

Industrial policy-making after COVID-19: Manufacturing, innovation and sustainability

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Abstract

This article critically analyses the opportunities for Australia to revitalise its strategically important manufacturing sector in the wake of the COVID-19 pandemic. It considers Australia's industry policy options on the basis of both advances in the theory of industrial policy and recent policy proposals in the Australian context. It draws on recent work from The Australia Institute's Centre for Future Work examining the prospects for Australian manufacturing renewal in a post-COVID-19 economy, together with other recent work in political economy, economic geography and labour process theory critically evaluating the Fourth Industrial Revolution (i4.0) and its implications for the Australian economy. The aim of the article is to contribute to and further develop the debate about the future of government intervention in manufacturing and industry policy in Australia. Crucially, the argument links the future development of Australian manufacturing with a focus on renewable energy.

JEL Codes: L50; L52; L78; O10; O13; O25; O44; P18; Q42

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COVID-19, government, industrial policy, Industry 4.0, innovation, manufacturing, renewable energy

Introduction

As Treasurer, Paul Keating lamented that *'in the 1970s . . . [Australia] became a third world economy selling raw materials and food and we let the sophisticated industrial side fall apart'*. If the country did not deal with these fundamental problems, Keating warned, it was destined to become a 'banana republic' (Mizen, 2020). Nevertheless, since the 1990s – and in particular since the Coalition government came to power in 2013 – the 'default' economic and industry policy setting of government has favoured resource extraction as our national strength. Despite deepening climate, pandemic and economic crises that demand alternative meaningful responses, current policy continues to reflect a deliberate, calculated emphasis on the extraction and export of raw resources. This is evidenced at present by the Coalition government's enthusiasm for a 'gas-fired recovery' from the economic recession caused by the COVID-19 pandemic: a strategy that makes little sense on economic and employment grounds, never mind its damaging ecological implications (Swann, 2020).

In contrast with resource extraction, manufacturing is a knowledge- and technology-intensive activity that is central to the process of economic development. Its activities form the foundations of more economically complex and competitive economies – a fact evidenced throughout modern history (see Kaldor, 1967; McCausland and Theodossiou, 2012; Porter, 1990; Wang, 2009). Today, however, manufacturing differs significantly from traditional conceptualisations of the sector. In the past, secondary manufacturing development was typically accompanied by the emergence of a range of tertiary industries that provide a gamut of complementary services. However, today those services are often part-and-parcel of manufacturing firm operations themselves, with companies packaging manufactured products with ancillary offerings – through an extensive 'servitisation' of manufacturing production. At the same time, manufacturers have been demonstrating a contradictory tendency to outsource various supply and service functions (that would previously have been performed within the firm) to independent suppliers and contractors, resulting in a more complex and geographically dispersed supply chain.

Australia's economy has for decades benefited from the foundation of a high-value, advanced manufacturing sector established in the post-war years; it has played a primary role in driving the nation's high standards of living. Presently, we are on the cusp of a so-called 'fourth industrial revolution', driven by digital technology and the so-called 'internet of things'. In light of its implications for the future of work – and keeping in mind continuing domestic and global economic instability, and the existential threat of climate change – the pivotal role of manufacturing in meeting these challenges is front-and-centre in the minds of policy-makers once again. The Centre for Future Work at the Australia Institute has analysed the unbalanced sectoral composition of the Australian economy, the future of work and the relationship between the revitalisation of

manufacturing and the expansion of renewable energy (see, for example, Nahum, 2020; Stanford, 2020a, 2020b). According to Stanford (2020a), manufacturing is not just another sector; rather, it carries strategic importance:

- Manufacturing is the most innovation-intensive sector in the economy.
- Manufacturing anchors hundreds of thousands of other jobs throughout the economy, via its long and complex supply chains.
- Manufacturing offers relatively high-quality jobs, more likely to provide full-time hours and above-average incomes.
- Manufactured goods account for a majority of international trade, and hence an undersized manufacturing sector contributes to trade deficits and balance of payments problems.

Given this unique strategic importance – all the more important as the global energy system shifts to renewable sources – what are the opportunities for a revitalisation of Australia’s manufacturing sector after COVID-19? This article considers this question, on the basis of both advances in the theory of industrial policy and recent policy proposals in the Australian context. It draws on recent work from the Centre for Future Work examining the prospects for Australian manufacturing renewal in a post-COVID-19 economy. It integrates complementary analysis developed by Rainnie (2021) and Rainnie and Dean (2019, 2021), critically evaluating the Fourth Industrial Revolution (i4.0) and its implications for the Australian economy (in general, and for manufacturing in particular). The aim of the article is to contribute to, and further develop, the debate about the future of government intervention in manufacturing and industry policy in Australia, in hopes of developing a more cohesive framework for active industry policy responses. Crucially, the argument links the future development of Australian manufacturing with a focus on renewable energy.

The article is organised as follows. The first major section documents the re-emergence of industrial policy as a central theme of economic policy, on both the national and international stage. We show how this rejuvenation has expanded the scope of industrial policy well beyond traditional frontiers, to confront problems driven by both COVID-19 and the ongoing ecological crisis. These problems are now widely acknowledged as being interconnected. We have an opportunity (and indeed a necessity) to develop and enact policy to deal with these interlinked challenges and crises. Recent developments in the theory of industrial policy and related fields (including new theories of the ‘Foundational Economy’, the ‘Entrepreneurial State’ and the ‘Environmental State’) provide an analytical framework that is helpful in understanding recent Australian experience – and informing appropriate and promising policy responses to it.

