Chapter 6

This chapter explores some of the policy considerations that might be relevant to pursuing innovation-led growth. Creating the general conditions conducive to innovation-led growth invariably involves an ongoing focus on skills and capabilities, competition and regulation, and access to finance suited to various stages of innovation.

Digital innovation is also increasingly important. Beyond this, some countries have started to experiment with policies aimed at HGFs directly, notwithstanding the numerous challenges involved.
Policy considerations for innovation-led growth

Despite their large contributions, it is difficult to target HGFs with policy tools.

Access to risk capital and skills mismatches are constraints on the innovation activity of Australian firms.

There is a positive association between levels of competition and innovation.

Policy should target enhancing framework conditions.

Income generated over the internet in 2015–16 was in excess of $320 billion, up from $144 billion 5 years earlier.

150% in foreign direct investment into Australia in 2016 compared to 2015.

6.1 Policy settings to enhance innovation

Targeting high-growth firms

Given the disproportionate economic contribution of HGFs, policy makers are understandably attracted to these firms as a potential means of supporting job creation and income growth. Some countries have been experimenting with targeted policy support for HGFs. France, for example, has been operating several support measures aimed at HGFs, with an estimated 62 per cent of the country’s HGFs accessing state support. Other notable examples include Germany’s High-Tech Start-up Fund and the Swiss CTI Start-up programme. The USA and UK have also introduced such policies.

To date, however, there is scant evidence to show that targeting HGFs has had a significant impact on economic performance, and some of the programmes have been discontinued, such as the UK Growth Accelerator programme. The feature article Innovation and High-Growth Firms (Section 6.5) discusses the challenges involved in targeting HGFs. Concerns have been raised in several international studies regarding such policy measures, pointing to issues such as:

- difficulties in predicting which firms will grow
- the lack of persistence of exceptional firm growth
- the lack of an economic rationale for intervention
- employment growth attributable to HGFs may occur outside of the home country where the firm is legally registered
- the failure of many HGFs to exhibit other desirable characteristics, such as profitability or sound financial position

The experimental research of CSIRO’s Data61 into ways of identifying Australian companies on high-growth employment trajectories is described in Section 4.2.
CHAPTER 6: POLICY CONSIDERATIONS FOR INNOVATION-LED GROWTH

6.2 Skills and capabilities

Building skills and management capabilities

Innovation-led growth requires a well-functioning education and training system, a skilled workforce, and capable management. Australia is performing relatively well in terms of generating knowledge but not so well in making the best use of skills or translating knowledge into commercial innovations.

Australia is recognised globally for its high-quality research and knowledge creation. Despite having only 0.3 per cent of the world’s population, Australia contributed to almost 4 per cent of world research publications in 2016. Australia has the third highest number of researchers in the government and higher education sector per thousand workers out of OECD+ countries. Australia also had relatively high levels of higher degrees by research graduates, with 11.7 doctorate holders per thousand people in the working-age population.

Innovation and Science Australia’s 2016 Performance Review of the Australian Innovation, Science and Research System (ISR System Review) also found a mismatch between industry demand and skills in the workforce. Australia’s Vocational, Education and Training (VET) sector was recognised as an underused resource, with challenges identified in ensuring VET training packages remained relevant to industry needs.

A recent OECD survey of adult skills also identified that skill mismatch was comparatively high in Australia, ranking 5th highest out of 29 OECD countries. Australian innovation-active businesses report high usage in all skill types, however lack of access to skills was often cited by businesses as a barrier to innovation in 2014–15. Innovation and Science Australia’s 2016 Performance Review of the Australian Innovation, Science and Research System (ISR System Review) also found a mismatch between industry demand and skills in the workforce. Australia’s Vocational, Education and Training (VET) sector was recognised as an underused resource, with challenges identified in ensuring VET training packages remained relevant to industry needs.

Ongoing skills gaps in management and leadership capabilities were reported by Australian firms in the ISR System Review and the current supply of information and communication technology (ICT) graduates does not appear to meet industry needs. A recent OECD survey of adult skills also identified that skill mismatch was comparatively high in Australia, ranking 5th highest out of 29 OECD countries. Recently published data of Management and Organisational Capabilities of Australian Business by the ABS shows sharp differences between large and small firms in the levels of management capability.

