumers.¹²²

The growing importance of services for manufacturing is also leading to a focus on providing solutions rather



than only the product.¹²³ This often involves services that add value to manufactured goods for the customer. It can include sales, maintenance, and other data driven solutions. For instance, Xerox—a company that makes printers, now positions itself as a document solution company through the addition of maintenance and document design services. Rolls Royce collects data on its jet engines to better tailor maintenance

and minimize downtime, while offering aircraft leases based on hours in the air. As such, Rolls Royce is focused on transport solutions instead of solely selling an airplane.¹²⁴

Underlying all these manufacturing transformations is the reality that manufacturers essentially need to also become services and software businesses.¹²⁵

GREATER INTEGRATION INTO GLOBAL VALUE CHAINS

Developing smart manufacturing should also create new opportunities for participation in GVCs.

GVCs are important drivers of trade in manufactured products. Countries that have high engagement in these chains show higher levels of GDP growth.

Participation in value chains offers particular opportunities. For one, linking domestic industry with dynamic and global multinational enterprises (MNEs) provides exposure to best practice management, know-how, and technology. Participation in production of goods for global markets, through these value chains, also affords opportunities of scale. Third, specializing in the production of high-value-to-weight products can help overcome the tyranny of distance,¹²⁶ and participation in global value chains is relatively insulated from appreciating exchange rates.¹²⁷

Data and digital technologies are affecting global value chain participation and manufacturing operations in several ways. First, in many respects the development of global value chains has been made possible by global connectivity and cross-border data flows that enable communications and can be used to coordinate logistics.¹²⁸

Second, digital services are themselves often part of cross-border value chains. There is also a trend to increasing the use of imported services inputs in manufactured goods exports, suggesting that digital services are more often traded within a global value chain.¹²⁹ Data also points to increased manufacturing productivity from access to high quality digital services, whether domestic or foreign.¹³⁰ Recent work shows that development of digital services increases the re-

vealed comparative advantage of manufacturing that embodies services—increasingly, smart manufacturing.¹³¹

Digital services in global value chains have distinct characteristics. Unlike the linear model of a global value chain for goods that describes the incremental addition of value to a product in a conveyor belt-like fashion, these global digital services are networked using platforms to coordinate multiple inputs. They are also solution shops, creating value by solving customer problems.¹³²

Australian business are poorly integrated into GVCs. According to the Australian Bureau of Statistics, as of 2016, less than 2 percent of all Australian manufacturing firms were engaged in GVCs.¹³³ The following figures show Australia's backward and forward linkages into global value chains and trends over time. As share of exports, Australia has relatively high forward linkages into such value chains; other countries draw on Australian energy and other commodities for their production of goods. In contrast, as a share of exports, Australia has one of the lowest levels of backward linkages into supply chains—such as the use of imported inputs to add value to more complex manufactured exports. Figure 6.2 also shows that between 2000 and 2011, forward linkages have grown over the course of Australia's mining boom, while backward linkages declined.

The impact of digital technologies on global value chains remains uncertain, although the OECD expects digitization of production to be one of the single most significant influences on such chains in the future.¹³⁴ For instance, on the one hand improvements in communication technologies, the growing importance of data and its ease of cross-border movement all could lead to expanding and deepening of GVCs. Yet, on the

Figure 6.1: Range and breakdown of Australia's linkages to global value chains

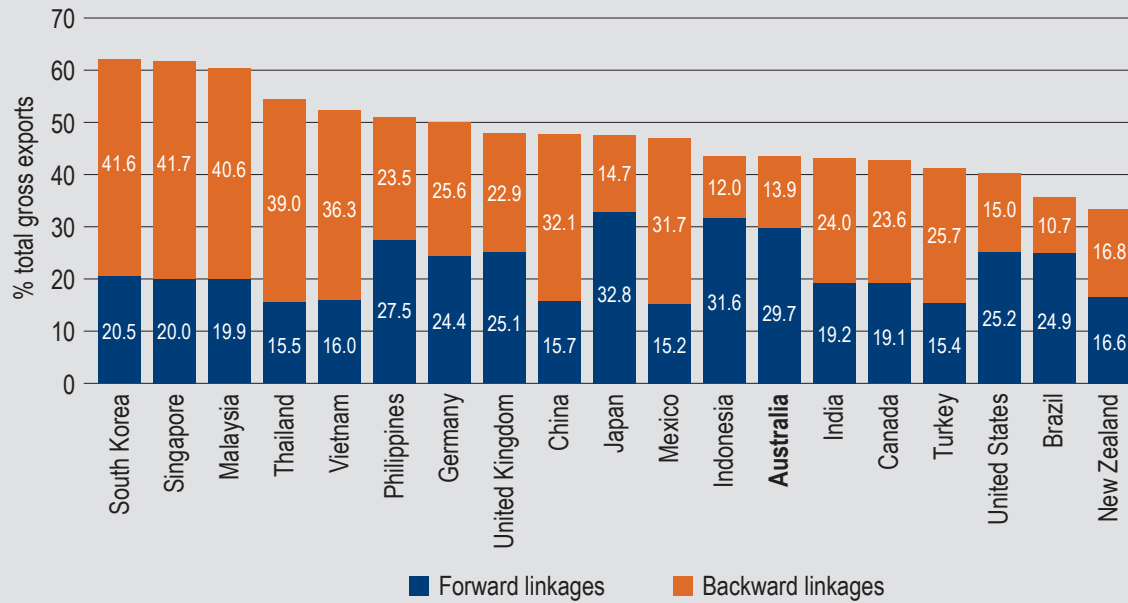
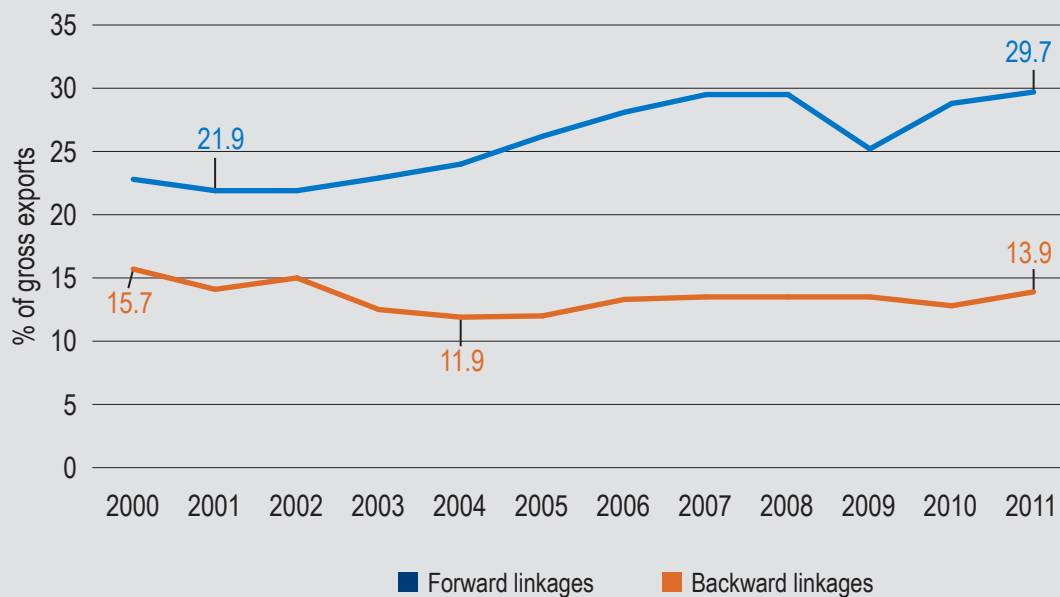


Figure 6.2: Differentiating forward and backward linkages over the past decade



other hand, technologies such as additive manufacturing, robotics, and artificial intelligence could reduce the economic advantages of manufacturing in lower-cost nations, while demand for tailored solutions could lead manufacturing being located closer to the customer.

These trends could all benefit Australia. Effective utilization of data and digital services to focus on manufacturing solutions could help overcome barriers such as high labor costs and distance to markets. At the same time, developing economies are investing heavily in smart manufacturing and digital capacity and the growing middle class in Asia will increase the attractiveness of these countries as markets of final demand.

Box 6.1. Transforming trade in manufactured products using 3D printing

In some respects, growth in data flows and additive manufacturing (for example, 3D printing) could lead to significant transformations in international trade. For instance, should 3D printing become widespread, manufacturing itself could be transformed into printing the object at the point of sale. In this scenario, the input becomes the 'ink' and the designs. Manufacturing increasingly becomes trade in a design, which relies on cross-border data flows and intellectual property protection.

In many respects, the move toward smart manufacturing opens new opportunities for participation in global value chains. Many of the trends that have underpinned the development in such chains to date—e.g., connectivity, data flows—will expand and deepen.

For instance, a building block of smart factories is connectivity and interoperability. This can refer to connectivity within the factories as well as among production units, which can be part of a global supply chain.¹³⁵

In addition, smart factories will increasingly rely on knowledge sharing and integration among engineers, designers, and services professionals, as well as utilization of innovation platforms. Each of these inputs into the innovation process can be located anywhere in the world.

International standards for a digital economy

The integration of digital technologies and reliance on communication within and across manufacturing platforms points to the importance of interoperability amongst software, machines, and processes. This requires the development of international standards for the digital technologies and processes that will enable smart manufacturing. This includes agreeing a uniform reference architecture upon which further standards can be built.

Standards enable systemic, repeatable, and efficient manufacturing systems. Standards also enable large and small business wherever located to participate in what will increasingly be distributed manufacturing.

Improving innovation and productivity in each industry sector will require broader and better use of digital technologies. Moreover, in all these sectors economic growth will require export success. In this regard, the development of international standards will also be relevant. Australia should ensure that its international strategy for global engagement and standards development takes into account the impact of digital technologies and the need for interoperability across these economic sectors.

Plattform Industrie 4.0 and the Industrial Internet Consortium are working on ways to ensure that their impacts on the global standards-making process is uniform.¹³⁶ This is positive for Australia and globally.

The cooperation agreement between the Prime Minister's Industry 4.0 Taskforce and the Plattform Industrie 4.0 includes cooperation on reference architecture and standards, which provides Australia with an opportunity to stay abreast of key developments and to influence outcomes.

However, Australia must be engaged with all key centers, including the US-based Industrial Internet Consortium (IIC), to ensure that the standard-making process produces standards relevant for Australian strengths. In addition, Australia's commitments in the WTO and free trade agreements (FTAs) that require domestic standards to be based on international standards means that getting the international standards right will directly affect the evolution of Australia domestic standards. The IIC is an open membership organization comprising mostly private companies but including some government representation, such as from German industry and trade ministries among its 256 members.¹³⁷ Standards Australia should also par-

ticipate to contribute to the development of standards in these and other areas.

Australia would not only benefit from helping craft global standards, it would also gain by ensuring that other key markets also adopt them. Should China, the EU, or the US agree to different standards, this disharmony would create significant costs for Australian industry, effectively reducing market access opportunities including participation in supply chains.

Cyber Physical Systems

The term cyber physical systems refers to the interactions between software and hardware. It is a key focus for Germany's Plattform Industrie 4.0 and US smart manufacturing systems, which are developing reference architecture for cyber physical systems. Australia has identified key strengths in this area and should participate in these processes.

DIGITAL PLATFORMS AND SMES

Ecommerce is a growing domestic and international business opportunity. As noted, UNCTAD estimates the B2C ecommerce market at US\$28 billion in 2015, but Australia's B2B ecommerce was almost seven times larger and worth US\$188 billion.

The capacity for firms to use the internet to engage in ecommerce relies on their access to and use of data. The basic ecommerce interaction that involves purchase, payment, and possible delivery online requires the provision of data in the form of name, address, financial details, and consumer ratings. Successful ecommerce strategies also use interactive websites with social media that leverage data collected from consumers to inform designs and better target services.

The expansion of the internet globally means that online platforms such as eBay and Alibaba can reach overseas customers and thereby engage in digital trade. According to UNCTAD, the global ecommerce market amounted to US\$25 trillion in 2015.¹³⁸

A related development is the use of the internet to interact with customers and to engage third parties in the co-design of products.

Data as opportunity for SME participation in the global economy

The global internet and cross-border data flows provide a particular opportunity for SMEs to engage in the international economy.¹³⁹ SMEs represent the overwhelming majority of Australian businesses. According to the Australian Bureau of Statistics, in June 2016, 60.7 percent of actively-trading businesses in Australia had no employees, 27.6 percent had 1-4 employees,

9.2 percent had 5-19 employees, and 2.3 percent had 20-199 employees. Only 0.2 percent of businesses had 200 or more employees.

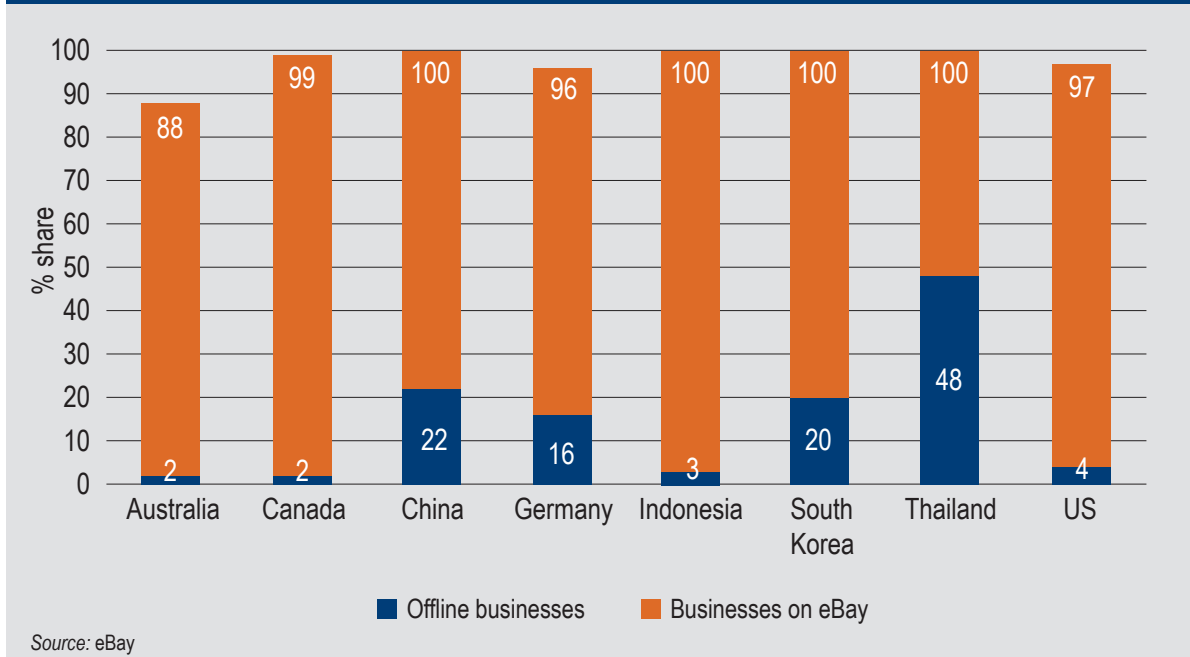
More broadly, the more that SMEs innovate, including using digital technologies, the more likely they are to engage in international trade.¹⁴⁰ At the same time, opportunities for international trade expose these firms to competition and new business practices which in turn can incentivize further innovation.

