

SPECIAL REPORT

Defence projects and the economy

A S P I



Rob Bourke

August 2019

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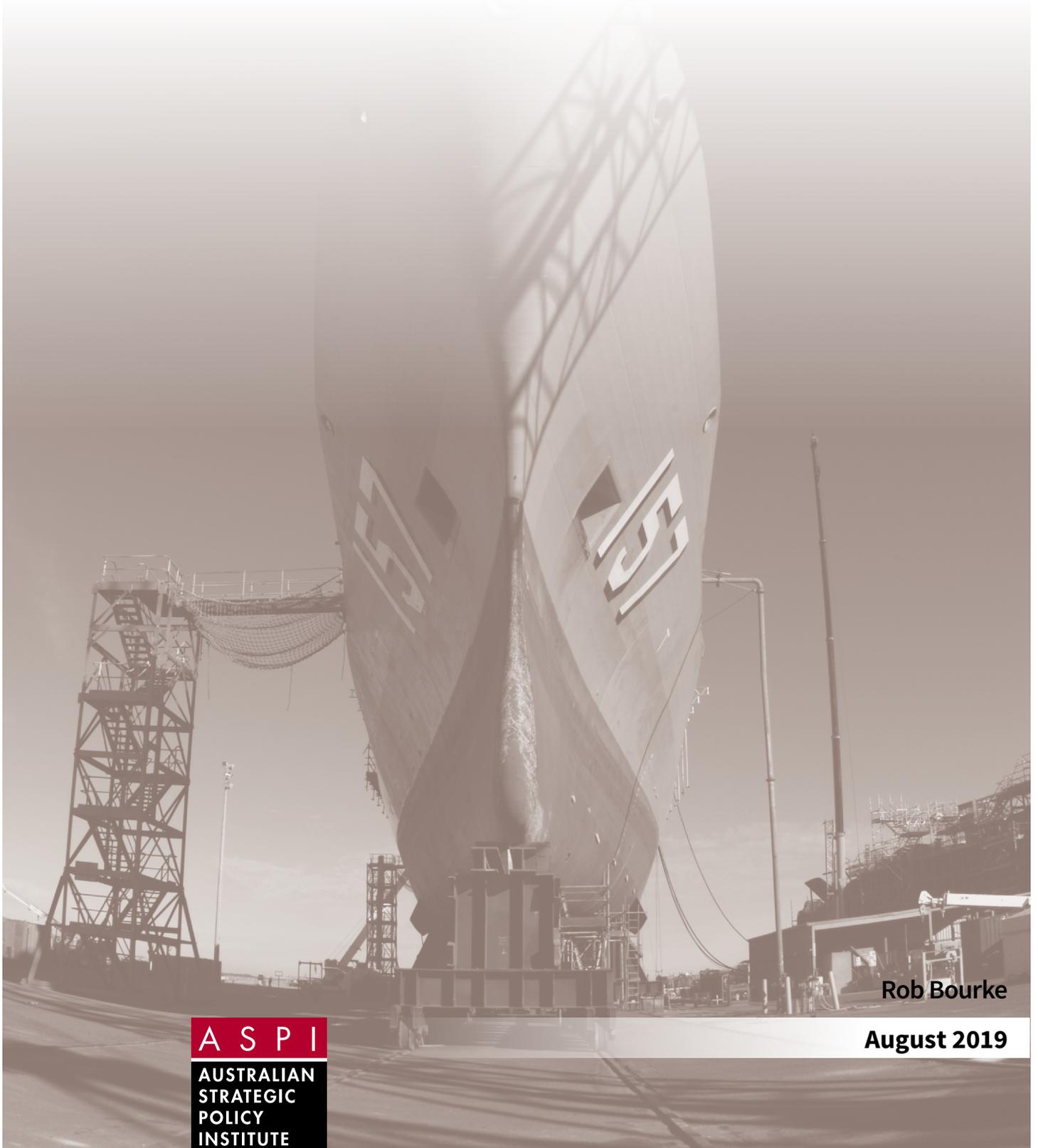
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Cover image: The bow of HMAS *Perth* towers over the dock yard. Photo: Australian Department of Defence, [online](#).

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INTRODUCTION

In response to Australia's increasing uncertain strategic outlook, pressure is mounting for annual expenditure by the Department of Defence ('Defence') to extend well beyond the current target of 2% of gross domestic product (GDP) for what's assumed to be a steadily growing economy. Although the need for a rise is not shared by all,¹ and why and where it should occur are keenly contested,² a substantial increase in funding for the department has drawn support from a wide range of defence pundits of otherwise different persuasions.³

If an increase does emerge, much of it appears earmarked for investment in Defence infrastructure—including the capacity to store fuel and sustain weapons platforms around the nation—for stockpiling equipment spare parts and sophisticated munitions available mostly from overseas, and for military training. However, accompanying the move may be calls for additional expenditure on building new capital equipment, including advanced weapons systems, and for a good deal of that expenditure to be directed to Australian-based companies under a recently formulated policy for defence industrial sovereignty.

With so many competing demands on the public purse, taxpayer support for any significantly expanded Defence budget may depend in part on whether the purchase of more equipment, preferably from Australia rather than from abroad, will help or hinder the national economy. The sums involved could move the issue of increased funding beyond the confines of Defence planning into the realm of broader public policy where economic impact has an important role to play. If the case for a budget increase for equipment built in Australia is supported by evidence of both military-strategic advantage and economic gain its passage could be smoother. If an economic loss is likely, the situation becomes more complex.

Pivotal to the economic impact of allocating an expanded budget to Australian-produced equipment are two factors. One is the size of any price premium that might apply for preferring domestic over foreign sourcing—a form of economic cost. The other is whether equipment acquisitions attracting significant price premiums pay for themselves by generating new knowledge that 'spills over' to help improve productivity in other projects and other industries—a form of economic benefit.

In the absence of a comprehensive economic profile of Australian defence industry and a clear indication of the capital equipment a potentially expanded Defence budget might secure, this paper uses publicly available data on major current acquisitions of naval vessels and military vehicles—all with sovereign status—to illustrate the generic issues involved. Those issues have been well summarised in several studies,⁴ most notably by Andrew Davies, Henry Ergas and Mark Thomson in April 2012 and by Defence in May 2015. But additional context, including an update for recent project and policy developments, can help to better appreciate what's involved.

The paper explores the factors affecting the future economic impact of these projects—including their prices, price premiums and spillovers—and whether these are consistent with improved outcomes from a national economic perspective. Beyond its scope is whether, if they were to emerge, higher prices and premiums are warranted for reasons of national security. The course of the projects examined may be set. However, given the projects' size and longevity, that course could influence what any expanded Defence budget can accommodate. The lessons in public

policy each project now provides may help to improve planning for equipment acquisitions of the future including those incorporating emerging technologies. Although vessels and vehicles might differ from things like drones and hypersonics, the economic principles governing the procurement of new and older equipment should be similar.

The paper cautions that the economic advantages of sourcing equipment domestically may be smaller than first impressions suggest. It also demonstrates the difficulty associated with gauging economic impact from publicly available data and the limited transparency that consequently surrounds some projects attracting substantial public funding.

A series of appendixes sets the scene. Appendix 1 compares government defence industry policies over the past decade, while Appendix 2 summarises public discussion on the outcomes of the current policy approach. Appendix 3 reviews recent official data on the defence industry's contribution to 'jobs and growth'.

ESTIMATING ECONOMIC IMPACT – THE BASICS

In recent years, economic contribution has typically been the first issue emphasised in official announcements on major Defence capital equipment acquisitions but the last issue subject to close public scrutiny—to the degree that such scrutiny has occurred at all. That’s despite ample evidence that major equipment sourcing decisions are now structured as much to achieve economic as other objectives:

...this [naval shipbuilding] program has now attracted an economic and political rationale quite separate from any strategic arguments that might be made for or against it. Recent governments have committed to building all these ships [air warfare destroyers, future frigates and elements of amphibious assault vessels], and a number of smaller ships and patrol boats, in Australia, and have presented the naval shipbuilding program as a key element – sometimes *the* key element - of plans to revitalise the Australian economy. The program has become critical to federal politics in South Australia, where both parties act as if unswerving commitment to South Australia’s right to build warships is necessary to avoid electoral disaster there. Poor strategy, bad economics and weak politics: it is hard to avoid a sense of deep dismay at this wasteful muddle.

—Dr Hugh White, *How to Defend Australia*, La Trobe University Press, Melbourne, July 2019, 307, [online](#).

Putting strategy, politics and even economic outcomes to one side, estimating the economic effects of Defence capital equipment projects can be technically complex. That, together with impact data often being difficult to locate and disentangle, helps to explain why the issue is visited infrequently by defence commentators despite its high public profile. However, the core concepts involved are reasonably straightforward.

Domestic benefits

The economic benefits of building equipment in Australia begin with domestically sourced materials finding their way into Australian-made systems, components and services that then support in-country assembly of the finished product. Economic activity is generated at each step along the way, supplemented by whatever spillovers are created. Employees of companies at all stages of the domestic supply chain, including final assembly, add further to economic activity by spending their income on consumer goods and services—until these effects diminish as the money involved is saved, taxed or spent on imports. Through all these avenues, a portion of the cost of the builds is recouped by government in the form of receipts generated from company, income, sales and other forms of taxation.

Domestic costs

From that, the economic and budgetary benefits of building vessels and vehicles in Australia will be greater if the levels of domestic content are high and spillovers are substantial. Nonetheless, those benefits need to be weighed against the economic costs involved which fall into two main categories: financial and resource.

Equipment builds must be paid for through higher taxes, reduced government expenditure elsewhere or increased government borrowing—all of which can detract from activity in areas of the economy they affect. And building the equipment can absorb land, labour and capital that's in short supply and that other areas of the economy might use to create economic benefits of their own. Those resources include a workforce that shares few of the characteristics of the long term unemployed.

Consequently, equipment projects undertaken in Australia and extending over a substantial period tend to deliver a net benefit only if they can generate themselves, or help to support in others, higher levels of productivity than most other areas of the economy.

Domestic v. overseas

Although the above range of benefits and costs are often applied to estimate the economic impacts of competing equipment projects undertaken in Australia, the focus is more often on the difference in impact between a given item of equipment built domestically and the same item built overseas.

Building equipment in Australia should offer a clear economic advantage over foreign sourcing, by enjoying significantly higher levels of domestic content and spillovers. But much of that advantage could be offset if the equipment can be produced abroad and the resources that would have been used had the builds been undertaken in Australia can be deployed elsewhere.

The advantage could also be offset if a significant price premium is paid for preferring domestic over foreign supply. In that case, Australia is paying more for a given defence capability than it could—and loses the opportunity to divert what might have been saved to bolster the economy by other means. For the purpose of measuring economic impact, a price premium represents a decline in productivity when an increase is the objective.

Price premiums may be subject to upward pressure if Defence seeks to increase the level of Australian content in projects by drawing on domestically produced inputs that aren't international competitive. However, that pressure might be offset by the additional spillovers higher content delivers and avoided if what's built in Australia for Defence can also be exported. Exports provide an opportunity to reduce prices for equipment destined for domestic use by helping Australian-based companies to exploit economies of scale.

In addition, relative to the same equipment built for Defence, what's exported could offer a higher economic benefit by being paid for by overseas customers. That might help to justify the initial payment of a premium to create the domestic production base from which foreign sales can evolve—provided those sales are achieved without the need for high levels of direct government assistance.⁵

What works and what doesn't

Bringing these points together, domestic builds tend to be economically advantageous if characterised by high Australian content, significant spillovers, a workforce drawn from the ranks of the long term unemployed, opportunities for unassisted exports and, where applicable, low price premiums. Here, an investment by Defence should deliver considerably more to the Australian economy than the nominal value of the investment itself, although not necessarily more than any alternative uses to which the funds for any premiums and the resources for domestic production might be put.

Conversely, domestic builds with low Australian content, limited spillovers, a workforce with alternative employment options, few unassisted export opportunities and, where applicable, high price premiums are often associated with poor economic outcomes. In that case, Australia may be paying a lot to protect a little and the economy might be better off if Defence preferred foreign over domestic sources of supply.

PRICES AND PREMIUMS

Prices

The latest prices for the vessel and vehicle projects noted in the introduction, published by ASPI and drawing on federal Budget data expressed in future or ‘out-turned’ prices,⁶ are as follows:

- \$35 billion plus for future frigates (SEA 5000- \$26 billion plus in today’s prices)
- \$79 billion plus for future submarines (SEA 1000- \$50 billion plus in today’s prices)
- \$3.7 billion for offshore patrol vessels (OPVs, SEA 1180- \$2.6 billion in today’s prices)
- \$5.8 billion for combat reconnaissance vehicles (LAND 400 Phase 2- \$5.1 billion in today’s prices) and
- \$10–15 billion for infantry fighting vehicles (LAND 400 Phase 3- \$8.4–12.6 billion in today’s prices).⁷

Premiums

Prepared by RAND at the pre-tender stage of projects using international benchmark data, the published price premium for the construction in Australia of major naval surface combatants—comprising the future frigates and replacements for the air warfare destroyers (AWDs)—consists of an initial premium of 30–40% measured against the United States (US). Associated benchmarking indicates improved industrial productivity—achieved in part through a shift from a batch to a continuous form of production—can halve that to 15–20% part way through an Australian future frigate build.⁸ With benchmark estimates available, supplementary data on premiums was not collected by Defence when the project subsequently entered its tender phase.

Derived from a Competitive Evaluation Process (CEP), the pre-tender price premium for the future submarines—estimated by Defence and published by the Australian National Audit Office (ANAO)—is 15%. That’s estimated on the basis of a more or less continuous or ‘rolling’ form of production and after other sources of productivity gain have been considered.⁹ The project is currently in its design phase, with production some years away.

There’s very little price premium data in the public arena covering the OPVs, despite production having commenced. The information that’s available points to an initial price differential favouring foreign over domestic supply of 30–40%—if the experience with the OPVs is similar to that of the future frigates and destroyers—and 50–100% if more specific, though still limited, international benchmarking data is used.¹⁰ Given that the OPVs are subject to a batch form of production, it seems unlikely that a productivity-adjusted price premium above the 15–20% applying to surface combatants can be avoided.

No price premium data is available publicly for the combat reconnaissance and infantry fighting vehicles. Neither project appears to have been exposed to benchmarking. And no tender data on price premiums has emerged publicly covering the acquisition of combat reconnaissance vehicles, despite the tender phase for LAND 400 Phase 2 having been completed some time ago. Tendering for the infantry fighting vehicles is currently in progress. Nevertheless, as explained in Appendix 5, the prospect of shorter production runs in Australia than overseas for these types of equipment, even if a continuous form of production eventuates, means that price premiums at least equal to those quoted publicly for larger naval vessels are difficult to discount.

AUSTRALIAN CONTENT AND SUBMARINE PREMIUMS

Neatly summarised by Ben Coleman in November 2017¹¹ and by Marcus Hellyer in May 2018,¹² two of the factors suggesting that the above prices and price premiums for vessels and vehicles are conservative are already well known—although still not resolved in the public arena.

The government's target delivery for future frigates, future destroyers and future submarines—of one vessel every two years—could exceed an economically optimal rate. Even at that extended rate of delivery, small Australian fleet sizes might mean that these classes of vessels become exposed to an additional cost—a form of price premium—from having to be retired before the end of their economic lives to guarantee greater continuity of work for Australian industry. That form of premium could apply despite the costs of repairs, maintenance and upgrades increasing as vessels approach the end of their service. The early retirement costs for military vehicles appear to be even higher, as explained in Appendix 4.

Two other less-publicised issues also suggest that the above prices and premiums for vessels and vehicles are below what they should be. First, the Australian content for the projects, estimated during the early or initial stages of their development and reflecting what Australian industry can readily accommodate, are not particularly high. Depending to some degree on how the projects are managed, any attempt to increase that content could place upward pressure on project costs.¹³ Second, the published price premium for the future submarines is unusually low relative to the premium for naval surface combatants, suggesting the possibility of a higher rate for the submarines. Both issues are examined more closely below.

Australian content

For vehicles, an indicative initial figure for Australian content released by Defence portfolio ministers is between 30% and 35%.¹⁴ Modest initial levels of Australian content could also characterise the future frigates and OPVs if those projects follow early assembly and strict 'build-to-foreign-print' strategies.¹⁵ For the AWDs, local content as low as 30% has been reported by Insight Economics.¹⁶ If correct, that suggests a low percentage may initially be applicable to their replacements in the form of the future destroyers.

For the future submarines, initial local content could be well below the figure of 70% or more often ascribed to them,¹⁷ as indicated by the following quote relating to Australia's existing Collins-class vessels:

ASC [Australian Submarine Corporation] was able to record greater than 70% local content for the submarine platform construction and approximately 40% for the delivery of the combat system. We could do this because in the Collins class contract Australian industry content was defined as work performed by an Australian company or business that was incorporated in Australia.

Hence, under this broad definition, work undertaken overseas was classed as local content where the supplier operated through an incorporated Australian company. The same rule applied to imported materials and sub-assemblies where the 'importing' entity was an Australian incorporated enterprise.

Thus, excluding the cost for imported materials, sub-assemblies and complete systems, the local content for work performed by ASC was merely 17.7%. It was only after fully accounting for the supply of locally produced steel, GRP composites, batteries, painting, pumps, valves, forgings, anechoic tiles, fire-fighting equipment, the assembly of motors, generators, diesel engines, stern and torpedo tubes, all of which actually had some overseas content, did the Collins class approach 40% local content, well short of the claimable 70% under the contract.

While ASC has established a reliable supply chain for its submarine maintenance activities, accelerating globalisation and the subsequent decline in Australian manufacturing capabilities means the local content performance achieved on Collins will be even harder to meet on the FSP [Future Submarine Program].

—Dr Hans Ohff, ‘Caveat emptor’, paper presented at the Australian Submarine Institute Conference, Adelaide, November 2015, 2, [online](#).¹⁸

No information has yet been released publicly for the above projects on what effect any shift from initial levels of Australian content of 30-40%, to official targets twice those numbers, may have on prices and premiums. Nor has data been released on an important associated issue: in net terms, Australian content figures could be even smaller if vessels and vehicles are able to be produced abroad and Australian industry can participate through exporting some inputs including materials, components and services. It’s the net Australian content figure—consisting of the Australian content for domestic assembly minus the Australian content for overseas production—that should be used to estimate the economic impact of projects.

Submarine premiums

At 15%, the published price premium for the future submarines seems low relative to the published premium for future major surface combatants of 15–20%.¹⁹ Publicly available evidence suggests that submarines should attract a relatively high—not low—premium.

Few people still in the Australian workforce have experience in assembling submarines, compared to surface combatants that are still under construction through the AWD program. None have recent experience, as the last Collins-class vessel was commissioned in 2003. The probable assembler of the future submarines in Adelaide, France’s Naval Group, holds no shipbuilding expertise in Australia. The company may need to secure much of what it needs through a recruitment strategy involving the workforce held by ASC. At this stage, neither the strategy nor how it aligns with ASC’s commitment to support the future frigate project and sustain and extend the operating life of the Collins-class submarines are clear.