The next section then reviews recent research on the need for a modern, sustainable approach to industrial policy in the Australian context. We outline a policy strategy that would apply these recent theoretical insights to the Australian industrial context, in hopes of sparking a well-rounded revitalisation of domestic manufacturing attuned to the constraints of sustainability and globalisation. As Stanford (2020a) argues, an ambitious and modern industrial policy is needed to ensure that Australian manufacturing gets a ‘fair share’ of the work and opportunity arising from Australia’s continuing consumption of

manufactured products. In highlighting the unusually small size of the Australian manufacturing sector, this work stresses several factors that have been particularly important in undermining Australia's recent manufacturing performance:

- The passive approach of national governments to industry policy priorities since the mid-1980s, and corresponding reliance on extraction and export of unprocessed natural resources as the main driver of economic development.
- The nature and unbalanced effects of international trade agreements.
- Failures in Australia's vocational education and training (VET) system.
- The revolution in the economics of renewable energy that have altered traditional cost models and opened new opportunities for Australian value-added manufacturing.

We explore the decline of manufacturing in Australia over the last generation and identify the core principles and policy levers that would facilitate a revitalisation of domestic manufacturing capability. Prospects for this revitalisation are discussed within the context of recent, rather half-hearted attempts by Australian governments and industry to spark a manufacturing recovery – attempts that arguably lack any critical consideration of the structural factors inhibiting a full-scale transformation, in the clear absence of consistent and systematic policy settings. Finally, the article concludes by analysing both the possibilities and the challenges of developing a new industrial policy, informed by modern understandings of technology, sustainability and social cohesion. While a modern, sustainable industry policy is not a one-dimensional solution to all of these challenges, it holds great potential to contribute to a redirection of Australia's recently unbalanced, extractivist trajectory.

The resurgence of industry policy in times of crisis

Discussing the British experience of COVID-19, Larry Elliott (2020), economics editor of *The Guardian*, has suggested that the crisis provides an opportunity to stop and reverse two centuries of economic and social decline. In Australia, the same could be said: it presents an opportunity to stop and reverse decades of deindustrialisation and uneven development, and the general erosion of Australia's manufacturing capabilities. Despite this opportunity, the danger – according to Elliott – is that policy will return to a 'business as usual' course: superficially acknowledging the need for fundamental change, while in reality carrying on much as before. This sounds eerily like the Australian Coalition government's response to COVID-19. Initially that response featured huge government expenditures and dramatic policy and regulatory interventions, but it quickly degenerated into the usual mix of income tax cuts, business subsidies and further (employer-friendly) 'reform' of industrial relations. For example, in the wake of rising tensions with China and widespread calls to make Australia more self-sufficient in essential medical equipment and supplies, Industry Minister Karen Andrews argued the government must be 'strategic' in promoting the development of national manufacturing, but in her view that effort should focus narrowly on the food and beverage and resources sectors because of Australia's assumed competitive strengths in those industries (Wiggins,

2020). This confirms the refusal of the current government to truly think beyond the primary-sector emphasis which has shaped Australian economic policy for the last generation. It also reveals the current government's failure to critically consider the supply chain vulnerabilities that were quickly exposed by the pandemic. Although Minister Andrews' comments acknowledge that the government recognises significant gaps in Australia's manufacturing supply chain, it also reveals that the government, by focusing on primary-linked sectors and refusing to broaden its traditional toolkit (consisting mostly of deregulation, trade liberalisation and tax preferences), is not considering the kind of ambitious and strategic interventions that would be required to truly address and reverse the recent trajectory of resource-dependence and deindustrialisation.

In contrast to this business-as-usual approach, a Leaders editorial (in *The Economist*, 2020) acknowledges that the COVID-19 and climate crises are connected:

Following the pandemic is like watching the climate crisis with your finger jammed on the fast forward button. Neither the virus nor the greenhouse gases care much for borders, making both scourges global. Both put the poor and vulnerable at greater risk than wealthy elites and demand action on a scale hardly ever seen in peacetime . . . The two crises do not just resemble each other. They interact. Shutting down swathes of the economy has led to huge cuts in greenhouse-gas emissions.

Furthermore, as Leaders went on to argue, the pandemic has revealed the size of the challenge ahead, creating what it described as a 'unique chance' to enact government policies that 'steer the economy away from carbon at a lower financial, social and political cost than might otherwise have been the case'. Consistent with a broad recognition of the interrelated nature of these social, environmental and economic crises, a growing range of researchers and organisations agree that post-COVID-19 conditions allow for, and demand, a more ambitious and interventionist policy approach: building on the connections between the future of work, industrial structure and the environment (see, for example, ACTU, 2020; WWF, 2020).

