Timothy Muya

An Analysis of Advanced Manufacturing Policies in Australia, Israel, and the UAE

Introduction

Advancements in technology in recent years have introduced the "fourth industrial revolution", in which digital technology and the internet of things will revolutionise traditional manufacturing. However, the global pandemic and its disruptions to global supply chains have been the catalyst for governments to re-evaluate their domestic manufacturing capability.

According to Manufacturing USA, *advanced manufacturing* is the "Use of innovative technologies to create existing products and the creation of new products… [which] can include production activities that depend on information, automation, computation, software, sensing, and networking" (Manufacturing.gov, 2022, para. 1). How important is manufacturing to economic growth and prosperity? Stanford (2022) asserts that manufacturing is important because:

(i) it is an innovation intensive sector and associated productivity gains
(ii) two thirds of goods traded globally are manufactured goods
(iii) complex supply chains create numerous jobs in sector adjacent businesses as suppliers.

Therefore, successful government policy that creates a macroeconomic environment conducive to a sustainable and robust advanced manufacturing industry can improve the welling of the economy. This paper investigates the current government policy and status of the advanced manufacturing industry in Australia, Israel and the UAE and recommends policy options and areas for collaboration between the three nations.

Australia

The recent impacts of COVID-19 on the Australian economy have reinvigorated debates about the current state, importance, and future of advanced manufacturing. The traditional economic view is that high production costs (mainly high wages) have meant Australia could not compete in manufacturing. Evidence from export success in goods and services such as resource mining, education, and agriculture in exchange for higher value-added manufacturing from trading partners affirmed arguments that Australia no longer needed to produce manufactured products (Stanford, 2022, pp.4-5). This viewpoint came at the cost of Australia's major car manufacturing plants, with Holden and Toyota ceasing operations in 2017. However, Stanford (2022) argues that the pandemic

revealed the "comparative advantage" specialisation strategy weakened the manufacturing sector that "carries strategic importance to our broader economy, society, and security"(Stanford 2020, p.4). This insight suggests that there needs to be a constructive reorientation of Australia's approach to the advanced manufacturing sectors.

Policymakers have since developed the Modern Manufacturing Strategy (MMS) and the Modern Manufacturing Initiative (MMI). These initiatives assist manufacturers in scaling and competing in high-value-added complex production by providing resources for each industry's research and development (R&D), design, logistics and services (The Australian Government's Modern Manufacturing Strategy, 2022). The MMS aims to create Australia as the destination for high-quality, sustainable manufacturing and foster a robust economy. This section examines the evolution of manufacturing in Australia and evaluates current policies and potential policy options.

Australian Manufacturing

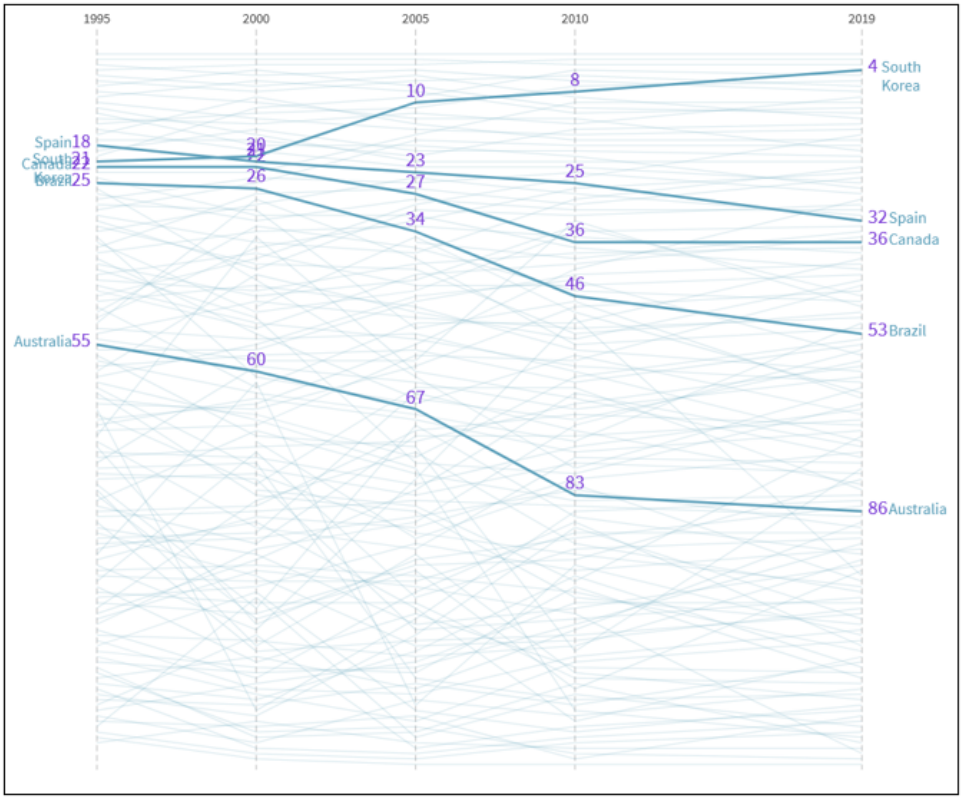
Australian Manufacturing post-WWII, between 1950-1960, accounted for almost 28% of GDP and 28% of employment (Crittenden, 2022 para. 8). The automotive industry comprising Ford, Toyota, and General Motors (Holden), were vital members of the manufacturing sector. Car manufacturing saw its peak in the late 70s with 90,000 workers and producing almost 500,000 vehicles a year (Australian Automotive Industry, 2020). Due to its size and relative complexity (per the Harvard complexity ranking), the car manufacturing industry is a substantial litmus test for advanced manufacturing in Australia. However, as the 2020 report by the Department of Industry Innovation and Science on the Australian Automotive Industry indicates, the manufacturing sector benefitted from tariff protectionism that was reduced successively by governments from 57% in the 1980s to just 5% in 2010, pursuing trade liberalisation policies. Macroeconomic policy in the 1980s favoured opening up the Australian economy to greater international competition for fears that the domestic industry was lagging in innovations, modernisation, and efficiency (Stanford 2020, p.33). A decade later, John Button, the then Minister for Industry and Commerce in the 1990s, stated that the "Australian manufacturing industry was still focused on the domestic market. Factories were closing. People were not prepared to think much about longer-term solutions. There was no export culture" (Emmery, 2022). At the same time, most imported manufacturers to Australia enter without tariffs if they are under a free trade agreement, reducing demand for Australian made products (Stanford 2020, pp. 14,30-36).