On the same comparative basis, the future submarines are inherently more complex to produce, despite the future frigates being assembled in Australia to a new design. That may be especially so with a requirement to adapt the parent French submarine from nuclear to diesel–electric power generation and from propeller to pump jet propulsion. Significant additional industrial infrastructure is required in Australia to support the FSP.

Those factors could not only increase the difference in price premiums between the assembly in Australia of submarines and surface combatants but drive a wedge between the prices associated with domestic submarine assembly and overseas submarine production. Together, they may be more consistent with a price premium for the future submarines of 30% mooted by the Productivity Commission.²⁰

And even that figure could be conservative if three factors already discussed above apply: the future submarines are assembled at an economically sub-optimal rate, the vessels are retired before the end of their economic lives to accommodate a program of rolling output, and government pushes for historically high levels of Australian content when Naval Group already has well established overseas supply chains for components and other inputs common to the submarines it designs. Unfortunately, difficulty in determining the premium that applied to the Collins-class submarines does little to help resolve the issue.²¹

In addition, all that presupposes no cost overruns after assembly commences for a class of vessel with a new and complex design, assembled in Australia for the first time by a monopolist²² reportedly ‘not known for its experience with international partnerships’.²³ Recently, the scientific,²⁴ political²⁵ and strategic²⁶ aspects of the FSP have attracted considerable attention. The project’s pricing aspects are no less deserving of scrutiny.

Given the dollar value of the FSP of \$50 billion plus in today’s prices—a figure that will rise again with an extra \$6 billion for submarine design²⁷—the uncertain nature of its ultimate price and price premium is no trivial matter. Whatever the final outcome, a premium well above 15% seems difficult to avoid—for no apparent improvement in platform capability or any indirect military-strategic or economic advantages that have been articulated clearly and publicly by Defence or others.

Finally, it seems as though the price premium for assembling the future submarines in Australia may not even be estimated—let alone acted upon—when the project reaches its production phase and price data is likely to be more accurate, due to assembly’s newly minted ‘sovereign’ status.²⁸ That’s despite the current published estimate of a premium of 15% being described by the ANAO as no better than a ‘rough order-of-magnitude’ prepared based on ‘different assumptions to the present program requirements for [higher] Australian industry involvement’.²⁹ In the absence of a reliable estimate of the price premium, any claim that the project will benefit the economy should be treated with caution, given that the premium is among the most important determinants of economic impact.

PRODUCTIVITY IMPROVEMENT

A significant reduction in prices and premiums due to improved industrial productivity is the issue on which the government's decision to source major naval surface combatants, and perhaps other types of defence equipment, from Australia depends. Only if significant productivity growth is achieved by Australian industry can the prices and premiums associated with assembling that equipment in-country be kept to an acceptable level.³⁰

The government's decision indicates that the military-strategic and economic advantages of assembling major naval surface combatants in Australia are together insufficient to offset the adverse effects of paying a price premium of more than 15-20%—possibly around 10% for each factor. For those vessels at least, preferring domestic assembly over foreign production does *not* equate to 'sovereignty at any price': a clear, overarching economic constraint should apply. If productivity growth is lower than expected that rule will obviously be broken.

Thus far, a cautionary note on the issue of industrial productivity improvement has been sounded based primarily on a single point: the potential limitations associated with seeking productivity gains by shifting from batch to continuous production for the future frigates, using OPVs as a conduit to allow the existing AWD workforce to transition into frigate assembly.³¹ Appendix 5 outlines the corresponding situation for vehicles. But other impediments to higher industrial productivity might also be relevant to the potential for prices and premiums to rise in the period ahead.

Benchmarking methods for vessels

Before exploring each impediment, it's worth noting that the estimate of an initial 30–40% price premium for future frigates and destroyers³² relies on the outcomes from three different benchmarking methods: input, comparative and parametric. Each method delivers similar results, giving greater confidence that the still heavily qualified figures are the best available. The last two methods for benchmarking use data specific to the types of naval vessels Australia will acquire.³³

An eventual halving of price premiums for those vessels through productivity improvement relies on a single method of estimation: input benchmarking. And that method draws its data from the commercial rather than the defence sector, at an industry rather than a project level. The data covers the labour, material and capital costs for oil, chemical and gas construction. Together, those factors add an extra layer of uncertainty to benchmarking's already high-risk profile.³⁴

Uncertainty about what level of productivity growth is required could be higher again due to benchmarking relying on data for the Anzac-class frigates. The Anzac project was apparently managed to a high level of efficiency (Note 8). If future frigate and destroyer assembly doesn't meet that managerial standard or has a larger residual risk, a higher than predicted level of productivity improvement will be required to achieve acceptable final project prices. Management can have a significant effect on project outcomes and is difficult to capture through benchmarking techniques.

Consequently, an accurate indication of the productivity improvement needed for surface naval combatants might only be available by verifying the outcomes from benchmarking with more specific estimates drawn from data collected through a tender process.³⁵ The need for tender data is even greater for other vessels and for vehicles, given that those projects appear not to have been benchmarked at all.

As explained in Appendixes 2 and 3, Defence has shown little inclination to collect the information required. That's due to a shift in defence industry policy, associated with the concept of sovereignty, that's attracted limited public attention. Even if tender data has been obtained, the strong preference for domestic over foreign assembly that sovereignty engenders may have reduced the incentive for companies to offer fully developed prices for overseas production and therefore reliable estimates of price premiums.

Fragmentation and follow-on work

The potential sources of productivity growth of shifting from a batch to a continuous form of production fall into two categories. One consists of defraying fixed costs over a larger number of vessels or vehicles, improving the efficiency of the industrial workforce through 'learning by doing' and avoiding the costs of hiring and rehiring workers. The other is providing assemblers of vessels and vehicles with greater confidence to invest in new technologies, workforce training and infrastructure.

For the future frigates and future destroyers, the current government policy seeks to exploit both categories of benefit through an 'enterprise' approach to planning. In a joint decision, made well before either project's tender stage, the government has committed to the coordinated assembly in Australia of both types of vessels (plus two OPVs) at a single industrial site.

However, an enterprise approach to boosting industrial productivity based on assigning different types of vessels to a single supplier applies only to the future frigates and destroyers—and even then in a somewhat constrained form given that the hull of the future frigates is based on a different design to the hull of the AWDs which the Australian workforce has striven so hard to master.

The approach doesn't apply to the future submarines and to most of the OPVs. The contracts for those items of equipment have been, or will be, awarded to different companies at different industrial sites on an individual basis when projects reach their tender stage. The notion that Australia's aggregate demand for naval shipbuilding can support a continuous assembly strategy yielding substantial national benefits³⁶ may not be compatible with that degree of industrial fragmentation, if benefits are measured purely in economic terms.

An enterprise, rather than a project-by-project, approach to planning for the future frigates and destroyers meant relying on benchmarking rather than potentially more accurate tender data to determine any price premiums involved. It might also have meant narrowing the chance to expose a future destroyer project to market competition. Against that, it's not clear what offsetting benefits enterprise planning contributed that a project-by-project approach to decision making couldn't provide. That's especially so given the relative size of the fleets involved.

For example, if a company is unwilling to invest in new technologies, workforce training and infrastructure based on nine future frigates as part of a project-by-project form of decision-making, will adding three future destroyers to its order book at an early stage as part of an enterprise approach to planning substantially alter its investment position?

The situation is slightly different for combat reconnaissance vehicles and infantry fighting vehicles given that these projects are not subject to enterprise planning—or at least not a plan that's been announced publicly. However, if LAND 400 Phase 3 for fighting vehicles is awarded to a new industry player, a high degree of industrial fragmentation will prevail. That could threaten not only investor confidence but any other sources of productivity improvement that greater continuity in production can potentially provide. Under those circumstances, the question arises of how follow-on work can be secured to keep the industry workforce continually employed.

Exports and expectations

The answer, of course, lies with exports. Assembly of vessels and vehicles for overseas customers has the potential to fill shortfalls in domestic demand that might limit the ability of Australian-based companies to improve their equipment design, development and production capabilities and competitiveness. Indeed, exports seem to be viewed as a panacea for whatever might—or perhaps will—impede strategies for vessel and vehicle assembly, including low initial levels of Australian content, sub-optimal rates of delivery, small fleet sizes, and fragmented domestic markets. Nonetheless, there are several potential constraints to consider.

‘Kick-starting’ export growth may rely on series of government assistance programs for industry whose impact, effectiveness and efficiency have yet to be firmly established.³⁷ Those programs include leveraging off major vessel and vehicle purchases to gain entry into overseas supply chains, export marketing campaigns, financial support for industrial innovation, and subsidised company access to finance.³⁸

In the longer term, the path by which exports can promote a more sustained and self-supporting process for productivity growth hasn’t been detailed publicly. Nor have the associated pre-conditions for success, and their risks, been explained. That path appears to be as follows. Defence’s current purchases of vessels and vehicles will facilitate the transfer of equipment design and development expertise from experienced foreign builders to Australian-based companies. Such expertise will help to establish a complete domestic capability for manufacturing niche products in the form of equipment platforms and components, at internationally competitive prices. In turn, those products will find significant custom, even in keenly contested overseas markets.

Substantially improving the industry’s export performance can be more difficult to achieve in practice than the above paradigm suggests. As Appendix 7 points out, Australia’s recent history in exporting completed vessel and vehicle platforms is less than encouraging. That’s due in part to the highly protected nature of international defence markets. And much vaunted global supply-chain participation—based on the provision to overseas-based prime contractors and their customers of specialised Australian-produced components and services, often by small to medium-sized enterprises—might have limited potential as a means of supplementing Defence demand and dampening price pressures, for similar reasons.³⁹

Global supply chains can have a limited effect on prices and premiums even if substantial entry can be achieved. The following stylised example illustrates the mechanics involved. Assume that components and specialist services produced in Australia account for 20% of the total cost of an Australian vessel or vehicle assembly project. Further assume that 50% of those items find their way, instantaneously, into a global supply chain. If the initial price disadvantage associated with those items is 30%—noting that companies may need to be already reasonably competitive to enter a chain—and supply chain participation removes that disadvantage by 70%—noting that not all costs can be reduced through the economies of scale exporting provides—the ultimate effect will be a reduction of only 2% in the overall project price.

And for exports to improve industrial productivity, several conditions must hold.⁴⁰ Among them are that export orders arrive at the right time, in the right quantities, at the right level of technical sophistication, on the right commercial terms and even from the right countries to bridge shortfalls in domestic demand—remembering that overseas customers act according to their needs, not ours. Winning one export order is no guarantee that others will follow.

Finally, the economic benefits of exporting don’t necessarily flow from companies to Defence. A presumption of automatic flow-through rests on the notion that Australian-based exporters lack the commercial skill and opportunity to keep the benefits for themselves.

The areas of Australia’s defence industry associated with vessel and vehicle assembly are dominated by a small number of foreign-owned multinational companies supported by a significant second tier of specialised suppliers. Most of those companies possess considerable commercial acumen and a degree of domestic market power, suggesting that flow-through is not a *fait accompli*. Defence faces formidable obstacles in regulating companies

by attributing whatever improvements in efficiency they achieve specifically to exporting and then ensuring that those improvements lead to lower prices, improved product quality or stricter delivery schedules for the goods and services companies provide.⁴¹

Infrastructure and ingenuity

Several factors relating to industrial infrastructure and innovation may also impede productivity growth. To begin, as Michael Shoebridge has indicated, standing in the way of growth is the possibility that the overseas-owned prime contractors now responsible for the future frigates may be reluctant to transfer to Australia their best managerial and technical staff.⁴² A similar reluctance might also apply to other projects.

New plant and equipment required to assemble vessels and vehicles in Australia must be paid for before it can add to productivity in net terms—and begin to reduce any price gap between domestic and overseas supply. And the established nature of many, or even most, assembly facilities in Australia may limit the extent to which that gap can be narrowed by reconfiguring existing industrial infrastructure.

Prime contractor labour accounts for only a small proportion of the total cost of most Defence capital equipment acquisition projects—typically no more than 20–25% for vessels and vehicles. That means a proportionately large increase in the productivity of their workforce, based mostly on its own ingenuity, is needed to prevent a proportionally small rise in prices and premiums.⁴³

The associated argument that upward pressure on prices and premiums can be slowed by prime contractors increasing competition between their material and other suppliers comes with significant caveats. Domestic suppliers—who are perhaps most easily influenced by primes and offer the greatest scope for productivity improvement—also account for a small proportion of the overall price of equipment. Any attempt to boost project productivity by replacing them means losing the expertise they hold and incurring additional costs to re-create industrial capability elsewhere. Finally, the concept relies on primes passing on to Defence an equitable portion of the benefits from higher productivity across the supply chain.

Regulation and replacement

Regulation

A potential obstacle to industry improving its productivity and sharing the benefits with Defence is the lack of a clear and comprehensive policy for constraining the future market power of vessel and vehicle assemblers through price regulation.⁴⁴ That power—which is highest during the post-contract phase of projects, especially for equipment assembled using a design new to the Australian workforce—includes the potential to overlook avenues for raising productivity by minimising project costs.

Nowhere in literally hundreds of pages of defence industry policy documentation are these competition policy issues considered in depth—if they're considered at all. That's unusual given the well-proven practice of ensuring a suitable regulatory framework is in place *before* establishing a monopolistic industry structure.⁴⁵

Replacement

Reflecting a legitimate fear that distributing projects between different companies is no better than a partial solution to the problem of market power—by at least avoiding the creation of a single, dominant supplier—replacing delinquent contractors part way through vessel assembly projects has emerged recently as a high-profile regulatory alternative.⁴⁶ In an unusual turn of events, what's normally the last line of a competition policy defence seems to have joined the first line of attack.

Nonetheless, replacing the industry's poor performers part way through projects, as a means of disciplining the market, suffers from several limitations. Perhaps the most obvious is that the key factors that now make the approach a more attractive policy option don't apply in full to most naval ship assembly projects or at all to

vehicle assembly. Those factors include holding assembly infrastructure under government ownership and having significant amounts of project design work undertaken in Australia. Less obvious is that the disruption that can accompany replacing poor performers, including job losses, can be more difficult to manage politically when a project is based here rather than overseas.

In the absence of Defence devising an effective way to control company prices, replacing established suppliers might result in nothing more than one monopolist with scope to perform poorly being supplanted by another with the same (discretionary) ability. Appendix 6 sets out some of the reasons why effective price regulation can be difficult to achieve in a defence environment.⁴⁷

A different company taking over a successful but only partially completed project can be challenging enough. Taking over a partly completed but clearly failing project can be more difficult again. That's especially so when replacing poorly performing companies involves, as it would for vessel and vehicle assembly, removing the original equipment manufacturers and losing the specialist knowledge they possess. Along with the complexities of price regulation, that helps to explain why replacing contractors during large and complex Defence capital equipment acquisitions is largely untested in an Australian environment.⁴⁸

ECONOMIC JUSTIFICATIONS FOR HIGHER PRICES AND PREMIUMS

Were they to arise, higher prices and premiums for vessels and vehicles might not necessarily be justifiable on economic grounds. In theory at least, the relevant justifications include domestic assembly: lowering in-country equipment sustainment costs (a form of spillover), generating new knowledge that ‘spills over’ to improve productivity in other areas of the economy, and contributing directly to ‘jobs and growth’. The issues involved are quite distinct from those of a military-strategic nature summarised in Appendix 8.⁴⁹

Sustainment savings

One reason for approaching economic justifications with caution is that the cost disadvantages from sustaining in Australia equipment produced overseas don’t last forever. The Australian workforce should eventually gain the experience needed to repair, maintain and even upgrade overseas-sourced equipment to a reasonable technical standard and level of cost effectiveness.⁵⁰ That can often be facilitated by Australian ‘reach-back’ into overseas design, development and production processes.

Even when equipment is assembled in Australia, the flow of expertise from assembly to sustainment can be constrained if assembly is centred in one geographic location or company and sustainment takes place in another. Transferring expertise between locations and companies is rarely a seamless process: resources can be lost along the way. That applies to some extent to all vessel and vehicle assembly projects. Similarly, expertise can dissipate if domestic assembly is scheduled well before the bulk of sustainment occurs. That’s especially so for equipment upgrades that might take place decades after platform assembly is complete and for batch forms of production.

During the sustainment phase of projects, when demand for the systems, components and services going into vessels and vehicles declines, overseas suppliers may enjoy longer production runs from a larger and more diverse client base than their Australian counterparts. If so, assembling vessels and vehicles in Australia might mean delivery of those items is timelier and perhaps even more secure—but not necessarily cheaper.

The knowledge gained from domestic assembly may not be as important to cost effective upgrades as a domestic capacity for equipment design and development. Yet most of the design and development for the offshore patrol vessels, the future frigates and the combat reconnaissance vehicles has already been undertaken abroad. And it appears that the future submarines and the infantry fighting vehicles will be designed and developed almost entirely overseas.

As already noted, Defence’s long-term objective appears to be to establish a complete capability for vessel and vehicle design and development within Australia, in part to ‘future proof’ equipment by expanding the scope for upgrades based on emerging technologies. But that could be a long way off and depend on exports to avoid a reliance on long-term government assistance. The real options theory⁵¹ that underpins Defence’s strategy has yet to be explored thoroughly in an Australian vessel or vehicle sustainment context.

Any higher prices and price premiums that might be associated with assembling vessels and vehicles in Australia will be incurred well before the full extent of savings in sustainment from domestic assembly emerge. In line with Department of the Prime Minister and Cabinet guidelines for cost–benefit analysis, the assembly premium (the cost) and sustainment savings (the benefit) should be discounted to their present value before being compared.⁵² Discounting reflects the relatively high opportunity costs that price premiums entail.

The discount rate recommended by the department is 7% per annum. For most Defence capital equipment projects, discounting at that rate will significantly reduce any offsetting effect that sustainment cost savings can have. For example, based on the hypothetical assembly of six Collins-equivalent submarines in Australia and a discount rate of 7% per annum, Defence has estimated that sustainment savings of approximately 40% would be needed to overcome an assembly price premium of around 15%.⁵³ What little historical data exists publicly on sustainment costs for naval vessel and military vehicle assembly—covering the Anzac-class frigates and Huon-class coastal minehunters—challenges the notion that those kinds of savings apply. Appendix 9 provides more detail.

Other spillovers

There's no doubt that assembling vessels and, to a lesser extent, vehicles in Australia for Defence or for foreign customers relies on *inputs* of advanced technologies and labour skills. However, that doesn't necessarily mean that their assembly delivers *outputs* of new knowledge on a significant scale that other areas of the economy can adopt. A series of impediments to the outward flow of knowledge could apply. An outstanding feature of recent official announcements on the economic benefits of Defence capital equipment projects is the absence of evidence to support substantial spillovers.

In order to qualify as a spillover, the knowledge in question must not only be new to vessel and vehicle assembly but new to the economy as a whole—or at least in short supply. But if only new knowledge is used for assembling vessels and vehicles, the cost, quality, performance and even safety of that equipment could be placed at risk. Only a small portion of an assembly project might therefore have spillovers potential.