Writing just prior to the onset of the pandemic, Aiginger and Rodrik (2020) argued that despite previous predictions of the death of activist industrial policy, it is actually making a global comeback. On an international scale, several factors are driving this resurgence. First, in developing economies there has been pushback against market fundamentalism, given the harsh economic and human consequences of neoliberal policies. In advanced economies, labour market malaise and the lingering effects of the global financial crisis (GFC) had a similar effect: sparking more openness to alternative, interventionist policy frameworks. The continuing decline in the employment shares of manufacturing in the USA and Western Europe and the increasing competitive threat of China have reinforced this tendency, for geostrategic and economic reasons. Finally, interest in industrial policy has been further stimulated by disruptive technological change – from automation to digitisation, Industry 4.0 and the 'Internet of things'.

However, the shape of industrial policy must change in response to these new motives and conditions. First, industrial policy can no longer be limited to manufacturing per se. Policy must nurture and develop strategic economic activities more broadly, including other sectors (such as innovation-intensive services) with similar desirable features to

manufacturing (namely, their innovation intensity, export orientation, complex supply chains, and potential to lead productivity and income growth). Second, policy must rely less on top-down incentives and seek to establish sustained collaboration between business, the public sector and other stakeholders (including organised labour) around issues of innovation, investment, productivity and social well-being. Third, industrial policy can no longer be isolated, developed on its own and competing with other policy streams (like competition, regional or growth policy). Instead, it should be seen as one element of a multi-dimensional effort to foster high-quality, sustainable economic and social development. Finally, targeting structural change and productivity growth can no longer guide policy without consideration of the *direction* of technological change. Steering technological change so that it is friendlier to the environment and labour must be a key element of new industrial policies (Aiginger and Rodrik, 2020: 192–193).

According to Aiginger and Rodrik (2020: 201–202), industrial policy should therefore incorporate several key understandings, which include, inter alia:

1. Manufacturing remains crucial for growth and well-being.
2. Industrial policy has to be systemic, not isolated or delegated to specialists.
3. The optimal scale of the industrial sector depends on capabilities, ambitions and preferences.
4. Industrial policy has to take a ‘high road’ that allows structural change within manufacturing.
5. Industrial policy should aim to redirect technical progress and prepare for less expansive growth.
6. Societal goals should be paramount, moving beyond a limited focus on correcting ‘market failures’.
7. Industrial policy is a search process, open to new solutions, experiments and learning.

In tracing the development of industrial policy in an Australian context, Roy Green (2020) comes to similar conclusions. Green writes in the middle of the pandemic, looking both backwards and forwards in history. He places the Australian experience into a general context marked by a structural deterioration in Australia’s productivity performance, which was temporarily masked by terms of trade effects associated with the resources boom:

This productivity slowdown, which afflicts a number of advanced economies, has been accompanied by wage stagnation, increasing social inequality and the ‘financialisation’ of large corporations as they preference share buy backs and executive bonuses over investment in innovation and research.

Drawing on the idea of a ‘resource curse’ (wherein a country’s competitive advantage in primary industry funnels the economy towards extraction, rather than a more diversified value-added economy), Green argues that Australia sustained (for a while) a developed-world lifestyle on the basis of a developing-world industrial structure. This is consistent with Australia’s very low rankings in international indices of complexity and

innovation (see Rainnie and Dean, 2020, 2021). Australia does benefit from the presence of manufacturers with a global presence, but they tend to be relatively small players selling into specialised markets. Building on ideas he helped develop earlier in a report for the previous Rudd-Gillard government, *Smart Manufacturing for a Smart Australia* (Prime Minister's Manufacturing Taskforce, 2012), Green outlines a framework for a national industrial strategy adapted to the specific conditions of the Australian economy. Echoing Aiginger and Rodrik (2020), Green argues that contemporary industrial policy requires a systematic approach that coordinates innovation, regional policy and trade policy, with manufacturing at its core, while also targeting upstream and downstream industries, sectoral change, clusters and networks. It should be steered by societal goals that support sustainability and responsible globalisation. Green proposes five building blocks for success:

1. *Industrial strategy commission*: develop national priorities in consultation with industry sectors, aimed at growing industries of the future with new technologies, skills and business models.
2. *Industry–research collaboration*: address a long-standing, widely acknowledged need to deepen collaboration between industry and research organisations, including around the Commonwealth CSIRO designated ‘national missions’.
3. *Start-ups and precincts*: acknowledge the contribution of entrepreneurial start-ups to economic renewal, including the integration of the digital and physical dimensions of manufacturing (an essential feature of Industry 4.0).
4. *Public procurement*: too often local tenders are overlooked in favour of large international companies selected on a narrow ‘value for money’ basis, when these large companies themselves might owe their own existence to another country’s more imaginative procurement policy.
5. *Skills and education*: it is widely recognised that industrial transformation in Australia will depend ultimately on the adequacy of the workforce and management skills, a key element of ‘non-R&D’ innovation.

Green concludes that

the challenge of the present crisis is to devise a growth path which doesn't simply replicate what came before but addresses broader issues of climate change and social inequality in conjunction with the imperative of technological change and innovation. To succeed in this challenge means creating a more dynamic, sustainable and inclusive, knowledge-based economy, with a major role for advanced manufacturing.