In 2008, the Australian Government would allocate $6.2 billion for a 'New car Plan for a Greener Future', of which $3.4 billion would promote investment in R&D and sustainable vehicle production (Australian Automotive Industry 2020, p.11). However, by 2013, after the winding back of government support, high exchange rates, international competition, a lack of commitment to remaining in Australia and shifting consumer preferences proved it difficult for car manufacturers to remain in operation (Australian Automotive Industry 2020, p.8). Ford motors announced its closure in 2013, followed by Toyota and Holden, with financial assistance from the Federal Government to help the industry transition over the next four years. Through the transition between 2013-17, the $2.5 billion of Government support to the vehicle manufacturing industry resulted in a value add of approximately $15 billion over that period (Australian Automotive Industry, 2020, pp.29-35). Although this investment was directed towards a sundown industry, it nonetheless evidences that investments in advanced manufacturing (and manufacturing in general) can generate significant returns beyond the initial investment. Australia has a storied history in manufacturing and possesses a pedigree that, if pivoted towards the future, can be reignited to compete successfully in this dynamic sector.

Australian manufacturing – A Global Comparison

Australia's economic make-up is unique compared to other OCED economies with its large share of natural resource exports. The Harvard Economic Complexity Index (ECI) measures the number and complexity of the exported products. Australia ranks 86th, and there has been a seven-position increase in rank in the period 2014-19 after a decade of steady decline, which suggests an improvement in the quality and quantity of advanced manufacturing exports (figure 1). Economies with similar characteristics, such as Canada, Spain, Brazil, and Korea, have all declined except for Korea, which has increased. However, the gap between Australia and these nations have remained steady or widened. Figure 1 suggests a global trend of developed economies reducing their manufacturing concentration, but this phenomenon need not be the rule, as evidenced by Korea's ascension in the rankings.

Figure 1 – Harvard Economic Complexity Index (Source: Harvard Atlas)



A Current Snapshot

Manufactured products currently account for approximately 11% of total exports 2020-21; however, advanced manufacturing (simply transformed or elaborately transformed) comprised almost 66% of exported manufactured products indicating that manufacturing is export orientated (DFAT TRIEC, 2022). Manufacturing is 5% of GDP, employs 860,000 and has a value add of $111 billion in 2019-20 or approximately 5.7% of GDP (Trading Economics, 2022; Australian Industry, 2019-20 financial year, 2022). However, there has been a steady decline in manufacturing employment since its peak in 2008, as observed in figure 2. An explanation of figure 2 is the decline and stagnation of the motor vehicle industry directly impacting advanced manufacturers (machine, metal

manufacturers and others in the supply chain), which reoriented to export markets or dissolved and retained workers with government support. Although these businesses were not well diversified (some 60% of leading suppliers had 90% of revenues from the Automotive industry), Australian firms were more likely to persist after closures, with 86% currently in business compared to 58% of multinationals (Australian Automotive Industry 2020, p.15). Therefore, investment in Australian firms could be more conducive to long-term success, but this outcome might be a consequence of how the industry was scaled back. For example, a $47.5 million Advanced Manufacturing Growth Fund was created for 32 businesses to transition to advanced manufacturing of high-value products.

Figure 2 – Manufacturing Employment in Australia (Source: St. Louis FRED)

Firm Level View

A firm-level view reveals the potential for growth and the challenges firms face while innovating and growing in the Advanced manufacturing sector. Advanced manufacturing is ranked 5th in innovation among innovation active businesses by sector and increased new innovations developed by 6% in the past decade (2009-2020) from 50.7% to 56.3% (Department of Industry, Science, Energy and Resources, 2022). Furthermore, 9.2% of goods and services innovation was new to Australia, and 9.1% was new to the world, although most of the innovation was new to the business only (72.3% and 87.8%, respectively – figure 3). Evidence from figure 3 implies that businesses have high adaptability and creativity to develop novel solutions to improve their products.

However, focusing on firm-specific innovation may limit Australia's long-term international competitiveness since consequential innovation is necessary to create quality, value-added products. Moreover, businesses that are pursuing innovative activities reported a lack of access to a qualified workforce (25%), uncertain demand for new products (23%) and a lack of access to additional funds (21.6%) (figure 4). These issues may lead to a decrease in business expenditure on R&D as a share of GDP from 1.37% to 0.92% (Department of Industry, Science, Energy and Resources, 2022).

Figure 3 – New Innovation in Goods and Services or Processes (Source: https://publications.industry.gov.au/publications/australianinnovationsystemmonitor/business-innovation/innovation-activity/index.html)