Even if new to the Australian economy, some knowledge might be so specialised that it has few alternative commercial or defence applications. Some new knowledge may be sensitive from a military-strategic standpoint and therefore off-limits to others for reasons of national security. Broad distribution could depend heavily on surrounding industry clusters, which may or may not exist. In their absence, it's necessary for vessel and vehicle assemblers to have a diversified domestic business structure for the new knowledge they create to find its way into other applications.

And any new knowledge could be at least partly owned by the companies that develop it, providing them with a competitive commercial advantage. To maintain their market positions, those companies have an incentive to keep their intellectual property to themselves. From that perspective, spillovers depend in part on new knowledge 'escaping' from its original owners.

Under batch forms of vessel and vehicle production, much of the labour skills component of new knowledge moves automatically from Defence projects into the broader economy at project completion. However, under the forms of more continuous assembly now proposed for most vessels and perhaps for vehicles, the same degree of project closure doesn't apply.

To boost national productivity, new knowledge from vessel and vehicle assembly should be available to others at a cost below the value of the benefit it generates. If what a user pays to access that knowledge equals the value of what it derives from utilisation, one area of the economy simply gains at the expense of another.

Few spillovers might emerge from assembling vessels and vehicles in Australia to an overseas design using mainly imported components. The metal fabrication and platform-level integration that goes with constructing the hulls of vessels and the bodies of vehicles may have limited spillover effects. Instead, most spillovers could originate from

designing, developing and producing the complex weapon, propulsion and operating systems and other technically advanced components and services that equipment embodies. Low Australian content for those inputs implies a limited spillover effect.

But design and development costs for those items can be very high. Such costs might be recoverable only through success in domestic and export markets—to the extent that recovery is feasible at all. In any event, if defence spillovers are the objective, the issue arises of whether the price premiums required to support domestic assembly of vessel and vehicle platforms would be better spent if channelled directly towards research and development for promising new technologies.

Finally, unlike other projects that might contribute to Australia's economic growth—including those associated with prudent investment in energy, transport, water and telecommunications infrastructure—naval vessels and military vehicles in their final physical form can't be accessed by businesses or the general public. For example, naval vessels can't be used by commercial fishermen or by tourist operators. Other types of investment—like better public transport infrastructure in congested cities and improved water storage for rural communities—might therefore have larger spillover effects, by virtue of being exploited directly by many more stakeholders.

Jobs and growth

The claims

With these points in mind, the economic justification for any rise in vehicle and vessel prices and premiums in the period ahead might ultimately narrow towards a single claim: domestic assembly will add significantly to Australia's economy by contributing directly to 'jobs and growth'. The nature of that claim is evident from the following statements by government in relation to vessels and vehicles, with a focus on the economic rather than the military-strategic benefits involved:

Building an Australian shipbuilding and submarine industry is a huge undertaking. It's a nation building project so of course it contains risk...The alternative would be to send \$200 billion of taxpayers' money we are spending on the largest build-up of our military capability in our peacetime history overseas, creating jobs and advanced manufacturing opportunities in other countries...We make no apologies for deciding to invest in Australian ships, creating Australian jobs and using Australian steel rather than buying foreign ships off the shelf and using Australian tax dollars to strengthen the defence industries and increase employment and wealth overseas.

—Minister for Defence Industry, *Defence Connect*, 14 May 2018

1,400 jobs are part of this project [Land 400 Phase 2] and those jobs aren't just here, as in Queensland, they're right around the country as part of an integrated supply chain. Our defence industry investments are creating jobs all around the country and providing a future for manufacturing here in Australia. Future jobs, future training, future apprenticeships, learning from around the world and bringing those skills and those technologies here to Australia and so they can be applied in so many other different manufacturing challenges that companies are engaged in, whether it's here in Queensland or through the supply chain...That's what this defence industry program is all about.

—Prime Minister, Doorstop, Wacol, Queensland, 5 August 2019, [online](#).

The data

Testing these kinds of statements is complicated by the absence publicly of project-specific data. No economic impact studies have either been conducted or made available publicly for SEA 1180, SEA 1000 or LAND 400 Phase 2. And only one rudimentary study, commissioned by industry rather than Defence and dealing with a limited range of economic benefits, has been released covering SEA 5000. On this basis, it seems unlikely that a useful study specific to LAND 400 Phase 3 will eventually be available for public perusal. As Appendix 3 notes, all this runs contrary to recent Department of Finance guidelines calling for improved economic impact reporting on major Commonwealth government procurements.

However, an extensive body of broader evidence⁵⁴ suggests that major vessel and vehicle assembly projects undertaken over an extended period have, at best, a small positive impact nationally after their economic benefits and economic costs are considered.⁵⁵ That's especially so when impact is measured using more than employment as an indicator of economic welfare.⁵⁶ The evidence also suggests that there may be better, including faster, ways to stimulate 'jobs and growth' on a national basis. Estimates of impact incorporate the effect of domestic assembly on spillovers. They also include the amount of tax revenue government receives by favouring domestic over foreign sourcing, as discussed in Appendix 10.

Modest economic outcomes tend to arise principally because vessel and vehicle projects for Defence are not cost free, irrespective of the reasons for preferring domestic over foreign sourcing. As already discussed, the equipment must be paid for somehow, ultimately through higher taxes or reductions in other forms of government expenditure. That includes price premiums. The projects tend to attract resources—of land, capital and labour—that other industries could use and are in short supply. Each of those factors 'crowds-out' activity in other areas of Australia's economy, some areas with higher levels of productivity.

Recent industry-commissioned studies

By covering both costs and benefits, the results from the broader evidence cited above differ fundamentally from those of a recent series of reports outlining the individual contributions to the economy of some of Australia's largest defence manufacturers.⁵⁷ Those documents deal only with the economic benefits of the defence industry, and only in a partial form.

The government has claimed that the most recent company report, dealing with the future frigates, has 'vindicated'⁵⁸ the development of a sovereign Australian naval shipbuilding capability in its entirety. That claim is interesting for several reasons: it ignores the limitations of a benefits-only approach to gauging economic impact which can be significant and even severe,⁵⁹ it's been made without other naval projects being considered, and it implies that the development of a sovereign industrial capability hinges on economic—rather than military-strategic—considerations.

Price premiums and economic impact

Crucially, the broader evidence points to significant rises in price premiums having the potential to push estimates of economic impact for vessel and vehicle projects into negative territory.⁶⁰ These projects might be considered a 'goldmine'⁶¹ for their closest stakeholders including the companies awarded contracts and the geographic regions attracting the bulk of project workload. But available research cautions that, in the presence of rising premiums, this might occur only as the rest of the country bears an even greater economic cost.⁶²

If higher premiums come at the expense of other areas of the Defence capital equipment budget, that cost may also fall on the rest of the defence industry. As some Australian-based defence companies gain from vessel and vehicle projects, others exposed to offsetting cuts in the Defence budget lose as part of what could—in the absence more funding for the department—be an industry zero-sum game.

The potential economic cost associated with rising price premiums is reflected clearly in the findings of a 2014 review for Defence by Deloitte Access Economics. As the ANAO noted in May 2018, that review:

[Did] not support the notion that major defence projects generate a sufficient amount of additional benefits to the economy that would offset any significant domestic price premium. The pure stimulatory effects often discussed in debates on defence procurement are unlikely to adequately account for the costs of funding the outlays and the displacement of resources from their most efficient uses when a new large defence capability is developed locally.⁶³

In a similar vein, the Productivity Commission concluded in March 2016 that:

Paying more for local builds, without sufficient strategic defence and spill-over benefits to offset the additional cost, diverts productive resources (labour, capital and land) away from relatively more efficient (less assisted) uses. It can also create a permanent expectation of more such high-cost work, as the recent heavily promoted ‘valley of death’ in naval shipbuilding exemplifies. Such distortion detracts from Australia’s capacity to maximise economic and social wellbeing from the community’s resources.⁶⁴

A worked example

To illustrate some of the dynamics behind conclusions of the kind reached by Deloitte and the Commission, consider again a hypothetical project to assemble six Collins-equivalent submarines in Australia when the option of an overseas build exists. Assume that the project has the following key features:

- assembly domestically by a wholly Australian-owned company
- a domestic assembly cost of roughly \$1 billion per annum in today’s prices over a 16-year period (or about half the estimated average annual spend on the future submarines)
- payment of the vessels through a non-distortionary tax
- Australian content of 67% for domestic assembly, drawn from official estimates
- Australian content of 12% for overseas production (yielding a net Australian content figure of 55%)
- a price premium of around 30%
- no exports or spillovers.

A project of this kind has been estimated by Defence, based on modelling by Victoria University, to reduce Australia’s real GDP by an average of \$368 million per annum and to support only 293 new jobs across the economy on an average annual basis—after the project’s economic benefits *and* costs have been considered.⁶⁵ Driving the results are assembling the submarines having no higher level of productivity than most other projects and other industries but imposing a higher cost on the economy in the form of a significant price premium.

A net job creation figure of 293—consisting of 2,964 jobs created from assembling the vessels and 2,671 jobs lost in other areas of the economy from having to pay for and resource the project—compares to initial national job reductions from a decline in Australian automotive manufacturing estimated by the Productivity Commission at around 32,000.⁶⁶

Supporting just one extra job in net terms from domestic submarine assembly would cost taxpayers close to \$1 million each year to subsidise, for a project extending for nearly two decades.⁶⁷ And, due in large part to the price premium, assembling the submarines in Australia rather than overseas would generate a net loss in tax revenue for government averaging \$61 million per annum.⁶⁸

At an effective rate of assistance (ERA) that I estimate to be a little over 100%, the amount of government support the project receives would be more than 10 times the rate provided for automotive production in Australia—before it was considered by government too high to be sustainable—and 25 times the average rate for the entire manufacturing sector.⁶⁹ On a sectoral basis, it would be higher again than the average ERAs for mining and agriculture.⁷⁰ Such a high ERA challenges the notion that assembling submarines would, or could, align with Australia’s economic comparative advantage and optimal path to higher productivity.

The military-strategic advantages of preferring domestic assembly over foreign supply of vessels and vehicles have been judged historically by Defence to warrant a price premium of around 10%.⁷¹ This figure should incorporate the discounted value of lower equipment sustainment costs and the opportunity costs of investing in other Defence capabilities. It provides a further indication that paying high price premiums may have more to do with the expectation of offsetting economic, than national security, gains.

If so, a Collins-equivalent build in Australia might prove positive for the nation if its broader economic benefits could offset a 20% rather than a 30% price premium. However, even on this basis, the project's economic impact is limited. For a 20% premium, the economic modelling indicates that real GDP declines on average by \$194 million per annum. Only 398 jobs are supported on average each year in net terms across the economy. The level of government assistance needed to support one net job is over \$700,000 each year. Government tax revenue declines by an average of \$17 million per annum, and the ERA still far exceeds the manufacturing industry average. Even a premium of 10% delivers mixed economic outcomes.⁷² Considerably less favourable results would apply if the project was undertaken by foreign-owned contractors who remitted their profits overseas and was financed through a tax that distorted the decisions of those who payed it to invest, save and work.

Accordingly, a positive economic outcome from the project may depend on submarine assembly creating substantial broader spillovers. In their absence, the idea that a project like a Collins-equivalent build will have a strong positive economic effect has recently been described as 'nonsense'⁷³ by a leading international advocate for military procurement as a pathway to economic growth. More specifically, for a Collins-equivalent build to pay for itself—by generating an economic benefit equal to its economic cost, measured in terms of real GDP—broader spillovers would probably need to create a benefit for the broader economy equal to at least 30-40% of the project's value. Based on the limited information available publicly, that seems unlikely.⁷⁴

Bringing these points together, the conclusions of Henry Ergas and Mark Thomson four years ago in a submarine context are worth considering in the period ahead, for these vessels as well as for naval surface combatants and military vehicles:

The economic argument for mandating local construction is ultimately no different to the neo-mercantilist arguments which sought to hold back productivity-boosting reforms [for the Australian economy] of the 1980s and 90s. Then as now, the focus should be on the overall benefits rather than those concentrated in the hands of a few.⁷⁵

Inherent tensions

In addition to the results of economic modelling, there are also a series of 'inherent tensions' with advocating the assembly of vessels and vehicles in Australia on economic grounds. One of them has already been discussed: pushing for significantly higher levels of Australian content than have applied in the past could move prices and price premiums upwards, perhaps sharply. But there are others.

If increases in industrial productivity are enough to prevent any future rises in prices and price premiums, Defence expenditure on vessels and vehicles might result in fewer jobs being created than early impressions suggest. With higher productivity comes a lower level of demand for labour—and fewer new employment opportunities. Proponents of assembly in Australia, based principally on its project-level job numbers, can't have it both ways.

The defence industry tends to employ highly trained and highly experienced people who are typically in short supply. That's evidenced by, among other things, concerted attempts now being made by Defence to support workforce training for future naval ship assembly. Even in times of high unemployment, there may be a shortage of the type of skilled labour on which the industry depends. The kinds of people involved in producing complex weaponry and the systems that support it—or who can be trained to do so—tend to display few, if any, of the characteristics of the long-term unemployed.⁷⁶

This does *not* mean that some people won't be disadvantaged if unable to secure employment on a vessel or vehicle project: relevant labour markets don't function perfectly. However, it suggests that by sourcing the equipment domestically, there's a good chance that much of the labour the project requires will be drawn from other productive areas of the economy. It also suggests that most people with the potential to contribute to these projects wouldn't be prone to persistent unemployment if vessels and vehicles had been sourced from overseas.

Finally, it's difficult to argue that the Australian economy is so dynamic that it generates large spillovers from assembling vessels and vehicles domestically at internationally competitive prices but not dynamic enough to find jobs for a relatively small number of people if this equipment was purchased from foreign suppliers.

The latest Defence data indicates that, 10-15 years from now when the largest vessel assembly projects move into high gear to create a peak in aggregate vessel and vehicle employment, the average annual number of assembly jobs supported will be counted in the thousands rather than tens of thousands. Appendix 3 provides more detail.⁷⁷ That compares to an already existing national workforce of more than 12 million people which has grown by more than 1 million people over the past three years and 1.3 million since 2014.

More broadly, the defence industry in total now accounts for a tiny fraction—probably less than one-third of 1%—of overall economic activity across Australia (Appendix 3 and Note 121). It's therefore difficult to imagine how, even with an expanding Defence capital equipment budget incorporating new vessel and vehicle assembly projects, the industry can materially improve the outlook for the entire Australian economy or its manufacturing sector. That's particularly true if prices and premiums for vessels and vehicles are likely to rise and impose additional economic costs on other projects and other industries.

CONCLUSIONS

With so many pivotal issues still not resolved or revealed fully in the public arena, it's difficult to assess the economic impact of Defence capital equipment projects using current vessel and vehicle acquisitions as a guide. With few exceptions, Defence has been unable or unwilling to explain the economic effects of its procurement decisions—a situation that extends to the defence industry's broader influence on 'jobs and growth'.

From publicly available data, it's extraordinarily difficult to assess the impact of any existing vessel or vehicle assembly project, in relation to economic benefits let alone economic costs. The absence publicly of reliable economic impact studies tailored specifically to each project leaves conclusions to be drawn from more broadly-based data.

That's despite an aggregate investment by Australian taxpayers approaching \$100 billion in today's prices and ample evidence that *perceived* economic impact, rather than military-strategic necessity, has been the driving force behind project sourcing decisions favouring domestic assembly over lower priced foreign production. It's also despite Department of Finance reporting guidelines recommending higher levels of information collection and concerns expressed by the Auditor-General in relation to the limited amounts of data available publicly.

Perhaps the only way to rectify the problem is to refer Defence procurement to the Productivity Commission for review. It's been 25 years since the last dedicated Commission inquiry. Much has happened since then, including a seismic shift in defence industry policy over the past three years towards higher levels of industry protection. With some calls for the Defence budget to increase by 50% or more, better understanding the effects of any increase on the economy through a Commission inquiry has added poignancy.

To date, much thought has gone into the engineering, logistical and contractual aspects of how vessels and vehicles can be assembled in Australia—but comparatively little thought into the broader implications of how assembly is financed and resourced. However, several generic points relating to the economics of these and perhaps other projects are reasonably clear.

A combination of initially low levels of Australian content, the narrow basis on which price premiums tend to be estimated and constraints to growth in industrial productivity mean that the prices and price premiums for equipment could be substantially higher than early published figures indicate. Benchmarking lacks the intrinsic capacity to fully capture those factors, even if expertly applied. And an enterprise approach to planning may not be better than a project-by-project approach, under all circumstances.

Paying high price premiums to have Defence capital equipment assembled in Australia has in the past been associated mainly with military-strategic imperatives. In future, under the banner of defence industrial sovereignty, it seems that the expectation of offsetting economic gains will play a more prominent role than before—giving sovereignty a broader remit than the term implies. However, in the absence of those gains, the cost of sovereignty has its limits. It can be argued that sovereign status shouldn't entitle an industrial capability to unfettered levels of government assistance unencumbered by critical analysis.

High price premiums for equipment projects could have serious implications for what an increased Defence budget can accommodate, by ‘crowding-out’ other forms of military investment. That situation may be exacerbated if projects impose a net cost on the economy from which Defence draws its financial resources.

If substantial price premiums are likely, any attempt by government or others to justify them on economic grounds warrants close examination. Justification should include an assessment of economic costs—not just economic benefits—and provide full transparency around final target levels of Australian content and premiums and any assumptions made in relation to exports and spillovers. Benchmark estimates of premiums should be verified using tender quality data.

Ostensibly, even projects with price premiums of 15-20% seem unlikely to yield clear, positive outcomes in terms of their national economic and perhaps even military-strategic impacts, especially if less than half of the inputs those projects require are produced in-country. Even if Australian industry participation can be bolstered without increasing premiums, any economic gains from the projects may be marginal. That’s not enough to justify the economic hyperbole that surrounds them.

In the event price premiums increase to levels significantly above 20% and there are no compelling military-strategic reasons for domestic assembly, projects might be better described as examples of ‘nation building’ than of defence sovereignty—when there are, in all probability, more effective and efficient avenues for building the nation’s economy. Whatever can be done to substantially reduce price premiums well above 20%, through improved program and project management by Defence and industry, is likely to have a strong, positive economic effect.

Perhaps the most difficult aspect of determining the economic impact of projects is the absence of a clear, public explanation of the path to economic growth underpinning the government’s policy approach. In short, the theory of growth is not explained. That makes it difficult to determine exactly what factors are involved and how they’re expected to interact. Commentators are left to guess what’s involved.

Stripped of its paraphernalia, the theory implicit to paying high price premiums appears to condense to the following: exports eventually facilitate the cost-efficient design, development and production of most of the complex systems, components, materials and services going into the capital equipment Australian industry delivers to Defence and to overseas customers, from which significant spillovers emerge to provide an additional—and perhaps even primary—impetus for ‘jobs and growth’ through productivity improvement.