These approaches echo Mariana Mazzucato's (2018) notion of the ‘entrepreneurial state’. More recently, Mazzucato et al. (2020) argue for a mission-oriented approach to creating and shaping markets and building advanced domestic capabilities to supply these markets. Faced with ‘grand societal challenges’ such as the ecological crisis, policy-makers have the opportunity to determine the direction of growth by making strategic investments across many sectors and nurturing new industrial landscapes which the private sector can further develop. The ‘ROAR’ framework that Mazzucato et al. propose

involves strategic thinking about the desired direction of travel (*Routes*), the structure and capacity of public sector *Organisations*, the way in which policy is *Assessed* and the incentive structure facing both the public and private sectors (*Risks and Rewards*). Mazzucato et al. (2020) conclude,

We argue that theoretical and practical approaches to policy evaluation should be considerably enriched and diversified in order to create the capacities needed to deliver challenge-driven policies. Governments should embrace new tools and techniques from service design research that focus on user experience and co-creating practices, and from evolutionary economics and related disciplines that focus on shifting and shaping technology and innovation frontiers, and managing complex systems in contexts of uncertainty. (p. 434)

This could be interpreted as a call to move beyond the entrepreneurial state towards what has been recently described as the ‘environmental state’. Hausknot and Hammond (2020: 2) suggest this can be understood as a logical next step in the evolution of the state, extending the functional logic of the welfare state from the mitigation of social externalities to the mitigation of environmental externalities. However, most commentators suggest that current conceptions of the environmental state go far beyond the discussion of enhanced industrial policy so far discussed (see Eckersley, 2020). In approaches to innovation that are more expansive than traditional new, but less expansive than theories of the environmental state, lie theories which consider socio-ecological understandings of innovation (see Coenen and Morgan, 2020). There are five elements crucial to this concept of innovation:

1. Attention is paid to innovating agents both within and beyond the firm.
2. Innovation is not limited to achieving competitive advantage, but aims to respond to social needs, often informed by ideological norms and values.
3. The process of innovation moves beyond exploration and exploitation of knowledge to recognise innovation as an act of deliberative collective problem-solving.
4. Innovation involves interactive learning, dependent on cooperative and inclusive relationships among individuals.
5. The model emphasises the interactions between institutional entrepreneurship and technological change, and is mindful of politics, conflicts and contestation. (Coenen and Morgan, 2020: 5)

There are similarities between this socio-ecological understanding of innovation and the idea of the ‘Foundational Economy’ (see Foundational Economy Collective, 2018). The foundational economy approach shifts focus beyond the fashionable high-tech sectors of the knowledge economy, to consider the seemingly more ‘mundane’ sectors that keep us safe, sound and civilised – such as health care, education, elder care, social housing, agri-food and energy. The theory of the foundational economy rests on two key ideas:

1. The well-being of communities depends less on individual consumption and more on social or collective consumption of essential goods and services.

2. It follows that a core priority for public policy should be to secure the supply of basic services for all citizens, not just targeting a quantum of economic growth and jobs.

In contrast to the zero-sum, beggar-thy-neighbour mindset that infuses most industrial and innovation policy, the foundational economy approach imagines a positive-sum process – since all countries, regions and cities have a significant stock of employment in these foundational sectors. Hence expanding and strengthening the foundational economy can generate mutual gains that are shared across communities and regions. Furthermore, all foundational sectors are technology-intensive, and therefore the perspective cannot be dismissed as Luddism or antithetical to technology (see Coenen and Morgan, 2020; Heslop et al., 2019). However, a drawback of the foundational economy approach is its apparent suggestion that each region has an inherent comparative advantage in at least some specific foundational industries, that could serve as a replacement for advanced manufacturing industry policy targeting. In essence, it dismisses the strategic imperative of countries' regions to move up value chains (something that is unlikely to occur in the absence of active industrial policy), as the alternative to merely subsisting on whatever supply chain activities are naturally present. Key literature in economic geography contests this notion. Rejecting the conventional lens of comparative advantage, Cooke and Leydesdorff (2006) have argued that regional development can be based on 'constructing' advantage from knowledge embedded in traditional local industries; this differs from the foundational economy approach. Capello and Lenzi (2018) further contend that because regional industrial transformation is path-dependent, a region's traditional industrial base becomes an opportunity for learning that leads to diversification within their scope of industrial strengths and, in turn, connects more deeply and uniquely to global value chains.

We will now consider applications of these recent advances in theorising industry policy and sector development to the reality of manufacturing and industry policy in Australia after the COVID-19 pandemic.

The state of Australian manufacturing – And how we got here

Over the last quarter century, the structure of the Australian economy shifted dramatically, with a trend towards increasing reliance on natural resource extraction and export replacing manufactured goods as the primary form of our participation in global trade. From constituting well under half of Australian merchandise exports in the 1980s and 1990s, primary products (including agriculture, unprocessed food and basic resources) grew dramatically after the turn of the century (see Figure 1), reaching three-quarters of total exports by 2019.