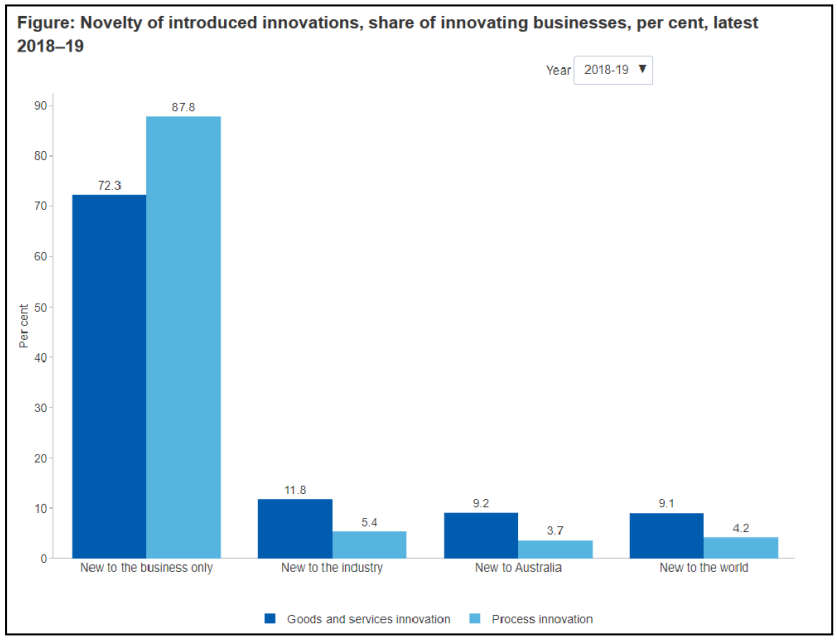
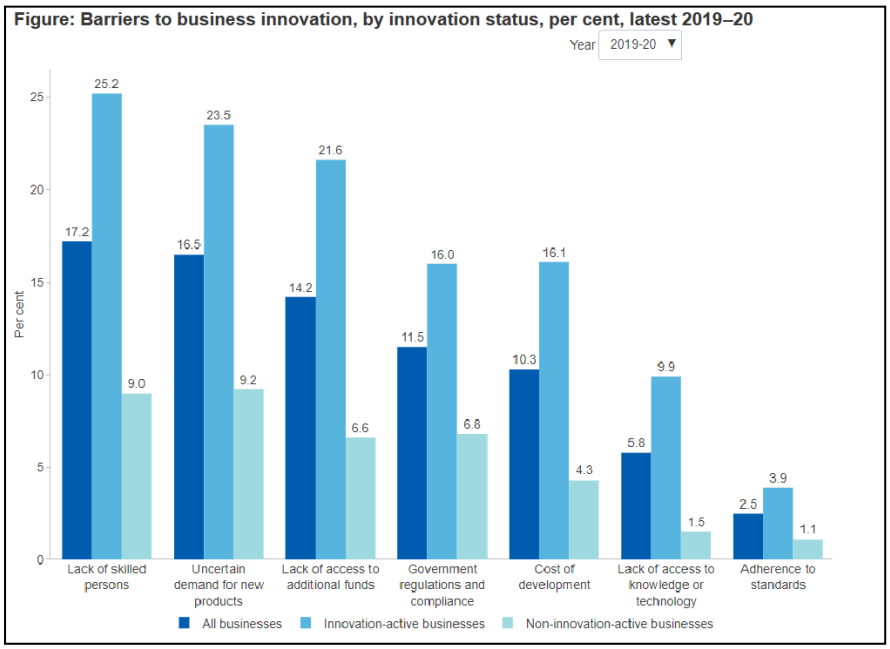
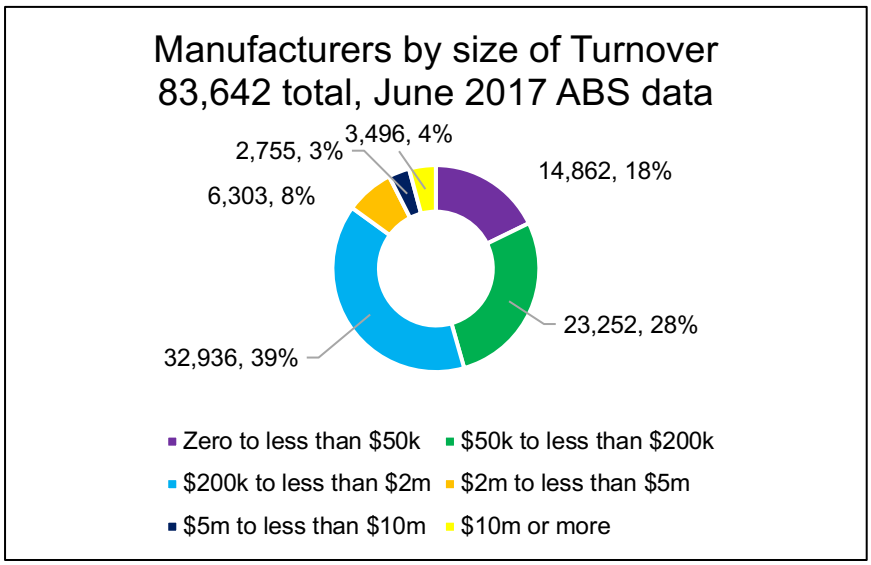


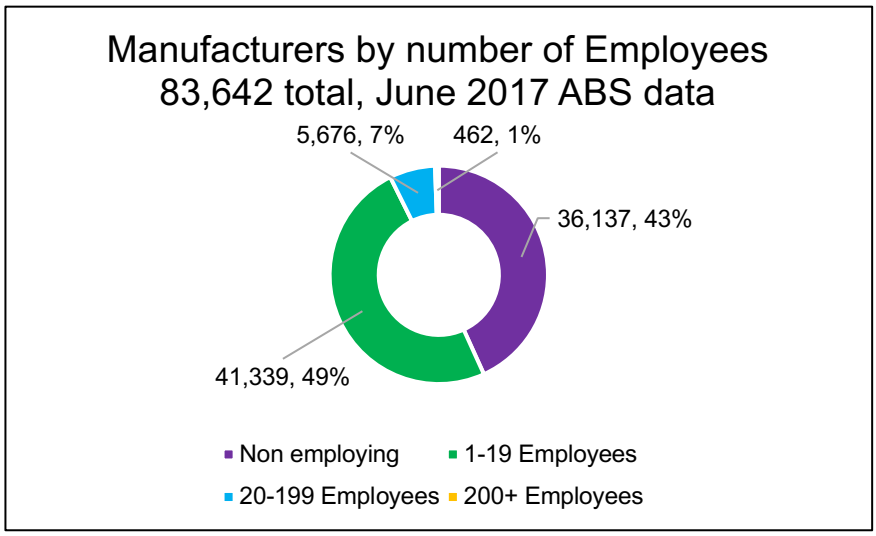
Figure 4 – Barriers to business Innovation (Source: https://publications.industry.gov.au/publications/australianinnovationsystemmonitor/business-innovation/innovation-activity/index.html)