However, banking export and spillover credits for projects that have barely commenced carries an unusually high degree of risk. Much of that risk is difficult to reduce solely through improved project management, which increases the chances that risk can only be overcome through government assistance—including assistance for keeping companies commercially viable until exports and spillovers arrive. The obstacles inherent in attempting to increase exports and spillovers in a defence environment challenge the notion that projects with initially high premiums will ultimately pay for themselves. As a means of fostering the innovation so highly prized in defence industry policy, choosing to incur large premiums to support relatively simple forms of equipment assembly may represent a poor public policy choice compared to selective direct investment in emerging defence technologies.

The case for caution and even scepticism is supported by the government’s latest strategies for developing the broader economy. Those strategies emphasise that ‘free trade creates jobs, while tariff barriers cost jobs’ and that ‘higher productivity is the key to sustainable economic growth and higher wages’.⁷⁸ As a barrier to trade, high price premiums for military equipment paid under a policy of defence industrial sovereignty are equally, if not more, economically restrictive than tariffs. And the spillovers-induced productivity growth associated with assembling that equipment is subject to heavy constraints.

More money for national defence has become the new catch cry. But how that money is spent is also important, not only in terms of what to buy but where to buy it from. Publicly available evidence casts doubt on whether increasing domestic investment in capital equipment attracting significant price premiums—as part of any extension of the Defence budget beyond 2% of GDP—can be readily supported, if economic impact is the issue of interest. Although Australia might purchase different types of equipment in the period ahead, some possibly with higher spillovers potential, existing vessels and vehicle purchases offer some salutary lessons in how Defence projects might affect the economy.

APPENDIX 1: COMPARISON OF THE PREVIOUS AND NEW POLICIES

The previous policy

Objectives and principles

From 2009 to early 2016, the primary objective of defence industry policy in Australia was to establish and maintain a domestic industrial structure to support the operational requirements of the ADF. Although always a consideration, the industry's contribution to the economy ranked a distant second as a publicly proclaimed policy priority.

To give effect to this approach, the policy was based on three principles. First, as a general rule but with some notable exceptions,⁷⁹ paying a significant price premium to have defence capital equipment built in Australia rather than overseas was appropriate only where a domestic build supported areas of defence industry holding capabilities essential to retain in-country for reasons of national security. Even in this situation, a clear trade-off normally existed between the benefits and costs involved.⁸⁰

Second, as a method for purchasing equipment, market competition—including potential competition from imported goods and services—was normally preferred over more restrictive forms of procurement, including sole sourcing and mandating production in Australia. Were it to be used, specifying that production must occur in-country didn't preclude foreign-headquartered companies from competing to build or sustain equipment by establishing or expanding a domestic industrial footprint. But it obviously protected Australian-based companies from anything produced abroad.

Third, Defence was willing to subsidise industry to improve its competitiveness through programs for workforce skilling, export market development and innovation. However, the levels of subsidy were modest—partly because assistance for skilling was drawn from existing project budgets. Australian-based companies holding capabilities of the highest military–strategic value tended to receive higher rates of assistance.

In part, restricting funding for programs reflected a degree of uncertainty about the 'market failure' arguments for government intervention and the programs' effectiveness. The latter included some scepticism about the capacity for exports of defence equipment to overcome the inherent economic disadvantages faced by an industry dependent on Defence's limited demand for materiel and the obstacles to Australian companies gaining entry to highly protected overseas markets.⁸¹

Underlying paradigm

These three policy principles were consistent with a certain understanding of how defence markets and the surrounding economy functioned.

Defence markets

For defence markets, not all Australian-based defence manufacturers provided capabilities that the government assessed were crucial to maintain in-country if Australia faced a situation of military confrontation or conflict. Indeed, the proportion of the industry in this category—covered under the rubric of ‘priority industry capabilities’ (PICs)—was relatively small, at about 20%. Naval shipbuilding and military vehicle production weren’t included in their entirety, although key elements of shipbuilding were covered. A similar situation applied to sustainment.

The rationale behind this was that, with few exceptions, overseas-based producers could normally supply the equipment that the ADF required, especially given Australia’s close relationship with the US. In any event, Australia couldn’t hope to produce itself—or even stockpile—all key components going into major weapons platforms. This made industrial self-sufficiency an unrealistic goal, even if Australia could fabricate platform superstructures. And overseas-built equipment could, for the most part, be sustained within Australia effectively and efficiently.

There were several reasons why assigning special status to all sustainment capabilities was rejected in favour of a narrower approach. Most sustainment—consisting of equipment maintenance, repairs, modifications and upgrades—tended to be conducted in Australia anyway for a mix of logistical and economic reasons. With sustainment enjoying a high degree of ‘natural’ protection, no special measures were normally needed to guarantee Australian over foreign supply. And sustainment tended to receive a reasonably steady flow of work from Defence. This meant its economic health could usually be maintained in what might be described as the normal course of business.

Although there were certain high-end skills associated with sustainment—relating mainly to systems engineering and platform integration—that were specific to the defence industry, most others, such as metal fabrication and equipment installation, were found elsewhere in the economy. Finally, military conflicts of the future seemed likely to be conducted with such speed and lethality that many weapons platforms would be destroyed or, if merely damaged, take too long to repair and return to battle.⁸² In this situation, an omnibus domestic sustainment capability was unlikely to be required.

Since the early 1990s, when government defence factories and dockyards were commercialised and then privatised, very high levels of foreign ownership pervaded most areas of the industry. However, this was rarely a concern. There was little evidence that such ownership had denied Australia access to important sources of military capability, significantly restricted indigenous industry innovation or threatened the disclosure of sensitive information—even when nine of the 10 largest defence manufacturers based in Australia were wholly foreign-owned. All this was partly because new proposals for domestic expansion by foreign firms were subject to scrutiny by the Foreign Investment Review Board. Substantial foreign ownership had provided an essential inflow of capital and expertise that Australia could duplicate only at a high cost. Any attempt to reverse ownership patterns would represent a policy in search of an objective.

Large price premiums for favouring Australian over foreign sources of capital equipment tended to signify areas of defence industry in which Australia lacked a comparative advantage.⁸³ Defence could alter its investment patterns to suit the industry’s requirements, and companies could restructure their operations. Nevertheless, Australia might still be better off if some of the resources used by areas of the industry not essential to hold in-country for military-strategic reasons were taken up in other areas of the economy with higher productivity reflected in lower effective rates of assistance (ERAs).⁸⁴ In this situation, Defence could benefit by obtaining more capability for its dollar by buying overseas.

A cautionary attitude towards protecting the defence industry from direct import competition (that is, competition from finished goods and services made abroad) was based on two factors. One was that protection stifled cost consciousness. Protection from imports might strengthen the ability of defence-oriented companies to exploit the scale-related benefits associated with larger and longer domestic production runs. However, mirroring the government's longstanding approach to the development of Australian manufacturing and other sectors of the economy, those gains were often outweighed by a tendency for protected companies to keep whatever scale-related gains they accrued to themselves and pass over other opportunities to reduce their cost structure.

The other factor was the difficulty of effectively regulating industry prices. Open competition to procure equipment was obviously a less than perfect method for providing individual companies with continuity of workload in a market as small as Australia's. But, as a method for seeking to achieve a reasonably competing cost structure, it was still preferable to the alternative of Defence attempting to regulate the prices of domestic equipment providers.

Without the threat of competition from imports, many of those companies had the potential to exercise significant market power—in an industry in which individual segments tended to be characterised by high levels of seller concentration and significant barriers to market entry and exit.⁸⁵ If the history of defence industry policy for the past 50 years offered only one lesson, it was this: attempting to tame that power through government regulation aimed at forcing companies to behave competitively was far more difficult than it sounded.⁸⁶

Neither splitting projects into discrete phases nor distributing projects between companies was an effective or cost-free solution for preventing the emergence of market power. And, other than through crude forms of international benchmarking, regulation had a limited role to play at the tender stage of projects in helping to place downward pressure on price premiums for producing equipment in Australia.

Regulation had some potential to contain cost overruns after the contracts for projects had been awarded and commercial leverage shifted markedly away from government in favour of industry. This could be done through investigating company claims for higher costs and profits. But none of the avenues for strengthening investigation were particularly effective. They included searching for more information to benchmark company productivity growth, hiring more Defence cost investigators and demanding greater access to company financial records.

Ultimately, Defence could seek to address the issue of cost overruns by replacing poorly performing companies part way through projects—a form of regulation. To help facilitate the process, it could lay claim to as much intellectual property pertaining to projects as it could and keep industrial infrastructure, or even an entire production capability, under government ownership.

But, irrespective of what facilitation might achieve, replacing companies was a difficult exercise. In effect, it required finding a company willing and able to take over a clearly failing project—all at a reasonable price. And, in the absence of effective price regulation, the company taking over the project might be able to exercise the same kind of monopoly power as the company it replaced.

The process of replacement was likely to be not only acrimonious but disruptive—quite possibly to the point of putting local jobs at risk. And threatening to replace a poorly performing company wasn't always an effective regulatory weapon when Australian production was mandatory. Here, the credibility of the threat was diminished by Defence being unable to access the equipment it needed from well-established overseas suppliers. Finally, there were few examples in which replacement had worked well in the past.

The upshot of all this was that regulation wasn't a substitute for direct import competition in situations where substantial price premiums applied and projects involved a high degree of technical risk. In those situations, the threat of purchasing from overseas was the only way to achieve value for money. That threat wasn't something to be surrendered lightly, if the economic aspect of procuring complex defence capital equipment was the principal focus.

Surrounding economy

Faced with a choice, there were probably better ways of expanding Australia's economy than investing in building or sustaining weapons and the systems that supported them. One reason for this was that, although defence capital equipment projects depended heavily on *inputs* of skilled labour and advanced technologies, the projects weren't normally a source of *outputs* of new skills and new technologies for other parts of the economy—or spillovers⁸⁷—on anywhere near the same scale. Collins-class submarines provided an example.⁸⁸

In the longer term, the Australian economy was sufficiently large and resilient to absorb whatever resources the defence industry might have used. Thus, if the industry was affected adversely by reductions in the size of Defence budgets or decisions to source equipment from abroad, the rest of the economy could eventually take up the slack.

Supporting this line of argument were several factors. The industry normally accounted for a tiny fraction—somewhere in the order of 0.25-0.38%, or an average of one-third of 1%—of overall economic activity across Australia.⁸⁹ Most of what Defence spent on acquiring and sustaining capital equipment to deliver this figure was normally retained in Australia as a matter of course. Consequently, changes in workload at an industry level tended to occur only at the margin.

And the industry typically employed people with few, if any, of the characteristics of the long-term unemployed. By and large, the industry's workforce comprised people who—compared to most other Australian industries—were highly trained, highly experienced, highly motivated, non-indigenous males with reasonable English language skills, between the ages of 25 and 55, in reasonable health and located in metropolitan areas. If you were the type of person who could build or sustain something as sophisticated as military equipment, or be trained to do so, the chances were you already had a job or could find one if the need arose. This was especially so if your employment prospects were viewed over a period that extended beyond typical fluctuations in Australia's business cycle.

Economic impact reporting

Defence investment in capital equipment projects in Australia obviously added to jobs and growth in areas of the economy in which the projects were located. However, there were also economic costs to consider. Those costs detracted from jobs and growth in areas of the economy they affected.

Projects, including their price premiums, had to be paid for somehow—through higher taxes, reduced government expenditure elsewhere or increased government borrowing. And they might draw on resources of land, labour and capital that other areas of the economy could use, including by drawing labour from other defence projects and other industries rather than from the ranks of the long-term unemployed. This could deprive higher productivity areas of the economy of the resources they needed and reduce the competitiveness of the traded goods sector of economy by pushing up resource prices.

In seeking to determine the difference between the economic benefits and the economic costs of projects, the price premium often had a pivotal role to play. Indeed, for many projects, the size of the premium 'tipped the balance' between a positive or negative net economic impact. High premiums for projects tended to result in a net cost to the economy.

Consequently, it was important to gauge their size with a reasonable degree of accuracy. Here, data collected at the tender stage of projects provided the single most reliable source of this kind of information, especially where tenderers believed that overseas sources of supply were considered by the Australian Government to be a viable option. The latter helped to avoid the possibility of overseas bidders offering an unrealistically low price (and a low premium) for building equipment in Australia, with the aim of raising the price (and the premium) after being awarded the supply contract.

Tender data on price premiums was far from perfect. The data represented an estimate of what might occur as projects progressed, rather than what had taken place by project completion. And companies might either under-price their bids to win contracts or overprice to compensate for risks that could be managed effectively.

However, by being project specific, tender data still offered an important advantage over the alternative of benchmarking information. Benchmarking did cover the outcome of projects; however, being based on historical data, it didn't necessarily capture the individual characteristics of projects currently under consideration.

Conceptually, benchmarking information could take two forms. One was data on the price premiums associated with previous Australian-based projects of a similar nature. For example, the price premium for building a new naval vessel or military vehicle in-country might be estimated by referring to the premiums for the Australian-built equipment they replaced. The other hinged on a comparison of prices—rather than premiums—between Australian and overseas production for the same or similar projects. For example, the price of building a vessel or vehicle in Australia might be compared against the price of a similar item of equipment built recently in the US or Europe to yield an estimate of what the premium might be.

However, reliable benchmark information of both forms was inherently difficult to obtain. Complex weapons systems might be technically unique, as many systems tended to be in smaller countries like Australia where demand was limited, repeat orders were infrequent and the physical operating environment of equipment differed from other locales. And long periods between projects could threaten the currency of benchmark figures, which was often the case for major weapons platforms. Both factors made 'apples with apples' comparisons of equipment more difficult.

Adding to the obstacles to achieving close comparisons were small sample sizes. Building prices from first principles, by combining benchmarked elements of individual cost 'from the bottom up', could be resource intensive. And, in the case of Australia versus overseas price comparisons, results were open to the influence of fluctuations in the exchange rate.

Complicating the situation was the fact that there tended to be a paucity of reliable historical data on the premiums applying to earlier Australian builds. For example, reliable estimates of premiums for the Anzac-class frigate and Collins-class submarine projects were hard to find, even for those inside the Defence bureaucracy. This had a very important implication: it meant that, if benchmarking did occur, it would rely on comparisons of (overseas) prices rather than (domestic) premiums. Arguably, this pushed benchmarking towards the higher end of an already significant risk spectrum.

Due to this risk and the fact that individual projects could vary greatly in their characteristics, including their levels of Australian content, properly assessing projects' economic impact ultimately required a case-by-case approach. Preferably, of course, this occurred at the tender stage of their development. Although this wasn't practical for all projects, it was certainly possible for the largest acquisitions of equipment, especially those in which a clear choice existed between Australian and overseas supply.⁹⁰

Having established individually that the economic fundamentals behind an Australian build for a project were sound based on tender quality data—including data on whether the build by itself might best progress under a batch or rolling/continuous form of production—steps could then be taken to examine the advantages (and disadvantages) of coordinating its structure, timing and location with that of other related projects already established or in their planning phase.

This kind of 'additive' or incremental method for shaping the elemental structure of the industry wasn't perfect. It sacrificed at least some of the potential advantages of simultaneously assigning more than one project to a single production site. In particular, it might not necessarily have created the kind of certainty for industry that fully encouraged investment in new technologies, workforce training and infrastructure.

However, incrementalism still allowed for coordinating a later project with one that went before. It therefore had the potential to exploit the remaining scale-related gains from coordination. Those gains included defraying the fixed costs of production over a larger number of weapons platforms or systems, improving the efficiency of the industrial workforce through 'learning by doing' and avoiding having to retire and rehire workers.

The approach was preferable to the alternative of attempting to establish a coordinated strategy for all related projects in a single stroke, before their individual attributes—including their price premiums and levels of Australian content—were better understood. Like most aspects of industry policy, trade-offs were involved.

The new policy

Key features

The new policy is the antithesis of what went immediately before. It has three overriding features. One is that Australia requires a far higher level of self-sufficiency in relation to its defence industrial capabilities—and to do so we should be willing to pay higher price premiums than before.

To that end, under the heading of industrial sovereignty, most of the equipment Defence requires *must* be made in Australia. Domestic manufacture should preferably occur under Australian ownership—ostensibly to promote greater industry innovation—using where possible a form of continuous, rather than batch, production. All aspects of equipment sustainment for submarines, military vehicles and aircraft are accorded sovereign status. Surprisingly, naval surface combatants don't appear to have made the list.

Next, economic benefit—under the banner of jobs and growth—holds a position of policy prominence and perhaps even primacy. Accompanying the policy has been an unprecedented amount of publicity relating to the industry's capacity for employment creation, to the point where defence manufacturing is portrayed by government as a pillar of the Australian economy along with agriculture, mining, manufacturing and services.

Finally, to kickstart and help maintain the relatively high levels of economic growth that government believes defence manufacturing can generate, higher levels of subsidy for company workforce skilling, exporting and innovation are warranted across the industry spectrum, not just for areas holding capabilities of the highest military–strategic value.

Implied paradigm

Behind the new policy is a raft of assumptions. Almost all of them are implicit. This means that it's difficult to determine in precise terms the policy's underlying rationale. However, *if* the policy's clearer objectives are based on public policy principles, that rationale should follow the derived narrative presented below—at least in general terms. The narrative is offered simply to draw out the points on which the new policy *appears* to be based.

Narrative—defence markets

Australia must strive for greater industrial self-reliance because much of the equipment we require is no longer available, or no longer likely to be available, from overseas suppliers. Greater self-reliance is feasible because Australia can build or stockpile key components for the major weapons platforms and systems that we decide to build in-country. At the same time, it's no longer possible to sustain adequately in Australia most equipment built overseas. And an adequate domestic sustainment capability for that equipment can no longer be maintained in the normal course of business.

In practice, the objective of self-reliance might be stronger for some industrial capabilities than others. At the higher end of the scale for paying premiums are specialist capabilities to build, modify or support weapons systems unique to Australia. Next comes the ability to sustain most major weapons platforms irrespective of origin. And finally comes the ability to build some platforms of our own. Nonetheless, the price premiums Australia should be willing to pay for greater self-reliance should be substantially higher across the board than before, given their links to notions of industrial sovereignty rather than merely industrial priority.

Mandating Australian production provides domestic manufacturers with what they need most: greater continuity of workload. That continuity ultimately enhances, not diminishes, the price competitiveness of defence-oriented companies. This is because price regulation of the industry by Defence, including replacing poorly performing

companies part way through projects, can ensure that all opportunities for the industry to lower equipment costs are realised and their benefits are shared equitably with the department.

Defence's own demand for equipment may, on occasion, fall short of providing the industry with complete continuity of demand. However, export orders can do much to fill the gaps. There are few barriers to improving those orders that can't be overcome by simply increasing the amount of government assistance the industry receives.

Finally, any added costs—in the form of price premiums to build major weapons platforms domestically and subsidies to encourage industry expansion—can be accommodated without the loss of other key defence capabilities. This is because both types of cost are modest, Defence's budget is amply supported by a funding target of 2% of GDP and increasing that target remains an option at the expense of non-defence forms of government expenditure.