The erosion of value-added manufactured exports coincided with a decline in real output from Australia's manufacturing sector, which peaked in 2008 and has since fallen by about 15%. Manufacturing employment also declined, with the sector losing about 200,000 jobs since the turn of the century. As a share of total employment, manufacturing fell from 17% in the early 1980s, to just 7% by 2019. In the early 1980s,

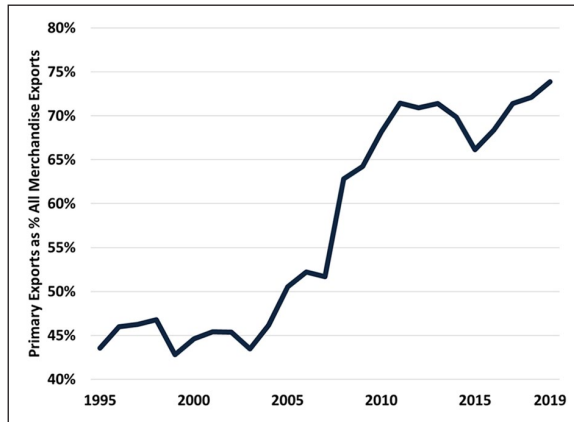


Figure 1. Primary product share of Australian resource exports.

Source: Stanford (2020a).

manufacturing was the largest single sector (measured by employment, at the two-digit level). By 2019, it had faded to seventh. Services industries, of course, became more important in total employment – a trend shared with other countries and driven by various factors including relatively slower productivity growth in service sectors and a high-income elasticity of demand for services among consumers. While other industrial countries have also seen a *relative* erosion in the importance of manufacturing, Australia's experience is quite unique: a sustained *absolute* decline in real output and employment, an extreme deindustrialisation of national exports and the corresponding emergence of enormous trade deficits in manufactured goods. The Australian Manufacturing Forum (Roberts, 2019: 2) painted a gloomy picture of Australia's deindustrialisation, arguing (reminiscent of Keating) that Australia now exhibited the economic diversity and export profile of a typical developing nation:

Our antipathy to value-adding activities such as manufacturing in favour of industries that require little more than digging it up and shipping it out, has left us dangerously dependent on quarrying.

The erosion of Australia's manufacturing capability has been paralleled by lagging performance in innovation and advanced technology adoption in other areas of the economy, as well. In a report documenting the decelerating pace of innovation and automation in Australia, Stanford (2020b) put forward eight 'exhibits' regarding the weak state of Australian technology:

1. Slowing business investment in innovation;
2. Slowing business investment in machinery and technology;
3. Slowing business capital investment in general;
4. Fading global ranking in R&D spending;
5. Very slow adoption of robots;

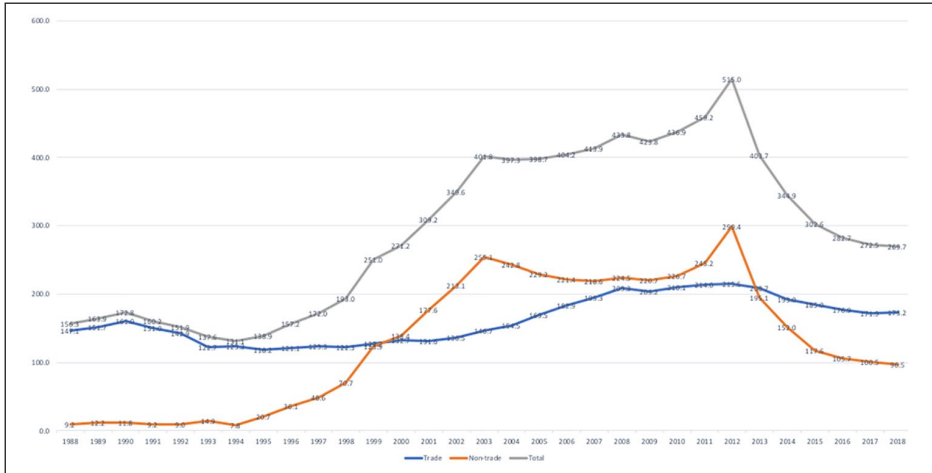


Figure 2. Apprentices and trainees in training (000s), 1988–2018.
Source: NCVET (2018).

6. A surprising decline in the aggregate capital-labour ratio;
7. Unprecedented weakness in productivity growth; and
8. A shift in employment-creation toward low-tech industries.

Despite the ‘hype’ surrounding Industry 4.0 (i4.0) transformations in Australia, as often promoted by Ai Group and other industry peak bodies, the reality is that the phenomenon is far from substantiated in Australia’s manufacturing sector. The federal Department of Industry, Science, Energy and Resources (DISER, 2020) claims i4.0 technologies hold the potential to provide a major boost to Australia’s economic competitiveness, creating an environment that would allow businesses to grow, explore new models and embrace digital technologies. But recent literature contextualising Australian government policy responses to i4.0-driven industrial transformation (see Dean and Spoehr, 2018; Trauth-Goik, 2021) has critiqued the comparative lack of government investment in the innovation processes necessary for structural change and the clear positioning of capital over labour in strategies to shape an employer-friendly digital industrial landscape. Overall, the Australian government approach to i4.0 is characteristic of the ‘business-as-usual’ neoliberalism, consistent with the approach of coalition governments since the 1980s. The tendency is to gradually diminish or fragment industry policy, provide minimal stimulus to private-sector innovation initiatives and rewrite industrial relations law in the interests of employers at the expense of trade unions. There have been limited exceptions to this trend during periods of Labor government.