The evidence indicates that firms are eager to introduce, develop and implement new technology but face capital and labour market failures that limit the industry's growth. Conversely, in a survey regarding what skill is the most important in advanced manufacturing, respondents ranked scientific research skills as the lowest (16%), highlighting the perception of R&D in manufacturing and a need to connect industry with academia and create pathways for skilled professionals to break into advanced manufacturing. Furthermore, of 83,642 manufacturers, 43% or 36,137 businesses were not hiring new workers despite 46% of the industry turning over between zero to 200k a year (figure 5). The data points to structural issues in the industry that could disincentivise the growth of businesses because potential employees may not view manufacturing as a career. Despite these challenges, firms continue to adapt and find new ways to develop new advanced manufacturing technologies.

Figure 5 – ABS Data





Considering these challenges, the AMGC has identified several issues and solutions that advanced manufacturers and policymakers must be aware of when strategising (Advanced Manufacturing Growth Centre, 2020) . The main issues cited by the AMGC:

1. Industry and media leaders need to **redefine perceptions around manufacturing** by highlighting its strengths and opportunities. **Manufacturers need to be willing to change, adapt and grow**. 88.2% of businesses report that they do not have a strategic plan, and 42% do not monitor key performance indicators. It recommends that businesses connect with industry partners and government agencies to maximise growth potential.
2. **Collaborating with industry and research** institutions: Only 12% of manufacturers collaborate with others in the industry. Moreover, 85% of small and 75% of medium businesses do not work with research institutions. Research suggests that manufacturers who collaborate with other businesses are more successful than those who do not (Min et al., 2005, pp.236-256). Therefore, it is recommended that businesses build networks, partnerships, and relationships to improve business outcomes.
3. **Technology adoption**: The manufacturing industry has some of the lowest adoption rates by industry (Appendix figure 1) because of the difficulty of moving away from tried software and the high risks and costs associated with integrating new technologies.
4. **Improving financial access**: Manufacturers have difficulty accessing funding, with 17.6% reporting that capita access impedes business operations.
5. **Labour recruitment**: The manufacturing sector faces the highest skills shortage by industry (Appendix figure 2), with 17.2% and 3% of students considering manufacturing as a career. The spillover effect of a skills shortage is that 14% of firms believe this issue to be a significant barrier to innovation.
6. **Creating and reaching large markets**: It is reported that 5% of manufacturers comprise 99% of export value, suggesting that companies that implement solutions to the challenges listed above should be able to take advantage of large export markets.

In short, given the statistical make-up of the industry, there are steps the policymakers and other institutions can take to improve the outcomes of the industry. The investigation shows that a manufacturing industry hit by the closure of large employers (Ford, Holden, Toyota) can still perform and displays vast growth potential with new horizons in advanced manufacturing development.

Current policies – Strengths and weaknesses

The Australian Government, as a part of the Modern Manufacturing Strategy (MMS), has created six growth centres in critical areas with the aim of "harness[ing] Australian manufacturing capability to drive economic recovery and future resilience" (The Australian Government's Modern Manufacturing Strategy, 2022; Industry Growth Centres Initiative: Progress and Impact, 2019). The Advanced Manufacturing and Growth Centre's (AMGC) goal is to help manufacturers compete on value-added products through research-based innovation and manufacturing of components, products, and services. According to the Department of Industry, Innovation and Sciences, it is predicted that the projects undertaken by the AMGC could contribute 25-35% in value added to the economy by 2026 and generate $240 million in revenue for Australian businesses and 1100 new jobs (Industry Growth Centres Initiative: Progress and Impact, 2019). The central policy is designed to improve economic conditions through deregulation, lower energy costs, investing in research and innovation through the MMI and

backing projects that align with the National Manufacturing Priorities (NMP). The NMPs are resource and minerals technology, food & beverage, medical products, recycling & clean energy, defence, and space.

Around $1.3 billion is dedicated to the MMI, which, through established Industry Growth Centres aims to invest in businesses that fit the NMPs (Industry Growth Centres 2021). Grants between $1 million - $20 million to entrepreneurial businesses wanting to integrate products and services into domestic and international value chains fitting the NMPs with the support of the CSIRO research and development facilities (Industry Growth Centres 2021). In short, the policy aims to encourage entrepreneurship and private investment through grants and tax incentives (market supply-side policies) for firms that meet NMPs and its objectives. However, these policies (on face value) address only a fraction of the issues raised by the AMGC – namely financial inclusion and collaboration – to limited degrees.

The main criticism of the MMS is that it is unclear how collaboration between various stakeholders (e.g., industry, government, unions) will be implemented to achieve the unspecified short- and long-term objectives of the NMPs. The MMS policy includes a skeleton outline of the objectives in two, five and ten years, but there is limited information on long-term policies to develop the industry. Dean and Spoehr have argued that the Government needs to improve the organisational capability and collaborative methods of small to medium businesses since "each growth centre is driven by a consortium of industry and research, with little direct involvement from government and no involvement of union" (Dean and Spoehr, 2018).

Recommendations

Short-term policies focused on tax incentives for start-ups and cutting-edge businesses may not create sustainable business models or jobs (Shane, 2009; Modern Manufacturing Initiative, 2022). The success rates of start-ups are known to be very low even with long terms support, and the grants made available are short-term lump sums. Moreover, under the current policy's incentive structure, technology innovations focused on short-term product improvements may be favoured over profound structural innovations that achieve the long-term objective of industrial transformation because their merits may not be apparent, or their capital requirements are over a long period of time. In short, while MMS may deliver positive results for entrepreneurs and start-ups, it fails to address long-term issues evidenced by the AMGC and industry statistics such as education, training, and collaboration.