The internet and global data flows enable SME participation in international trade in several ways. First, having a website gives SMEs an instant international presence without having to establish a physical presence overseas—often not an economic option for SMEs. Second, access to cost-effective, data-based services—including online advertising and communication services, cloud computing, and access to critical knowledge and information on foreign markets—facilitate SME growth in important ways.¹⁴¹ For example, challenges in accessing information on foreign markets and regulations are known impediments to SMEs engaging in international trade.¹⁴²

Perhaps the most immediate trade opportunity for SMEs is using internet platforms such as eBay or Alibaba. For instance, in Australia only 2 percent of SMEs export, whereas 88 percent of SMEs that use eBay are immediate exporters. Similar results are seen in all countries where eBay operates (figure 7.1).

Despite these digital trade opportunities, only about 7 percent of all Australian businesses export.¹⁴³ Slow adoption of digital platforms could be one of the reasons behind Australia's underperformance. For instance, while businesses report internet access levels at over 95 percent, only around 40 percent of Australian firms with 5-19 employees have a web pres-

Figure 7.1: Share of SMEs that exported products and services, 2016



ence, compared to over 90 percent for business with 200 or more employees.¹⁴⁴ Additionally, only around 30 percent of small businesses receive orders over the internet. This suggests that more needs to be done to improve how SMEs, in particular, engage with the internet and use it to participate in digital trade.

AUSTRALIA'S FINTECH OPPORTUNITY

The economic benefits

Fintech has emerged as an area where Australia could assume a global position. Australia's Fintech strengths include a well-regulated banking sector, with some of the world's largest and safest banks. Compulsory retirement savings has resulted in Australia having the fourth-largest pool of investment fund assets in the world, and this will continue to grow as the population ages. Additionally, the relative ease of starting a business in Australia and its leadership—along with the US—in cybersecurity policy benefit Fintech innovation.¹⁴⁵ Investment in the Fintech sector increased to A\$675 million in 2016 from A\$53 million in 2012.

Currently, Australia's Fintech market remains smaller than that of the UK or Singapore, but tax incentives in Australia for both investors and Fintech operations are competitive. For instance, investors enjoy tax relief for eligible investment in early stage venture capital limited partnerships, while Fintechs also benefit from the tax incentives for R&D activities.¹⁴⁶

Proximity to Asia, including free-trade agreements with China, Japan, Korea, and other countries within ASEAN makes Australia an attractive hub for servicing the region.

The term Fintech usually covers digital innovations and technology-enabled business models in the financial sector.¹⁴⁷ Another term, "regtech", is considered below; it refers to ways of using technology to provide real-time regulatory oversight and financial regulatory compliance solutions for regulators and businesses.

A key element of Fintech is its use of the internet and data to provide new financial services. It includes

digital wallets that can facilitate payments and person-to-person crowdfunding platforms that are opening new channels for capital raising and can be of particular benefit for SMEs. Access to consumer data allows for better-tailored and lower-cost insurance services, and so-called robo-advisers can provide automated wealth management services.

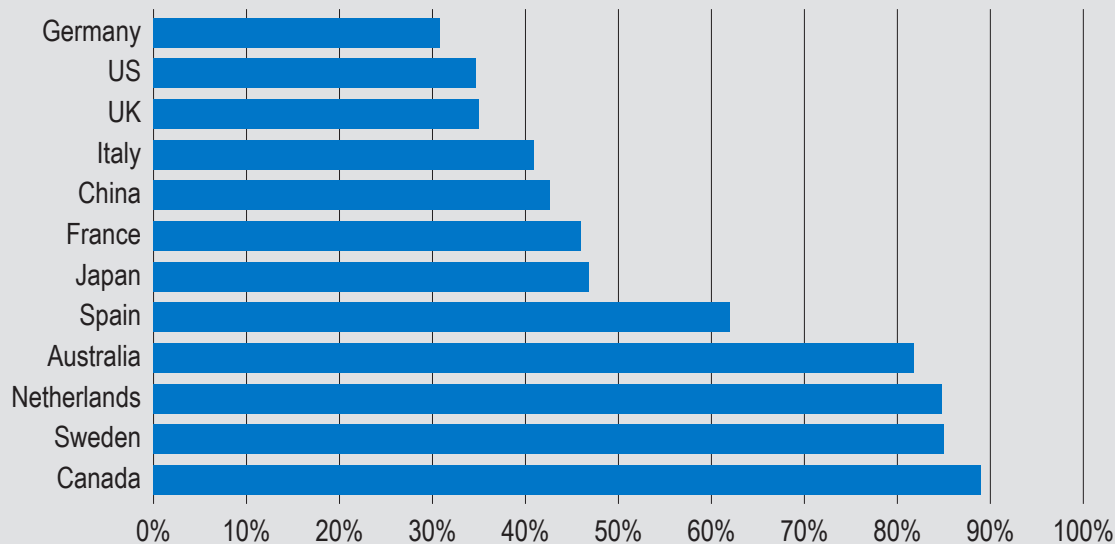
Blockchain is another emerging technology with Fintech applications (see page 43 for a more detailed blockchain discussion). For instance, distributed ledgers enable secure and real-time payment and settlement of securities.¹⁴⁸ Digital currencies such as Bitcoin are the most well-known example of a blockchain.

Fintech should also catalyze improvements in financing decisions and resource allocation within the financial sector, providing capital and other financial services to SMEs, supporting job creation and innovation across the economy. Fintech can drive innovation in financial services that can deliver competition and gains in efficiency and productivity across the sector.

According to the Australian Competition and Consumer Commission (ACCC), the Australia retail bank sector "is not vigorously competitive and has not been for some time".¹⁴⁹ The combined market share of the four major banks is almost 80 percent, up from just over 60 percent in 2008 before the financial crisis. There is also concentration across other areas of the financial sector. For instance, the top five institutions have over 80 percent market share in life insurance and in private health insurance.¹⁵⁰ Figure 8.1 also shows that concentration in the Australian banking sector is high by global standards.

Consistent with the sustainability and stability of the financial services sector, the government should support Fintech as an opportunity to increase competition.

Figure 8.1: Australia's financial sector and the dominance of its biggest banks



Sources: APRA, Bank of Canada, Bank of Japan, RBA, S&P Global Market Intelligence, Swedish Bankers' Association

Regulating Fintech

Australia is developing a regulatory environment that encourages Fintech startups by reducing regulations and licensing requirements, while taking into account risks to consumers. The government has already undertaken a number of regulatory reforms and other support for Fintech development, including:

- The Australian Securities and Investment Commission (ASIC) offers a “regulatory sandbox”, which has provided a quicker pathway for eligible Fintech startups to test products and services for up to 12 months without holding an Australian financial services license or Australian credit license.¹⁵¹
- ASIC’s Innovation Hub fields requests for informal guidance to eligible Fintechs, including helping them to understand the regulatory framework, know their

options, and, if relevant, prepare applications for licenses or seek waivers with the help of staff experienced in Fintech and relevant areas.¹⁵²

- ASIC also has a range of relief powers to permit changes to how the law works, and these are often applied to assist fintechs as was seen with many of the Market Place Lenders. Further there are broad class relief options given in many areas, a common one fintechs utilize is the existing Non Cash Payment Facility relief.¹⁵³
- ASIC has established a Digital Finance Advisory Committee to guide it in how to better assist Fintech firms.
- ASIC so far has engaged with over 200 fintechs, many in payments, crowd source funding, digital

advice or market place business models.¹⁵⁴ Many of these entities enjoyed significant improvements in terms of reduced licensing application periods.

- The Australian Prudential Regulatory Authority (APRA) is reducing bank licensing processes for institutions with less than A\$50 million in capital.
- The Australian Transaction Reports and Analysis Centre (AUSTRAC) have also undertaken an engagement model for start-up businesses to assist them.¹⁵⁵
- The government has removed goods and services tax (GST) from digital currencies so these can be treated as money for GST purposes.

Other reforms to support innovation and which should support Fintech development include:

- A 'significant investors' visa program to enable venture capital fund managers to assist high-growth technology businesses.
- In 2016, Australia took further steps to create residency pathways for foreign students in science, technology, engineering, and math (STEM) and information communications technology at Australian universities.¹⁵⁶
- Development of a 2030 strategic plan to ensure Australia is positioned as a leader in innovation.

Other official bodies and agencies are also supporting Fintech through their own testing and use of data and digital opportunities. For example, the New Payments Platform (NPP) developed by the Reserve Bank of Australia (RBA) and 13 other financial institutions will enable real-time clearance and settlement of pay-

ments. Business will be allowed to use the NPP to provide added value services, providing opportunity for companies to innovate. In addition, the Australian Stock Exchange has adopted blockchain to settle and clear equity transactions.

What more is needed domestically

Many of the domestic reforms outlined in this report are also relevant for the development of Fintech.

As noted, the Australian banking sector is concentrated but a wider embrace of Fintech could inject competition and reduce the pressure on the government for top-down regulation. This is where consideration is needed for government support, such as sandbox arrangements. However, even here the outcomes are uncertain. For instance, should the major banks move to acquire Fintech developments, this would likely further consolidate their dominance.

Access to data will also be needed in order to realize Fintech possibilities. For instance, the ability to collect data on consumer preferences and to use analytics to better understand the market and provide a digital solution is common to many new innovative business models, including Fintech. Yet access to consumer data, such as bank details and credit scores, is either held by the large banks or—in the case of credit scores—is not readily accessible.

A number of reviews and inquiries have recommended expanding access to data, including financial data.¹⁵⁷ The 2017 Productivity Commission Inquiry into Data Availability and Use has recommended a new right for consumers to direct data to nominated third parties. There is also a Productivity Commission investigation underway into the competitiveness of the Australia banking sector.

The UK, the EU, and the US are in different ways also moving to standards that support access to, and the sharing of, banking data. In this light, the Australian government is conducting a review to determine the most appropriate model for 'open banking' in Australia, the appropriate regulatory framework, and timeline for change.¹⁵⁸

A related issue is the difficulty in shifting bank accounts between institutions in Australia. There is no frictionless way to transfer from an account at one bank to another institution. This includes challenges to consumers in assessing whether such a move would be welfare enhancing.

These challenges also could be alleviated by the development in Australia of digital identities (a fuller consideration of this issue is not within the scope of this paper).¹⁵⁹

The broader macroeconomic benefits from Fintech underscore the need for Australian authorities to carefully balance policies in favor of a homegrown Fintech sector while avoiding restrictions on foreign companies also competing in this space. This will also be important as Australia seeks to export Fintech services globally (see below).

Fintech governance

Fintech poses a range of domestic and international issues regarding its governance—specifically, how to balance risks and opportunities. Fintech governance is still being developed and Australia should play a leadership role. At the request of the G20 at its Hamburg summit in 2017, the Financial Stability Board is considering the financial risks posed by Fintech.¹⁶⁰ In addition to potential systemic risks, there are issues around regulatory relief for Fintech startups that does not compromise consumer protection.

Fintech will also raise cybersecurity issues, and developments with cryptocurrencies are raising the question as to how anti-money laundering laws should apply. Already, Australian authorities are making progress with revisions to an anti-money laundering and counter threat finance bill, which will include Bitcoin exchanges under the scope of Australian legislation for the first time. Australia is thereby well positioned to play a significant role in ensuring that a robust and sensible set of rules develops that appropriately balances the risks with the opportunities.

Fintech and going global

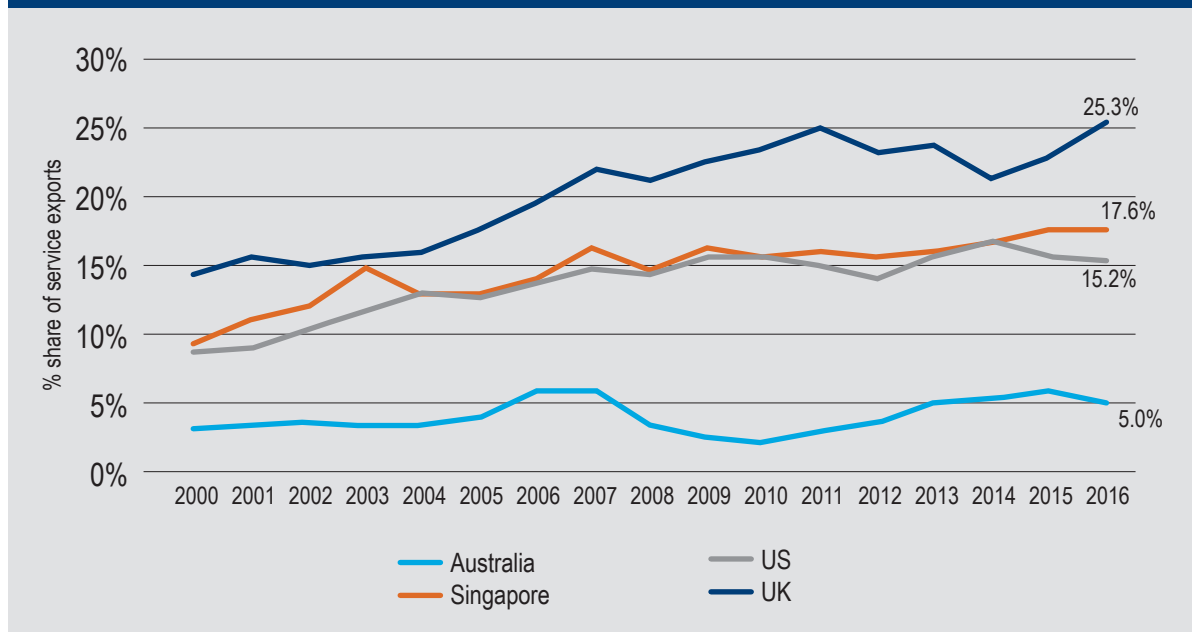
Australia needs to factor in a global approach to Fintech development, with a focus on export markets.

Notwithstanding Australia's Fintech strengths, Australia lacks the domestic market that exists in the US, China, or the UK (as part of the EU—for now), which allows scaling-up. This means that a key value proposition for Australia's Fintech appeal is its location as a hub to service local markets, in particular Asia.

Advantages for Australia's Fintech exports include its geographic proximity to Asia and shared time zone. There is a range of opportunities for Fintech exports to Asia. Fintech developments could expand access to financial services and capital for SMEs, providing greater financial inclusion for those without formal banking.¹⁶¹

As figure 8.1 shows, Australia financial services exports as a share of total services are low compared to other financial services hubs. While Australia's financial services exports have been growing since the 2008/09 financial crisis, they are still only around 5 percent of services exports, compared to over 15 percent for the US, over 17 percent for Singapore, and more than 25 percent for the UK.

Figure 8.2: Australia lags well behind other hubs in financial service exports



There is already some recognition of the need to expand opportunities for Fintech exports. ASIC has pursued cross-border regulatory cooperation agreements with Switzerland, Canada, Hong Kong, Singapore, Malaysia, Japan, New Zealand, and with regulators in the UAE, as well as signed information sharing agreements with China, Indonesia, and Kenya.¹⁶² The Australian and UK governments have also signed a government-to-government Fintech Bridge. The Australian and UK financial conduct regulators are one pillar in the Fintech Bridge, which also includes trade departments and industry associations. These agreements help regulators exchange information, assist local Fintechs to expand into other jurisdictions,

and engage in roadshows to attract foreign Fintechs to relocate in Australia. Australian incubators like Stone & Chalk and Tyro Fintech Hub have also established their networks in the US, driving multinational partnerships and collaboration.