Framework conditions and complementary measures

The extent to which firms might pursue growth through innovation depends on a range of factors, the most obvious of which relate to the quality of the business environment in which firms operate. The targeted policy support for HGFs mentioned above is invariably introduced as complementary policy to the ongoing efforts across developed economies to improve general framework conditions. These ongoing reforms cover broad areas such as competition, regulation, intellectual property arrangements, skills and management capabilities, or access to finance.

Sound framework conditions are necessary but not sufficient for achieving innovation-led growth. Complementary measures can help unlock the benefits of innovation, especially where they aim to address specific market failures such as those related to coordination problems or innovation spillovers. For example, supporting the development of innovation ecosystems (around specific technologies) or clusters (around certain geographical locations) may assist by facilitating collaboration between firms and research institutions so that they may identify and address issues of common interest.

However, regardless of their particular design or scope, complementary measures should be based on a sound economic rationale that sets out the case for why policy action may be warranted. The case for policy action should be supported by evidence and, where possible, supplemented with an analysis of the expected net social benefit the measure is intended to deliver.

(a) Skill mismatch arises when workers have an educational attainment that is higher or lower than that required by their job.
STEM skills underpin new-to-market product innovation

To enable firms to pursue innovation-led growth, it is important that the education system generates the kinds of skills required to drive new-to-market innovation in goods and services. In Chapter 1 it was noted that Australian firms tend to have less focus on new-to-market innovations, precisely the kind that have a higher degree of novelty and therefore more economic value. Chapter 4 presented evidence that innovation in goods and services is related to firm growth.

Science, technology, engineering and mathematics (STEM) skills play an important role in enabling firms to pursue new-to-market innovation in goods and services, especially for innovations that are new to the world. New-to-market international innovators (Definition 1.3) are:

- more than twice as likely to use engineering skills and professional IT skills than domestic modifiers
- four times more likely to use scientific and research skills, than domestic modifiers
- more likely to use project management, business and marketing skills than domestic modifiers
- three times less likely to use trades skills than domestic modifiers of existing innovations (Figure 6.1).

STEM skills are relevant not only for new-to-market innovation but also for the absorptive capacity of firms — their ability to recognise the value of new, external information, assimilate it and apply it to commercial ends. Prior knowledge of the most recent scientific and technological developments in a given field is a determinant of a firm’s ability to innovate through exploiting external knowledge.20

An education in STEM also develops a range of generic and specialised skills and strategic thinking that enables individuals to identify and grasp opportunities. These capabilities — including deep knowledge of subject, creativity, problem-solving, critical thinking and communication skills — are essential in an increasingly wide range of occupations.

Figure 6.1: Skills used by new-to-market international innovators and domestic modifiers, 2014–15

<table>
<thead>
<tr>
<th>Skills</th>
<th>New-to-market international innovators</th>
<th>Domestic modifiers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>0%</td>
<td>20%</td>
</tr>
<tr>
<td>Financial</td>
<td>40%</td>
<td>60%</td>
</tr>
<tr>
<td>Business management</td>
<td>60%</td>
<td>80%</td>
</tr>
<tr>
<td>Project management</td>
<td>80%</td>
<td>20%</td>
</tr>
<tr>
<td>Marketing</td>
<td>20%</td>
<td>40%</td>
</tr>
<tr>
<td>Transport, plant and machinery operation</td>
<td>0%</td>
<td>20%</td>
</tr>
<tr>
<td>Scientific and research</td>
<td>20%</td>
<td>60%</td>
</tr>
<tr>
<td>IT professionals</td>
<td>20%</td>
<td>60%</td>
</tr>
<tr>
<td>IT support technicians</td>
<td>20%</td>
<td>60%</td>
</tr>
<tr>
<td>Trades</td>
<td>0%</td>
<td>20%</td>
</tr>
</tbody>
</table>

Note: The axes show the proportion of businesses reporting the use of skills.