The potential long-term strategies that can be implemented include reducing energy prices for manufacturers by leveraging renewables, connecting universities to IGCs and businesses to develop new skills and technologies, developing trade policies to promote Australian advanced manufacturers' interests and growing business by investing in public infrastructure using local industry. Australia has a large natural endowment in renewable energy, boasting an average solar radiation per meter square that is greater than any other land mass and nine of the ten mineral elements for lithium-ion production (Li, Edwards, Hosseini and Costin 2020, p.4; The Lithium-Ion Batter Value Chain - New Economy Opportunities for Australia: AusTrade 2018, p.5). Dan Nahum argues that manufacturers could save greater than one-quarter on energy costs by switching to renewables which increases international competitiveness and innovation around sustainable manufacturing (Powering onwards: Australia's opportunity to reinvigorate manufacturing through renewable energy 2022, p.296). Thus, the first recommendation

is to develop a growth centre around renewable manufacturing that can attract investment, develop supply chains, and attract OEMs to establish new industries in renewable manufacturing and be a world leader in this sector.

The second recommendation is for the Australian Government to create an advanced manufacturing strategy with clear milestones and objectives with the involvement of stakeholders from industry, business, education, and unions (Transforming Australian Manufacturing: Preparing businesses and workplaces for Industry 4.0, 2022). Outlining a vision and metrics for success in areas such as innovation, production, and economic impact (e.g., the market capitalisation of industry, employment figures, %of GDP and other relevant indicators) will improve the ability of stakeholders' peak bodies to navigate toward positive economic outcomes.

The third recommendation is to increase collaboration with research and industry by adding more incentives (e.g. subsidies and tax breaks) for the industry to hire researchers to improve their products, as well as creating pathways for universities and TAFE to increase work with advanced manufacturers as part of their skill development pathways. Bridging common perceptions of manufacturing as a career pathway will help resolve some of the long-term issues with innovation and skills gaps in the industry (such as expanding the IMCRC).

Another recommendation is for the Australian Government to implement trade strategies that help the growth of the advanced manufacturing industry, considering past trade policies (e.g., tariff reduction and free trade agreements) have had significant adverse effects on the manufacturing industry.

Finally, State and Federal Governments should invest in public assets that utilise local manufacturers in public projects that take risks otherwise untenable for individual businesses but can spur innovation in sectors ranging from transportation to defence.

Israel

Israel has been a world leader in advanced manufacturing processes and is known to be one of the most innovative countries in the OECD, with one of the highest ECIs (figure 8). The high-tech start-up nation has been responsible for world-renowned companies such as Wix, Waze, Viber, Teva pharmaceuticals and many more (Business Insider, 2022). The 'start-up nation' has the highest amounts invested in research in development as a percentage of GDP (figure 9), and this expenditure is often credited as a major propellant for its technology industry. Israel also has numerous collaborations in research and development and operations with multinational corporations from government programs such as the Israel Innovation Authority as a deliberate strategy for economic growth (foreign direct investment or FDI).

Figure 6 – Economic Complexity Index (Source: Harvard Atlas)

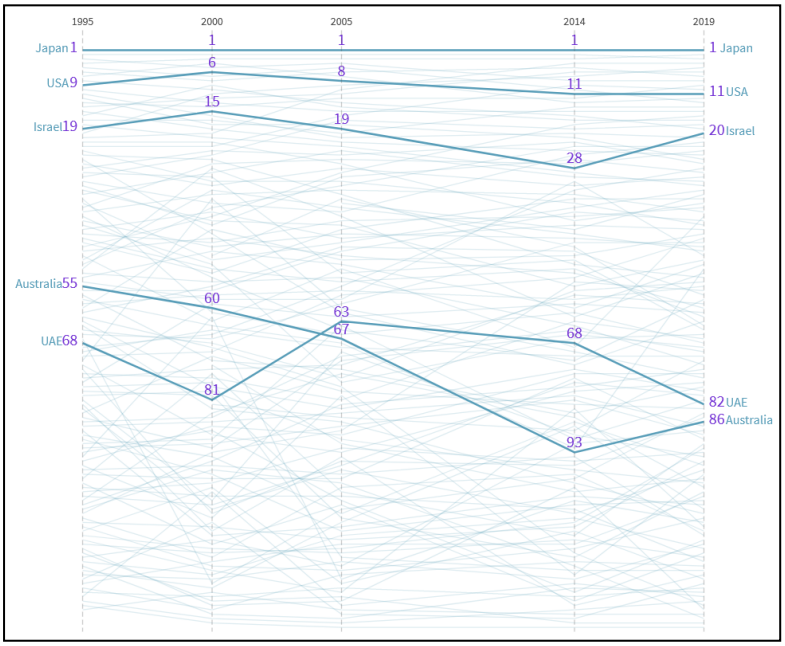
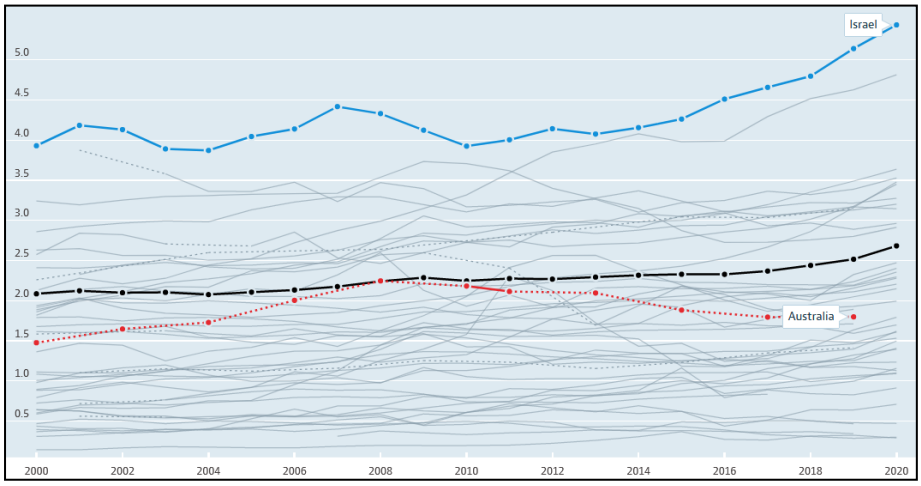


Figure 7 – R&D as a percentage of GDP (Source: World Bank)



However, in recent years and as a consequence of the pandemic, the high-tech industry has shown signs of maturity, with the number of new start-ups decreasing from 14000 to 850 (2014-2019) (Israel Innovation Authority Report 2021, pp.16-18). Furthermore, there is an increasing skills gap between new graduates and inexperienced workers and what the industry demands of new hires. Policymakers in high-tech and advanced manufacturing aim to address some of these issues and develop strategies for the advanced manufacturing sector. This section explores the high-tech industry and advanced manufacturing in Israel and policy recommendations.