The Australian Trade and Investment Commission (or Austrade) has also supported Fintech-specific delegations to countries such as China, Indonesia, Singapore, and Hong Kong.

However, more is needed. The section on Australia's trade policy provides a discussion as to initiatives that could further support Fintech exports.

AUSTRALIA AS A CENTER OF BLOCKCHAIN EXCELLENCE

Blockchains are a digital technology that combine with cryptographic data management, networking, and incentive mechanisms to support the checking, execution, and recording of transactions between parties.¹⁶³ Processing nodes within each blockchain community check the integrity of transactions. Each new block is recorded across all participants in the blockchain, providing consensus about their integrity and content. The new block contains a time stamp and is linked to a previous block, creating a complete record.

A key benefit of blockchain is the ability to build trust among disparate parties. By providing trust in a ledger based on distributed consensus, the blockchain can replace reliance on independent third parties who traditionally have performed this role. Take land title registries, for example, where each change in a land title is recorded and maintained by a trusted government entity. Blockchain technology can be used to replace the need for government or any third party, while providing enhanced levels of trust, integrity, and speed of transaction.

A blockchain also establishes a trust ledger, an oracle if you like, that is a permanent reference of transactions.¹⁶⁴ As a corollary, blockchains can significantly reduce fraud. Blockchains are also much harder to attack, as all copies of the ledger would need to be altered and affected simultaneously.

The flexibility of blockchain technology in terms of what data can be stored and its use across the economy (finance, contract, IP, trade) makes it like a general-purpose technology;¹⁶⁵ these typically can take a while to diffuse but can be important drivers of innovation and productivity.

Box 9.1. Distributed ledgers, blockchains, and bitcoin

Blockchain is an application of the more abstract notion of a distributed ledger—the distributed replication of auditable logs of transactions, shared between parties of interest. Not all applications of distributed ledger technology need to be in the form of blockchain, however.

Bitcoin is a specific application of a blockchain that uses the Nakamoto consensus and a proof of work mechanism to confirm the integrity of an existing block of transaction and to add it to existing blocks by completing a computationally difficult task (so-called mining). There are other consensus mechanisms and applications of blockchain technologies.

Smart contracts

Blockchains also provide scope for so-called smart contracts, which are not legal contracts, despite the name. Smart contracts are instead uses of computer programs incorporated into a blockchain that can automatically execute an action once specified conditions have occurred. For instance, a blockchain could be created to automatically transfer payments upon receipt of goods. This allows blockchain to become more than just a distributed database and increases the range of potential uses.

Blockchain technology and its applications are still in their infancy. The most well-known demonstration has been the cryptocurrency Bitcoin and other variations. Blockchain could have a range of Fintech applications given that much of the financial sector is there to mediate transactions and payments, and disintermediation is one key innovation that blockchains can perform. Already, the Australian Stock Exchange has become the first bourse to use blockchain to settle securities transactions and payments.

This is only the beginning. Many government services that involve acting as trust intermediaries—think land title registration and drivers' license registration—could be placed on a blockchain, increasing security and transaction speed while reducing costs.

Blockchain and international trade

International trade is one area where blockchain technology could add value. For instance, blockchain technology can reduce costs and frictions from continued reliance on paper-based manual processes for recording international transactions. Blockchains can become trust ledgers for recording the movement of goods across borders and using smart contracts can allow for real-time payments upon export or receipt of the goods.

Blockchain can also be used for supply chain management and provenance, to increase efficiency, and reduce costs. For instance, supply chains stretching across countries and involving multiple parties could use a blockchain to confirm the movement of goods through each stage in the chain, the receipt of documentation (i.e., contract of sale, bill of lading, customs duties payment), and when goods have been received. Using a smart contract could lead to automatic payment using a cryptocurrency.

Box 9.2: Private sector blockchain applications: IBM and Danish shipping company Maersk have developed an end-to-end supply chain using blockchain technology aimed at increasing reliability and speed and reducing costs amongst trading parties.

Blockchains can also be used to store digital representation of real-world assets. Combined with radio-frequency identification tags, for instance, blockchains can be used to record the provenance of agriculture

products, determining the particular farm or even the single paddock that high-quality beef came from, potentially adding value and creating new market opportunities.

Many of these applications will need to find ways to verify the identity of participants while remaining sensitive to privacy concerns. Blockchain could also help here by providing ledgers with the minimum personal data needed for verification for a particular transaction. For instance, in the case of most commercial transactions, a name, an address and maybe a credit score is all that is needed. In other cases, such as when accessing government health services, health history may be relevant. This is about using blockchain to provide 'attributes of identify' that are under the control of the user rather than singular state-used identification that was common across uses.¹⁶⁶

Blockchain challenges and risks

While blockchain presents a range of important opportunities, there are also risks and unknowns that need to be considered and where further work is needed. Some of the key potential risks are:

- Private blockchains risk creating opportunities for collusion amongst sellers.¹⁶⁷
- There is a privacy risks in that the immutability of data can clash with privacy norms that personal information can be deleted—the so-called right to be forgotten.
- While not a legal contract, smart contracts can be have real-world consequences such as payments and settlement. How existing law would apply to execution of a smart contract that caused loss or damage needs further work.

- There are other potential technology costs, such as whether the expense of verification—using mining and proof of concept—changes the economics of Bitcoin; once there are no more new Bitcoins, it moves to a commission-based scheme.¹⁶⁸

Developing blockchain technology in Australia

Blockchain technology development and application is already being studied and commercialized in areas such as finance and work is being undertaken on its application to international trade and, in particular, to supply chains.

Standards Australia manages the Secretariat of the International Technical Committee for Blockchain standards at the International Standards Organization (ISO). This places Australia in a strong position to influence international standards relevant for blockchain. In addition to shaping outcomes, it provides an opportunity for Australia to build a capacity and a reputation as a center for blockchain research development and application.

Standards Australia has developed a roadmap prioritizing ISO's work on this subject that focuses initially on developing blockchain terminology, standards for privacy, and security and identity issues associated with blockchains, using progress in these areas to develop a reference architecture standard.

The Australia government should build on these strengths to articulate a vision for how blockchain can be used to first improve the delivery of government services, reduce cost and improve security and trust in a whole range of online transactions. This could include in areas such as land titles, vehicle registration, health records, and distribution and monitoring of welfare.¹⁶⁹

In addition, the government should continue to support work to better understand the potential risks and regulatory challenges. This could include using CSIRO Data 61 data innovation group as the key leader to leverage internal resources, industry bodies, and academic works in Australia, and globally. It could consider establishing blockchain centers of excellence in academic institutions, with support from the private sector.

The government should also seek to develop partnerships with the private sector to test applications of blockchain technologies in areas such as Fintech, supply chain management, and international trade. The work of the Australian Stock Exchange and the Reserve Bank with its NPP and are an important beginning here. The overall aim should be to not only assist with specific business outcomes but to develop global leading technologies and skills based around blockchain technologies.

DEVELOPING A DIGITAL TRADE POLICY

Australia's digital trade agenda should address barriers and include support for new rules and standards that promote growth. This could include facilitating access to the use of data globally, strengthening trust in digital trade and developing international standards.

Australia's digital trade goals should be pursued in trade negotiations, whether at the WTO, regionally or bilaterally. The G20 is developing a digital agenda and Australia should play an active role, as well as seeking to support the work of the OECD as it explores measurement issues. APEC is another forum where there are opportunities to increase understanding of the trade and regulatory needs for a digital economy. Australia should consider introducing a digital trade agenda into its bilateral economic relations with key countries.

Digital trade barriers

As the opportunities presented by digital technologies grow, governments and regulators have to determine how to benefit from going digital while maintaining the integrity of their domestic regulations. Against this backdrop, governments are experimenting with greater internet regulation.

Some interventions reflect regulatory concerns arising from the ability to move data globally, undermining domestic regulatory goals. Take privacy, for instance, where the ability to move personal data to a jurisdiction with lower privacy protection can undermine domestic protections. The EU Data Privacy Directive (and GDPR from April 2018) for example, prohibits personal data leaving the EU unless the receiving country has an equivalent level of privacy protection.

Some governments censor what content can be accessed online, with such restrictions often justified on moral or religious grounds. In Iran, censorship aimed at creating the 'Halal internet' limits access to content deemed offensive to Islam. China blocks access to political speech directed at the Chinese Communist Party.

Some governments are intervening for commercial reasons. For example, the important role of data has led a range of governments to require data to be held locally. The abovementioned restrictions on transfers of personal data is a form of data localization. Other forms of data localization include Turkey's requirement for internet payment services, such as PayPal, to store data in Turkey for 10 years. Vietnam requires domestic internet service providers (ISPs) to store all data transmitted on the internet within Vietnam for at least 15 days.¹⁷⁰

Other governments limit access to particular websites or content in order to support the growth of domestic internet champions. China, for instance, blocks access to 11 of the top 25 global sites among an estimated 3,000 prohibited foreign websites.¹⁷¹

There are also other forms of digital trade barriers, such as service restrictions that affect digitally-deliverable services. Domestic standards that ignore international standards have the effect of segregating the smart manufacturing market, hampering export opportunities. Inefficient customs procedures, barriers to express delivery services, and tariffs that raise the cost of exports using digital platforms should also be understood as digital trade barriers.

Digital developments in trade agreements and other economic forums

The global nature of the internet and the digital trade opportunities will require international cooperation, new trade rules and international standards.

Governments are still learning the steps needed (particularly developing ones) to develop their digital economy and engage in digital trade.

The Australian government has recently taken important steps to develop a digital trade policy, most recently outlined in Australia's International Cyber Engagement Strategy. This includes pursuing digital trade commitments in future trade agreements as well as engaging on digital trade issues in international forum such as APEC, the OECD and the G20.

The following builds on the key areas of opportunity and reform needed to develop a digital economy and links this with the Australian government's digital trade priorities and the international forum where these digital opportunities should be pursued.

Australia's digital trade policy should be developed with the following goals in mind:

- Maximizing access to data and digital services
- Reducing barriers to exports of digital products
- Developing international standards consistent with Australia's interests
- Addressing other countries regulatory barriers including restrictions on data flows that affect Australia's digital exports.

- Engaging other countries on the regulatory agenda needed to support digital economic growth and digital trade

Australia is already developing a multifaceted international agenda with respect to digital trade that includes engagement at the WTO and through free trade agreements. This includes working through the G20, APEC, OECD, and international standards organizations.

The following builds on the government's digital trade policy - it reaffirms much of what the government is doing and expands on it in some areas. This report also clearly links Australia's digital trade policy to recommendations for a domestic digital agenda (see table ES1).

The WTO and free trade agreements

The WTO and in particular bilateral and regional free trade agreements (FTAs) have been at the forefront of developing new digital trade rules.

The following table outlines the development of digital trade rules in the WTO and in Australia's most significant FTAs over the last 10 or so years. As can be seen, Australia has progressively adopted more comprehensive and binding digital trade rules, starting with the Australia-US Free Trade Agreement (AUSFTA) and with the recently-concluded CPTPP. The table also shows that when it comes to digital trade commitments it is important to look beyond the e-commerce chapter a (as important as it is in the CPTPP) to commitments in areas such as IP, competition, trade facilitation, and standards.

These trade agreements have provided the opportunity to push for domestic reforms in key export markets and reduce barriers to digital trade exports. Table 10.1 shows that Australia already has a range of trade

agreements with commitments relevant for digital trade. At a minimum, the government should review these agreements to assess relevant digital trade commitments, including with respect to market access, and be prepared to use them to address barriers where they exist.

This paper has not addressed issues related to connectivity and infrastructure, though commitments in trade agreements in areas such as competition and

access to telecoms infrastructure has also been important in tackling telecom monopolies and reducing mobile and internet costs. More could also be done on this front.¹⁷²

The following section outlines some key digital trade commitments that Australia should prioritize in future FTAs and where the government should use existing trade commitments to develop a dialogue on digital trade.

Table 10.1: Australia's Digital Trade Commitments

	WTO	AUSFTA (2005)	AANZFTA (2010)	Japan (2014)	Korea (2014)	China (2015)	CPTPP (2018)
Ecommerce Chapter	None	Required	Required	Required	Required	Required	Required
No customs duties on transmissions	Required	Required	Required	Required	Required	Required	Required
Non-discrimination between digital products	None	Required	None	Required	Required	None	Required
Authentication and digital certificates	None	Required	Required	Required	Required	Required	Required
Paperless trading	None	Best Endeavors	Best Endeavors	Best Endeavors	Best Endeavors	Best Endeavors	Best Endeavors
Consumer protection	None	Required	Required	Required	Required	Required	Required
Transparent regulatory process	None	Required	Required	Required	Required	Required	Required
Protection of online personal information	None	Best Endeavors	Required	Required	Required	Best Endeavors	Required
Ecommerce regulation	None	None	Best Endeavors	Best Endeavors	Best Endeavors	Best Endeavors	Best Endeavors
Cooperation on ecommerce	Best Endeavors	None	Required	Required	Required	Required	Required
Access to and use of internet, services, and applications	None	None	None	None	None	None	Best Endeavors
Cross-border transfers of information	Some	Some	Some	Some	Some	Some	Almost all
Avoid data localization	None	None	None	None	None	None	Required
Not require source code	None	None	None	None	None	None	Required
Address unsolicited commercial messages	None	None	Best Endeavors	Required	Best Endeavors	Best Endeavors	Required
Market access for digital services	Required	Required	Required	Required	Required	Required	Required
Copyright protection	Required	Required	Required	Required	Required	Required	Required
Intermediary liability protection	None	Required	None	Required	Required	Required	None
Reduced tariffs	Required	Required	Required	Required	Required	Required	Required
Customs facilitation	Required	Required	Required	Required	Required	Required	Required
SMEs	None	Best Endeavors	Best Endeavors	Best Endeavors	Best Endeavors	Best Endeavors	Required
International Standards	Required	Required	Required	Required	Required	Required	Required
Competition	None	Required	Required	Required	Required	None	Required
Telecoms	Required	Required	Required	Required	Required	Required	Required

■ Required ■ Best Endeavors ■ None

Cross-border data flows

As discussed, cross-border data flows underpin many digital economy and trade opportunities. Under the CPTPP, Australia now has a commitment to the free flow of information and to avoid data localization requirements subject to a GATS-style Article XIV exception.

The value of this commitment will be reflected in the extent that governments resort to these exceptions. The government should use the CPTPP data flow commitment as a basis for engaging other CPTPP parties as to how to regulate in ways that maximizes the opportunities of cross-border data flows and avoids regular recourse to the exceptions.

Privacy

Australia's trade agreements provide an opportunity to develop a framework for linking privacy regimes. Most of Australia trade agreements recognize the importance of having privacy regimes and note the need to develop privacy laws according to international standards. The CPTPP goes further and encourages compatibility between regimes. It also includes a commitment by all parties to apply their privacy laws to all ecommerce users, not limited to their own citizens. The government should seek to reflect a similar commitment in its free trade agreement negotiations with the EU.