Coupled with this has been the government’s dismantling of key pillars of Australia’s VET infrastructure. Scholars at the Mitchell Institute have calculated that between 2005–2006 and 2015–2016, federal government funding to higher education increased each year – but for VET it decreased each year from 2011 to 2012 (Pilcher and Torii, 2017). In terms of VET enrolments, the National Centre for Vocational Education Research

(NCVER) has shown that following steady growth in both trade and non-trade VET participation between 1988 and 2012, participation in both categories began declining rapidly after 2012 (see Figure 2).

Even prior to COVID-19, structural weaknesses were entrenched in the current VET system, with little policy consideration of the skills needs required for the elsewhere-celebrated arrival of i40 technologies and capabilities in Australia. To support any systematic digitalisation of Australian manufacturing, a highly skilled workforce comprising re-trained workers and a pipeline of apprentices and trainees with i4.0 skills is critical. But a downturn in apprenticeship commencements and completions at the beginning of the pandemic prompted the Mitchell Institute to forecast a drop in apprenticeship commencements – with an estimated decline of 45,000 in 2021 and 2022 compared with pre-COVID-19 levels (Hurley, 2020). The fiscal decisions of the Coalition government also reflect the long-standing undervaluing and fragmentation of VET, and the government's preference for entrenching private suppliers of VET services. After the pandemic, this will do little to help achieve the levels of coordination required to supply the skilled workers needed for advanced industrial occupations.

The conclusion of this pessimistic review is that the much-anticipated acceleration of automation and robotisation predicted by many observers is nowhere to be seen in Australia – and that the general failure of business innovation, technological adoption and investment in skills and training in Australia continues to undermine the long-run competitiveness, quality and prosperity of the national economy. In order to encourage technology adoption and nurture a stronger portfolio of innovative firms, high-tech industries and skilled workers, government must play a more active and ambitious role. This echoes the core conclusions of modern industrial policy theorists reviewed above. In addition to supporting investment in physical capital, innovation and skills through concrete fiscal measures, government will also need to create conducive economic and social conditions more broadly – including stronger public procurement targets and a strengthened VET sector (Stanford, 2020a: 34).

As the data and our analyses have shown, this need was already obvious pre-COVID-19. But the pandemic has clearly reinforced the importance of manufacturing self-sufficiency and less reliance on elongated, fragile global supply chains. In rebuilding the economy in an inevitably changed post-pandemic global configuration, Australia is especially fortunate to have access to abundant renewable energy resources. Once the immediate danger of coronavirus has passed, the world will need to accelerate climate-related industrial transitions; indeed, the shocks to fossil fuel markets and prices experienced during the pandemic confirm that carbon-based energy sources are approaching the end of their dominance. With the right policy settings in place, Australia's unmatched endowment of renewable resources will serve us well in fostering economic reconstruction after the pandemic (Nahum, 2020: 55).

Winning a fair share

The effort to revitalise domestic manufacturing cannot isolate Australia from international trade, in some fruitless, autarchic attempt to manufacture everything that Australians use. At the same time, there are clearly some products with national strategic

importance – like defence, energy and health products – where ensuring a well-rounded domestic manufacturing should indeed be a priority. But rather than an all-round ‘do-it-yourself’ mentality, the aim should be to build a manufacturing sector that is broadly proportionate to the size of the country’s purchases of manufactured goods. Exports would reflect the success of particular sub-sectors where Australian firms have notable advantages, while imports would reflect a lack of domestic presence or capability in certain sub-sectors. Then, across the entire portfolio of manufactured products, Australia should retain a level of manufacturing output and employment proportional to the scale of its national needs for manufactured products: a state which Stanford (2020a) defines as ‘self-sufficiency’. Another motive for increasing manufacturing self-sufficiency is the increasing fragility of global supply chains, particularly in strategically important sectors. This implies a parallel need to reduce Australia’s dependence on imports from China (among other locations).

The extent of Australia’s industrial decline over the past quarter-century is confirmed by analysis of data on this concept of self-sufficiency. In 2017–2018, Australia produced manufacturing value-added equivalent to only 68% of the total value of manufactured goods purchased in Australia. That was lower than any other Organisation for Economic Co-operation and Development (OECD) economy, confirming the uniquely stunted state of Australia’s manufacturing base after decades of policy neglect. So achieving this broad goal of aggregate manufacturing self-sufficiency would imply a very ambitious increase in the scale of domestic manufacturing: equivalent to an expansion of almost 50%. There is reasonable debate over whether such a quantum advance in the scale of domestic manufacturing is practicable – and in any event it would take many years to achieve such an expansion in domestic secondary production. On the contrary, the possibilities of new technology in re-localising production of many goods (see Rainnie, 2021), and greater public concern with national self-reliance in strategically important products, give more credence to the idea. And the traditional assumption that countries which specialise in primary production and exports are simply aligning their economy with a natural comparative advantage has been discredited by modern industrial policy theory showing that specialisation in sophisticated, high-value manufactured products is never ‘natural’ for any country: rather, the capability to produce and export such desirable products always reflects the impacts of active policy.