Background

Israel's technological development dated as far back as the 1970s and formed the basis for its current dominance in the tech industry. The economic strategy for development was to invite foreign companies (Multinational Corporations or MNCs) to set up research institutions. Breznitz (2006) describes that "Israel focused first on trying to convince MNCs to open R&D centres rather than manufacturing facilities within its border, " which had two main effects. First, it meant that Israel could develop new technologies and products based on the frontier of scientific knowledge and, secondly, become the supplier of these research and development inputs. Concurrently, the Israeli Government, through the Office of the Chief Scientist (OCS) (now the Israeli Innovation Authority (IIA) since 2017), promoted the increase of research and development by financially backing projects without targeting specific sectors or technologies in the 1990s (Riley, 2021; Kellerman, 2002). The OSC also sparked the venture capital industry, as the Government offered 40% of what private investors offered and successfully raised a $250 million fund for 40 companies (Riley, 2021). This strategy of high-risk innovation backing continues today, with financial support for approved projects between 20%-50% and 75% for under-represented communities (R&D Fund, 2022). The combination of MNCs improving the R&D capability and the OSC reducing the market failures created the optimal environment for the tech-based export industry to grow.

Additionally, investment in universities and, more importantly, developing patent rules have continued to perpetuate and skyrocket the tech industry to what it is today. The IIA recognised that to bridge the gap between academia and business to bring laboratory breakthroughs to create market solutions, ownership of the product or services needs to be clearly defined. The Intellectual Property (IP) generally remains the property of the academic to allow reuse if the company dissolves, and if the product or service generates sales, the financial support must be repaid to the IIA (generally a 3% royalty of sales) (Arrangements That May Apply to IP Rights of Israeli Companies, 2022; Swiss – Israeli bilateral call for joint Innovation Projects, 2022). Moreover, the Ministry of Economy and Industry State of Israel (MEISI) are leveraging technological skills of the Israeli workforce and IP to attract foreign investment and research and development. The ministry launched a tax regime to “encouraging multinationals to consolidate IP ownership and profits in Israel along with existing Israeli research and development (R&D) functions” (Ministry of Economy and Industry State of Israel, 2022, pp.7-8). By increasing taxation benefits, MEISI aims to increase R&D in Israel via direct private investment as well as gaining a knowledge advantage through the collection of already developed IP. This structure encourages or even motivates academics to work with companies to develop products from lab theories, as much of the risk is reduced through the IIA funding scheme. As the IIA Chief executive Dror Bin notes, "If you only have innovation but not the ability to bring it to the market, then you don't have an ecosystem and cannot compete globally", but, "If you can take it to the market but you don't have enough skilled personnel, infrastructure, regulation, and a friendly environment for doing business, you also have a problem" (Riley, 2021).

Over the last 30 years, the high-tech industry in Israel has exploded to comprise 57% of manufactured exports (high to medium tech) and up to 45% of all manufactured exports (World Bank; Israel Innovation Authority's 2021 Innovation Report, 2021). The most considerable change in high-tech manufacturing came in 2007-9, with a 21% increase from 38% to 59%; However, most export growth has been in the service sector of high value-add exports (Appendix figure 3, 4), which has stagnated over the past few years, even before the pandemic. This suggests that high-tech exports are reliant on the booming export sectors and have neglected the industrial sector. The

Innovation 2021 report by the IIA suggests three main issues facing the high-tech sector regarding its stagnation and future: (i) State Investment in R&D as a percentage of GDP has remained low a percentage of GDP and below the OECD average (ii) An aging tech workforce (iii) A higher education sector not matching the market demand for trained professionals and a skills gap between graduates and employers. The report states that graduates with limited experience in the high-tech industry represent only 11% of the industry, with most workers having an average age of 40 (Israel Innovation Authority's 2021 Innovation Report, p.31). The skewness in the age groups in the industry could highlight a maturing industry with higher barriers to entry for new graduates or an increasing gap between higher education and industry.

Recommendations

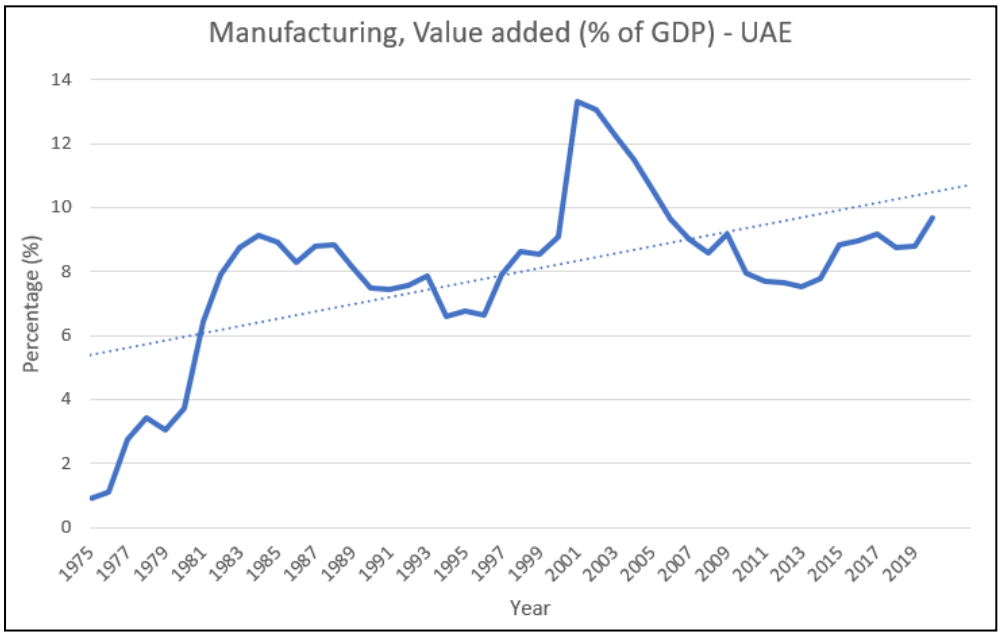
Some potential policy recommendations are encouraging more young graduates to pursue high-tech courses and more work placements for younger graduates for experience. This could be implemented by extending grants for companies to train newer workers or building in work experiences as part of university coursework experience. To this idea, the IIA has already proposed programs to encourage training in high-tech programs, such as the High-Tech human capital fund. One final policy recommendation is to use government public initiatives that require high tech as a pathway for new graduates to develop skills for the high-tech industry.