6.3 Competition and regulation

Competition can drive innovation

Competition is a key driver of innovation and arguably one of the most important conditions for innovation-led growth. A joint study by the ABS and the Productivity Commission suggests firms appear more likely to innovate if they face stronger competition. Firms may innovate to increase their profit margins or improve their offering. As the number of competitors in a given market increases so does the proportion of innovation-active businesses (Figure 6.2).

Competitors can be a direct source of ideas for innovation. In 2014–15, around 28 per cent of innovation-active businesses cited competitors as a source of ideas, led by Information, Media and Telecommunications and Accommodation and Food Services, which reported this source in the highest proportions (Figure 6.3). Interestingly, less than 20 per cent of innovation-active Manufacturing businesses consider competitors to be a source of ideas for innovation, despite being a highly trade-exposed sector and subject to strong levels of competition.

The OECD Economic Survey of Australia 2017 concluded that progress in structural reform in recent decades has considerably improved policy settings for the Australian business environment. However, Australia’s competitive advantage in these areas is being eroded as other countries improve their framework conditions. To boost innovative capacity and business productivity, it was recommended that, among other things, Australia continues to follow through on the recommendations of the Competition Policy Review.

The Productivity Commission has recently put forward a broad suite of recommendations aimed at improving the factors and influences that may affect Australia’s economic performance. With regard to competition reform as it relates specifically to innovation, the Productivity Commission suggests the following:

- revitalising competition policy with respect to the digital economy
- removing the competition law exemption for intellectual property
- improving access to, and the availability of, data
- making sure that firms can operate in an environment of intellectual license.
Australia’s regulatory environment supports innovation

The ISR System Review assessed Australia’s regulatory environment as generally supportive of innovation and its broader outcomes. Australia performs well above OECD averages for indicators of federal regulatory policy and governance. It ranks 8th of 127 economies for regulatory quality and 13th of 189 economies for ease of doing business. Australia also ranks highly in terms of the soundness of its banks, legal rights and corporate finance; it has one of the world’s most efficient stock markets and some of the strongest financial and banking regulations and competition legislation.

Product Market Regulation (PMR) is the degree to which polices promote or inhibit competition in areas of the product market where competition is viable.

Australia has a respectable overall PMR score (1.3), just below the OECD average (1.5) in 2013. Other PMR indicators reveal Australia has low initial costs associated with creating a new business, but once created, businesses have to negotiate higher levels of business regulation compared to other OECD countries.

Rather than being a major barrier, Australia’s regulatory frameworks are generally seen as essential to consumer and environmental protection, providing a form of assurance behind exported products which rely on reputational capital of the exporting country. Government regulation or compliance was the sixth of nine barriers to innovation identified by innovation-active businesses in 2015–16, behind lack of access to additional funds or skills, cost of development or implementation, and uncertain demand for new goods or services.
Regulation is both a barrier and a driver for innovation

Regulations can have both positive and negative effects on the innovation activities of firms. In 2014–15, around 7.5 per cent of innovation-active businesses reported pursuing innovation in response to government regulations or initiatives. At the same time, Government regulation and compliance was identified by 12.7 per cent of innovation-active businesses as a barrier to their attempts at innovation. Financial and Insurance Services was the industry with the highest proportion of innovation-active businesses reporting regulation affected their innovation efforts, both positively and negatively (Figure 6.4).

Frequent regulatory changes can stifle innovation activity and investment by introducing uncertainty to business planning, increasing the costs of development or undermining the viability of entire ventures. Regulatory stability can encourage and incentivise innovation by setting clear quality, environmental and ethical standards, providing confidence to consumers in both domestic and foreign markets.