But while an industrial renaissance of this scale is obviously an ambitious and long-term goal, there are clear precedents for ways in which Australia could enhance its aggregate self-sufficiency. For example, Sweden’s strategy to develop its aircraft industry on the strength of public procurement is a noteworthy success. In its publicly funded development of the JAS 39 *Gripen* fighter aircraft, Sweden utilised advanced public procurement to nurture innovation and industrial spillovers into other high-tech and knowledge sectors (Eliasson, 2010). Not only did the primary contractor Saab serve the local industry partners as a ‘technical university’ for training highly skilled workers in processes of ‘innovative discovery’ to deliver the highest possible quality products, but the industry itself became self-sustaining and is today one of Sweden’s most advanced regional industrial export clusters (Eliasson, 2011).

We do not recommend that Australia pursue a similar public procurement strategy to build a home-grown aerospace industry – an industrial undertaking unlikely to yield any

competitive advantages or political support in the Australian context. However, major transformative opportunities exist in taking a similar ‘innovative discovery’ approach in other industries. An obvious example is renewable energy technologies, an industry where Australia holds relative competitive strengths. The connection of industrial strategy to sustainability goals is fundamental, given the important connections between renewable energy development and manufacturing. These connections include purchases of manufactured inputs in renewable energy developments and the use of cheap, abundant renewable energy to power expanded production in other manufacturing sectors.

Indeed, according to Nahum (2020), Australia’s abundance of renewable energy resources will offer a significant and growing competitive advantage for manufacturing in general. An expanded manufacturing sector could be powered by renewables; pursuing this course of action would be substantially cheaper than an energy system based on coal and gas. Accelerating the shift towards renewable energy would also support the needed shift in sectoral emphasis away from resource extraction towards value-added production. Australian manufacturers could save around one-quarter of their energy costs by switching their energy purchases entirely to renewables (Nahum, 2020: 4). That would support greater international competitiveness and more high-quality Australian manufacturing jobs.

A renewables-focused strategy for revitalising Australian manufacturing would focus on fostering more domestic production of manufactured goods with a direct connection to renewable energy, such as the following:

- Manufactured equipment used in renewable energy developments (including windmills, solar panels, batteries, advanced cables and transmission equipment, and more).
- Sustainable transportation equipment, including electric vehicles and rolling stock for public transit applications.
- Lithium-ion batteries and related products, leveraging off Australia’s abundant endowments of lithium.
- Green hydrogen, produced with renewable power.

Nahum (2020) concludes that Australia can attain both global manufacturing success and timely reductions in greenhouse gas emissions, but this will require active and consistent government action. Australia is particularly well positioned to achieve a rejuvenation of manufacturing industry based on renewable energy.

Principles for modern industry policy

According to Stanford (2020a: 67–71), a modern and effective industrial policy framework must be based on several core principles and policy levers:

Sector strategies: Government needs to identify manufacturing sub-sectors with the best chance for success and then coordinate interventions with other sector stakeholders for maximum impact on investment and growth.

Domestic content in public procurement: Australian governments are massive purchasers of manufactured goods and should use those purchases to lever domestic production, rather than making purchases based solely on lowest immediate cost.

Networks, eco-systems and clusters: Spillovers and knowledge-sharing among diverse sector participants are crucial to achieving a ‘critical mass’ in any high-tech industry.

Innovation: Better systems to link public innovation activity with commercial application, coupled with more effective support for industrial innovation.

Targeted fiscal support for investment: Fiscal incentives should be linked directly to new investment, rather than given to firms unconditionally (such as through company tax cuts). Examples of more effective, tied fiscal measures include accelerated depreciation and investment tax credits.

Industrial infrastructure: To help offset weakness in private investment, especially in the post-COVID-19 economy.

Mobilising capital: Public finance vehicles (e.g. national investment funds) can supplement access to capital and support manufacturing investment. This could include a larger role for industry super funds.

Leveraging energy: Superabundant renewable resources, with the potential to substantially cut energy costs, can be a powerful lever for attracting manufacturing investment.

Skills and training: Linking training programmes to future workforce needs in strategic sectors. Reconstructing the neglected and damaged VET system.

Trade that goes both ways: Trade arrangements must make access to Australian markets conditional on comparable purchase of Australian-made value-added products (not just raw resources).

Rebuilding Australia’s manufacturing capability to become commensurate with the scale of our domestic consumption of manufactures is an ambitious, long-term goal; it will require governments to mobilise all of those policy levers in an aligned, consistent strategy to foster more investment, innovation, production and export of value-added goods. The longest journey has to start with some initial steps, however, and to this end, Stanford (2020a: 72–74) proposes several initial, incremental measures to start the process of industrial revitalisation. In addition to concrete improvements in manufacturing activity and employment that would result from these initial measures, an even more important outcome would be to demonstrate the value and effectiveness of modern industrial policy interventions – debunking the neoliberal assertion that governments cannot ‘pick winners’ and should simply create favourable conditions for profit-seeking private ventures to pursue their own interests. Stanford thus proposes the following initial steps towards a larger, long-lasting reorientation of manufacturing industry policy:

1. Establish a network of *Advanced Manufacturing Sector Councils* to identify the most promising sub-sectors for industrial policy interventions; engage all

stakeholders; develop investment and innovation plans and oversee implementation of these plans.