UAE

The United Arab Emirates (UAE) is part of the Gulf Cooperation Council, and its economic history is based on oil and diversification. Oil exports currently account for approximately 30% of GDP, a considerable decrease from around 70% because of diversification initiatives since the 1980s, which aimed to decrease dependence on finite and unpredictable oil revenues. The Harvard Economic Complexity Index indicates that economies with diversified, complex and technology-intensive products have higher growth rates; however, oil-rich nations face the "resource trap" (Fernando, 2020). Fernando's theory of the 'resource trap' suggests that an economy (capital and labour force) that becomes concentrated in a few sectors that are resource dependent may harm growth as a high-quality export mix is better for economic growth (Abdalla Alfaki and El Anshasy, 2022).

The UAE has developed a federal initiative to boost all manufacturing by 30% and increase GDP by $6.8 Billion by 2031 by increasing manufacturing capabilities by partnering with global technology companies (United Arab Emirates Smart Manufacturing Initiative: International Trade Administration, 2022). The initiative is motivated by the drive to diversify from oil production and revitalise a stagnant manufacturing industry that contributes 8% to GDP and has only seen a 1% change in the last ten years after falling from 12% in the early 2000s (figure 8). The pivot to increase focus on manufacturing, like many other nations, was the impact of the pandemic, causing a 'wake-up call' to boost growth in this sector (Omar, 2022).

Figure 8 – Manufacturing – Value Added UAE (Source: World Bank Data)



However, the manufacturing sector relies heavily on oil-intensive industries (aluminium, petrochemicals, Gold and other metals) and low-skilled labour (Jensen 2018, p.79; Harvard Atlas, 2022). Moreover, Jensen (2018, pp.77-79) the non-oil sector relies heavily on the public sector to obtain investment because finance is concentrated in the labour-intensive real estate and construction industry, thus neglecting other SMEs. Furthermore, Jensen (2018, pp.77-79) also notes that the UAE's economic performance is procyclical with the price of oil – when prices are high, government expenditure is high, and vice versa when the price is low. However, the UAE has been successful in leveraging tourism to unlink oil-based economic development. The insights provided by Jensen can be summarised into a few key issues: (i) financing is mainly directed towards construction and real estate, which may reduce capital accessibility to SMEs (ii) Low skilled labour (lack of human capital) is a barrier to the creation of new industries (iii) Uncertainty around future oil-based revenues. Therefore, the UAE should consider these issues when implementing industrial policy to improve manufacturing and diversification.

Current Government Policy

The UAE government's policy is 'operation 300 billion'. The strategy is designed to diversify the nation's economy from oil by increasing the manufacturing sector's contribution to GDP from AED133 billion (USD 36.2 billion) to AED 300billion (USD 81.6 billion) by 2031 (Siddiqui, 2022). The five main goals of the plan are to (Operation 300bn, the UAE's industrial strategy, 2022):

1. Develop the UAE's industrial sector and create a business environment for local and international investors by offering financial services to support new and upcoming businesses
2. Increase its in-country value (ICV) by adopting technologies in the industrial supply chain that supports the growth of manufacturers and improves export competitiveness
3. Establish the UAE as a global hub for future industries and innovation
4. Build the reputation of the UAE's industrial products through the promotion of exports to global markets

There are 17 initiatives following these objectives, which can be summarised broadly into four main categories:

1. Creating a roadmap to develop an innovative R&D environment by adopting and developing advanced technologies that can attract a global audience
2. Promoting the 'Made in Emirates' brand for national products
3. Developing new mutually beneficial trade agreements, modernising industry law and industry regulation
4. Reducing energy costs through subsidies and improving the UAE's digital capabilities

These initiatives are designed to help vital sectors of the UAE's economy, such as advanced manufacturing, become industries of the future. The strategy aims to improve the manufacturing subsectors such as petrochemicals, rubber and plastics, machinery, and equipment by using the Emigrated Development Bank's $30 billion fund over five years to finance advanced manufacturing and other key sectors (Operation 300bn, the UAE's industrial strategy, 2022). The policy's objective is to finance 13,500 SMEs and create 25,000 jobs in alignment with the national strategy and the UAE's commitments to global climate actions (Operation 300bn, the UAE's industrial strategy, 2022; Ismail and Abdul Kader, 2022).

Recommendations

Some potential policy recommendations are:

(i) Improving the education of workers by providing pathways to attain skills for advanced manufacturing

(ii) Partnering with international firms to onshore R&D or manufacturing facilities to boost the advanced manufacturing sector

(iii) Encouraging private investment in non-oil advanced manufacturing through tax incentives and grants and avoid investing in oil adjacent industries to further promote diversification and economic resilience.