Figure 6.4: Government regulations as a driver or barrier to innovation in innovation-active businesses, 2014–15

<table>
<thead>
<tr>
<th>Industry</th>
<th>% of Innovation-Active Businesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial and Insurance Services</td>
<td>27.7</td>
</tr>
<tr>
<td>Mining</td>
<td>13.5</td>
</tr>
<tr>
<td>Health Care and Social Assistance</td>
<td>12.8</td>
</tr>
<tr>
<td>Electricity, Gas, Water and Waste Services</td>
<td>12.8</td>
</tr>
<tr>
<td>Administrative and Support Services</td>
<td>10.1</td>
</tr>
<tr>
<td>Professional, Scientific and Technical Services</td>
<td>8.5</td>
</tr>
<tr>
<td>Rental, Hiring and Real Estate Services</td>
<td>15.9</td>
</tr>
<tr>
<td>Agriculture, Forestry and Fishing</td>
<td>17.0</td>
</tr>
<tr>
<td>Accommodation and Food Services</td>
<td>20.4</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>11.6</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>16.1</td>
</tr>
<tr>
<td>Transport, Postal and Warehousing</td>
<td>11.6</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>11.8</td>
</tr>
<tr>
<td>Other Services</td>
<td>8.3</td>
</tr>
<tr>
<td>Construction</td>
<td>7.7</td>
</tr>
<tr>
<td>Information Media and Telecommunications</td>
<td>8.4</td>
</tr>
<tr>
<td>Arts and Recreation Services</td>
<td>7.9</td>
</tr>
</tbody>
</table>

Notes: Barriers — respondents identified government regulations and compliance; Drivers — innovative activity was in response to government regulations or initiatives.

Further regulatory reform could boost innovation

While regulation is not seen as a major barrier to innovation by Australian firms, some areas could be improved. The ISR System Review identified a number of areas for regulatory improvement, some of which include improving intellectual property arrangements, strengthening insolvency laws, and reforming planning and zoning regulations. Reform is underway in many of the identified areas, through the National Innovation and Science Agenda and other initiatives.

6.4 Finance

Risk capital access

At the SME end of the business size spectrum, access to risk capital appears to be a major hurdle for innovative Australian businesses. In 2015–16, between 21 and 27 per cent of innovation-active SMEs reported lack of additional funds as a barrier to innovation (Figure 6.5). The ISR System Review also found that while financial markets generally function well, access to risk capital is a constraint for Australian businesses.

A relatively large proportion of Australian SMEs do not seek external finance, and those firms that do so are more likely to seek debt finance, rather than equity finance. In 2015–16, only 12 per cent of micro-businesses, 19 per cent of small businesses and 24 per cent of medium-sized enterprises sought debt or equity finance (Figure 6.6). Of these, around 94 per cent sought debt finance and only around 24 per cent sought equity finance. The rate of success for debt finance acquisition was in the range of 88–95 per cent. For equity finance, however, the success rate ranged between 50–53 per cent.

The types of finance sought by SMEs can have implications for their future growth and are heavily influenced by the risk profile and collateral available within the business. Recent research has found that “debt financing appears to be ill-suited for newer, innovative and fast-growing companies, with a higher-risk return profile”. A lack of funds for the higher-risk early stages of innovation may impose significant limitations on the growth potential of innovative and disruptive firms in Australia.

Furthermore, the interest rate disparity between loans to SMEs and to large firms has remained high ever since its increase during the GFC. This is likely underpinned by SMEs’ share of total outstanding loans, which increased by 4.6 percentage points between 2007 and 2015. While the average interest rate charged to Australian SMEs declined by 2.4 percentage points between 2007 and 2015, it is still high compared to most other OECD countries.

Figure 6.5: SMEs identifying ‘lack of access to additional funds’ as a barrier to innovation, 2015–16

Figure 6.6: SMEs that sought debt or equity finance, by business size, 2015–16
strategy and led product development. Growth was slow, and decision-making, management and administration systems remained largely informal.

The mining boom brought rapid change — sharply growing demand with little pressure on prices. Over the three years from 2010, revenue tripled and the number of employees increased by more than five times, to 33.

However, the rapid growth during the mining boom masked a deeper issue. The inadequacy of the company’s largely informal approaches to product design and quality control became evident as complaints and product returns increased. Nautitech’s reputation and sales declined, followed closely by staff morale — putting out the fires created by these issues absorbed their energy.

The emphasis on the design and manufacture of devices during the first phase of rapid growth caused the company to underestimate the need for stronger management systems. This focus led to missing an important change in the market, namely that mining companies were increasingly seeking lifetime product support services, rather than only hardware. Other competitors noticed this change earlier and, as a result, captured Nautitech’s market share. Nautitech failed to recognise the need for both management and business model innovation.