Narrative—surrounding economy

Expanding the defence industry is a better way to grow the economy than alternative forms of investment by government or the private sector. This is because the industry constitutes an important source of spillovers. It's also because the industry can, in a sense, create its own comparative advantage. With a modicum of flexibility on the part of Defence and industry, domestic production can become internationally competitive—obviating the need for high price premiums or drawing resources from more productive areas of the economy.

Even at the margin, the industry's workers can't be absorbed by other industries if major items of defence equipment are built abroad. Despite the industry accounting for a tiny fraction of GDP, the number of displaced or potentially displaced workers is too large, and the size and flexibility of remaining areas of Australia's economy are too limited, to accommodate change. If most major equipment build projects aren't awarded to Australian-based companies, their existing and potential employees are condemned to long-term underemployment or unemployment—no matter what positive work attributes they might possess.

Narrative—economic impact reporting

Finally, the economic benefits ascribed to most forms of in-country defence manufacturing are so large and self-evident that their economic costs don't need to be established in any formal way or can be gauged adequately using benchmarked price premium data based mainly on overseas prices.⁹¹

This has two implications. First, there's no need to take the next step of verifying benchmarked price premiums by examining projects on an individual basis using tender quality data. Second, a cross-project or 'enterprise' approach to industry development can be established well before planning for individual projects reaches maturity.

The new policy—vessels and vehicles

The way in which the policy plays itself out in relation to naval shipbuilding, and to a lesser extent military vehicle production, is especially important. By accounting for close to \$100 billion in today's prices in Defence's planned capital acquisition expenditure, build programs for both types of equipment will dominate the department's capital budget—and levels of defence industry activity—for decades. Again, the exact reasoning behind this aspect of the policy hasn't been made explicit. However, a public policy narrative consistent with its objectives is as follows. Again, this narrative is offered simply to draw out the possible rationale for a policy with a largely opaque underlying basis.

Narrative—shipbuilding

Building frigates, destroyers and submarines in Australia is necessary as an insurance policy against disruption to overseas supply in the event of a deterioration in Australia's strategic outlook, an already shrinking global market for build capability, and problems in ensuring access to spare parts from overseas for what are long-lived military assets.⁹²

Such builds are no reason for concern from an economic perspective. Indeed, they should be viewed as opportunities. This applies for three reasons. First, for naval vessels, price premiums for preferring domestic over foreign supply aren't especially high.

Second, those premiums can be reduced substantially (for naval surface combatants, halved within a short period) through limiting the modifications that Defence makes to established equipment designs, shifting from batch to continuous or rolling forms of production and otherwise raising industrial productivity.

In this context, productivity gains should flow not only from scale-related sources but from designing or redesigning dockyards for optimal efficiency as well as purchasing more modern types of production equipment. They should also emerge from overseas-headquartered companies responsible for building vessels in Australia transferring managerial and technical expertise into the domestic labour force.

Third, if after all this a significant price premium remains, its costs are justified on the grounds that Australian-based build projects deliver a military–strategic advantage, result in savings in the cost of equipment sustainment and stimulate growth in the economy.

In terms of military–strategic advantage, domestic builds enable vessels to be adapted more effectively to meet the ADF's unique operational requirements. This includes incorporating into vessels specialised components designed for local conditions and adapting overseas designs to satisfy Australia's relatively high occupational health and safety standards. In terms of savings in sustainment, domestic builds help to reduce the time needed for equipment repairs, improve access to some spare parts and add to the flexibility with which vessels can be upgraded to take advantage of emerging technologies.⁹³

Narrative—production rates for shipbuilding

For Australia's naval shipbuilding program, the rate at which larger naval combatants can be delivered most economically is around one vessel every two years. Those combatants include nine future frigates, three future replacements for the AWDs and 12 future submarines.

Coincidentally, a rate of delivery of one vessel every two years matches the economically optimal age at which the vessels they replace should be withdrawn from service (about 24 years). As a result, there's no need to retire vessels before the end of their economically optimal operating lives to provide the defence industry with a steady flow of work.

At the naval prime contractor level, the scale-related benefits from rolling or continuous production of major combatants should be available even if projects are (for the most part) distributed between different companies rather than awarded to a single dockyard.

A broader distribution of work should help to avoid situations in which any prime contractor enjoys a significant degree of monopoly or market power. Nonetheless, to further reduce the possibility of that power being created and exercised, several initiatives have been—or will be—introduced.

They include progressing a design phase for submarines prior to finalising an approach to production, prototyping elements of the future frigates, and coordinating across individual build projects the procurement of combat management systems common to vessels of different classes.

All three measures will help to establish a competitive starting price for projects against which their eventual production costs can be compared, to avoid cost overruns. To further assist with this form of benchmarking, the effect of the production learning curve over the duration of the builds will also be gauged. And critical naval shipbuilding infrastructure will be held under government ownership to help reduce the costs of Defence replacing poorly performing companies should the need arise.⁹⁴

Finally, whatever gaps in company workload emerge from a somewhat fragmented industry structure should be small and able to be bridged in large part by export orders. The primary, but not the only, avenue through which export success will be achieved is Australian industry participation in global supply chains for vessel components and specialised support services—rather than complete weapons platforms. Supply chain participation involves relevant Australian producers supporting the same class of vessels used by other countries, in order to bolster the long-term economic viability of the domestic companies involved. It can add to economic growth by, among other things, driving down build price premiums.

Narrative—military vehicles

Vehicle builds differ from vessel builds in several respects. The military–strategic necessity to build vehicles domestically is lower. The price premiums for Australian-produced vehicles are probably higher, partly because a shift from batch to continuous or rolling production is more difficult to achieve without retiring vehicles early. And the need to customise vehicles to meet Australia’s unique requirements is smaller.

Nonetheless, domestic production of vehicles is still advantageous. This is because the costs of producing vehicles in Australia can be reduced substantially through general productivity improvement by domestic suppliers. It’s also because whatever price premiums remain can be offset by a combination of savings in vehicle sustainment and the contribution of production to Australia’s economic growth.

APPENDIX 2: SUMMARY OF PUBLIC DISCUSSION ON THE NEW POLICY

To say that the new policy and what surrounds it are mired in controversy is something of an understatement. Few aspects have escaped unchallenged—or unscathed.

The Defence Industry Policy Statement⁹⁵ has been criticised for a lack of clarity in relation to two issues that traditionally dominate policy debate.⁹⁶ One is whether the government should pay a price premium to have defence capital equipment built domestically rather than overseas. The other is the degree to which market competition should be used as a method for equipment procurement.

Official data on the industry's size and structure has been described as puzzling.⁹⁷ Figures highlighted in government press releases on industry jobs,⁹⁸ growth⁹⁹ and exports¹⁰⁰ are piecemeal, exclude economic costs or exceed what reliable sources of information reflect. Appendix 3 reviews the leading examples.

The Defence Industry Policy Statement and accompanying ministerial pronouncements were clear that the previous list of industrial capabilities deemed essential to hold in Australia for reasons of national security had 'served their purpose',¹⁰¹ partly by being defined too broadly. Yet, the subsequent Defence Industrial Capability Plan has gone in the opposite direction.

Under the plan, rebadged 'priority industry capabilities' (PICs) now form the backbone of a new industrial sovereignty framework. And, from around 20% of the industry being covered by PICs, it seems only 20% of the industry has now been denied sovereign status in the longer term.

Behind the move is a definition of sovereignty that, in effect, goes well beyond the traditional basis of military-strategic necessity¹⁰² to cover virtually any industrial capability that might fall within Australia's technical reach. One implication is that accurately checking the economic health of industry capabilities will be enormously challenging in the period ahead.¹⁰³ Another, detailed in this paper, is the significant economic costs that a shift to sovereignty seems to entail.

The Naval Shipbuilding Plan¹⁰⁴ has been described even by Defence as 'high to extreme risk',¹⁰⁵ although that was before the department introduced a number of changes that it claims will help alleviate the problem. Since those changes have been made, the plan has been described by the Auditor-General as involving 'very high expectations indeed'¹⁰⁶ and by others as a 'shambles'.¹⁰⁷

Finally, the Defence Export Strategy¹⁰⁸ has attracted criticism from several sources.¹⁰⁹ Concerns have ranged from the strategy failing to explain the rationale behind substantial increases in government assistance for industry to it setting arbitrary export performance targets. After reviewing the strategy's flagship Defence Export Facility, the Productivity Commission concluded recently that 'the justification for assistance appears to be simply about a desire to sustain and grow an industry that has historically been an expensive failure in Australia.'¹¹⁰

The outstanding feature of the new policy is that the expense to which the Productivity Commission refers is hidden from public view. This doesn't necessarily mean that government assistance for some areas of defence industry is unwarranted: there may be instances in which it can lead to successful forms of industrial development. But, at

a minimum, the costs of any assistance need to be well understood—and made public—before commitments in relation to assistance are made. Only then can Australians have confidence in the Defence procurement process.¹¹¹

How much of Defence's budget for industry support programs—covering industry workforce skilling, export market development and innovation—is 'new' money isn't especially clear, at least for innovation.¹¹² And the department now releases less data on approval rates for its proposed capital equipment projects.¹¹³ Among other things, this complicates the task of determining whether unexpected increases in the cost of major equipment acquisitions are occurring at the expense of other forms of defence capability.

Perhaps more importantly, now that most capabilities held by the defence industry have been classified by government as sovereign, limited data on the price premiums associated with preferring domestic over foreign production appears to have been collected by Defence at the tender stage of its major acquisition projects.¹¹⁴

This already covers OPVs, future frigates and combat reconnaissance vehicles, and it seems likely to apply to premiums for other large projects with tender phases on the horizon. Those include future submarines and infantry fighting vehicles. If data on premiums isn't collected at the tender stage of projects, it's unlikely that it would, or even could, be compiled at another time.

Ceasing to collect tender quality data on premiums for these and other projects mirrors a broader change in Defence's procurement policies and procedures that has gone largely unnoticed.¹¹⁵ In response to changes in the Commonwealth Procurement Rules (CPRs) in 2017 and working primarily through the Australian Industry Capability (AIC) Program, the department intends to assemble data only on some of the economic benefits of larger capital equipment projects. None of the projects' economic costs, including their price premiums, need to be considered. Appendix 3 details the situation.

APPENDIX 3: GOVERNMENT DATA ON JOBS AND GROWTH

The most visible of the changes accompanying the current defence industry policy framework is the emphasis given by government to how the defence industry contributes to the size of the national economy. This is evident from statements made and data released relating to how the industry impacts on GDP, exports and job creation.

Gross Domestic Product

In the absence of a recent and comprehensive economic profile¹¹⁶ of the industry, the following ministerial statements serve as the key points of reference on the issue of GDP:

[S]ince the [Defence] White Paper was announced by the government, for the first time in living memory defence industry has been showing up in the national accounts as one of the drivers of the economy.

and

[T]he nation-building agenda is creating a defence industry as one of the significant pillars of our economy, alongside mining, agriculture and the services sector.¹¹⁷

GDP Growth

Those claims are somewhat unusual. To begin, the Australian Bureau of Statistics (ABS) data on which the statements are based refers to Defence's investment in capital equipment acquisition and facilities construction—when the commonly accepted definition of the industry is capital equipment acquisition and equipment sustainment. For the purpose of measuring GDP, Defence capital equipment acquisition and facilities construction are covered under the heading of Gross Fixed Capital Formation in the national accounts. Defence capital equipment sustainment is covered under the heading of Final Consumption Expenditure.

The investment to which the statements refer includes equipment imports—which the Australian defence industry obviously doesn't make—and excludes equipment exports that the industry clearly does produce. And the investment relates to movements between the September quarter 2016 and the December quarter 2016 and between the December quarter 2015 and December quarter 2016, against a backdrop of considerable quarterly volatility.

The industry, as defined in the statements and comprising the defence component of Gross Fixed Capital Formation, accounted for 14.1% of growth in GDP between the September quarter and December quarter 2016 and 3.3% of growth in GDP between the December quarter 2015 and December quarter 2016. However, after adjusting for volatility—by moving from ABS seasonally adjusted data to trend data—the figures are 2.1% and 5.2%, respectively.

Those percentages could be significantly smaller again if adjusted for imported capital equipment, the value of which tends to be much higher than the value of equipment exports. But, even without those adjustments, the figures indicate that the defence industry's contribution to recent economic growth was relatively small.¹¹⁸ Can

an industry that accounts, at best, for somewhere between one twentieth (5.2%) and one fiftieth (2.1%) of the expansion that's occurred in the Australian economy over a relatively short timeframe really be considered a 'driver' of economic growth?

Defence spending naturally rises over time with increases in the real cost and capability of modern weapons systems. Despite this, in the December quarter 2016, Defence spending on the industry as defined in the statements was exceeded at least three times in dollar terms over the preceding eight years. As a proportion of GDP, the same spending was exceeded at least five times over the same period—the most recent being in the June quarter 2016. It's not readily apparent how this pattern accords with the defence industry showing up in the national accounts for the first time 'in living memory' as a driver of the economy.¹¹⁹

Pillar of the economy

In the 2016–17 financial year, Defence budget figures reveal that sales came to around \$4.1 billion (\$2.6 billion for materiel acquisition and \$1.5 billion for facilities construction), after adjusting for equipment imports and my estimate of equipment exports.¹²⁰ Again, this is based on the definition of the defence industry used in the statements. If the industry is defined correctly, as materiel acquisition and sustainment, the corresponding sales figure should be around \$6.5 billion (\$2.6 billion for acquisition and \$3.9 billion for sustainment).¹²¹

The corresponding ABS sales figures for the same period were \$96 billion for agriculture, forestry and fisheries, \$189 billion for mining, \$371 billion for manufacturing and \$2,327 billion for services including construction.¹²² Projected increases in the size of the defence industry in the short to medium term suggest limited prospects for relative change. On these bases, it's difficult to view the defence industry as a significant pillar of the economy.¹²³

For completeness, value-added (rather than sales) for the industry—defined correctly as equipment acquisition and sustainment—was around \$2.7 billion for 2016–17.¹²⁴ For the same period, the industry value-added for agriculture, forestry and fishing was \$35 billion, for mining \$125 billion, for manufacturing \$100 billion and for the services sector including construction \$875 billion. Value-adding is the basis on which GDP is estimated.¹²⁵

Defence exports

Industry exports

Claims that in 2016–17 total industry exports amounted to between \$1.5 billion and \$2.5 billion appear unusually high. For these figures to be correct, the industry must have recently exported as much as it built for the ADF. That claim is not supported by historical industry survey results—indicating exports accounted for only around 10% of total industry sales rather than the roughly 100% indicated by the latest Defence trade figures—or the widely referenced analysis of international agencies such as SIPRI. They appear to originate from export permit data based on *potential* rather than *actual* export activity.

Moreover, the single largest export project—Joint Strike Fighter (JSF) global supply chain participation—accounts for only around 5% of the published \$1.5 billion to \$2.5 billion figure. This prompts the obvious question of where the other 95% originates? Nowhere in the government's policy documentation is an answer provided, in the form of supporting export sales estimates for even a single remaining constituent project.¹²⁶

JSF global supply chain

In a similar vein, job figures for JSF global supply-chain participation are perplexing. They show the program supporting 2,400 jobs across the economy in 2016, 5,000 jobs in 2026 and 6,350 jobs in 2037. The corresponding JSF-related sales figures are \$169 million, \$293 million and \$133 million.¹²⁷ These figures are unusual by indicating that, from 2026 to the completion of the program 12 years later, jobs keep growing as JSF-related sales decline progressively and sharply.

More broadly, the figures contrast with ABS input–output multipliers¹²⁸ that I estimate to indicate a maximum job number of around nine jobs per \$1 million of sales over recent years and probably a figure of similar magnitude in the period ahead. In contrast, figures that support estimates of 14.2 jobs per \$1 million of JSF-related sales for 2016, 24.6 jobs per \$1 million of sales for 2026 and 47.1 jobs per \$1 million of sales for 2037 have been promulgated—all without a clear explanation of what will drive such a rapid proportional rise.¹²⁹

The implicit assumption behind these patterns appears to be that, as Australian-based companies complete each discrete task in the production of a good or service to support the JSF project, their order books will be replenished by demand from new or existing clients drawn to the companies by their JSF supply chain participation.

However, if correct, this assumption of self-perpetuating or cumulative economic growth hasn't been accompanied by evidence of who those new clients have been in the past or who they might be in future. This is despite the supply chain program having operated for more than a decade.

Take away the apparent assumption and I estimate that job creation declines from 2,400 jobs across the economy in 2016 to 495 jobs, from 5,000 jobs in 2026 to 548 jobs, and from 6,350 jobs in 2037 to 161 jobs. The long-term annual average for jobs created under the lower set of figures is 371. These are large differences.

Job creation

Naval shipbuilding jobs

The latest estimates of job creation for major naval shipbuilding projects cover direct jobs (i.e. jobs in domestic shipyards) and indirect jobs (i.e. jobs in domestic project supply chains) for several projects.

The relevant figures are pacific patrol boats (400 jobs in total), offshore patrol vessels (1,000 jobs), future frigates (4,000 jobs, which compares to 4,140 jobs from industry-sponsored modelling) and future submarines (2,800 jobs). The aggregate figure covering all these projects is 8,200 jobs—3,200 direct and 5,000 indirect. However, the figures are difficult to interpret, for several reasons.

First, not all the projects covered by DoD estimates will be undertaken at the same time. Simply adding the figures for each project to arrive at an aggregate of 3,200 direct and 5,000 indirect jobs assumes that all these projects coincide. That's not the case. The following broadly indicative production schedules apply to each project: pacific patrol boats (2018-2023), offshore patrol vessels (2018-2030), future frigates (2021-2041) and future submarines (2023-2057). Of the largest projects, the future frigate and future submarine projects are likely to overlap at peak production only towards 2030.

Next, the job figures for the submarines and frigates seem unusual in relative terms given the estimated size of each project. At a cost of \$79 billion plus in out-turned dollars or \$50 billion plus in today's prices, the submarine project is much larger than the future frigate project whose cost is estimated at \$35 billion plus in out-turned dollars or what I estimate to be around \$26 billion plus in today's prices.

Even after adjusting for differences in estimated project duration—27 years for 12 future submarines versus 20 years for nine future frigates—the future submarines will attract around \$2.9 billion annually in Defence spending in out-turned dollars (\$1.9 billion in today's prices) while the future frigates will attract around \$1.8 billion annually in out-turned dollars (around \$1.3 billion in today's prices).

Yet, the submarines are estimated to support 2,800 jobs (0.97 jobs per \$1 million per annum in out-turned dollars or 1.5 jobs per \$1 million in today's prices) and the future frigates 4,000 jobs (2.2 jobs per \$1 million per annum or 3.0 jobs per \$1 million in today's prices). In short, with an average annual spend much lower than for the future submarines, the future frigates are estimated to deliver many more jobs.

The figures might be justified if building frigates is significantly more labour intensive than building submarines. That is, the figures might be justified if, based on some standard measure like jobs per \$1 million invested or jobs per ton of vessel constructed, assembling frigates tends to employ more people than assembling submarines.