The government should use its FTAs to raise privacy and interoperability issues as they relate to trade with other FTA parties. Developing such a dialogue with trade officials can highlight the links between privacy and economic and trade outcomes. This can help broaden discussion within these countries about how to protect privacy and to develop their digital economy and trade opportunities.

Smart manufacturing and integration into supply chains

Trade agreements can support manufacturing and, in particular, the shift to smart manufacturing. As the discussion on smart manufacturing makes clear, this will require more than tariff reductions. In particular, the focus on manufacturing and integration into supply chains is about creating opportunities to use data and develop digital services that add value to manufacturing processes. This includes the above commitment on cross-border data flows. It also includes the following trade commitments:

- Identifying the types of services related to smart manufacturing and removing barriers where they exist. Generally, services barriers are significantly higher than tariffs. From a smart manufacturing perspective, services barriers have two effects. For one, they reduce the scope for exports of the types of value-added services in manufacturing in which Australia could specialize. Second, as services are increasingly part of the package of solutions offered by companies, high services barriers can nullify otherwise low goods tariffs.
- Align Australian standards with international standards where they exist, including participation in international standards-setting bodies.¹⁷³ The WTO Technical Barriers to Trade agreement includes commitments to basing technical regulation on international standards, where they exist. The CPTPP expands on this, particularly through commitments to develop mutual recognition of conformity assessment bodies.
- Customs facilitation: build on the WTO trade facilitation agreement and customs chapters in FTAs. Consider seeking commitments on de minimus levels under which duties do not apply to imports.

Australia has a de minimus level of A\$1,000 which facilitates online imports of goods. Similar de minimus levels in other countries could improve SME export opportunities.

Intellectual property rights

The importance of intellectual property rights for developing a digital economy and engaging in digital trade has been addressed in this report. From a digital economy and trade perspective, Australia's copyright protection needs to balance the importance of supporting the development of domestic online content while providing a legal regime that fosters the development of digital startups and provides legal certainty over liability for third party hosting of infringing content.

The IP debate in Australia and in trade agreements to which the US is a party often traces the contours of this domestic US debate. The challenge for Australia is identifying an optimal path. This is not the place to identify that with any precision but the discussion above outlines where Australia's IP regime may fall short.

In terms of free trade agreements, the CPTPP includes a number of revisions to the original TPP, many of them to the intellectual property chapter. The key ones relevant for digital trade are:

- No extension of the copyright term
- No commitments on temporary protection measures
- No new protections for rights management information that is used to identify a copyright work, its owner, and terms and use of the work
- No obligation to have safe harbor for legitimate internet service providers

As table 10.1 shows, these commitments are already reflected in previous FTAs, including with the US. The net result is that the CPTPP will provide less protection for Australian content exporters in other CPTPP markets.

At the same time, the CPTPP does retain the commitment by the parties to endeavor to “achieve an appropriate balance in its copyright and related rights system...including those for the digital environment.”¹⁷⁴ This reflects the broader issue of how to balance copyright protection with the opportunities for innovation from access to information.

Going forward, Australia's position on intellectual property rights will depend on whether it moves to expand safe harbor and adopt something akin to US-style fair use exceptions along the lines of the recommendations in the Productivity Commission inquiry and this report.

This report has analyzed how IP protection will become increasingly important as Australia transitions to a digital economy. From a trade perspective, there should be a growing focus by the government on supporting IP protection in its key export markets.

Fintech

As noted, part of Australia's allure as a Fintech hub will rest on its being a platform for providing Fintech services globally, particularly into Asia. With this in mind, Australia should use FTAs to expand market access for Fintech services.

Key challenges for Fintech exports include:

- Market access barriers. These can include requirements of a physical presence to provide the service, requirements to have a domestic partner, and licensing requirements.

- Laws and regulations that discriminate in favor of domestic financial services companies, including other Fintech startups.
- Regulation and other licensing requirements. Australia's approach to Fintech regulation—regulatory sandboxes and other licensing exemptions—highlights how the application to Fintech of regulations designed for large banks can stifle innovation. From an export perspective, the operation of Australian Fintech businesses overseas may require similar regulatory relief.

Given that Fintech development can require a new regulatory approach, FTAs should include commitments to recognize Australia's regulatory regime for Fintech as achieving necessary levels of consumer protection and prudential control. Essentially, avoid regulations in third countries being the basis for restricting access for exports from Australian Fintech companies that are taking advantage of regulatory sandbox or other regulatory exemptions and licensing relief.

In addition, Australia should use FTAs as vehicles to share information on best practices to Fintech regulation. This could be done with commitments to cooperation among regulators.

Fintech in the Comprehensive and Progressive Trans-Pacific Partnership Agreement

As the most ambitious FTA, the CPTPP provides the best point to assess Australia's trade commitments relevant for Fintech exports. The CPTPP includes some provisions that could support Fintech exports. And as noted, cross-border data flows will support exports of Fintech services.

Cross-border data flows

In many respects, the discussion regarding the importance of cross-border data flows applies to Australia's Fintech export opportunities. Providing Fintech solutions overseas will require collection and analysis of data. For many businesses, and in particular SMEs, collecting data and analyzing it in Australia will reduce costs. In addition, Fintech companies will rely on digital services such as cloud computing, which as discussed, relies on cross-border data flows to provide a global service and to maximize security.

Data localization requirements could demand that such activities to be performed in the country of imports, creating costs that many startups will be unlikely to afford.

Moreover, the ability to aggregate data from across countries can provide additional information on risk profiles and consumer preferences, which can be the basis for further innovation and product differentiation. Again, this will require the ability to move data globally and aggregate data from multiple markets.

However, CPTPP commitments for cross-border data flows do not apply to the financial services sector. This outcome was due to opposition from the US Treasury. However, the US position (under the Obama administration) subsequently evolved and the extension of data flow commitments to financial services was also being sought in the Trade in Services Agreement negotiations. Going forward, Australia should support data flows commitments for financial services.

The CPTPP includes pathways for recognition of prudential measures, including through harmonization and by agreement.¹⁷⁵ This can open opportunities to align application of prudential measures to Fintech startups.

The CPTPP also includes commitments of national treatment for “new financial services” and is defined as including “any new form of delivery of a financial service to the sale of a financial product.”¹⁷⁶ The commitments for new financial services apply to “financial institutions”, which are defined as “any financial intermediary or other enterprise that is authorized to do business and regulated or supervised as a financial institution.” In essence, the provision applies to financial institutions as defined and regulated by domestic law. However, this definition may be too narrow as it is not clear whether all Fintech startups will be regulated or supervised as financial institutions. Moreover, financial services are defined broadly and include “services incidental or auxiliary to a service of a financial nature”. For instance, Fintech companies in Australia that enable invoice trading may not need to be regulated as financial institutions, leaving them outside the scope of the CPTPP.

It is also the case that a CPTPP party retains the right to require a financial institution to obtain authorization to supply a new financial service (this authorization may only be refused for prudential reasons). This commitment underscores the importance of developing a dialogue among financial regulators on the risks that Fintech might pose to financial stability and what prudential measures may be needed. This could include using meetings of the Trans-Pacific Partnership Committee on Financial Services to have a dialogue about regulatory approaches to Fintech, including lessons learned.

The CPTPP also includes robust commitments to transparent regulations in financial services.¹⁷⁷ Commitments to publish proposed regulations in advance and provide opportunities for other parties to comment can be a useful means for informing regulators in other countries about the impacts on Fintech de-

velopment. In most cases, Fintech startups in Australia will not have the resources to monitor or respond to such overseas development. The government should actively monitor such regulatory developments and be proactive in responding to regulations that could negatively affect Fintech exports.

Australia’s Fintech industry body—Fintech Australia—should also develop partnership with similar bodies in Asia in order to develop their understanding of overseas developments that could affect Australia’s Fintech exports.

Pursuing digital trade at the World Trade Organization

The WTO agreements, which were finalized during the Uruguay Round in the early 1990s before the internet existed, fail to directly address digital trade issues. Moreover, since the formation of the WTO in 1995, WTO members have not taken up the challenge of designing new rules for digital trade. However, as Table 10.1 shows, a number of WTO agreements are relevant for digital trade, such as the Trade Facilitation Agreement and Information Technology Agreement II. Moreover, constructive WTO Appellate Body decisions have given some aspects of the WTO General Agreement on Trade in Services (GATS) new life when it comes to digital trade.

The following provides more detail on the key WTO areas that are relevant for digital trade:

- WTO GATS commitments apply to the digital delivery of the service. This outcome is the result of the panel decision in *US-Gambling*, which found that GATS mode 1 commitments apply to “all means of delivery, whether by mail, telephone, internet, etc.,” unless otherwise specified in a member’s sched-

ule.¹⁷⁸ The Appellate Body in China-Audiovisual confirmed that GATS commitments apply to services delivered electronically.¹⁷⁹

- The WTO Understanding on Commitments in Financial Services includes a GATS Annex on financial services agreement that members will not “prevent transfers of information or the processing of financial information, including transfers of data by electronic means.”
- Since 1998, WTO Members have maintained a moratorium on applying customs duties to electronic duties.
- The WTO Trade Facilitation Agreement’s impact on customs efficiency can help digital trade in low-value goods.
- The WTO Information Technology Agreement II reduces tariffs on digital technologies that enable digital trade.
- The importance of effective protection and enforcement of intellectual property rights as an enabler of digital trade underscores the ongoing relevance of the WTO Trade-Related Aspects of Intellectual Property Rights Agreement.
- The WTO Telecommunications Annex commitment to access and use of public telecommunications transport networks for the delivery of a service includes those networks for online delivery.¹⁸⁰
- The WTO Telecommunications Reference Paper outlines fundamental principles designed to regulate competition and ensure that former monopoly operators do not use their market power—such as control of access to telecommunications infrastruc-

ture—to undermine competitive opportunities for new entrants.

The opportunity to use existing WTO commitments to address trade barriers that affect digital trade has yet to be tested using the WTO dispute settlement system. There is scope to use the WTO more effectively to address barriers to digital trade. Since 2011 the US administration has been using the WTO to push China to clarify the impact of internet censorship and other restrictions on digital trade. More recently, US intervention in the WTO Services Committee included more specific US claims that China’s digital trade barriers are inconsistent with existing GATS commitments.

WTO ecommerce negotiations

The negotiation of new digital trade rules in the WTO remains under consideration. The WTO has a Work Programme on Electronic Commerce where e-commerce issues are discussed but it is not a forum for formal negotiations. At the WTO ministerial meeting in Argentina in December 2017, Australia joined 48 other WTO members, including the US, the EU, Japan, Canada, Korea, China, and Brazil in issuing a Joint Statement on Electronic Commerce, which included agreement to “initiate exploratory work together toward future WTO negotiations on trade-related aspects of electronic commerce.”¹⁸¹ The composition of the group suggests that progress will be slow.

The G20

Following the 2017 G20 summit in Hamburg, there is now a digital agenda that provides an important opportunity for Australia to shape global engagement and understanding on a range of digital economy and trade issues. In particular, the government should use the G20 to make progress on issues relating to the devel-

opment of interoperable privacy regimes; smart manufacturing (including the development of international standards); a regulatory framework to support Fintech development; and better measurement of digital trade.

Developing interoperable privacy regimes

The G20 Roadmap for Digitization notes that “trust and security are fundamental to the functioning of the digital economy”. As part of promoting trust and security, the G20 governments “recognize the importance of promoting interoperability between privacy frameworks of different countries.”

Argentina has signaled that, as host of the G20 this year, it intends to discuss international public policy issues related to privacy and security in the digital economy.

The government should encourage G20 work on interoperability, ensuring that it addresses the key challenge of interoperability between the top-down EU GDPR approach to privacy and data flows and the bottom-up accountability-based approach taken by the US and Australia. Such an accountability approach to privacy and cross-border data flows is also reflected in the APEC CBPRs. This could include a more focused assessment of the extent that the EU-US Privacy Shield, which effectively straddles this divide, provides a framework for developing interoperability between the EU and other privacy regimes.¹⁸²

Smart manufacturing and international standards development

There are multiple G20 agendas relevant for smart manufacturing and international standards. The G20 Digital Economy Ministerial Declaration recognizes

that digitization of production “may act as a driver of global growth”, but also notes potential effects on employment and automation of tasks.

With regard to the development of international standards, the G20 Digital Economy Declaration reaffirms the need for consistency with the WTO Technical Barriers to Trade Agreement. The G20 Declaration also calls for an exchange of best practices in areas such as digitization of production. The G20 usefully notes the need for an open standards marking process and the need to develop “standards to improve digitalization of production and facilitate the conduct of international trade.”

When it comes to G20 priorities for digital trade, the importance of smart manufacturing and the development of international standards is included through the G20 Digital Economy Development and Cooperation Initiative.

The G20 Blueprint on Innovative Growth 2016 also outlines a number of key reforms needed to promote innovation, all of which are directly relevant for growth in digital economy and trade. These include the G20 Digital Economy Development and Cooperative Initiative. The Blueprint includes endorsement of the G20 New Industrial Revolution Action Plan, which is focused on improving communication and collaboration including on digital issues relevant for smart manufacturing. For example, the Action Plan recognizes the need to speed up international standards development and calls for “inclusive, mutually beneficial and efficient cooperation on standards development in standards developing organization.”

However, more could be done. In this regard Australia could consider seeking more concentrated discussion in the G20 on the need for the development of smart

manufacturing standards in international standard setting bodies. This could build on the agreement between Germany's Plattform Industrie 4.0 and the US-based Industrial Internet Consortium to ensure a uniform impact on global standards. Australia should also use the G20 to encourage China to develop smart manufacturing standards in accordance with and in conjunction with international standard setting bodies.

Australia should use its chair of the international standards blockchain committee as a basis to highlight its role and to push for further international standards development in areas needed to promote smart manufacturing.

Fintech

The G20 has an expansive agenda to improve financial inclusion and in this context, Fintech development has a role to play.

The G20 High Level Principles (box 10.1) supports a Fintech agenda focused on expanding financial inclusion and development in the developing world.

These principles address key regulatory and trade issues for Fintech development and include a range of actions that Australia should promote and lead where possible. This includes in areas such as digital trade and access for Fintech services (Principle 1), how to regulate Fintech to balance risk and opportunity (Principle 2), developing appropriate privacy and consumer protection frameworks (Principles 3 and 5); and assessing the development of digital identities (Principle 7).

In addition, the G20 2017 Roadmap for Digitalisation includes further discussion on digital economy business models and frameworks as they affect financial

Box 10.1. G20 High-Level Principles for Digital Financial Inclusion

Principle 1: Promote a Digital Approach to Financial Inclusion.

Principle 2: Balance Innovation and Risk to Achieve Digital Financial Inclusion

Principle 3: Provide an Enabling and Proportionate Legal and Regulatory Framework for Digital Financial Inclusion.

Principle 4: Expand the Digital Financial Services Infrastructure Ecosystem.

Principle 5: Establish Responsible Digital Financial Practices to Protect Consumers

Principle 6: Strengthen Digital and Financial Literacy and Awareness

Principle 7: Facilitate Customer Identification for Digital Financial Services

Principle 8: Track Digital Financial Inclusion Progress

inclusion. The government could use this as basis for a G20-focused discussion on Fintech exports as a source of digital inclusion.