Survival strategy

In 2011, the CEO began to address the quality issues by contracting Alex Lester, then an independent consultant, to advise on systems for on-time delivery, cost reduction and continuous improvement.

But by then the mining boom was coming to an end. The price of coal dropped by more than 50 per cent, mines closed and investment almost stopped. Sales dissipated — Nautitech’s revenue declined by over 30 per cent each year for two years. And at this low point, Nautitech’s CEO and co-founder died suddenly — the firm’s survival was in doubt. Despite the risks and challenges, the remaining owner, Aga Blana, decided to back the survival strategy proposed by Alex and reinvest in the company. Alex was appointed general manager and set about addressing the firm’s strategic, managerial, technical and marketing shortcomings.

Nautitech’s new survival strategy, which also became a foundation for renewed growth, had four elements.

“We had to re-engage with our final customers and build a reputation for integrity, says Alex.
Innovation initiatives

Nautitech launched three innovation initiatives.

1. Business model innovation

Refocusing the value proposition on the needs of the final customer led Nautitech to provide ongoing support for the installation, maintenance and improvement of its devices. This required building a direct relationship with users rather than relying on equipment producers to install and market the devices. As the firm evolves beyond focusing on product design and manufacturing, Nautitech will likely require further business model improvements, involving greater innovation in software and the capacity to contribute to the performance of overall mining operations.

2. Management innovation

The Six Sigma, LEAN and Continuous Improvement methodologies were adapted and introduced across all functional areas, including product development, production and marketing. These management innovations were embedded in a values-based approach to corporate culture. “We aimed to rebuild the firm on a foundation of integrity: high-integrity relationships with customers, employees involved in decision-making and hiring new staff based on character and integrity more than skills,” says Alex.

3. Solutions focus

The third improvement involved developing new products and a culture of disciplined innovation based on defined processes and focussed on customer priorities. Institutionalising a culture of innovation linked with the changes to Nautitech’s business model led the company to focus increasingly on customer solutions, rather than just on products. When developing new products, Nautitech now collaborates with a coal miner (Glencore), a mining equipment firm (Komatsu Mining) and two research organisations (CSIRO and the University of Technology Sydney), and is discussing further collaboration with other research groups. Increasing automation in mining is driving a need for a wider range of sensors and a greater...
capacity to link, collect, integrate and interpret diverse data streams — which translates into market opportunities for Nautitech.

Using a modified stage-gate innovation approach,[ag] Nautitech’s portfolio of new products is reviewed every two weeks, and the time to market has been more than halved. Alex adds: “We also work with external engineering groups for aspects of new product development where they can be faster or cheaper than an in-house team for that work”.

Ongoing evolution

As opportunities are likely to decline in the underground coal industry in Australia, Nautitech recognises it must invest in developing new products, markets, relationships and capabilities. It must continue to evolve from a product company to a solutions provider, with the systems and culture to support this.

“We have started trials in hard rock underground mines in South Africa and Poland, and won our first sales in South Africa. Exports to other markets and acquisitions are now on our radar,” says Alex.

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[ag] A Stage-Gate system is a conceptual and operational road map for moving a new-product project from idea to launch. Stage-Gate divides the innovation effort into distinct stages separated by management decision gates (gatekeeping).
Venture capital investment is low in Australia

Venture capital (VC) investments depend on considerable information sharing between venture capitalists, entrepreneurs, and others in the innovation ecosystem, such as bankers, fund managers, advisors and technology specialists. It’s estimated this type of activity generates significant positive knowledge spillovers to other firms. The role of venture capital in funding Australia’s high-growth firms is described in the feature article titled Australia’s venture capital and private equity market in Section 5.6.