However, historical job figures for the predecessors to the future frigates (the Anzac-class frigates) and future submarines (the Collins-class submarines) provide limited support for that proposition. Anzac-class frigate assembly apparently supported around 1.1 production jobs per ton per year or 10.1 production jobs per \$1 million per year in 1998-99 prices. Assembling the Collins-class submarines apparently supported 2.52 production jobs per ton per year or 9.2 production jobs per \$1 million per year in 1998-99 prices. Using these metrics, frigate assembly appears at best to be only marginally more labour intensive than submarine assembly, to the degree that it's more labour intensive at all.

The upshot of all of this seems to be that, if Defence's latest figures on jobs from major naval ship acquisition projects are deemed to be correct, the Australian content figure on which job estimates for the future submarines are based is unusually low or that the content figure for the future frigates is unusually high. Either way, the job relativities between the two projects appear questionable.

However, the problem with the relativities seems to arise from a simple—but significant—arithmetic error relating to the future submarine job figure of 2,800. This figure mirrors almost exactly the figure obtained by Defence in 2015 for a Collins-equivalent build. But that build is much smaller than a future submarine build, and therefore should generate a lot fewer jobs.

A Collins-equivalent build has an average annual level of expenditure of around \$1 billion per annum in today's prices (a \$16 billion spend in today's prices, spread over a build period of 16 years). The future submarines are estimated to have an average annual spend of close to \$2 billion per year in today's prices (a \$50 billion plus spend in today's prices, spread over a build period of 27 years). That makes sense given that, compared to the Collins-class submarines, the future submarines will be bigger and more complex and there will be twice as many of them.

On that basis, it's perhaps not unreasonable to assume that the future submarines could support twice as many jobs as a Collins-equivalent build. In turn, this suggests that the jobs figure for the future submarines should be around 5,600 compared to the current figure of 2,800 jobs and 4,000 jobs for the future frigates. From this, the job relativities between the future submarine and the future frigate begin to make more sense.

All the data used in this section is referenced in Note 77.

Economic costs

For the past few years the government has announced the economic impact of projects by referring to the number of jobs created within the project's prime contractor—'direct jobs'—and jobs created along the project's extended supply chain, which it calls 'indirect jobs'. Recent decisions to purchase new frigates¹³⁰ and combat reconnaissance vehicles¹³¹ exemplify the approach. Typically, the announcements cover projects that the government has decided must be undertaken in Australia.

However, what are almost never presented are the numbers of jobs created not just inside the project but across the economy after the economic benefits and costs of the project are considered. This omission tends to result in far higher estimates of national job creation than should apply.

Projects must be paid for somehow, ultimately through higher taxes or reductions in other forms of government expenditure. And they tend to attract resources—of land, capital and labour—that other industries could use, perhaps even more productively. Both factors impose a cost on the economy, by detracting from economic activity elsewhere and the jobs it could have supported. _

For example, if hypothetically Australia decided to build six Collins-equivalent submarines in-country at an internationally competitive price with 67% Australian content, the annual average number of full-time equivalent

jobs created by the project has been estimated by Defence at 2,964.¹³² But when the economic costs of the project are also considered—in the form of an increase in (non-distortionary) taxes to pay for the vessels and the project drawing part of the resources it needs from other industries—the job number across the economy drops by more than 75%, to just 733. This consists of 2,964 jobs in submarine construction less 2,234 jobs ‘lost’ in other areas. And the net job figure is likely to be much lower again if the economic distortions caused by higher taxes are considered, a significant price premium applies for supporting domestic over foreign assembly and Australian content is lower—as it seems to have been.

Acquisition jobs and sustainment jobs

Job numbers for assembling and sustaining equipment in Australia are often combined, at least for creating a media headline relating to a new acquisition project. Although not strictly incorrect, this way of presenting data can be confusing for two reasons.

First, unlike for acquisition, sustaining equipment overseas is rarely an option—it would have occurred in Australia anyway. Any notion that assembly in Australia would prevent those sustainment jobs going overseas is misleading. Second, whatever jobs are created to help sustain newly assembled equipment in Australia tend to be offset in part by job losses in sustaining the equipment it replaces.

For example, the creation of 1,450 jobs was recently claimed by government in relation to the assembly of new combat reconnaissance vehicles for the ADF under Land 400 Phase 2.¹³³ Only 640 of those jobs relate to the assembly itself. And those figures exclude the effects of the project’s economic costs. The other 810 jobs relate to sustaining the project’s 211 new vehicles that will replace the Army’s 253 Australian light armoured vehicles (ASLAVs). Most of these 810 jobs could be offset by a reduction in the ASLAV sustainment workforce.

Economic impact reporting

If the claimed contribution of the defence industry to jobs and growth at the national level is the most visible aspect of change associated with the current defence industry policy framework, the least visible aspect is change at the bureaucratic level associated with the collection of data on the economic impact of individual defence projects.

Changes to the Commonwealth Procurement Rules

Prompted in part by two parliamentary inquiries—one on naval shipbuilding¹³⁴ and the other on defence exports¹³⁵—the government introduced a change to the CPRs in March 2017. The changes related to the collection of economic impact data by all Australian Government departments and agencies.

For procurements above \$4 million, federal officials are now required to consider the ‘economic benefit’ of the procurement to the Australian economy. However, this is only for officials in departments and agencies not subject to national and international agreements to which Australia is a signatory that might restrict their obligation to do so.

Finance guidelines

This change was accompanied by Department of Finance guidelines.¹³⁶ The guidelines define the economic benefit associated with procurements as anything that improves national productivity. That improvement is based typically on boosting employment and allowing industry to exploit economies of scale in production, develop workforce skills, and adopt and transfer new technologies.

Nevertheless, the definition comes with important caveats. According to the guidelines, an economic benefit is generated only if government projects are ‘employing persons who would be otherwise under- or unemployed’, ‘allowing resources to be allocated to sectors in which Australia has a comparative advantage’, ‘freeing government funds for other spending’ and using government funds efficiently.¹³⁷

For practical purposes, this means that an economic cost—rather than an economic benefit—is generated if Defence’s projects rely on attracting people who already have a job or have reasonable prospects of finding one. It also means that a cost rather than a benefit will arise where a price premium is paid for a good or service produced in Australia when otherwise equivalent products are available from overseas, and where a project draws resources from more productive areas of the economy.

Defence discretion

Government departments and agencies whose actions are subject to Australia’s international treaty and related obligations are exempt from the need to comply with the CPRs’ new economic benefit reporting requirements. However, Defence is subject to the requirements because our international treaty obligations exclude most of the capital equipment that it procures.

In this context, the current version of the *Defence procurement policy manual* indicates that the consideration of economic benefit—for procurements under Defence Procurement Policy Directives D2–D4¹³⁸—takes place through the department’s Australian Industry Capability (AIC) Program.¹³⁹

That program currently seeks from companies bidding for capital equipment projects over \$20 million information on the effort bidders have made to test the Australian market for potential project participants as well as the projects’ Australian content.¹⁴⁰

In addition, the program requests from companies data on ‘the significance of the work, the skills and knowledge that will be transferred, the training that will be provided, the new technologies or innovations that will be introduced, and the contribution to Australian company competitiveness, including access to global supply chains, technical data and intellectual property’.¹⁴¹

None of those factors appears to capture the economic costs implicit in the way economic benefits are defined under Department of Finance guidelines (noting that the guidelines aren’t binding on government departments and agencies). Despite changes at the whole-of-government level, Defence has gone down a different path.

Recent experience

Before the changes in the CPRs noted above, Defence sponsored several studies examining the economic benefits *and* costs of submarine, frigate, vehicle and other major investment projects—without a formal policy requirement.¹⁴²

However, since changes to the CPRs and revisions to the AIC Program in June 2017, no studies appear to have been undertaken for major equipment acquisitions, including OPVs (SEA 1180), combat reconnaissance vehicles (Land 400 Phase 2) and future frigates (SEA 5000).

From this, some obvious questions arise. If the government is unwilling to undertake economic impact studies for such prominent projects, when will it be prepared to do so? And, even where the government has mandated the domestic production of defence capital equipment, is there merit in understanding the economic costs involved or even the full extent of the economic benefits?

Future direction

Even if AIC plans are extended to cover obvious issues associated with Finance’s definition of economic benefit as part of an impending AIC Policy Strategy, Defence will face enormous challenges on several fronts. Those fronts include the complexity of estimating the employment and regional economic impacts of projects.¹⁴³

Among the most obvious challenges are determining what proportion of jobs are likely to be filled by the long-term underemployed or unemployed and whether defence projects have a lower effective rate of assistance than the industries from which they’re likely to draw resources—in an environment where the companies providing that data have an incentive to accentuate their claims. Moreover, to do this for the literally hundreds of defence capital equipment projects valued at more than \$4 million seems impractical. Ultimately, these issues can be addressed only by more sophisticated types of economic analysis than the AIC Program has embraced thus far.

APPENDIX 4: VESSELS AND VEHICLES—ASSET LIVES AND INDUSTRY STRUCTURE

Delivery and early retirement

The government's two-year average delivery schedule for future frigates, destroyers and submarines compares with RAND's estimate of 1.5 years and ASPI's preferred schedule of around a year.¹⁴⁴ ASPI's preference is based on the historical average 'drumbeat' for delivering Australia's Anzac-class frigates and Collins-class submarines. This aligns with the RAND analysis.

For the economically optimal age to retire vessels, the Australian Naval Shipbuilding and Repair Sector Strategic Plan in 2002 advocated 20 years. In 2015, RAND seems to have been silent on the issue. However, ASPI has recently suggested a time closer to the vessels' normal operating lives than the government's now planned 24-year delivery cycles.

The most recently published data puts those lives at 30–35 years for frigates and destroyers and 24–30 years for submarines.¹⁴⁵ If correct, this delivers a price premium for early retirement of around 20–30% for future frigates and destroyers and 0–20% for future submarines.

Very high potential costs for early retirement seem applicable to OPVs. Indeed, an added cost for the early retirement of vessels of 40% seems likely to apply if a program of continuous production of the vessels were to be pursued. This is based on Defence's demand for 12 vessels, an economically efficient delivery rate that appears to be more than one vessel each year and an economically optimal retirement age that should be at least 20 years.¹⁴⁶

For military vehicles under Land 400 Phase 2, continuous production implies a delivery rate of fewer than one vehicle each month. This seems unworkable, if only because the Army would get only 10 or so vehicles annually.

Industry structure

One aspect of the new industry policy that's especially difficult to interpret is whether the costs of building naval vessels can be minimised only through consolidating projects in the hands of one or two companies, or whether a more fragmented market structure, involving a wider distribution of projects, is acceptable. Available data on the issue tends to support a consolidated market structure but displays a considerable degree of ambiguity.

The Australian Naval Shipbuilding and Repair Sector Strategic Plan concluded that, under a regime of rolling or continuous production for surface combatants, costs could be minimised by concentrating all naval surface ship builds under a single prime contractor and by encouraging competition among its material, component and service providers.¹⁴⁷ However, this applied to a situation in which Australia's demand for new builds was set to decline substantially rather than rise sharply, as currently applies. And the analysis excluded submarine construction.

A reasonably high degree of consolidation was a theme echoed in RAND's 2015 study on Australian naval shipbuilding. The study excluded submarines but did apply to a situation in which Australia's demand for other new vessels is set to rise sharply.

Based on the number of workers needed to build the OPVs, future frigates and next generation of AWDs, RAND's analysis pointed to the economic advantages of assigning the work to a single Australian prime contractor. This was based on the number of workers required for all projects equating to that held by 'a medium or small shipyard by international standards'. It went on to conclude that 'sharing the rather low annual workforce demands among more than one shipyard may lead to inefficiencies in labour, excess costs in shipyard overhead, and scheduling problems' and that, 'based on our future projections of workforce demand, it may be costly to sustain more than two shipyards.' From this, 'starting to build new patrol boats in 2017 and having them built in the same shipyards that will build the future frigate ... would help to sustain a skilled workforce'.¹⁴⁸

Exactly how these types of structures match to the expected structure of naval shipbuilding hasn't been articulated in the Naval Shipbuilding Plan, despite the government declaring its adherence to an enterprise approach for naval construction projects.

Perhaps the only point of clarity relates to the OPVs. In effect, two of the vessels are being assigned to ASC in Adelaide, to help with workforce retention pending the commencement of work on the future frigates, while the remaining 10 are going to Cvmec in Perth. This had led one close observer of the project to conclude that 'there's no benefit for the OPV project in splitting the build. On the contrary, it will inevitably introduce inefficiencies into the construction process and increase the cost'.¹⁴⁹

APPENDIX 5: MILITARY VEHICLES

Thales

In 2015, Thales was awarded LAND 121 Phase 4 to produce 1,100 Hawkei protected mobility vehicles and 1,000 trailers. This provides some continuity of workload following the company's production of around 1,100 of its Bushmaster vehicles under Land 116, ending in 2016.¹⁵⁰ What will happen after Phase 4 is complete in 2022 is unclear.¹⁵¹

No data on price premiums appears to be available publicly for the Bushmaster, perhaps due to that vehicle's unique design. The only published figure for the Hawkei vehicles is 23%,¹⁵² but it's heavily qualified and includes a referenced omission of a potentially large premium—estimated at an additional 10%—associated with Defence having to purchase additional Bushmaster vehicles to keep the industrial capability in place to support an eventual Hawkei build. Unfortunately, the Australian content of the projects is difficult to determine from public sources although a figure of 55% has recently been cited publicly for the Hawkei (noting that this appears to include a design component which is not relevant to many other vehicle projects in Australia).¹⁵³

Rheinmetall

Rheinmetall's current involvement in LAND 121 Phase 3B—for approximately 2,700 medium and heavy trucks along with 3,800 specialist modules—is scheduled to finish in 2020.¹⁵⁴ The project as a whole has an estimated Australian content of around 30%, including the involvement of Australian subcontractors.¹⁵⁵ The precise origin of the trucks under LAND 121 Phase 3B is not especially clear from official sources,¹⁵⁶ although ASPI notes that they're produced overseas.¹⁵⁷ No price premium data for the project is available publicly.

More recently, some additional work has been awarded to the company under LAND 121 Phase 5B.¹⁵⁸ This work covers additional modules and trailers—but not additional trucks, which will continue to be manufactured overseas. Unfortunately, price premium data for LAND 121 Phase 5B is also not available publicly.

The awarding of LAND 400 Phase 2 to Rheinmetall in March 2018 would appear to provide the company with greater continuity of work, as LAND 121 Phase 3B draws to a close. However, the mounted combat reconnaissance vehicles under LAND 400 Phase 2 are already produced in Europe with the aid of significant domestic and export demand. Production numbers in Australia are relatively small at 186 vehicles, after the first 25 units are built abroad.¹⁵⁹ This suggests that a significant price premium applies for production in Australia, although no official data on the issue is available publicly. The Australian content for LAND 400 Phase 2 is also unclear from public sources although a figure of 'over 50%' has been mooted in the popular press.¹⁶⁰

Given that the published operating life of the vehicles under LAND 400 Phase 2 is 30 years,¹⁶¹ a significant cost from early retirement would arise if the vehicles were produced on a continual basis. In this situation, the most obvious alternative for Rheinmetall to be provided with a steady flow of work is to award the company all or part of LAND 400 Phase 3.¹⁶² This is a \$10–15 billion project to replace the Army's M113 armoured personnel carriers with a fleet of up to 450 modern infantry fighting vehicles and 17 manoeuvre support vehicles.¹⁶³

However, guaranteeing that kind of work would necessarily eliminate the prospect of market competition for LAND 400 Phase 3. It may perpetuate a process in which Defence continues to pay high price premiums for its vehicles—and transfer the responsibility for achieving value for money from market competition to departmental regulation of the company's profits and costs. It may even result in Defence being forced to order vehicles that it doesn't need in order to keep the company viable. The pitfalls of this approach are graphically illustrated in the ANAO's recent report on LAND 121 Phase 4.¹⁶⁴

The only alternatives would be for Rheinmetall in Australia to obtain defence export orders or diversify its Australian business into commercial markets. Based on recent history, set out in Appendix 7, those options appear to carry a considerable degree of risk.

APPENDIX 6: SOME OF THE OBSTACLES TO EFFECTIVE PRICE REGULATION

If competition can't be relied upon to deliver reasonable prices for a complex weapons project and ultimate value for money in defence procurement, it may be possible for Defence to achieve 'competitive' outcomes through direct regulation based on enquiry by the department into company costs and profits.

Industry claims for unacceptably high prices, and the consequent need for incentives to modify company conduct, are of little concern if the department can readily detect anomalies or even improprieties in the prices of equipment projects by scrutinising company accounting and engineering data and by collecting its own information.

Positives

The capacity of Defence to investigate its suppliers is normally supported by the following factors.

Defence may have some capacity to compel contractors to declare their intentions to follow honest business practices—including honesty in pricing at the tender stage of projects—and to prosecute or otherwise penalise firms proven to engage in misleading conduct.

There may be situations in which Defence and its suppliers work together to establish the costs of a project before a formal contract is signed. A negotiation process of this kind is sometimes called 'parallel pricing'. It involves Defence having 'open-book' access to company accounts and sitting with firms to explore costing and pricing issues in detail.

The department prefers to specify its project requirements in terms of equipment capability rather than inputs and processes. This simplifies the task of monitoring a project's results in terms of equipment functionality.

Notionally, Defence has complete access to data for a wide range of projects that it has supported over an extended period. If carefully managed, that data should provide a rich source of information for benchmarking company cost structures.

The department becomes more familiar with a project as it evolves. The capacity to identify actual or potential instances of contractor inefficiency and poor cost control should therefore improve with time.

After contracts are established, company claims for cost increases tend to be incremental. This limits the amount of work Defence cost investigators need to perform with typically limited resources—at least after work on a project commences.

Finally, in theory at least, only a portion of a company's operations may need to be investigated by Defence in order to induce general cost consciousness among suppliers. Selective investigation can have a significant deterrent effect if it's performed randomly, backed by strict penalties for poor contractor practices and accompanied by the perceived threat of return visits by departmental officers.

Negatives

Against this, there are several factors that significantly hinder government insight into the activities of defence suppliers before and after contracts are signed. Those factors also inhibit Defence's ability to promote commercial transparency among its suppliers.

In attempting to benchmark prices for a good or service, Defence can be at a distinct disadvantage, given the plethora of industry data required. And companies have a strong disincentive to reveal their true costs at the tender stage of projects if that data can be used by Defence to restrict the returns that the company receives in future.

In theory, it's possible to impose tendering rules and regulations that require contractors to submit detailed cost and profit data when they negotiate the price of a contract and to certify—subject to criminal or civil penalties—that this information is current, accurate and complete. However, the difficulties in relying on the threat of prosecution to elicit reliable tender information are considerable.

The outputs or functionality associated with complex weapons systems are normally underpinned by myriad underlying costs. In this environment, even though Defence's knowledge might improve as projects progress, industry's expertise and insight often increase at an equal or even faster rate—leaving the disparity in knowledge between the department and its suppliers undiminished.