Conclusion

To summarise, the covid-19 pandemic reiterated to these economies the importance of a robust domestic manufacturing sector and reinvigorated government strategies to foster innovation to improve the sector. The UAE and Australian economies have primary export dominate industries, whereas the software and high-tech industries dominate Israel. Advanced manufacturing in Australia is looking to emerge from the closure of the car manufacturing industries, and Israel is looking to reach new heights and areas in its high-tech industries. The UAE is pursuing diversification away from adjacent oil industries and becoming a global centre for technology innovation. After assessing the industry and current policy of all three nations, there are a few potential areas for collaboration between the three nations:

1. Learning how to develop effective innovation centres to promote domestic innovation
2. Creating joint ventures companies in areas where the manufacturing strategies align (a trade that improves each nation's value chain target for advanced manufacturing)
3. Creating a venture capital ecosystem that promotes investment in each nation's manufacturing sectors

In conclusion, advanced manufacturing presents many positive economic benefits for each nation, and where there are areas for collaboration, it can generate lasting positive economic benefits.

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Appendix

Figure 1 – Lack of Access to knowledge/technology as a barrier to technology adoption (Source: AMGC)

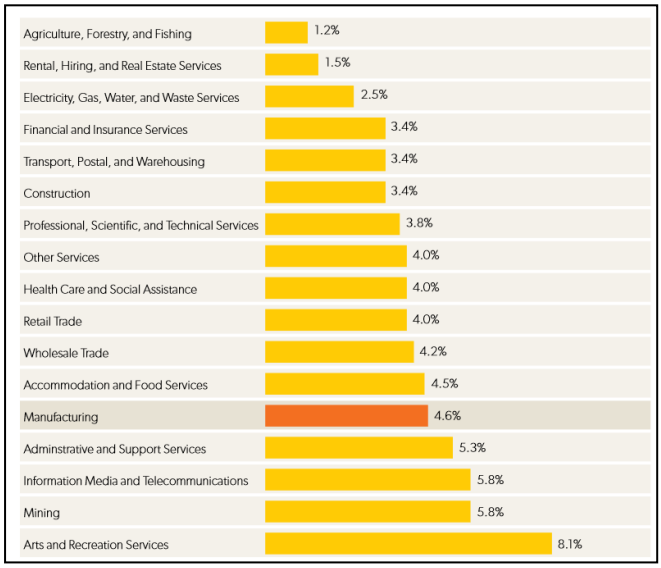

Figure 2 – Labour recruitment (Source: AMGC)

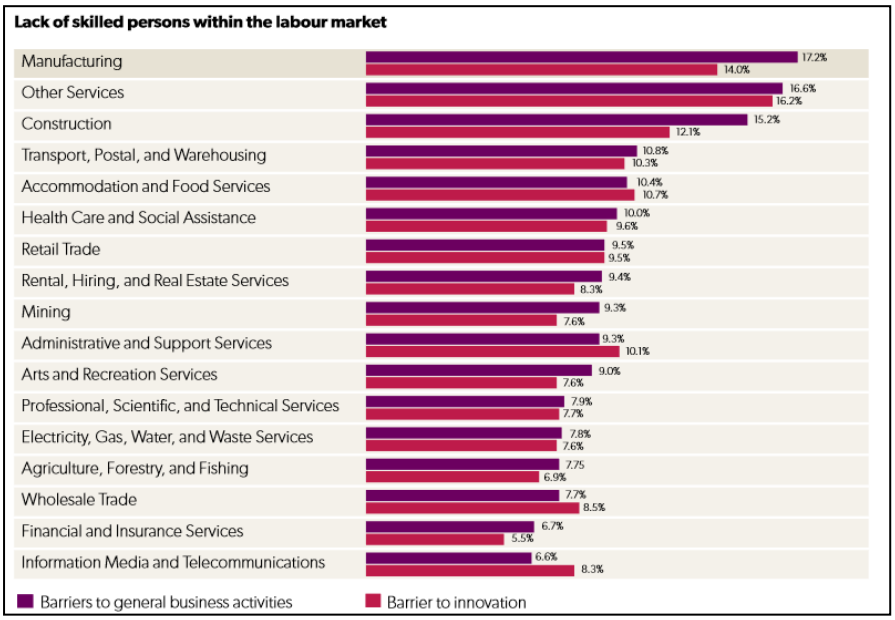

Figure 3 – Medium and high-tech exports (% of manufactured exports) (Source: World Bank Data)

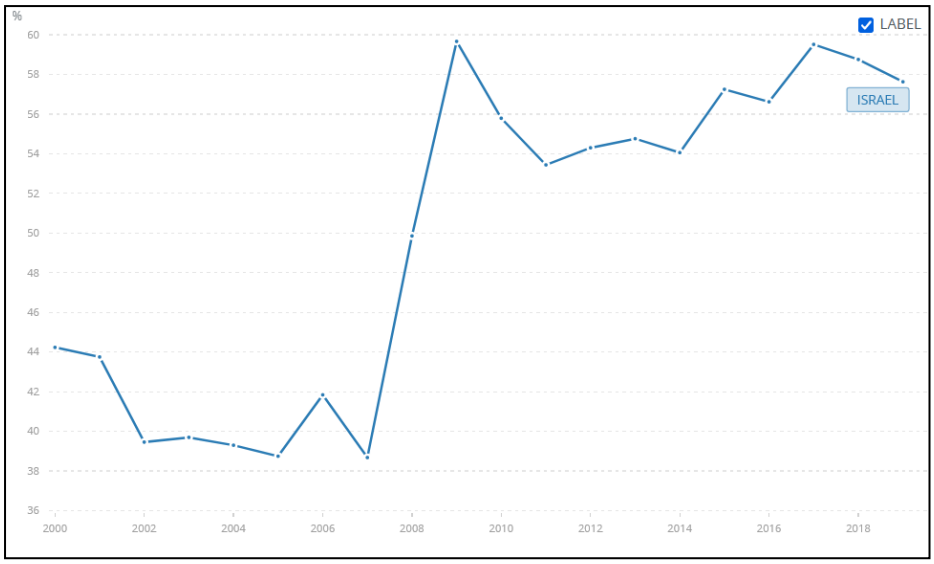

Figure 4 – (Source: Israel Innovation Authority)