Improve the government's digital economy and trade measurement capacity

A key challenge in developing a global consensus on the importance of the internet and data for economic growth and digital trade has been the lack of sound trade and economic statistics on this very question.

This report outlines current limits to measuring Australia's digital economy and digital trade. The G20 has identified measuring digital trade as a priority and

has invited international organizations to propose ways to measure digital trade. Australia should also support ongoing work by the OECD, UNCTAD and WTO to measure digital trade.

The measurement of digital trade by international organizations is likely to take some time given the data challenges outlined above. In addition, data on the importance of the internet and data for each country are also needed and is something which governments will need to drive.

As a starting point, Australia should develop its own measurement of the importance of the internet and digital trade for the Australia economy. This could start with deep dive into measuring Australia's digital economy, including how to improve data collection in order to build a more complete picture than currently exists of the economic and trade implications. Work by the US International Trade Commission and Department of Commerce provides a framework.

Australia should also offer to assist other countries in measuring their digital economy and trade position. Such work would complement the ongoing work of international organizations on broader digital trade measurement. Such capacity building could support bilateral discussions with other governments on digital economy and trade issues.

APEC

APEC has developed a number of outcomes and workstreams relevant for digital trade, including the APEC Internet and Digital Economy Roadmap, the Cross-Border E-Commerce Facilitation Framework, and the APEC Cross-Border Privacy Rules. Much of this work occurs in the APEC Electronic Commerce Steering Group, which includes a Data Privacy Subgroup

chaired by Australia and which is responsible for developing CBPR and promoting interoperability of CBPR with the EU privacy system.

Australia should build on its work in APEC. First could be extending APEC's work around privacy and the cross-border privacy rules to develop interoperability globally. The second could be to further APECs work on building understanding on the range of policy and regulatory reforms needed to engage in digital trade, including how to regulate cross-border data flows and build confidence that data flows do not undermine regulatory objectives. Thirdly, Australia could seek to ensure that APEC can also support the development of Fintech.

The APEC Internet and Digital Economy Roadmap recognizes the importance of privacy frameworks to strengthen trust and security and the need to preserve the global nature of the internet. To this end, the APEC Roadmap notes the need to create interoperable privacy systems. In addition, the Cross-Border E-Commerce Facilitation Framework includes a working pillar focused on the development of trust, interoperability, and the strengthening of domestic privacy regimes based on the APEC cross-border privacy rules and on promoting interoperability between privacy frameworks globally.

Australia should finalize its participation in the APEC Cross-Border Privacy Rules and play a lead role in terms of capacity building and sharing of best practices as it relates to privacy protection and cross-border data flows.

APEC should also be a focus for developing a dialogue on regulation and digital trade that could address many of the regulatory issues identified in this paper. The Digital Economy Roadmap already encourages mem-

ber economies to “promote mutual understanding and strengthen cooperation in approaches to regulation”. The APEC Cross-Border E-Commerce Facilitation Framework provides additional context and, in particular, a focus on improving the capacity of micro, small, and medium enterprises (MSMEs) to engage in e-commerce. It also provides an opportunity to discuss costs to these businesses of restrictions on cross-border data flows. The government should support workshops and dialogue among regulators, as well as capacity building around regulating for a digital economy,

Fintech

The APEC Action Agenda on Economic Financial and Social Inclusion announced at by leaders at APEC in 2017 includes a potential work stream on a range of financial services aspects, including extension of Fintech opportunities throughout APEC. This includes devising e-payments solutions and improving access of MSMEs to financial services, including capital. There is also agreement in APEC to promote international cooperation in areas such as sharing information and best practices.

The government should seek to broaden this to address cross-border access to financial services that can achieve these APEC goals in increasing financial inclusion.

More broadly, the APEC action agenda on financial inclusion includes agreement on developing the regulatory environment that can support Fintech and access to financial services.¹⁸³ This could include two elements:

- The development opportunities of Fintech—extend access to financial services in developing countries
- Developing an optimal regulation of Fintech—this should start with information sharing on Fintech activities to better understand risks that may arise and sharing of regulatory approaches and lessons learned. This should include risks including cyberattacks and those related to underlying technologies, such as cloud computing.¹⁸⁴

ENDNOTES

1. Harper Ian, Peter Anderson, Su McCluskey, and Michael O'Bryan. (2015). Competition Policy Review: Final Report", Canberra: Australian Treasury. http://competitionpolicyreview.gov.au/files/2015/03/Competition-policy-review-report_online.pdf
2. *Solving the Productivity Puzzle*, McKinsey Global Institute, 2018.
3. CSIRO (Commonwealth Scientific and Industrial Research Organisation). (2016). Our Future World. Global megatrends that will change the way we live. Brisbane: CSIRO. <https://doi.org/10.4225/08/584ee9706689b>
4. United States International Trade Commission. Digital Trade in the US and Global Economies, Part 2, August 2014.
5. Digital Australia: Seizing the opportunity from the Fourth Industrial Revolution, Digital McKinsey 2016.
6. Baldwin, R. (2016) *The Great Convergence: Information Technology and the New Globalization*. Boston: Harvard University Press.
7. Harper I. et al (2015) Competition Policy Review Final Report", March 2015.
8. Ibid.
9. Productivity Commission (2017) Data Availability and Use, Productivity Commission Inquiry Report No. 82, 31 March 2017.
10. Australian Law Reform Commissions. (2013). Copyright and the Digital Economy, ALRC Report 122, November 2013, p. 250.
11. Anupam Chander.2014. "How Law Made Silicon Valley", *Emory Law J.* 63, 639.
12. Ibid.
13. Data 61, Risks and opportunities for Systems Using Blockchain and Smart Contracts, May 2017.
14. Productivity Commission. (2017). "Shifting the Dial 5 Year Productivity Review", *Inquiry Report* 84.
15. Harper Ian, Peter Anderson, Su McCluskey, and Michael O'Bryan. (2015). Competition Policy Review: Final Report", Canberra: Australian Treasury. http://competitionpolicyreview.gov.au/files/2015/03/Competition-policy-review-report_online.pdf
16. Ibid.
17. Germany Trade and Invest. (2017). Industrie 4.0.
18. CSIRO (Commonwealth Scientific and Industrial Research Organisation). (2016), Our Future World. Global megatrends that will change the way we live. Brisbane: CSIRO <https://doi.org/10.4225/08/584ee9706689b>.
19. Parkinson, Martin. (2015). "The Lucky Country: Has it Run out of Luck?", Griswold Center for Economic Policy Studies, Working Paper No. 247, September 2015.
20. United States International Trade Commission. Digital Trade in the US and Global Economies, Part 2, August 2014.
21. The Economist. (2017). The World's Most Valuable Resource Is No Longer Oil, But Data. <https://www.economist.com/leaders/2017/05/06/the-worlds-most-valuable-resource-is-no-longer-oil-but-data>

22. ACS. (2017). Data Sharing Framework, Technical White Paper (ed. Ian Opperman), p. 9.
23. National Broadband Network Annual Report 2017.
24. United States International Trade Commission, Digital Trade in the US and Global Economies, Part 2, August 2014.
25. Digital Australia: Seizing the opportunity from the Fourth Industrial Revolution, Digital McKinsey 2016.
26. Business Council of Australia (2014), "Building Australia's Comparative Advantages", July 2014, p. 43.
27. WTO Work Programme on Electronic Commerce, WT/L/274, 30 September 1998.
28. USITC (2014), Digital Trade in the U.S. and Global Economies, Part 2, Pub. No 4485, August 2014.
29. Meltzer (2016), Maximizing the Opportunities of the Internet for International Trade, The E15 Initiative (ICTSD and WEF).
30. Brynjholfsson E., McAfee, A. (2014), The Second Machine Age. New York: W.W. Norton & Company. p. 62.
31. Mandell M. (2017), The Economic Impact of Data: Why Data Is Not Like Oil, Progressive Policy Institute.
32. Manyika J. et al. (2016), Digital Globalization: The New Era of Global Flows", McKinsey & Co 2016.
33. Ibid.
34. Baldwin, R. (2016) The Great Convergence: Information Technology and the New Globalization. Boston: Harvard University Press.
35. Bacher, Koen De, Dotothee Flaig. (2017). "The Future of Global Value Chains", *OECD Science, Technology and Innovation Policy Papers*, 41. July 2017.
36. US Department of Commerce (2016) Measuring the Value of Cross-Border Data Flows, https://www.ntia.doc.gov/files/ntia/publications/measuring_cross_border_data_flows.pdf p. iii.
37. World Economic Forum, The Global Competitiveness Report, 2017-2018.
38. Manyika J. et al. (2016), *Digital Globalization: The New Era of Global Flows*, McKinsey & Co.
39. Digital Australia: Seizing the opportunity from the Fourth Industrial Revolution, Digital McKinsey 2016.
40. Ibid., p. 11.
41. McKinsey Global Institute. (2011). Internet Matters: The Net's Sweeping Impact on Growth, Jobs and Prosperity, <https://www.mckinsey.com/industries/high-tech/our-insights/internet-matters>
42. McKinsey & Company. (2016). Digital globalization: The New Era of Global Flows. <http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/digital-globalization-the-new-era-of-global-flows>
43. McKinsey & Company. (2015). By 2025, Internet of things applications could have US\$11 trillion impact, <http://www.mckinsey.com/mgi/overview/in-the-news/by-2025-internet-of-things-applications-could-have-11-trillion-impact>

44. McKinsey & Company (2016) Digital globalization: The New Era of Global Flows, <http://www.mckinsey.com/business-functions/digital-mckinsey/our-insights/digital-globalization-the-new-era-of-global-flows>
45. OECD. (Organization for Economic Co-operation and Development). (2014) Measuring the Digital Economy: A New Perspective, <http://www.oecd.org/sti/ieconomy/9789264221796-sum-en.pdf>
46. Castro, D. (2013). D. Castro (2013) The False Promise of Data Nationalism. Information Technology & Innovation Foundation (ITIF), <http://www2.itif.org/2013-false-promise-data-nationalism.pdf> in Castro, D., and A. McQuinn. (2015) Cross-Border Data Flows Enable Growth in All Industries. The Information Technology & Innovation Foundation (ITIF). <http://www2.itif.org/2015-cross-border-data-flows.pdf> p. 11.
47. OECD Digital Economy Outlook 2015.
48. OECD Digital Economy Outlook 2017.
49. Blackburn, Simon, Michaela Freeland, and Dorian Gärtner. (2017). Digital Australia: Seizing opportunities from the Fourth Industrial Revolution. New York: McKinsey & Co. <https://www.mckinsey.com/global-themes/asia-pacific/digital-australia-seizing-opportunity-from-the-fourth-industrial-revolution>
50. Deloitte Access Economics. (2015). The Connected Continent II: How digital technology is transforming the Australian economy: An update to The Connected Continent. Sydney: Deloitte Access Economics Pty. Ltd. <https://www2.deloitte.com/content/dam/Deloitte/au/Documents/Economics/deloitte-au-economics-connected-continent-ii-2015-300315.pdf>
51. Knickrehm M. et al (2015), Digital disruption: The growth multiplier, Accenture Strategy.
52. Blackburn, Simon, Michaela Freeland, and Dorian Gärtner. (2017). Digital Australia: Seizing opportunities from the Fourth Industrial Revolution. New York: McKinsey & Co. <https://www.mckinsey.com/global-themes/asia-pacific/digital-australia-seizing-opportunity-from-the-fourth-industrial-revolution>
53. United Nations Conference on Trade and Development. (2009). Information Economy Report and European Centre for International Political Economy. (2014). Digital Trade in the US and Global Economies, in The Information Technology & Innovation Foundation (ITIF) D. Castro, A. McQuinn (2015) Cross-Border Data Flows Enable Growth in All Industries, <http://www2.itif.org/2015-cross-border-data-flows.pdf> p. 1.
54. United States International Trade Commission. (2014). Digital Trade in the US and Global Economies Part 2, in D. Castro and A. McQuinn. (2015). Cross-Border Data Flows Enable Growth in All Industries. Information Technology & Innovation Foundation (ITIF) <http://www2.itif.org/2015-cross-border-data-flows.pdf> p. 1.
55. Brookings Institute. (2014). The Importance of the Internet and Transatlantic Data Flows for US and EU Trade and Investment, <http://www.brookings.edu/~media/research/files/papers/2014/10/internet-transatlantic-data-flows-meltzer/internet-transatlantic-data-flows-version-2.pdf>. See also Information Technology Industry Council (ITIC) (2016) The EU-US Privacy Shield: What's at Stake, <http://www.itic.org/dotAsset/9/b/9b4c-b3ad-6d8b-469d-bd03-b2e52d7a0ecd.pdf>
56. The range reflects lower and upper bounds of what the services assessed as digitally-deliverable.

57. OECD. (2013). Measuring the Internet Economy: A Contribution to the Research Agenda, OECD Digital Economy Papers, 226, <http://dx.doi.org/10.1787/5k43gjq6r8jf-en> p. 9.
58. Hofheinz, P. and M. Mandel. (2015). Uncovering the Hidden Value of Digital Trade: Towards a 21st Century Agenda of Transatlantic Prosperity. Lisbon Council and Progressive Policy Institute. <http://www.lisboncouncil.net/publication/publication/127-uncovering-the-hidden-value-of-digital-trade-towards-a-21st-century-agenda-of-transatlantic-prosperity.html> p. 4.
59. Ibid. p. 2.
60. US Department of Commerce (2016) Measuring the Value of Cross-Border Data Flows, https://www.ntia.doc.gov/files/ntia/publications/measuring_cross_border_data_flows.pdf p. 8.
61. President William J. Clinton, Vice President Albert Gore, Jr. A Framework for Global Electronic Commerce. Washington D.C. <https://clinton-whitehouse4.archives.gov/WH/New/Commerce/>
62. Chander A. (2014). How Law Made Silicon Valley, 63 Emory Law Journal, 639.
63. Harper I. et al (2015) Competition Policy Review Final Report”, March 2015.
64. Ibid.
65. Statista; Statcounter at <http://gs.statcounter.com/search-engine-market-share/all/australia/2016>
66. David S. Evans. (2017). The Emerging High-Court Jurisprudence of the Antitrust Analysis of Multisided Platforms, Competition Policy International Antitrust Chronicle, Feb.
67. Ignacio De Leon, Competition Policies in the Internet-based industries” Available at SSRN: <https://ssrn.com/abstract=2870576> or <http://dx.doi.org/10.2139/ssrn.2870576>
68. Anja Lambrecht, Catherine E. Tucker. (2015). Can big Data Protect a Firm from Competition? p. 9; John M. Yun et (2017), Comment on the Global Antitrust Institute, Antonin Scalia Law School George Mason University, on the Canadian Competition Bureau’s White Paper, “Big Data and Innovation: Implications for Competition Policy in Canada”. George Mason University Law & Economics Research Paper Series, 17-44.
69. Ibid. p. 13.
70. Farrell, J. and P. Klemperer. (2007). Coordination and Lock-in: Competition with stitching costs and network effects. Handbook of industrial organizations 3, 1967-2012.
71. Frank Pasquale. (2017). When Antitrust becomes Pro-Trust: The Digital Deformation of US Competition Policy, University of Maryland Francis King Carey School of Law Legal Studies Research Paper No. 2017-24, p. 3.
72. Daniel L. Rubinfeld and Michal S. Gal. (2017). Access Barriers to Bid Data, 59 Arizona L. Rev. 339.
73. <https://www.geekwire.com/2014/google-amazon/>
74. Productivity Commission, Government response to digital disruption 2015, p 98.
75. Office of the Australian Information Commissioner, Australian Community Attitudes to Privacy Survey 2017.