Most leading Australian defence contractors are wholly foreign owned, typically by corporations in the US or Europe with extremely diverse business structures. The companies aren't traded on the Australian Stock Exchange (ASX). This can greatly complicate the task of obtaining financial data—including data for benchmarking—to enable their risk-adjusted profit rates to be estimated independently.

Even if Defence has direct access to data across a range of projects to facilitate price and cost benchmarking, the number of projects with the same or similar economic attributes might still be small. And the period between the projects can often be very substantial, which often means that up-to-date data is difficult to obtain.

And, even though the individual components of work to which excessive costs and profits apply may be small relative to the size of an overall project, they can still be substantial and difficult for the department to detect.

Most forms of detection are problematic for the simple reason that determining whether a cost is reasonable requires a close understanding of not only the unit price of inputs used in production—such as the cost per hour of hiring a skilled tradesperson—but the quantity of inputs involved.

Analysis of quantity moves cost investigation from the area of forensic accounting, where Defence staff are most comfortable and well equipped, into the area of production engineering where industrialists more often hold sway. Potentially adding to the challenge facing Defence investigators is the task of apportioning the cost of a company's overheads when cost investigation is focused on individual project activities that share inputs to production, such as plant, equipment, buildings and labour.

To cost audit a complex defence project requires considerable technical skill and experience. Forensic cost and profit investigation demand a mix of financial, economic and engineering expertise that's almost always in short supply. From this perspective, defence procurement is renowned as an area in which industry can afford to appoint staff with greater experience and understanding than their public-sector counterparts.

Finally, unless managed carefully, there may be institutional barriers at work. It may be in Defence's and industry's interest to present very large estimates of required project expenditure to government for approval. That way, there's little risk of projects running over budget.

Inflated costs and profits tend to be beneficial for companies, which can be relied on not to protest. But, by reducing the prevalence of cost overruns after contracts are signed, artificially high tender prices can also: assist Defence project managers to look more efficient than they are; permit senior Defence executives to minimise their exposure to adverse public opinion, which more often than not centres on the magnitude of cost overruns than on the ancillary issue of whether original contract prices from which overruns were estimated were reasonable; allow Defence budget planners to avoid the cumbersome task of seeking expenditure supplementation from government; and, reduce the need for Defence cost investigators to work too hard to identify what appear to be substantial savings.

APPENDIX 7: PAST EXPORT PERFORMANCE—VESSELS AND VEHICLES

Historical experience and the limited market intelligence contained in government policy statements provide little confidence that the long-term economic viability of relatively small domestic production runs for vessels and vehicles can be bolstered—and significant price premiums avoided—by export orders of finished platforms or components and specialist services.

Vessel platforms

No Collins-class submarines or Huon-class minehunters were exported. Two Anzac-class frigates were exported, but only to New Zealand as part of an original production program. There are currently no export orders for Australia's Hobart-class AWDs. The littoral ships supplied by Austal to the US Navy are built in the US, limiting Australian content to remitted profits, design costs and possibly some component production.

None of the Armidale-class patrol boats built by Austal originally for the Royal Australian Navy were subsequently built for export. Only two high-speed support vessels made in Australia have been sold overseas by the company, in this case to the Royal Navy of Oman. Derivatives of the earlier versions of the patrol boats, built by Australian Shipbuilding Industries, met with only a modicum of success in export markets.

Under the Pacific Patrol Boat Project, 21 Guardian-class boats are being built by Austal¹⁶⁵—but only for other countries under Australia's Defence Cooperation Program which pays for the vessels.¹⁶⁶ The outlook for further defence exports of patrol or similar vessels isn't particularly clear, now that the OPVs have been contracted to Lürssen as the prime—with ASC and Cvmec as subcontractors—rather than to Austal.

Vehicle platforms

Exports of Bushmaster military vehicles have been restricted to about 130 (or 11%) of a total production run of close to 1,200 units. The breakdown of overall production is Australia 1,052 vehicles, the Netherlands 98, the UK 24, Indonesia three and Japan four. This level of exports was clearly not enough to overcome 'valleys of death' in domestic demand or significantly improve price competitiveness in the longer term.

Global supply chains

For now, Australian-made OPVs and Hawkei and Bushmaster military vehicles lack an established and significant overseas customer base and therefore have no obvious global supply chains to enter.

Equally, the global supply chains for military vehicles provided by Rheinmetall—the medium-heavy trucks, modules and trailers under LAND 121 Phase 3 and the combat reconnaissance vehicles under LAND 400 Phase 2—are already well established overseas.

These chains might therefore be difficult for the company to penetrate, especially now that Australia has already purchased the vehicles and has minimal contractual leverage. To do so may require that the company already be internationally competitive or in some way subsidised by the Australian Government.

Global supply-chain participation might contribute to lower equipment sustainment costs, but that relates only to the savings from perhaps keeping smaller inventories of components by virtue of being able to access them more quickly and reliably from domestic rather than overseas suppliers.

Although participation might potentially add to GDP by generating additional export income for Australia,¹⁶⁷ a recent economic impact study of Joint Strike Fighter global supply-chain participation indicates clearly that participation isn't all economic upside.¹⁶⁸ There are economic costs to consider, including participants drawing resources away from other, more productive Australian industries and supply chain exports driving up the exchange rate.¹⁶⁹

General outlook

The government's policy statements shed little light on why, when and where history will apparently reverse itself to provide greater opportunities for Australian vessel and vehicle exporters. It's difficult to accept the case for a significant expansion in export activity in the absence of any reliable indication of which class of equipment is most in demand by potential overseas customers, who those customers are, what their level of interest might be, what degree of international competition exists in overseas markets, how protected those markets are from foreign entry and what advantages Australian exporters might possess.

APPENDIX 8: VESSELS AND VEHICLES—MILITARY—STRATEGIC GAINS FROM DOMESTIC PRODUCTION

Set out below is a brief description of some of the issues raised publicly in relation to the military-strategic necessity for assembling vessels and vehicles in Australia. It should be emphasised at the outset that the objective of the Appendix is only to summarise the issues raised—not to adjudicate on their validity.

Background

Early thinking

For roughly three decades prior to 2018 the policy towards assembling vessels and vehicles in Australia was guided by the principles articulated in strategic reviews by Defence in 1986, 1989 and 1993. The reviews' overarching objective in relation to defence industry was self-reliance rather than self-sufficiency, centring on:

- limiting Australia's dependence on overseas sources for equipment repair and maintenance
- focusing design capacities on areas where Australia has unique needs
- concentrating domestic manufacturing on areas where Australian industry is broadly competitive or where there are unique Australian requirements.¹⁷⁰

The reviews made clear that, under any kind of credible military contingency, Australia needed only to be able to sustain (i.e. repair, maintain and adapt) naval vessels and their systems. Similarly, the only requirement was to sustain military vehicles suited to Australia's terrain and environment.¹⁷¹ In all cases, domestic assembly was *not* a prerequisite for sustainment to occur effectively and efficiently.

Priority Industry Capabilities

This approach was refined in 2009, when government introduced the concept of Priority Industry Capabilities (PICs). Included as PICs were 12 industrial capabilities government considered important to retain in-country for purely military-strategic reasons.¹⁷² One advantage of introducing the PICs was that it prescribed capabilities in very specific terms, from which Defence could monitor industrial capacity—and intervene in the market should capacity shortfalls emerge.

By being defined narrowly, PICs covered a relatively small proportion of the defence industry, at about 20%. Naval shipbuilding and military vehicle production weren't included in their entirety, although the supply of some specialist components for both types of equipment were covered. A similar situation applied to sustainment.

The rationale behind this was that, with few exceptions, overseas-based producers of vessels and vehicles could normally supply the equipment that the ADF required, especially given Australia's close relationship with the US. In any event, Australia couldn't hope to produce itself—or even stockpile—all key components going into major weapons platforms. This made industrial self-sufficiency an unrealistic goal, even if Australia could fabricate platform superstructures. And overseas-built equipment could, for the most part, be sustained within Australia effectively and efficiently.

There were several reasons why assigning special status to all sustainment capabilities was rejected in favour of a narrower approach. Most sustainment—consisting of equipment maintenance, repairs, and adaptation—tended to be conducted in Australia anyway for a mix of logistical and economic reasons. With sustainment enjoying a high degree of ‘natural’ protection, no special measures were normally needed to guarantee Australian over foreign supply. And sustainment tended to receive a reasonably steady flow of work from Defence. This meant its economic health could usually be maintained in what might be described as the normal course of business.

Although there were certain high-end skills associated with sustainment—relating mainly to systems engineering and platform integration—that were specific to the defence industry, most others, such as metal fabrication and equipment installation, were found elsewhere in the economy. Finally, military conflicts of the future seemed likely to be conducted with such speed and lethality that many weapons platforms would be destroyed or, if merely damaged, take too long to repair and return to battle.¹⁷³ In this situation, an omnibus domestic sustainment capability was unlikely to be required.

Industrial sovereignty

In 2018 the situation changed markedly. Assembling frigates, destroyers and submarines in Australia suddenly became necessary, apparently as an insurance policy against: disruption to overseas supply in the event of a deterioration in Australia’s strategic outlook; an already shrinking global market for assembly capability; and, difficulty in adequately sustaining in Australia equipment produced abroad including ensuring access to spare parts from overseas for what are long-lived military assets.¹⁷⁴ Similarly, assembling vehicles in Australia suddenly became essential for obtaining leading edge equipment.¹⁷⁵

These sentiments, together with a new-found—if implicit—belief that the only way to sustain vessels and vehicles of the future was to also assemble them, appears to have driven the 2018 *Defence Industrial Capability Plan* which virtually mandates domestic vessel and vehicle production.

All this took place against a background in which the Plan appears to have deviated markedly from the principles established in the preceding *2016 Defence Industry Policy Statement*. The *Statement* noted that ‘The concept of a sovereign industrial capability does not mean that all industrial elements must be wholly maintained within government or Defence. Defence envisages that the number of sovereign industrial capabilities will be small, properly targeted and managed. Key examples could include the industrial capabilities underpinning the Nulka active missile decoy system and the CEA phased array radar.’¹⁷⁶

Despite this, the Plan went on to include almost all forms of vessel and vehicle building and sustainment under a sovereignty umbrella as well as nearly all forms of sustainment for most other military equipment. This had the effect of expanding the proportion of the industry with sovereign status from around 20%, to what will eventually become around 80%.

Criteria

Immediately prior to 2018, the criteria used to select industrial capabilities important to hold in-country were not disclosed publicly. Nonetheless, they appear to have been based on purely military-strategic considerations and to have covered materiel with all the following features:

- materiel that held a pivotal position (as a finished product or a component) in the ADF’s order of battle, now or in the foreseeable future
- whether built in Australia or overseas, materiel that was unable to be amassed during periods of relative tranquility
- materiel that was difficult to acquire from overseas, or to send abroad to be sustained, in the event of a significant deterioration in Australia’s defence outlook.¹⁷⁷

In 2018, an opaquer set of three core criteria appear to have been used. Crucially, only one of the three criteria had to be satisfied for a capability to be accorded sovereign status. And the second and third criteria—which appear most relevant to vessel and vehicle assembly—give every impression of moving capability selection well beyond issues of military-strategic necessity. The criteria covered materiel:

- operationally critical to the Defence mission
- a priority within the Integrated Investment Program over the next three to five years to maintain their ability to meet Defence needs or
- due to their industrial complexity, Government priority or requirements across multiple capability programs, need more dedicated monitoring, management and support to meet Australia’s defence needs.¹⁷⁸

Counter arguments to a military-strategic advantage

Strategic considerations

The counter arguments to the claim of a military-strategic advantage from domestic assembly of vessels and vehicles begin with the fact that Australia seems to have survived quite adequately for long periods, including during the Cold War, without the same ‘strategic insurance’ that assembly in Australia now seeks to provide.

As Andrew Davies has pointed out in more contemporary terms, ‘even a more isolationist America that has largely decamped from Asia would be unlikely to actively oppose Australia’s military engagements in the region to the point of cutting off support to Australia’s forces.’ He adds that ‘there’s no sensible scenario that has us taking on a substantial power a long way from home’ and that in the unlikely event some form of confrontation close to Australia eventuates it’s likely to involve countries with a relatively low threat profile.¹⁷⁹ These factors reduce the need for Australia to pursue a policy of industrial self-sufficiency defined simply as the ability to assemble—rather than sustain—the vessels and vehicles it requires.

In the nuclear age, future military conflicts may be so short that a domestic assembly capability taking years to deliver a single vessel, or a small number of vehicles, has limited value. Any advantage that domestic assembly confers on domestic sustainment might be mitigated by major repairs to damaged vessels and vehicles still taking too long to return equipment to battle in a timely manner, even if repairs can be undertaken more efficiently than if the equipment had been assembled overseas.¹⁸⁰

It’s not clear how much difference the insurance provided by domestic assembly might make if other key elements in the ADF’s order of battle, such as aircraft, can probably never be assembled in Australia—and therefore never provide the same insurance coverage—in an era of network-centric warfare where a network is only as strong as its weakest link.

And it seems rather incongruous that Australia intends to concentrate the bulk of its investment resources on assembling major vessel and vehicle platforms at what could be a relatively high price, when the battlefield of the future seems set to be dominated by next-generation technologies—like hypersonics, directed-energy weapons, quantum information sciences, space constellation efforts, and rocket propulsion¹⁸¹—and lethal autonomous and semi-autonomous weapons systems.¹⁸² Moreover, a focus on vessel and vehicle assembly seems questionable when major naval platforms and military vehicles are becoming increasingly vulnerable to attack from modern missiles.¹⁸³

If Australia can save money by sourcing its vessels and vehicles from overseas, those savings might be redirected to improving the country’s defence self-reliance by providing for increased investment in other areas. As Paul Dibb and Richard Brabin-Smith have recently suggested, that investment could in the short-term focus on ‘higher training levels, a demonstrable and sustainable surge capacity, increased stocks of munitions, more maintenance spares, a robust fuel supply system, and modernised operational bases, especially in the north of Australia.’ In the longer term it could include ‘the development of an Australian equivalent of an anti-access and area-denial capability (especially for our vulnerable northern and western approaches) and an improved capacity for antisubmarine warfare.’ Assembling vessels and vehicles doesn’t appear to be included.¹⁸⁴

Equipment availability

If Australia's strategic outlook is deteriorating faster than previously thought,¹⁸⁵ overseas supply would appear to offer quicker access to more reliable equipment than domestic assembly.¹⁸⁶ This is especially so under the proposed continuous or rolling domestic assembly programs prescribed for domestic naval shipbuilding.

Tangible evidence to support the notion of an imminent demise of naval dockyards and vehicles production plants around the world, or a lack of capacity in plants that survive, has yet to surface publicly. In this context, there's also limited evidence on the public record that the naval vessels, military vehicles and their components that Australia requires can't be accessed reliably from overseas in configurations that satisfy our needs.

Even if Australia could fabricate the superstructure for naval combatants and for vehicles and perform relevant aspects of platform-level systems integration during a period of military confrontation, we would still depend on key equipment components—including propulsion, operating and weapons systems—from overseas that would presumably also be in short supply.¹⁸⁷ In the foreseeable future, that dependence is likely to be high given that most of the vessels and the vehicles Australia has bought recently, or currently intends to buy, are designed abroad. Overseas design tends to restrict scope for Australian industry participation and increase Australia's reliance on imported inputs.

With initial levels of Australian content for vessel and vehicle assembly projects in the order of 30-40%, reaching the point of industrial self-sufficiency—where Australia can act independently of other countries to obtain the vessels and vehicles it needs, by providing 100% of the inputs this equipment requires—seems decidedly optimistic without detracting from other areas of the Defence budget and the defence capabilities they can provide.

The counter arguments to the claim that Australia must build vessels and vehicles to ensure long-term access to spare parts are based on the following points. Even for Australian assembly, many or even most component parts still need to come from abroad. Smaller/shallower parts supply chains in Australia may be more—not less—vulnerable to closure than probably larger/deeper chains overseas associated with larger equipment production runs, in an era where global supply chains are taking hold.

And assembling an entire vessel or vehicle to ensure access to a small proportion of its components seems like a costly option that might come at the expense of the ability of Defence to invest in new military capabilities. Although not perfect, stockpiling more imported parts and even commissioning Australian industry to hold in reserve or reopen production lines for selected items seem like more practical solutions.

The build-sustain nexus

On the issue of needing to assemble equipment in Australia to be able to sustain it, there are numerous examples of Australia adapting effectively and efficiently to the domestic sustainment of naval vessels and military vehicles built overseas. Drawing on these and other factors, Andrew Davies, Henry Ergas and Mark Thomson concluded some time ago for vessels that the 'strategic benefits of local construction are at best unproven, at worst highly implausible'.¹⁸⁸ Their study remains the most comprehensive of its kind available publicly.

Australia has in the past successfully adapted overseas-built vessels and vehicles to incorporate specialised components designed for local conditions, despite this equipment being designed overseas. With careful project planning, early intervention to ensure that design work conducted overseas reflects Australia's unique requirements—including those relating to equipment sustainment—should be an achievable objective.¹⁸⁹

In this context, the idea that vessels and vehicles can't—from a purely technical perspective—be sustained in Australia unless they are also built in-country can be questioned on at least two counts. One is that the workforce involved in maintaining and repairing overseas-built vessels and vehicles should eventually gain the experience it requires to perform these tasks effectively.¹⁹⁰ More advanced forms of maintenance and repair—such as refits—might over time provide a level of understanding of the technical features of a vessel or vehicle that approaches what's achievable from a build. This might then assist with aspects of equipment adaptation.¹⁹¹

The other is that a design capability is generally considered essential for fully adapting equipment to incorporate emerging technologies developed within Australia, especially for upgrading weapons systems consisting of combat systems, weapons and sensors. However, in the foreseeable future most of Australia's vessels and vehicles and the weapons systems they incorporate have been, or will be, designed abroad.

Australia's heavy reliance on overseas designs in the short to medium term suggests that, although fostering an indigenous design capability might be a laudable objective in theory,¹⁹² it's too expensive in practice. It also suggests that the domestic assembly of vessels and vehicles does little to help overcome the problem, in the sense of assembly being significantly more effective than maintenance and repair in developing the expertise that complex forms of equipment adaptation require.¹⁹³

The idea that Australia will eventually be able afford its own design capabilities, by selling what it assembles into export markets, carries with it a high—if not extreme—degree of risk. And any expectation that overseas designers of weapons systems should be willing to reveal their source codes—to enable Australia to independently tailor those systems to its needs or add sub-systems of its own—seems rather optimistic given the dire consequences if the codes were subject to unauthorised disclosure. In any event, Australia doesn't currently aspire to develop the weapons systems themselves just the platforms that surround them, which means that domestic platform assembly confers little advantage.¹⁹⁴

The questionability of a tight nexus between domestic assembly and domestic sustainment has also been made elsewhere, based on two arguments. First, history demonstrates that Australia has the ability to sustain more sophisticated types of overseas sourced equipment than vessels and vehicles, in the form of military aircraft.¹⁹⁵ Second, Defence has an apparent desire to minimise the 'Australianisation' of its new vessels and vehicles, partly to maintain high levels of interoperability with allies.¹⁹⁶

The case of submarines

The decision to assemble submarines in Australia is most often mentioned as an example of where domestic assembly is essential for military-strategic reasons including enabling the vessels to be sustained adequately in-country. However, the history of the Collins-class and future submarine projects suggests that this issue is anything but clear.