The GFC caused a prolonged slump in Australia’s VC market, but there are some signs the number of investment deals is starting to recover, as the number of pre-seed, seed and start-up investments has been increasing since 2013–14. Annual VC investment data from ABS shows volatile swings in recent years, growing from $295 million in 2013–14 to $383 million in 2014–15 before falling to $223 million in 2015–16 (Figure 6.7). This data, however, pre-dates implementation of some of the NISA changes, including the Biomedical Translation Fund and the changes to Early Stage Venture Capital Limited Partnerships (ESVCLPs) that may significantly increase VC funding. In contrast, AVCAL reports that in 2015–16 there was a record 48 per cent increase in VC investment from $233 million in 2014–15 to $346 million in 2015–16. The difference in these two data sources stems from different scopes and definitions of venture capital in their respective surveys (for example, the ABS survey, which is a census of all investment vehicles active in Australia, omits investments by non-resident funds in Australian investee companies. On the other hand, AVCAL’s survey does not include the pre-seed stage of investment).

Based on ABS data, investment from the venture capital sector in Australia continues to rank well below other OECD countries, at 0.013 per cent of Australia’s GDP, less than half of the 0.054 per cent OECD average (Figure 6.8). Research by the Office of the Chief Economist found that the largest share of venture capital investment goes not to young start-ups but to more mature firms aged five years or older.

Figure 6.7: Venture capital investment in Australia, 2005–06 to 2015–16

Informal investment is strong

Informal investment is strong in Australia, with the prevalence of business angels at 4.1 per cent of the population in 2016.\(^{[43]}\) This equates to about 0.6 million informal investors financing entrepreneurial ventures in Australia. This is comparable to the US at 4.2 per cent and above the 3.4 per cent average for developed economies. However, at just over $75,000, the average amount invested in Australia is well above that of both the US ($21,000) and the developed country average ($48,000).

Foreign direct investment is growing

Foreign direct investment (FDI) and foreign ownership in companies are associated with higher degrees of innovation novelty and are more likely to achieve new-to-world innovation than businesses 100 per cent domestically owned.\(^{[44]}\) After large falls in 2014 and 2015, FDI inflows increased by 150 per cent in 2016 to $64.8 billion, ranking Australia 4th in the OECD, up from 10th in 2015.\(^{[45]}\) A large portion ($18 billion) of this investment was directed to the mining sector which accounts for 39 per cent of Australia’s total FDI stock, but in recent years foreign investment has increasingly flowed into service industries.\(^{[46]}\)

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**Figure 6.8: Venture capital investment as a percentage of GDP, 2016**

<table>
<thead>
<tr>
<th>Country</th>
<th>Seed/start-up/early stage</th>
<th>Later stage venture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Israel</td>
<td></td>
<td></td>
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<tr>
<td>United States</td>
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<tr>
<td>Canada</td>
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<td>Ireland</td>
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<td>Finland</td>
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<td>Sweden</td>
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<td>Switzerland</td>
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<td>Latvia</td>
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<td>Denmark</td>
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<td>United Kingdom</td>
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<td>Netherlands</td>
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<td>Japan</td>
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<td>Austria</td>
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<td>Australia</td>
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<td>Slovak Republic</td>
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<td>Portugal</td>
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<td>Slovenia</td>
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<td>Italy</td>
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<td>Poland</td>
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<td>Czech Republic</td>
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<td>Luxembourg</td>
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<tr>
<td>Greece</td>
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</table>

Notes: 2014 data is used for Israel and Japan.


\(^{[ah]}\) A business angel is an individual who uses his own funds to contribute capital for the development of a business. Business angels are typically wealthy individuals aiming to help entrepreneurs and small business start-ups succeed.
6.5 Digital economy

Digital innovation is increasingly important

Adoption and use of ICT can lead to improved innovation performance and productivity growth.\textsuperscript{47} The use of digital technologies can drive innovation by reducing transaction costs, enhancing communication, and further enabling the diffusion of ideas within and between organisations. Firms using data-driven innovation have raised productivity faster than non-users by approximately 5–10 per cent, according to the OECD.\textsuperscript{48} Digital technologies can also have positive spillover effects within and across industries.