76. Office of the Australian Information Commissioner, Australian Community Attitudes to Privacy Survey 2017.
77. ACS (2017), Data Sharing Frameworks, Technical White Paper (ed. Ian Opperman), p. 14.
78. Are other exception to requirements of consent, such as the use is required/authorized under law; or for a permitted health situation.
79. OAIC (2015), Australia Principles Privacy Guidelines.
80. APP 5.
81. OAIC (2017), Australian Community Attitudes to Privacy Survey 2017.
82. APP 8.2.
83. See APEC Cross-Border Privacy Rules System, Policies, Rules and Guidelines, 10.
84. Productivity Commission Inquiry Report, Data Availability and Use, No. 82, 31 March 2017.
85. Department of Prime Minister & Cabinet, "Data Analytics teams to delivery better targeted services", Press release, 25 May 2017.
86. OAIC (2015), Australia Principles Privacy Guidelines, p. 12.
87. Productivity Commission Inquiry Report, Data Availability and Use, No. 82, 31 March 2017, p. 69.
88. Privacy Amendment (Enhancing Privacy Protection) Bill 2012 Explanatory Memorandum, p. 61.
89. ACS (2017), Data Sharing Frameworks, Technical White Paper (ed. Ian Opperman), p. 21.
90. OAIC Australian Privacy Principles Guidelines, B.94 (as at 2 March 2018).
91. OAIC, Guidelines on Data Matching in Australian Government Administration, June 2014.
92. Productivity Commission (2017) Data Availability and Use, Productivity Commission Inquiry Report No. 82, 31 March 2017.
93. National Laundering and Counterterrorism Financing Act; National Consumer Credit Reporting Protection Act; Telecommunications Inceptions and Access Amendment (Data Retention) Act.
94. Data Governance Australia (2017) Code of Practice.
95. Data Future Partnership (2017), A Path to Social Licence Guidelines for Trust Data Use.
96. Australian Law Reform Commissions. (2013). Copyright and the Digital Economy, ALRC Report 122, November 2013, p. 250.
97. 94 OECD. (2013). New Sources of Growth: Knowledge-Based Capital", OECD Publishing Synthesis Report.
98. Anupam Chander.2014. "How Law Made Silicon Valley", *Emory Law J.* 63, 639.
99. CDA s230 (c)(1).
100. DCMA section 512(a)-(d).
101. 464 US 417, 442 (1984); Grokster, 545 US at 933.
102. Jennifer Urban et al. (2017). Notice and Take-down in Every Practice, Berkeley Law, Columbia University under Creative Commons License March 2017, p. 10.

103. Copyright Amendment (Service Providers) Bill 2017.
104. Copyright Act 1968 (Cth) Div V Part 2AA.
105. Kimberlee Weatherall, Internet Intermediaries and Copyright: An Australian Agenda for Reform, Policy Paper for discussion by the Australian Digital Alliance, April 2011.
106. ALRC 42, para 67.
107. Australian Law Reform Commission. (2013). Copyright and the Digital Economy, ALRC Report 122, November 2013; Productivity Commission Inquiry Report, Intellectual Property Arrangements, No. 78, 23 September 2016.
108. Gilbert, Benjamin. (2015). The 2015 Intellectual Property and Economic Growth Index. Lisbon Council Policy Brief; Gonzales, Frederic, J. Bradford Jensen, Yunhee Kim, and Hildegun Kyvik Nordas. 2012. "Globalization of Services and Jobs" in Policy Priorities for International Trade and Jobs. Paris: OECD Publishing.
109. Ibid.
110. Brynjholfson and McAfee, The Second Machine Age (W.W. Norton & Company 2014).
111. Gwen Hinze, Peter Jaszi, and Matthew Sag. (2013). "The Fair Use Doctrine in the United States—A Response to the Kernochan Report, July 2013, www.ssrn.com/abstract=2298833 p. 4.
112. Pamela Samuelson. (2009). Unbundling Fair Uses, 77 Fordham L.R. Rev. 2537, 2541.
113. Martin N Bailey, "Policies to enhance Australia's growth: A US perspective", Washington D.C.: Brookings Institution, May 2016, p. 33.
114. Ibid.
115. PWC (2016), Industry 4.0: Building the digital enterprise.
116. Standards Australia. (2017). Industry 4.0: An Australian Perspective, Recommendations Report to Australian Government—Department of Industry, Innovation and Science, March 2017.
117. Lan Yu, et al. (2016). Current Standards Landscape for Smart Manufacturing Systems, NIST, NISTIR 8107, February 2016.
118. Ibid. p.4.
119. Ibid. p. 28.
120. Department of Innovation, Industry and Science, Australia Industry Growth Centers Sector Competitiveness Plans Overviews. September 2017.
121. Baur C. and Wee D. (June 2015). Manufacturing's next act, New York: McKinsey & Company.
122. De Backer, K., I. Denoyers-James and L. Mousiegt (2015), "Manufacturing or Services—That is (not) the Question: The Role of Manufacturing and Services in OECD Economies", OECD Science, Technology and Industry Policy Papers, No. 19. OECD Publishing, Paris., p. 28.
123. Ibid. p. 34.
124. PricewaterhouseCoopers (PWC). (2016). Industry 4.0: Building the digital enterprise. 2016 Global Industry 4.0 Survey.
125. OECD. (2017). The Future of Global Value Chains, Business as usual or "A New Normal"? OECD Science, Technology and Innovation Policy Papers, 41, p. 15.

126. IEC. (2015). Factory of the Future, IEC White Paper.
127. Ibid. p. 10.
128. James Macaulay et al. (2015). The Digital Manufacturer. CISCO, p. 10.
129. James Macaulay et al. (2015). The Digital Manufacturer, CISCO.
130. Hutchinson D. (2014). Manufacturing in Simon Ville and Glen Withers (eds.) The Cambridge Economic History of Australia, Cambridge: Cambridge University Press, 287-308.
131. Athukolara Prema-chandra, Tala Talgaswatta and Omer Majeed. (2016). Global Production Sharing: Exploring Australia's Competitive Edge, ANU Working Paper No 2016/5, p. 10.
132. Helpman E. (2011), Understanding Global Trade, Cambridge, Mass: Harvard University Press.
133. Miroudot S., Charles Cadestin. (2017). Services in Global Value Chains: From Inputs to Value-Creating Activities", OECD Trade Policy Paper 197, p. 16.
134. Hoekman, B. and Aaditya Mattoo. (2008). Services Trade and Growth", Policy Research Working Paper No. 4461, Washington DC: World Bank.
135. Liu, X., A. Mattoo, Z. Want, and S.-J. Wei. (2017). "Services Development and Comparative Advantage in Manufacturing."
136. Miroudot S., Charles Cadestin (2017), Services in Global Value Chains: From Inputs to Value-Creating Activities", OECD Trade Policy Paper No 197, p. 28.
137. ABS Survey of Business Characteristics.
138. OECD. (2017). The Future of Global Value Chains, Business as usual or "A New Normal"? OECD Science, Technology and Innovation Policy Papers, 41, July 2017. p. 45.
139. IEC. (2015). Factory of the Future, IEC White Paper, p. 26.
140. Cooperation between Plattform Industrie 4.0 and Industrial Internet Consortium at <http://www.iiconsortium.org/press-room/03-02-16.htm>.
141. WTO TBT Agreement, Article 2.
142. <http://www.iiconsortium.org/members.htm>, accessed November 23rd, 2017.
143. United Nations Conference on Trade and Development (UNCTAD). US\$22 Trillion E-Commerce Opportunity for Developing Countries (19 July 2016). http://unctad.org/es/paginas/newsdetails.aspx?OriginalVersionID=1281&Sitemap_x0020_Taxonomy=Informacion%20and%20Communication%20Technologies.
144. Meltzer, Joshua. (2014). "Supporting the Internet as a Platform for International Trade: Opportunities for Small and Medium-Sized Enterprises and Developing Countries", Brookings Working Paper 69. Washington D.C.: Brookings Institution.
145. Steen J. (2013), Productivity, exporting and innovation in Australian SMEs; Evidence from a longitudinal dataset."
146. OECD. 2009. "Top Barriers and Drivers to SME Internationalization." Report by the OECD Working Party on SME and Entrepreneurship. Paris: OECD Publishing.
147. Schoonjans, Bilitis, Van Cauwenberge, Philippe and Heidi Vander Bauwhede et al. (2013). For-

- mal Business Networking and SME Growth. *Small Business Economics*, p. 41.
148. ABS Selected Characteristics of Australian Business.
 149. ABS Selected Characteristics of Australian Business.
 150. Australia has best-in-class legal measures for investigating and enforcing cybercrime, and it has recently launched The Cyber Security Growth Centre to bring together industry, academia, and government experts to inform the national cybersecurity agenda.
 151. The highest priority for startups has been improving the R&D tax incentive, mandating open data controls, and capital gains relief. See: <https://www.smartcompany.com.au/startupsmart/news-analysis/aussie-fintech-startups-boast-200-percent-revenue-growth-but-work-needed-diversity-collaboration/>
 152. Philippon T. (2017). *The Fintech Opportunity*, BIS Working Papers No. 655, August 2017.
 153. Hossein Kakavand et al. (2017). *The Blockchain revolution: an analysis of regulation and technology related to distributed ledger technologies*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2849251
 154. ACCC (Australian Competition and Consumer Commission). (2017). *Submission to the Productivity Commission Inquiry into Competition in the Australian Financial System*.
 155. APRA (Australian Prudential Regulation Authority). (2017). *Submission to the Productivity Commission Inquiry into Competition in the Australian Financial System*.
 156. ASIC (Australian Securities and Investment Commission). (2017). *Retaining ASIC's Fintech licensing exemption*, Consultation Paper 297, December 2017.
 157. ASIC (Australia Securities and Investment Commission). See: <http://asic.gov.au/for-business/your-business/innovation-hub/>
 158. ASIC (Australia Securities and Investment Commission), RG 157. See: <http://asic.gov.au/regulatory-resources/find-a-document/regulatory-guides/rg-185-non-cash-payment-facilities/>
 159. ASIC (Australia Securities and Investment Commission). See: <http://asic.gov.au/for-business/your-business/innovation-hub/results/>
 160. AUSTRAC (Australian Transaction Reports and Analysis Centre). See: <http://www.austrac.gov.au/start-businesses-and-financial-services>
 161. Ernst and Young. (2016) *An Evaluation of the International Fintech Sector*. See: <http://www.ey.com/Publication/vwLUAssets/EY-UK-Fintech-On-the-cutting-edge/%24FILE/EY-UK-Fintech-On-the-cutting-edge.pdf>
 162. 2014 Financial System Inquiry; 2015 Competition Policy Review; 2016 Report of the House of Representatives Standing Committee on Economics' Review of the Four Major Banks.
 163. Australian Government Review into Open Banking in Australia Issue Paper, August 2017.
 164. Speech by Mark Carney, Governor of the Bank of England. (2017). *The Promise of Fintech—Something New Under the Sun*, Deutsche Bundesbank G20 conference on “Digitising finance, financial inclusion and financial literacy”, 25 January 2017.
 165. Financial Stability Board. (2017). *Financial Stability Implications from Fintech*, 27 June 2017.
 166. In East Asia and the Pacific, 69 percent of adults may have bank accounts but formal savings is at 36

- percent and formal borrowing is at 11 percent, according to the World Bank analysis of financial inclusion. According to KPMG, only 27 percent of Southeast Asia's population have a bank account, leaving some 438 million unbanked. In poorer countries like Cambodia, this number falls to just 5 percent.
167. See: <https://www.lexology.com/library/detail.aspx?g=60655aa7-51fc-4a74-93eb-9c121a3a7371>.
168. Data 61, Risks and opportunities for Systems Using Blockchain and Smart Contracts, May 2017.
169. Data 61, Distributed Ledgers, May 2017.
170. Christian Catalini and Gans, J.S. (2017). Some Simple Economics of the Blockchain.
171. Data 61, Distributed Ledgers, May 2017.
172. Lin William Cong and Zhiguo He. (2018). "Blockchain Disruption and Smart Contracts", paper presented at the NBER Conference on Financial Market Regulation, January 10, 2018.
173. Data 61, Distributed Ledgers, May 2017.
174. Standards Australia. (2017). Roadmap for Blockchain Standards, Report, March 2017.
175. Nigel Cory, "Cross-Border Data Flows: Where Are the Barriers, and What Do They Cost?", ITIF May 2017.
176. USTR National Trade Estimates Report 2017, p. 89.
177. Joshua Meltzer, World Economic Forum paper.
178. Standards Australia. (2017). Industry 4.0: An Australian Perspective, Recommendations Report to Australian Government—Department of Industry, Innovation and Science, March 2017.
179. CPTPP Article 18.66.
180. TPP Article 11.12.
181. TPP Article 11.7.
182. TPP Article 11.13.
183. Panel Report, US-Gambling, para 6.285.
184. Appellate Body, China-Publications and Audiovisual Services, para 364.
185. Appellate Body, China-Electronic Delivery.
186. WT/MIN(17)/60.
187. Forthcoming World Bank report.
188. See APEC Action Agenda on Advancing Economic, Financial and Social Inclusion in the APEC Region, para 5(b).
189. Financial Stability Board. (2017). Financial Stability Implications From Fintech, 27 June 2017.