2. Capitalise a new *Advanced Manufacturing Investment Fund* to make strategic investments in new projects identified and developed through the Sector Councils.
3. Establish a *Manufacturing VET Policy Board* to develop a more coherent and constructive framework for manufacturing skills and vocational training.
4. Implement an Australian-made *Medical Equipment Strategy* to identify specific medical equipment and supplies of strategic national importance, link Australian medical research to industrial opportunities and enhance domestic production capacity.
5. Establish a *Buy Australian Infrastructure Council*, supported by Infrastructure Australia, to compile catalogues of publicly funded projects; develop timetables for purchases of manufactured inputs; monitor and report on domestic procurement.
6. Implement accelerated depreciation provisions in the federal corporate income tax code to foster real investment spending by Australian-based manufacturing firms.

These steps are designed to quickly stimulate more investment, innovation, output and employment. Equally as important, their successful implementation would help to nurture a new sense of multi-partite commitment and cooperation, which in turn would facilitate further, more ambitious industry policy initiatives.

Conclusion

Early in this article, we cited Larry Elliott, economics editor of *The Guardian*, warning of the danger of post-COVID-19 policy prescriptions that ultimately amounted to little more than ‘business as usual’: discourse that superficially accepts the need for fundamental change, but in reality carries on much as before. A classic example of this syndrome was provided in Australia through the proposals of the Ai Group (Willox, 2020), the leading lobby group for Australian industrial firms. Chief Executive Innes Willox recycled well-worn criticism of government ‘picking winners’ and then advanced a familiar list of business-friendly demands, including small and medium-sized enterprise (SME) support, tax incentives and promotion of Industry Capability Networks. Unsurprisingly, Willox argues that industry policy should be modest and limited, not requiring governments to make ‘big calls on the future’. All that is needed is to build on existing policies and programmes, and let Australian companies develop and expand in whatever areas they excel. It could be argued that this is precisely the approach that got Australia into its current state. The Coalition government’s evolving policy framework, focused on tax cuts for high-income households and companies, subsidies for further fossil fuel use and further interventions to weaken industrial relations practices, reflects its attempt to use the pandemic as an opportunity to reinforce its previous commitment to a business-dominated economic strategy.

Not all governments, however, are wedded to such a business-centric approach. In many other countries, governments responded to the economic and social challenges of

the pandemic with plans to fundamentally redirect investment, innovation and industrial development in line with evolving social and environmental priorities. For example, the South Korean government is launching a vision of environmentally sustainable economic growth – the so-called K-New Deal (Sung-Young et al., 2020). The package consists of US\$135 billion in investment, shared between national and local governments and the private sector, with an emphasis on renewable energy, microgrids and green manufacturing. Similarly, the European Union recently approved a €1.8 trillion Recovery Plan with a focus on green technologies, accelerated conversion to renewable energy and a Just Transition Fund (European Commission, 2020). Canada's post-COVID-19 recovery plan features big investments in renewable energy and fossil fuel clean-up, the complete phase-out of coal-fired power by 2030, subsidies for electric vehicle manufacture and support for new Innovation Super-Clusters to foster value-added research and manufacturing (Governor General of Canada, 2020). The contrast between these ambitious and forward-thinking COVID-19 recovery plans, and the business-as-usual wish list of the AiGroup and the Coalition government, suggests that while industrial policy may indeed be back on the agenda, the choice among the range of possible strategies will be fiercely contested.

The vision of modern, sustainable industry policy mapped out by Stanford and Nahum moves beyond the limits of traditional industrial policy. As Stanford (2020a: 76) concluded,

For many reasons, the old recipes of resource extraction and business-led growth are clearly inadequate to the challenges of the present moment. We have described a goal – ensuring that Australia produces a 'fair share' of manufactured output, proportionate to our (growing) needs for manufactures – that would generate enormous benefits flowing to all parts, and all sectors of Australia's economy. And we have catalogued the rich range of policy tools and levers that are available to achieve that goal. What is needed now is policy-makers to pick up those tools and use them.

Furthermore, as Nahum (2020: 56) added, the growing importance of renewable energy adds a hopeful new dimension to policy strategies aimed at revitalising domestic manufacturing:

That Australia would not have already seized the positive potential of its renewable energy wealth to foster an industrial renaissance reflects a general lack of courage, imagination and proactivity on the part of policy makers, and this has caused a series of lost opportunities. However, it is not too late to overcome these failures and grasp the enormous potential of sustainable manufacturing. Australia has the natural resources and investment wealth to pivot to renewables and simultaneously reinforce the strategically important and socially beneficial manufacturing sector.

Of course, there are additional challenges and limitations that must be confronted as these visions of modern, sustainable industrial policy are further developed and mobilised. For example, as Stilwell (2020) warns, even 'green Keynesianism' still rests on 'productivist' assumptions. And Koch (2020) has argued that the growth imperative can be seen as a 'glass ceiling', acting as a structural limit to the state's capacity to engage in

societal and ecological transformation. Nevertheless, the obvious failure of the extractivist model of economic development in Australia, and the growing acceptance of the need for a vision that embraces rather than denies the need for sustainability and social inclusion, opens opportunities for advocating a more modern and exciting vision of industrial policy in Australia.

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