In Australia, businesses seem to be embracing digital technology. Income generated over the internet in 2015–16 was more than $320 billion, up from $144 billion five years earlier. In 2015–16, more than half of Australian businesses placed orders via the internet, almost 40 per cent had a social media presence, and 30 per cent used paid cloud computing services.\textsuperscript{49}

By international standards, however, there are elements of the digital economy where Australia is lagging behind other developed countries. Australia’s investment in ICT as a percentage of GDP in 2015 was just over 2 per cent, below the OECD average of 2.3 per cent, putting Australia at 18th out of 32 OECD countries.\textsuperscript{50} Similarly, Australia is typically below the OECD average for BERD in the ICT sector as a percentage of GDP, despite it being almost a third of Australia’s total BERD. Investment in Australia’s digital economy is incredibly important, especially as some estimate that digital technology can be expected to add between $140 and $250 billion to Australia’s GDP by 2025.\textsuperscript{51}

Regarding specific technologies, mobile internet and access to high speed broadband are considered to be most important among Australian businesses (Figure 6.9). Some industries are more predisposed to pursuing specific technologies (e.g. data analytics and intelligent software systems are most important for Mining). There is still considerable scope for a broader adoption of emerging technologies, such as the Internet of Things (IoT), data analytics, or intelligent software systems, which have been identified to be among the most promising in their potential contribution to productivity growth.\textsuperscript{52}

Figure 6.9: Importance of digital technologies, by technology, 2015–16

Notes: ‘Importance’ adapted from survey responses to the extent of digital technology importance.

Policy and regulatory settings

Framework conditions have an important part to play in encouraging the uptake of digital technologies. Policy and regulatory settings to stimulate digital innovation may include, for instance:

- improving conditions for digital innovation by encouraging ICT diffusion, supporting innovation networks or expanding access to finance.
- stimulating the creation of data analytics capacity, for example by investing in technologies and training.
- facilitation of organisational change within/among firms, such as by encouraging teleworking and teleconferencing.

Looking into the state of digital disruption in Australia, the Productivity Commission recently found that “some regulations and regulatory approaches are explicitly preventing the development and efficient adoption of [digital] technologies”. The findings were wide-reaching, but provide some guidance on areas that Australia’s framework conditions — as far as they relate to digital innovation — can improve. Looking internationally, the OECD’s Digital Economy Outlook 2017 places Australia at or better than the OECD average, “suggesting that framework conditions in Australia are more favourable to the creation of innovative start-ups, new business models and new services enabled by digital technologies”.

Evidence suggests that investment in digital technologies alone is not enough to drive innovation and productivity growth. Effective use of ICTs depends on complementary investment in management capability and knowledge-based capital, in particular, firm-specific skills, and organisational change, including new business processes and business models.

Australian businesses, however, do not seem to be investing in management capability to enable effective use of digital technologies. In 2015–16, more than 70 per cent of Australian businesses indicated that they had not implemented any management practices for the use of ICT and/or the internet. Similarly, business investment in new ICTs is low, with only 8.1 per cent of businesses investing in new digital technologies, and 11 per cent upgrading their cybersecurity, in 2015–16.
Feature Article: Innovation and high-growth firms

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High-growth firms (HGFs) have generated a lot of excitement in recent years, because of their potential to make a huge contribution to job creation, productivity growth, and economic development.

Many studies, focusing on OECD countries, have shown that 4 per cent of firms, or perhaps fewer, create about 50 per cent of the jobs.

HGFs can also play an important role in the emergence of new innovative industries, such as Microsoft, Intel and Amazon in the sectors of ICT and internet retailing.

Last but not least, HGFs can be a formidable driving force in an innovation system to re-energize mature sectors.

HGFs are in all sectors

The prototypical ‘Schumpeterian’ entrepreneur is a charismatic individual who brings to market a new innovative business idea, and who generates sufficient interest from stakeholders and wider society that the firm experiences fast growth. Indeed, some entrepreneurship scholars write that entrepreneurship is innovative and high-growth by definition (which, if true, means that it becomes tautological and meaningless to inquire into the contribution of entrepreneurship to innovation and growth).

The evidence suggests, however, that HGFs are not more common in high-tech sectors — HGFs are found in all sectors, and in fact they appear to be relatively under-represented in high-tech manufacturing sectors. Nevertheless, it may be that HGFs are relatively high-tech when compared to their peers within their low-tech sectors. For example, IKEA revolutionised the generally low-tech furniture industry.