REFERENCES

- Alpha Beta. 2017. "Digital Nation: Policy Levers for Investment and Growth." http://www.alphabeta.com/wp-content/uploads/2017/05/DigiNations_FA.pdf
- Arico, Sandra and Vivek Srinivasan. 2014. "Enabling Australia's Digital Future: Cyber Security Trends and Implications." Commonwealth Scientific and Industrial Research Organization. <https://www.csiro.au/~media/Do-Business/Files/Futures/Enabling-Australias-Digital-Future-2014-pdf264MB.pdf?la=en&hash=D0B58A5FE7EF-3442F37A470C2CFD0061510D3BB3>
- ASEAN (Association of Southeast Asian Nations). "APEC Cross-Border Privacy Rules System: Policies, Rules, and Guidelines." <https://www.apec.org/Groups/Committee-on-Trade-and-Investment/~media/Files/Groups/ECSG/CBPR/CBPR-PoliciesRulesGuidelines.ashx>
- Prema-chandra, Athukolara. 2016. "Global Production Sharing: Exploring Australia's Competitive Edge." Australia National University, Working Paper No. 2016/5. https://crawford.anu.edu.au/acde/publications/publish/papers/wp2016/wp_econ_2016_05.pdf?
- ABS (Australian Bureau of Statistics). 2014. Business Characteristics Survey. <http://www.abs.gov.au/ausstats/abs@.nsf/products/8DF4417273266B-0ACA25707C0078D6C4?OpenDocument>
- ACCC (Australian Competition and Consumer Commission). 2017. Submission to the Productivity Commission Inquiry into Competition in the Australian Financial System. <https://www.accc.gov.au/system/files/ACCC%20submission%20to%20Productivity%20Commission%20Inquiry%20into%20Competition%20in%20the%20Australian%20Financial%20System.pdf>
- ACS (Australian Computer Society). 2017. "Data Sharing Frameworks." Technical White Paper. https://www.acs.org.au/content/dam/acs/acs-publications/ACS_Data-Sharing-Frameworks_FINAL_FA_SINGLE_LR.pdf
- APEC (Asia-Pacific Economic Cooperation). 2017. Annex A: APEC Action Agenda on Advancing Economic, Financial, and Social Inclusion in the APEC Region. https://www.apec.org/Meeting-Papers/Leaders-Declarations/2017/2017_aelm/Annex-A
- APRA (Australian Prudential Regulation Authority). 2017. Submission to the Productivity Commission Inquiry into Competition in the Australian Financial System. <http://www.apra.gov.au/Submissions/Documents/APRA-PC-Submission-FINAL-September2017.pdf>
- ASIC (Australian Securities and Investment Commission). 2017. "Retaining ASIC's Fintech Licensing Exemption." Consultation Paper 297. <http://download.asic.gov.au/media/4570456/cp297-published-12-december-2017.pdf>
- ASIC (Australian Securities and Investment Commission). 2018. Innovation Hub. <http://asic.gov.au/for-business/your-business/innovation-hub/>
- AUSTRAC (Australian Transaction Reports and Analysis Centre). 2018. "Start-up Businesses and Financial Services." <http://www.austrac.gov.au/start-businesses-and-financial-services>
- Australian Government, Department of Industry, Innovation and Science. 2017. "Industry Growth Centres Initiative Sector Competitiveness Plans Overview." <https://industry.gov.au/industry/Industry-Growth-Centres/Documents/Sector-Competitiveness-Plan-Overview.docx>

- Australian Government, The Treasury. 2018. Review into Open Banking in Australia – Final Report. <https://treasury.gov.au/consultation/c2018-t247313/>
- Australian Government, Federal Register of Legislation. “Anti-Money Laundering and Counter-Terrorism Financing Act 2006.” Act No. 169 of 2006 as amended. <https://www.legislation.gov.au/Details/C2012C00915>
- Australian Law Reform Commissions. 2013. “Copyright and the Digital Economy.” ALRC Report 122, Canberra. <https://www.alrc.gov.au/publications/copyright-report-122>
- Backer, Koen De, and Dorothee Flaig. 2017. “The Future of Global Value Chains.” OECD Science, Technology and Innovation Policy Papers. https://www.oecd-ilibrary.org/science-and-technology/the-future-of-global-value-chains_d8da8760-en
- Bailey, Martin. 2016. “Policies to Enhance Australia’s Growth: A US Perspective.” Brookings Institution. https://www.brookings.edu/wp-content/uploads/2016/12/baily_australiagrowth_122016_final.pdf
- Baldwin, Richard. 2016. *The Great Convergence: Information Technology and the New Globalization*. Boston: Harvard University Press.
- Baller, Silja et al. 2016. “The Global Information Technology Report: Innovating in the Digital Economy.” World Economic Forum’s Global Competitiveness and Risks Team and the Industry partnership Program for Information and Communication Technologies. http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf
- Bauer, Cornelius and Dominik Wee. 2015. “Manufacturing’s Next Act.” <https://www.mckinsey.com/business-functions/operations/our-insights/manufacturings-next-act>
- Blackburn, Simon et al. “Digital Australia: Seizing the Opportunities from the Fourth Industrial Revolution.” Digital McKinsey. <https://www.mckinsey.com/featured-insights/asia-pacific/digital-faustralia-seizing-opportunity-from-the-fourth-industrial-revolution>
- Brynjolfsson, Erik and Andrew McAfee. *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*. WW Norton & Company.
- Business Council of Australia. 2014. “Building Australia’s Comparative Advantages.” http://www.bca.com.au/docs/23dbf7d2-0e3c-46f9-9287-e61bf62eedf7/Building_Australias_Comparative_Advantages_FINAL_28.7.2014.pdf
- Carney, Mark. 2017. “The Promise of Fintech—Something New Under the Sun.” Deutsche Bundesbank G20 Conference on Digitizing Finance, Financial Inclusion and Financial Literacy. <https://www.bis.org/review/r170126b.pdf>
- Castro, Daniel. 2013. “The False Promise of Data Nationalism.” Information Technology & Innovation Foundation. <http://www2.itif.org/2013-false-promise-data-nationalism.pdf>
- Castro, Daniel, and Alan McQuinn. 2015. “Cross-Border Data Flows Enable Growth in All Industries.” The Information Technology & Innovation Foundation. <http://www2.itif.org/2015-cross-border-data-flows.pdf>
- Catalini, Christian and Joshua S. Gans. 2017. “Some Simple Economics of the Blockchain.” Rotman School of Management Working Paper No. 2874598; MIT Sloan Research Paper No. 5191-16. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2874598

- Chander, Anupam. 2014. "How Law Made Silicon Valley." *Emory Law Journal*. 63, 639. <http://law.emory.edu/elj/content/volume-63/issue-3/articles/how-law-made-silicon-valley.html>
- Cong, Lin William and Zhiguo He. 2017. "Blockchain Disruption and Smart Contracts." Paper presented at the NBER Conference on Financial Market Regulation. <https://philadelphiafed.org/-/media/bank-resources/supervision-and-regulation/events/2017/fintech/resources/blockchain-disruption-smart-contracts.pdf?la=en>
- Cory, Nigel. 2017. "Cross-Border Data Flows: Where Are the Barriers, and What Do They Cost?" Information Technology and Innovation Foundation. <http://www2.itif.org/2017-cross-border-data-flows.pdf>
- CSIRO (Commonwealth Scientific and Industrial Research Organisation). 2016. "Our Future World. Global Megatrends That Will Change the Way We Live." Brisbane. <https://doi.org/10.4225/08/584ee9706689b>
- Data 61. 2016. "Risks and Opportunities for Systems Using Blockchain and Smart Contracts." In participation with CSIRO. Sydney. <https://www.data61.csiro.au/~/media/052789573E9342068C5735BF604E7824.ashx>
- Data 61. 2017. "Distributed Ledgers: Scenarios for the Australian Economy Over the Coming Decades." In participation with CSIRO. <https://www.data61.csiro.au/~/media/2579B61A69FD-4C0BA985AE8B823557DE.ashx>
- Data Futures Partnership. 2017. "A Path to Social License: Guidelines for Trusted Data Use." <https://trusteddata.co.nz/wp-content/uploads/2017/08/Summary-Guidelines.pdf>
- Data Governance Australia. 2018. "Code of Practice." http://datagovernanceaus.com.au/wp-content/uploads/2016/07/DGA_Code_of_Practice_2017_15.11.17.pdf
- De Backer, Koen et al. 2015. "Manufacturing or Services—That is (not) the Question: The Role of Manufacturing and Services in OECD Economies." OECD Science, Technology and Industry Policy Papers, No. 19. OECD Publishing, Paris. <https://www.oecd-ilibrary.org/docserver/5js64ks09dmn-en.pdf?expires=1526657545&id=id&accname=guest&checksum=463D37DFE25592FB8B18868700A46B51>
- De Leon, Ignacio. 2016. "Competition Policy in the Internet-Based Industries: Do We Need to Reboot the Debate?" Inter-American Development Bank. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2870576
- Deloitte Access Economics. 2011. "The Connected Continent II: How Digital Technology is Transforming the Australian Economy." <https://www2.deloitte.com/content/dam/Deloitte/au/Documents/Economics/deloitte-au-economics-connected-continent-ii-2015-300315.pdf>
- The Economist. 2017. "The World's Most Valuable Resource Is No Longer Oil, But Data." <https://www.economist.com/leaders/2017/05/06/the-worlds-most-valuable-resource-is-no-longer-oil-but-data>
- Ernst and Young. 2016. "UK FinTech: On the Cutting Edge." In participation with HM Treasury. <http://www.ey.com/Publication/vwLUAssets/EY-UK-Fintech-On-the-cutting-edge/%24FILE/EY-UK-Fintech-On-the-cutting-edge.pdf>
- Evans, David. 2017. "The Emerging High Court Jurisprudence on the Antitrust Analysis of

- Multisided Platforms.” <https://www.competitionpolicyinternational.com/wp-content/uploads/2017/02/CPI-Evans.pdf>
- Evans, Mark. 2017. “Harnessing the Fintech Opportunity.” HSBC. <http://www.gbm.hsbc.com/-/media/gbm/reports/insights/harnessing-the-fintech-opportunity.pdf>
- [The Executive Office of the President, William J Clinton. “A Framework for Global Electronic Commerce.” Washington, DC. https://clintonwhitehouse4.archives.gov/WH/New/Commerce/](https://clintonwhitehouse4.archives.gov/WH/New/Commerce/)
- Parkinson, Martin. 2015. “The Lucky Country: Has it Run out of Luck?” Griswold Center for Economic Policy Studies, Working Paper No. 247 <https://www.princeton.edu/ceps/workingpapers/247parkinson.pdf>
- Export Council of Australia. “The Future of Australia’s Trade: A Digital Vision for 2025.” In partnership with KPMG Australia and the Australian Digital Commerce Association. <https://www.export.org.au/LiteratureRetrieve.aspx?ID=160736>
- Farrell, Joseph and Paul Klemperer. 2007. “Coordination and Lock-in: Competition with Stitching Costs and Network Effects. Handbook of Industrial Organizations.” Handbook of Industrial Organization, Volume 3. https://www.nuff.ox.ac.uk/users/klemperer/Farrell_klempererWP.pdf
- Financial Stability Board. 2017. “Financial Stability Implications from FinTech: Supervisory and Regulatory Issues that Merit Authorities’ Attention.” <http://www.fsb.org/wp-content/uploads/R270617.pdf>
- Gilbert, Benjamin. 2015. “The 2015 Intellectual Property and Economic Growth Index.” Lisbon Council Policy Brief. <http://www.innovationeconomics.net/component/attachments/attachments.html?id=263&task=view>
- Gilbert and Tobin. 2017. “Australia Extends Fintech Focus with Cooperation Agreements and a Fintech Bridge.” <https://www.lexology.com/library/detail.aspx?g=60655aa7-51fc-4a74-93eb-9c121a3a7371>
- Gonzales, Frederic et al. 2012. “Globalization of Services and Jobs.” In Policy Priorities for International Trade and Jobs. Paris: OECD Publishing.
- Government of Australia. 2017. “The Digital Economy: Opening Up the Conversation.” Ministry for Industry, Innovation and Science. <https://www.industry.gov.au/innovation/Digital-Economy/Documents/Digital-Economy-Strategy-Consultation-Paper.pdf>
- Harper, Ian et al. 2015. “Competition Policy Review: Final Report.” Australian Treasury, Canberra. http://competitionpolicyreview.gov.au/files/2015/03/Competition-policy-review-report_online.pdf
- Hanson, RT et al. 2017. “Distributed Ledger: Scenarios for the Australian Economy Over the Coming Decades.” Commonwealth Scientific and Industrial Research Organization. <https://publications.csiro.au/rpr/download?pid=csiro:EP175257&dsid=DS1>
- Helpman, Elhanan. 2011. Understanding Global Trade. The Belknap Press of Harvard University Press.
- Hinze, Gwen et al. 2013. “The Fair Use Doctrine in the United States - A Response to the Kernochan Report.” https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2298833
- Hoekman, Bernard and Aaditya Mattoo. 2008. Services Trade and Growth. Policy Research Working Paper No. 4461, Washington DC: World Bank. <http://documents.worldbank.org/curated/en/117601468178449072/pdf/wps4461.pdf>

- Hofheinz, Paul and Michael Mandel. 2015. "Uncovering the Hidden Value of Digital Trade: Towards a 21st Century Agenda of Transatlantic Prosperity." Interactive Policy Brief. Issue No 19. https://lisboncouncil.net/index.php?option=com_downloads&id=1184
- Ville, Simon and Glenn Withers. 2014. "The Cambridge Economic History of Australia." Cambridge: Cambridge University Press.
- IEC. 2015. "Factory of the Future." White Paper. <https://www.anixter.com/content/dam/Suppliers/Hitachi/iecWP-futurefactory-LR-en.pdf>
- Industrial Internet Consortium. Plattform Industrie 4.0 and Industrial Internet Consortium Agree on Cooperation. <http://www.iiconsortium.org/press-room/03-02-16.htm>
- Industrial Internet Consortium. Current Member Directory. <https://www.iiconsortium.org/members.htm>
- ITIC (Information Technology Industry Council). 2016. "The EU-US Privacy Shield: What's at Stake, <http://www.itic.org/dotAsset/9/b/9b4c-b3ad-6d8b-469d-bd03-b2e52d7a0ecd.pdf>
- Hossein Kakavand et al. 2017. "The Blockchain Revolution: An Analysis of Regulation and Technology Related to Distributed Ledger Technologies." https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2849251
- Knickrehm, Mark et al. 2015. "Digital Disruption: The Growth Multiplier." Accenture Strategy. https://www.accenture.com/_acnmedia/PDF-4/Accenture-Strategy-Digital-Disruption-Growth-Multiplier.pdf
- Lambrecht, Anja and Catherine E. Tucker. "Can Big Data Protect a Firm from Competition." http://ec.europa.eu/information_society/newsroom/image/document/2016-6/computer_and_communications_industry_association_-_can_big_data_protect_a_firm_from_competition_13846.pdf
- Liu, Xuepeng et al. 2017. "Services Development and Comparative Advantage in Manufacturing." World Bank Working Paper 8126. https://www.k-state.edu/economics/seminars/Liu_Xuepeng_Paper_Services%20Development%20and%20Comparative%20Advantage%20in%20Manufacturing.pdf
- Lopez Gonzalez, J and M Jouanjean. 2017. "Digital Trade: Developing a Framework for Analysis." OECD Trade Policy Papers, No. 205. OECD Publishing, Paris. <http://dx.doi.org/10.1787/524c8c83-en>
- Lu Yan et al. 2016. "Current Standards Landscape for Smart Manufacturing Systems." NIIIST, NISTIR 8107. <https://nvlpubs.nist.gov/nistpubs/ir/2016/NIST.IR.8107.pdf>
- Macchi, Mauro, et al. 2015. "Guiding Digital Transformation." Accenture Strategy. https://www.accenture.com/t20150523T023959_w_/it-it/_acnmedia/Accenture/Conversion-Assets/DotCom/Documents/Global/PDF/Dualpub_13/Accenture-Digital-Density-Index-Guiding-Digital-Transformation.pdf
- Macauley, James. 2015. "The Digital Manufacturer." CISCO. https://www.cisco.com/c/dam/en_us/solutions/industries/manufacturing/thought-leadership-wp.pdf
- MacDougall, William. 2018. "Industrie 4.0: Germany Market Report and Outlook." Germany Trade and Invest, Berlin. <https://www.gtai.de/GTAI/Content/EN/Invest/SharedDocs/Downloads/GTAI/Brochures/Industries/industrie4.0-germany-market-outlook-progress-report-en.pdf?v=12>

- Mandel, Michael. 2017. "The Economic Impact of Data: Why Data is Not Like Oil." Progressive Policy Institute. http://www.progressivepolicy.org/wp-content/uploads/2017/07/PowerofData-Report_2017.pdf
- Mandel, Michael and Elliott Long. 2017. "The Rise of the Australian App Economy." Progressive Policy Institute. http://www.progressivepolicy.org/wp-content/uploads/2017/07/PPI_AustralianAppEconomy_V6.pdf
- Manyika, James. 2016. "Digital Globalization: The New Era of Global Flows." McKinsey Global Institute. <https://www.mckinsey.com/~media/McKinsey/Business%20Functions/McKinsey%20Digital/Our%20Insights/Digital%20globalization%20The%20new%20era%20of%20global%20flows/MGI-Digital-globalization-Full-report.ashx>
- Manyika, James and Michael Chui. 2015. "By 2025, Internet of Things Applications Could Have \$11 Trillion Impact." <https://www.mckinsey.com/mgi/overview/in-the-news/by-2025-internet-of-things-applications-could-have-11-trillion-impact>
- Meguerditchian, Varant. 2017. "Roadmap for Blockchain Standards Report." Standards Australia. https://www.standards.org.au/getmedia/ad5d74db-8da9-4685-b171-90142ee0a2e1/Roadmap_for_Blockchain_Standards_report.pdf.aspx
- Meltzer, Joshua P. 2014. "The Importance of the Internet and Transatlantic Data Flows for U.S. and EU Trade and Investment." <https://www.brookings.edu/research/the-importance-of-the-internet-and-transatlantic-data-flows-for-u-s-and-eu-trade-and-investment/>
- Meltzer, Joshua P. 2014. "Supporting the Internet as a Platform for International Trade: Opportunities for Small and Medium-Sized Enterprises and Developing Countries." Brookings Institution, Working Paper 69. Washington, DC. <https://www.brookings.edu/wp-content/uploads/2016/07/02-internet-international-trade-meltzer.pdf>
- Meltzer, Joshua P. 2016. "Maximizing the Opportunities of the Internet for International Trade." The E15 Initiative, in participation with ICTSD and WEF. http://e15initiative.org/wp-content/uploads/2015/09/E15_no5_Digital_Economy_final_REV_x1.pdf
- Minifie, Jim. 2014. "The Silver Lining: Cloud Computing and Small and Medium Enterprises." Grattan Institute. <https://grattan.edu.au/wp-content/uploads/2014/06/814-the-silver-lining.pdf>
- Miroudot, Sebastien and Charles Cadestin. 2017. "Services in Global Value Chains: From Inputs to Value-Creating Activities." OECD Trade Policy Paper 197. <https://www.oecd-ilibrary.org/docserver/465f0d8b-en.pdf?expires=1526658949&id=id&accname=guest&checksum=9A7E-8525BA8E48F68750AB34D2FEC8E9>
- National Broadband Network. 2017. "Annual Report 2017." <https://www.nbnco.com.au/content/dam/nbnco2/images/media-releases/nbn-annual-report-2016-2017.pdf>
- Nicholson, Jessica and Giulia McHenry. 2016. "Measuring the Value of Cross-Border Data Flows." Economics and Statistics Administration and the National Telecommunications and Information Administration. https://www.ntia.doc.gov/files/ntia/publications/measuring_cross_border_data_flows.pdf
- OAIC (Office of the Australian Information Commissioner). 2014. Guidelines on Data Matching in Australian Government Administration. <https://www.oaic.gov>

[au/agencies-and-organisations/advisory-guidelines/data-matching-guidelines-2014](https://www.oaic.gov.au/agencies-and-organisations/advisory-guidelines/data-matching-guidelines-2014)

OAIC (Office of the Australian Information Commissioner). 2018. APP Guidelines. <https://www.oaic.gov.au/agencies-and-organisations/app-guidelines/>

OECD (Organization for Economic Cooperation and Development). 2009. "Top Barriers and Drivers to SME Internationalization." Report by the OECD Working Party on SME and Entrepreneurship. Paris: OECD Publishing.

OECD (Organization for Economic Cooperation and Development). 2013. "Measuring the Internet Economy: A Contribution to the Research Agenda." OECD Digital Economy Papers, 226. <http://dx.doi.org/10.1787/5k43gig6r8jf-en>

OECD (Organization for Economic Cooperation and Development). 2013. "New Sources of Growth: Knowledge-Based Capital Key Analyses and Policy Conclusions." A Synthesis Report. <https://www.oecd.org/sti/inno/knowledge-based-capital-synthesis.pdf>

OECD (Organization for Economic Cooperation and Development). 2014. "Measuring the Digital Economy: A New Perspective." <http://www.oecd.org/sti/ieconomy/9789264221796-sum-en.pdf>

OECD (Organization for Economic Cooperation and Development). 2015. "Digital Security Risk Management for Economic and Social Prosperity." <http://www.oecd.org/publications/digital-security-risk-management-for-economic-and-social-prosperity-9789264245471-en.htm>

OECD (Organization for Economic Cooperation and Development). 2015. "Digital Economy Outlook 2015." <http://ec.europa.eu/eurostat/>

[documents/42577/3222224/Digital+economy+outlook+2015/dbdec3c6-ca38-432c-82f2-1e330d9d6a24](https://www.oecd.org/dataoecd/42/57/3222224/Digital+economy+outlook+2015/dbdec3c6-ca38-432c-82f2-1e330d9d6a24)

OECD (Organization for Economic Cooperation and Development). 2016. "Managing Digital Security and Privacy Risk." Background Report for the 2016 Ministerial Meeting on the Digital Economy. <https://www.oecd.org/internet/ministerial/meeting/Managing-Digital-Security-and-Privacy-Risk-discussion-paper.pdf>

OECD (Organization for Economic Cooperation and Development). 2017. "Digital Economy Outlook 2017." <http://espas.eu/orbis/sites/default/files/generated/document/en/9317011e.pdf>

OECD (Organization for Economic Cooperation and Development). 2017. "The Future of Global Value Chains, Business as usual or 'A New Normal'?" OECD Science, Technology and Innovation Policy Papers. <https://www.oecd-ilibrary.org/docserver/d8da8760-en.pdf?expires=1526657771&id=id&accname=guest&checksum=11C0609285FEAC-9D8460A7FDC09CA7B2>

The Parliament of the Commonwealth of Australia. 2012. "Privacy Amendment (Enhancing Privacy Protection) Bill, Explanatory Memorandum." <https://www.legislation.gov.au/Details/C2012B00077/Explanatory%20Memorandum/Text>

The Parliament of the Commonwealth of Australia. 2016. "Review of the Four Major Banks (First Report)." https://www.aph.gov.au/Parliamentary_Business/Committees/House/Economics/Four_Major_Banks_Review/Report

Pasquale, Frank. 2017. "When Antitrust Becomes Pro-Trust: The Digital Deformation of US Competition Policy." University of Maryland

- Francis King Carey School of Law, Legal Studies Research Paper No. 2017-24. <https://www.competitionpolicyinternational.com/when-an-antitrust-becomes-pro-trust-the-digital-deformation-of-u-s-competition-policy/>
- Pelissie du Rausas, Matthieu et al. 2011. "Internet Matters: The Net's Sweeping Impact on Growth, Jobs, and Prosperity." McKinsey Global Institute. <https://www.mckinsey.com/industries/high-tech/our-insights/internet-matters>
- Philippon Thomas. 2017. "The Fintech Opportunity." BIS Working Papers No. 655. <https://www.bis.org/publ/work655.pdf>
- PriceWaterhouseCoopers. 2016. "Industry 4.0: Building the Digital Enterprise." <https://www.pwc.com/gx/en/industries/industries-4.0/landing-page/industry-4.0-building-your-digital-enterprise-april-2016.pdf>
- Pollari, Ian and James Mabbott. 2017. "Scaling the Fintech Opportunity: For Sydney and Australia." KPMG for the Committee for Sydney. <https://assets.kpmg.com/content/dam/kpmg/au/pdf/2017/scaling-fintech-opportunity-sydney-australia.pdf>
- Powell, Dominic. 2017. Aussie Fintech Startups Boast 200% Revenue Growth, but There's Still Work To Be Done on Diversity and Collaboration. Fast Company. <https://www.smartcompany.com.au/startupsmart/news-analysis/aussie-fintech-startups-boast-200-percent-revenue-growth-but-work-needed-diversity-collaboration/>
- Productivity Commission. 2015. "Government Response to Digital Disruption." Commission Paper, Melbourne. <https://www.pc.gov.au/research/completed/digital-disruption/digital-disruption-research-paper.pdf>
- Productivity Commission. 2016. "Digital Disruption: What Do Governments Need to Do?" Commission Research Paper, Melbourne. <https://www.pc.gov.au/research/completed/digital-disruption/digital-disruption-research-paper.pdf>
- Productivity Commission. 2017. "Data Availability and Use." Productivity Commission Inquiry Report No. 82, Melbourne. <https://www.pc.gov.au/inquiries/completed/data-access/report/data-access-overview.pdf>
- Productivity Commission. 2017. "Shifting the Dial 5 Year Productivity Review." Productivity Commission Inquiry Report No. 84, Melbourne. <https://www.pc.gov.au/inquiries/completed/productivity-review/report/productivity-review.pdf>
- Department of Prime Minister and Cabinet. 2017. "Data Analytics Teams to Deliver Better Targeted Services." Press release. <https://ministers.pmc.gov.au/taylor/2017/data-analytics-teams-deliver-better-targeted-services>
- Ralston, Deborah and Martin Jenkinson. 2017. "Innovation in Australia." Submission to Financial System Inquiry for the Australian Centre for Financial Studies. https://australiancentre.com.au/wp-content/uploads/2016/04/Innovation-in-Australia_.pdf
- Ralston, Deborah and Martin Jenkinson. 2014. "Funding Australia's Future International Linkages: Financial Markets and Technology." Australian Centre for Financial Studies. <https://australiancentre.com.au/wp-content/uploads/2016/04/FAF2-International-linkages.pdf>
- Rubinfeld, Daniel and Michal Gal. "Access Barriers to Big Data." Arizona Law Review. Vol. 59:399. <http://arizonalawreview.org/pdf/59-2/59arizrev339.pdf>

- Samuelson, Pamela. 2009. "Unbundling Fair Uses." 77 Fordham Law Review. https://heinonline.org/HOL/Page?handle=hein.journals/flr77&div=85&gsent=1&casa_token=
- Schatsky, David and Ramya Kunnath Puliya Kodil. 2017. "Cyber Security Sector Competitiveness Plan." Australian Cyber Security Growth Network.
- Schoonjans, Bilitis et al. 2011. "Formal Business Networking and SME Growth." Small Business Economics 41 (1). https://www.researchgate.net/publication/257661656_Formal_business_networking_and_SME_growth
- Soper, Taylor. 2014. "Google's Eric Schmidt: Our biggest search competitor is Amazon — not Microsoft or Yahoo." Geekwire. <https://www.geekwire.com/2014/google-amazon/>
- Standards Australia. 2017. "Industry 4.0: An Australian Perspective, Recommendations Report to Australian Government." Department of Industry, Innovation, and Science. <https://www.standards.org.au/getmedia/29653164-cd4d-43f0-9afc-e8db58710f2e/Industry-4-0-Recommendations-Report.pdf.aspx>
- Startup AUS. 2016. "The Crossroads Reports 2016." In partnership with Google. <https://startupaus.org/document/crossroads-2016/>
- StatsCounter: GlobalStats. 2017. "Search Engine Market Share Australia." <http://gs.statcounter.com/search-engine-market-share/all/australia/2016>
- Steen, John. "Productivity, Exporting and Innovation in Australian SMEs: Evidence from a Longitudinal Dataset." Australian Council of Learned Academies. <https://acola.org.au/wp/PDF/SAF04Reports/Steen%20Productivity%20exporting%20and%20innovation%20in%20Australian%20SMEs.pdf>
- Urban, Jennifer et al. 2017. Notice and Takedown in Every Practice." UC Berkeley Public Law Research paper, No. 2755628. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2755628
- UNCTAD (United Nations Conference on Trade and Development). 2016. "US\$22 Trillion E-Commerce Opportunity for Developing Countries." http://unctad.org/es/paginas/news-details.aspx?OriginalVersionID=1281&Sitemap_x0020_Taxonomy=Informatio%20n%20and%20Communication%20Technologies.
- UNCTAD (UN Conference on Trade and Development). 2017. "Information Economy Report 2017: Digitalization, Trade and Development." http://unctad.org/en/PublicationsLibrary/ier2017_en.pdf
- USITC (United States International Trade Commission). 2014. "Digital Trade in the US and Global Economies, Part 2." Publication No. 4485. <https://www.usitc.gov/publications/332/pub4485.pdf>
- USTR (United States Trade Representative). 2018. "National Trade Estimate Report on Foreign Trade Barriers." <https://ustr.gov/sites/default/files/files/Press/Reports/2018%20National%20Trade%20Estimate%20Report.pdf>
- Van Souwe, Jayne et al. 2017. "Australian Community Attitudes to Privacy Survey." Wallis Market and Social Research in partnership with the Office of the Australian Information Commissioner. <https://www.oaic.gov.au/resources/engage-with-us/community-attitudes/acaps-2017/acaps-2017-report.pdf>
- Walport, Mark. 2016. "Distributed Ledger Technology: Beyond Block Chain." UK Government Chief Scientific Adviser. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/492972/gs-16-1-distributed-ledger-technology.pdf

- Weatherall, Kimberlee Weatherall. 2018. "Internet Intermediaries and Copyright – A 2018 Update." Policy paper produced for the Australian Digital Alliance. <https://digital.org.au/sites/digital.org.au/files/documents/Weatherall%20on%20Internet%20Intermediaries%20and%20Copyright%20-%20Update%20Final.pdf>
- WTO (World Trade Organization). 1998. "WTO Work Programme on Electronic Commerce." WT/L/274 <https://docsonline.wto.org/dol2fe/Pages/FormerScriptedSearch/directdoc.aspx?DDFDocuments/t/WT/L/274.DOC>
- Yermack, David. 2015. "Corporate Governance and Blockchains." National Bureau for Economic Research, Working Paper 21802. <http://www.nber.org/papers/w21802>
- Yun, John et al. 2017. Comment on the Global Antitrust Institute, Antonin Scalia Law School George Mason University, on the Canadian Competition Bureau's White Paper, "Big Data and Innovation: Implications for Competition Policy in Canada." George Mason University Law & Economics Research Paper Series. <https://gai.gmu.edu/wp-content/uploads/sites/27/2017/11/GAI-Comment-for-Canada-on-Big-Data-2.pdf>
- Zetzsche, Dirk et al. 2017. "Regulating a Revolution: From Regulatory Sandboxes to Smart Regulation." The European Banking Institute. Working Paper Series, No 11. European Banking Institute Working Paper Series 2017 - No. 11; University of Luxembourg Law Working Paper No. 006/2017; UNSW Law Research Paper No. 71; Center for Business and Corporate Law Working Paper Series 001/2017. <https://ssrn.com/abstract=3018534> or <http://dx.doi.org/10.2139/ssrn.3018534>



The views expressed in this working paper do not necessarily reflect the official position of Brookings, its board or the advisory council members.

BROOKINGS

1775 Massachusetts Avenue, NW
Washington, DC 20036
202-797-6000
www.brookings.edu/global