HGFs are a problematic target for policy

HGFs have therefore attracted lots of interest from investors keen to make a handsome return, as well as from policymakers keen to repeat the success stories of recent years.

HGFs are a problematic target, however, for two main reasons.

First, it is overall quite difficult to predict which firms will grow fast. There are a few variables that help predict which firms will, on average, have faster growth rates. Young firms, for example, tend to have higher average growth rates, especially in the first few years immediately after entry. Smaller firms generally grow faster than larger firms, although there are many large firms that become
HGFs. Questionnaire-based evidence shows that a founder’s stated desire to grow is sometimes (but not always) associated with subsequent growth of the firm. Other variables relating to the entrepreneurs (such as education and experience of the founding entrepreneurs) or the firm (such as legal form, financial performance or previous growth) or environment (such as geographical region or sectoral affiliation) can be shown to have an effect, although the effect is so small that, overall, scholars have suggested that firm growth is best approximated by a random statistical process. And if growth is random and unpredictable, this makes it difficult for policy to directly target HGFs.

Second, and relatedly, there is remarkably little persistence in rapid growth. Even if a firm grows fast in one year, it is unlikely to repeat this performance in the next year. Repeated fast growth events do happen — just as it does happen that a lucky dice player might roll three sixes in a row. However, repeated fast growth is rare, and difficult to predict. Scholars have written about HGFs as “one-hit wonders.” Hence, by the time you have found an HGF, you have probably already missed the action, because HGFs are unlikely to continue growing into the future.

The challenges of supporting HGFs

The difficulties of predicting which firms will become HGFs, and the lack of persistence in high-growth episodes, mean that it is difficult to target or support HGFs.

Some variables, such as young age, or being incorporated or having a patent, improve the probability of high-growth to some extent, and so these firms can be kept in the portfolio of potential HGFs. Old small firms run by solo-entrepreneurs are unlikely to become HGFs, so these firms can be dropped from the portfolio. A broad-based portfolio investment approach needs to be followed, however, because picking out an individual firm as a future HGF is prohibitively difficult — for investors as well as for policymakers. The evidence also shows that boosting the raw number of business start-ups will not increase the number of HGFs, because there seems to be a trade-off between quantity and quality of new firms.

Removing barriers to growth

Policymakers have also sought a ‘detour’, a less direct approach, to remove the contextual barriers that might be hindering (potential) HGFs. Removing barriers to growth seems to be a no-regret policy.

Questionnaire evidence has highlighted a number of barriers to growth. HGFs often face difficulties in finding skilled employees. HGFs sometimes face problems with bureaucracy as well, although it should be remembered that bureaucratic procedures are supposed to be in place for good reasons (i.e. to foster public interests and the common good). Potential HGFs might have problems in finding sufficient financial resources to realize their entrepreneurial visions, but it should also be noted that many entrepreneurial visions turn out to be mistakes, and they should not all be funded. HGFs might also complain about facing too much competition, which of course does not imply that the optimal policy response would be to reduce competition. Finally, another consideration is that encouraging firms to grow excessively fast might actually push them into financial problems (where the costs of growth outweigh the incoming cash flow) and ultimately into bankruptcy.

HGFs as part of a multi-faceted ecosystem

We argue that HGFs do indeed play an important role in shaping and activating an innovation system from the bottom-up — but that they participate in a multifaceted ecosystem that includes many partners and stakeholders.

HGFs play an important role, but they are not a sufficient ingredient for economic success per se — an innovation system requires other agents too, such as removing barriers to facilitate growth.

Furthermore, given that HGFs interact with many stakeholders, and require the assistance of many agents (such as providers of finance, a skilled workforce, an entrepreneurial culture, and suppliers, clients, and collaboration partners) as well as supportive values and attitudes (such as an entrepreneurial culture, ‘born-global’ ambitions, mobility of resources, and the alignment of incentives), policy should focus on the broader ecosystem, rather than chasing in vain after elusive unicorns.