Economic issues, based around 'jobs and growth', appear to have played a more prominent role in deciding whether the Collins-class vessels were assembled in Australia rather than overseas.¹⁹⁷ And with an actual level of Australian content of less than 40%,¹⁹⁸ it seems highly unlikely that sovereignty over the supply of key components going into the Collins-class submarines could have been achieved.

The Competitive Evaluation Process (CEP) for the future submarine project expressly included an overseas build option.¹⁹⁹ According to Insight Economics,²⁰⁰ the FSP was submitted to Cabinet for approval in 2016 without a recommendation from Defence in relation to whether the vessels should be sourced from Australia or from abroad.

If so, the notions that domestic sourcing of the future submarines is a military-strategic imperative and that a significant price premium must therefore be incurred can be questioned. And if that imperative doesn't exist for submarines—which has also been canvassed in recent discussion of a nuclear submarine option for Australia²⁰¹—the idea that it should apply to other (less technically complex) vessels or vehicles is even less persuasive. Implicit to any argument that Australia should purchase nuclear powered submarines from the US or other countries is an acceptance that even the most sophisticated vessels built overseas can be sustained adequately in Australia with proper planning.

The government's recent decision to extend the operating life of the Collins-class vessels could provide the relevant Australian workforce with the skills and experience to sustain more efficiently any future submarines built overseas.

Issues of practicality

Defining an industrial capability as sovereign has limited practical value unless Defence is then able to accurately assess the economic 'health' of capabilities with sovereign status and intervene in the market to address capability shortfalls.

In the recent past, the department has struggled with these aspects of policy implementation. And that was when checking and intervention needed to cover around 20% of the defence industry. Now that the scope of sovereignty covers most of the industry, the logistical challenges associated with health checking and intervention are greatly magnified.²⁰²

And if vessels and vehicles must be assembled in Australia for military-strategic reasons, it's reasonable to expect that the government should be willing to pay a high price premium for domestic assembly (should the need arise) and that the economic impact of that assembly should be of considerably lower importance. However, for vessels at least, the exact opposite appears to be true. When sourcing the future frigates government was highly sensitive to the size of a potential price premium, and economic impact has recently been used by government to 'vindicate' its Naval Shipbuilding Plan.²⁰³

APPENDIX 9: SUSTAINMENT COST SAVINGS

Anzac frigates

The most quoted research into the subject remains a 2000 study on the economic impact of the Anzac-class frigate build.²⁰⁴ The study claimed that, based on ‘past experience’, the annual cost of repairs, maintenance and spares ‘could be higher by a factor of two if the original source of [the build] had been overseas’.²⁰⁵ That is, the study claimed that domestic production of the frigates could halve annual sustainment costs. After discounting at a rate of close to 7% per annum, lower sustainment costs would more than outweigh a price premium for the build of 3.5% and deliver a net savings of \$520 million over the service life of the vessels estimated on the same discounted basis. However, there’s a long list of issues that points to the need for the claim to be treated with caution.

To begin, no historical cost and other data relating to ‘past experience’ was presented in the study. Nor was a breakdown provided of cost savings into the various categories through which savings could have occurred. The only clear examples of savings presented in the study related to the stockpiling of spare parts rather than to the remaining—and potentially much larger—sources of more efficient repairs and maintenance.²⁰⁶

Unfortunately, the study provided no clear indication of what level of savings in sustainment would be needed to offset anything other than a minimal build price premium. Thus, no clear indication was given of what contribution sustainment savings could make to overcoming premiums of say 15-20% or more apparently associated with future frigate construction.

The study did not indicate whether it had factored into its estimates the fact that, even if the frigates had been built overseas, the workforce that repaired, maintained and upgraded them in Australia would have eventually improved its efficiency. That is, the learning-curve effect was not mentioned. If that effect was excluded from estimates of sustainment savings, the study would have implicitly assumed that the same cost disadvantage in sustainment from an overseas build that applied at the beginning of the sustainment phase of the project also applied at the end. That doesn’t seem realistic.

And the study does not appear to have accounted for the possibility that the expertise gained through assembling the frigates domestically could have dissipated for the purpose of sustainment, if vessel assembly and sustainment varied according to location and time.²⁰⁷

Next, the argument relating to spare parts was that, if those items were supplied from Australia rather than overseas, Defence would need to hold fewer parts in storage due to quicker local delivery. But the savings in this case wouldn’t necessarily be from lower priced spare parts but the lower costs from financing extra inventory. Those costs are not especially high.

In terms of the price of spare parts, it’s difficult to see how Australia could have produced parts common to the overseas vessels on which the Anzacs were based—that probably accounted for around half of all parts used—as economically as overseas suppliers who the study acknowledged explicitly were likely to enjoy longer production runs.²⁰⁸

According to Davies, Ergas and Thomson, in the years following the 2000 study the sustainment costs of the Anzac-class frigates turned out to be more than three times higher than expected despite the vessels being built in Australia—due partly to the higher cost of Australian parts than those available from abroad.²⁰⁹ Higher costs for parts were due to the fixed cost of duplicating foreign production lines and higher marginal cost due to small cumulative production runs for domestic consumption. Interestingly, research on the through-life support of naval shipbuilding in general released more than 10 years after the 2000 Anzac study neither mentions the Davies et al. findings nor adds much new evidence to the study's findings.²¹⁰

If so, Australian part suppliers might have been internationally price competitive during the build phase of the project—a point reflected in an apparent overall build price premium of only 3.5%. But that competitiveness declined sharply during the project's sustainment phase, as Defence demand for parts declined.

This, together with learning curve effects and the need to discount nominal savings figures, gives limited support to the notion that preferring a domestic over a foreign build necessarily leads to significant reductions in domestic sustainment costs. In support of this argument, the Anzacs appear to have been upgraded reasonably efficiently, despite being built to a foreign design and the build in Australia being completed well before most upgrades were undertaken— with a consequent loss of build skills.²¹¹

Minehunters

One of the few published studies on the savings in sustainment from building vessels in Australia rather than overseas covers the Huon-class coastal minehunters. That study was completed in 2002. As a result of the minehunters being built in Australia, savings in sustainment costs were noted in three generic categories: inventories, repairs and maintenance, and preventative maintenance and training. The benefits from these categories were described as 'many' and 'significant'.²¹²

However, monetary estimates of sustainment savings from domestic assembly were only provided for inventories. Here, three types of savings were cited by Defence as likely over the 20-year operating life of the vessels, none of which are particularly large:

- \$6–8 million for the repair and maintenance elements of the overall sustainment contract
- \$7–8 million in inventory holding savings, and
- in the order of \$300,000 per annum in inventory distribution and collection procedures.²¹³

These figures appear not to be discounted, which would substantially reduce their value for the purpose of a comparison against a build premium.

In any event, the absence of a comprehensive dollar estimate of savings for all categories of sustainment prevents meaningful conclusions being drawn from the study in relation to whether those savings were sufficient to overcome a substantial price premium on a build worth \$917 million.²¹⁴ Unfortunately, the price premium (if any) associated with the build is not indicated clearly in the study—implying that it was set at zero for the purpose of estimating economic impact.

APPENDIX 10: TAX REVENUE EFFECTS

The basic concepts

When defence capital equipment projects such as those for vessel and vehicle assembly are undertaken in Australia, they give rise to an economic benefit by adding to the value of what the nation produces.

Increased production arises from the activities of prime contractors (the ‘initial effect’) as well as from the activities of companies further along the project supply chain (the ‘production-induced effect’). It also arises from all those companies’ employees, who spend their wages and salaries on consumption goods and services (the ‘consumption-induced effect’).

With higher production at all levels comes increased government revenue from a combination of company, personal income, sales, payroll, property and other taxes. That revenue isn’t available if the relevant industrial activity is undertaken overseas.

However, in estimating these gains, three constraints need to be considered. First, the amount of tax revenue the government ultimately gains from vessel and vehicle assembly is based on their Australian content not their final value or final price, which might include imported goods and services.

If the level of Australian content is high, the amount of tax revenue will be high, but lower levels of Australian content mean lower amounts of tax revenue. For example, assume that the Australian content for a domestic vehicle assembly project is 35%—as official data indicates. In this case, any gain in tax revenue from assembly would be generated from less than half of the vehicles’ final price.

Second, assembling vessels and vehicles in Australia also imposes costs on the economy, which affect the value of production and hence tax revenue. Those costs take two forms.

One is that the vessels and vehicles must be paid for somehow—ultimately through higher taxes or reduced government expenditure elsewhere. To the extent that this occurs, expanding production of vessels and vehicles will generate more tax revenue for government, while a contraction of production in other areas of the economy affected adversely by higher taxes or reduced government expenditure will deliver less revenue than before. Consequently, any net gain in revenue from vessel and vehicle assembly may be smaller than it initially appears.

In this context, if increased taxes are used to pay for assembly—which is typically the way tax impacts are modelled—those taxes can distort the work, savings and investment decisions of the companies and individuals who pay them (the tax distortion effect). Such distortions reduce the value of production across the economy. The economic cost of those distortions is variously estimated at around one-third of the value of any net tax benefit that domestic assembly generates.²¹⁵

Another form of economic cost is that domestic assembly might draw a portion of the resources—of land, labour and capital—that it requires from other areas of the working economy and in doing so also drive up the prices of whichever of those resources are in short supply. This includes drawing skilled labour from other defence projects and other industries, rather than from the ranks of the long-term unemployed.

Again, by gaining resources, production in areas of the economy involved in assembling vessels and vehicles will expand—and generate more tax revenue for government. However, at the same time, production in other areas of the economy now facing resource constraints will contract—and deliver less tax revenue. The difference between these two effects will determine how much revenue the government receives in net terms.²¹⁶

Australian versus overseas supply

The above tax revenue effects all apply when the assembly of vessels and vehicles must occur in Australia because either the equipment in its completed form isn't available from overseas or domestic assembly is deemed essential for military–strategic or other reasons.

Equally, they can apply to situations in which overseas assembly is potentially viable and interest turns to whether assembly in Australia would be more advantageous from a tax revenue perspective. In this case, several additional factors need to be considered.

To begin, when Defence pays a price premium to ensure that this equipment is assembled in-country, government needs to raise more tax revenue than would otherwise apply. Ostensibly, the extra economic costs involved should be more than offset by premiums allowing Australian industry to attract a considerably greater amount of work than if the equipment had been sourced from abroad. However, in this situation, two factors need to be considered.

One is that an adjustment may need to be made for any Australian industry participation in overseas assembly. For example, assume that the domestic content for vehicles assembled in Australia is 35%. Further assume that overseas assembly is a viable option and that the Australian content for vehicles purchased from overseas is 15% as a result of some domestic component production for export, together with aspects of vehicle systems integration and operational test and evaluation taking place domestically after initial overseas assembly has been completed. In this case, any gain in tax revenue from domestic assembly would be generated from a net Australian content figure of only 20% (35% Australian content for domestic assembly less 15% Australian content for overseas assembly) of the vehicles' final price.

The other factor is that offsetting economic benefits apply only to the extent that resources employed in connection with vessel and vehicle assembly in Australia couldn't be put to good use somewhere else in the economy in the event of overseas supply. That is, the benefits apply only to the extent that the resources used in domestic assembly are deemed to have no opportunity cost.

An outstanding feature of vessel, and to a lesser extent vehicle, assembly in Australia is that those opportunity costs can be substantial. Domestic assembly uses resources that are often in short supply nationally—and therefore in high demand by other projects and other industries. This includes skilled labour. Current efforts by Defence to invest in skilling programs to support the Naval Shipbuilding Plan illustrate the point.

UK research

The tax revenue effects from assembling vessels and vehicles in Australia have attracted a great deal of public attention, based partly on research published in the UK in 2012.²¹⁷ Its results are often used for predicting what the tax revenue from defence projects in Australia might be.

The UK study divided the costs associated with a single, service-oriented defence capital equipment project into separate categories that accorded with the various types of taxes payable to government. For example, one category was labour costs. To that category, a typical rate for personal income tax was applied to arrive at an estimate of the project's potential to provide government with additional tax revenue.

After applying this approach to all the different categories making up the project's total cost, the study estimated that, for every £1 million spent by government on the project, 39% would be returned in the form of tax revenue. This had the effect of substantially reducing the project's net cost to government, compared to a situation in which the project had been undertaken overseas.

Quite apart from the fact that a figure of 36% is more than three times higher than that of a broader UK study conducted in 2009,²¹⁸ it's important to understand that key assumptions associated with the 2012 research—some explicit and some implicit—might limit its wider applicability. In effect, those assumptions were as follows:

- A single small support project with high levels of labour-intensity would adequately reflect the structure of other projects, including much larger and more capital-intensive acquisitions.
- One hundred per cent of the value of the project was UK content. That is, the project had no imported inputs.
- If the project had been undertaken overseas, no UK industry participation was possible.
- None of the resources needed to support the project in the UK—of land, labour or capital—were in short supply nationally or drawn from other industries. Thus, all the resources required, including labour, were taken to be previously 'unemployed'.
- If the project had been undertaken overseas, none of the resources that would have been devoted to it had the project been progressed in the UK could have been put to productive use in other parts of the UK economy—perhaps because the study was undertaken during a period of economic recession in that country.
- The project was internationally price competitive. That is, no price premium was involved.
- Together, all these factors led to the project creating a net expansion in the size of the UK economy (normally measured by real GDP), from which added tax revenue could be generated.

Implications for Australia

If any one of those assumptions had changed significantly, the outcome from the 2012 UK study could have been very different. This suggests that, if UK experience is being extrapolated to an Australian environment, it's essential to test whether the assumptions still hold. Failure to do so can lead to misleading results.

To illustrate, consider an Australian defence capital equipment acquisition project with the following features:

- a significant level of overseas content, even if the equipment is assembled in Australia
- a significant level of Australian industry input, if the equipment is produced overseas
- a significant price premium
- a highly skilled domestic workforce
- an assembly schedule in Australia mostly spanning 'normal' levels of national economic activity.

These features match those of a hypothetical project involving the assembly of six Collins-equivalent submarines over a 16-year period. Economic modelling for the project, which covers its economic benefits and costs, yields the tax revenue outcomes shown in Table 1²¹⁹—noting that the outcomes are conservative by excluding the economic costs associated with a tax distortion effect and assuming that the company assembling the vessels is wholly Australian-owned. The figures are expressed as annual averages.

Table 1: Tax revenue outcomes—Australian build versus optional overseas build

	Australian build only (no overseas option)	Australian versus overseas build (overseas option open)
Value if assembled in Australia	\$943 million	\$943 million
Overseas content in Australian build	33%	33%
Australian content if assembly occurs overseas	n.a.	13%
Price premium	n.a.	30%
Workforce skill level	High	High
Level of national economic activity during assembly	Normal	Normal
Increase (+) or decrease (-) in real GDP	+\$65 million	-\$368 million
Tax revenue gain (+) or loss (-)	-\$51 million	-\$61 million

n.a. = not applicable.

Source: Department of Defence, *Building submarines in Australia: aspects of economic impact*, Australian Government, Canberra, May 2015, Table 6, pp. 8, 20–25, [online](#).

Other issues

When evidence drawn from the 2012 UK study is used to impute the tax revenue effects of defence projects in Australia, one or more of the following assumptions are being made, if only implicitly:

- The tax revenue issue is new to any consideration by Defence and others of economic impact.
- The economic models that have been used in the past to estimate the economic impact of defence projects in Australia exclude a tax estimation capability.
- If that capability exists, it's less comprehensive than the form of analysis that the UK study contains.
- When impact results are reported, the tax revenue effects are somehow excluded.

If used, none of these assumptions is correct. The tax revenue effect of projects isn't a new issue in the Australian defence context. It's been a widely accepted component of the economic analysis of projects for decades.²²⁰ Next, most if not all economic models that have been applied to major defence projects in the recent past have a tax revenue estimation capability.²²¹ In almost all cases, that modelling capability is significantly more—not less—comprehensive than the 2012 UK study provides. And finally, when the results of economic impact are presented, they don't normally exclude the tax revenue effect. Indeed, it's difficult to find an example where impact results without the effect have been used.

NOTES

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- 3 Brendon Nicholson, 'Hugh White calls for Australia to scrap ships and build more submarines', *The Strategist*, 2 July 2019, [online](#); Peter Jennings, 'The case for a new defence white paper', *The Strategist*, 18 June 2019, [online](#); Malcolm Davis, 'Forward defence for Australia', ASPI, June 2019, 3 and 13, [online](#) and 'Forward defence in depth' for Australia (Part 3)', *The Strategist*, 18 December 2018, [online](#); Kim Beazley, 'Defence policy in an era of disruption', *The Strategist*, 8 December 2018, [online](#); Richard Menhinick, 'Australia must double defence spending to address worsening strategic outlook', *The Strategist*, 11 October 2018, [online](#); Marcus Hellyer, 'Self-reliance to have its price', *The Australian*, 25 May 2019, [online](#) and 'The cost of defence: beyond 2% of GDP', *The Strategist*, 5 June 2019, [online](#).
- 4 Industry Commission, *Defence procurement*, report n. 41, Australian Government Publishing Service, Canberra, August 1994, 39–45, [online](#); Andrew Davies, Henry Ergas, Mark Thomson, *Should Australia build warships? An economic and strategic analysis*, discussion paper, ASPI, Canberra, April 2012, [online](#); Andrew Davies, Mark Thomson, *An enterprise-level naval shipbuilding plan*, ASPI, Canberra, July 2015, [online](#); Edward G Keating et al., *The economic consequences of investing in shipbuilding: case studies in the United States and Sweden*, RAND Corporation, Santa Monica, 2015, 7-12, [online](#); Department of Defence (DoD), *Building submarines in Australia: aspects of economic impact*, Australian Government, Canberra, May 2015, 20-26, [online](#); Productivity Commission, *Trade and assistance review 2014–15*, Australian Government, Canberra, 2016, 36–38, [online](#); Insight Economics, *Australia's future submarine: getting this key capability right*, public policy report to Submarines for Australia, Melbourne, September 2017, 112–115, [online](#); Australian National Audit Office (ANAO), *Naval construction programs—mobilisation: department of defence*, performance audit report n. 39 2017–18, ANAO, Canberra, May 2018, 47–50, [online](#) and *Army's protected mobility vehicle—light*, performance audit report n. 6 2018–19, Canberra, September 2018, 54–55, [online](#); Hugh White, *How to Defend Australia*, La Trobe University Press, Melbourne, July 2019, 448-454, 468-71, 490-493, [online](#). The 2015 DoD report on submarines appears to be an early version, essentially an initial working draft, of what could be a considerably more comprehensive final document that hasn't yet been released by government. The early version cited above was released only through an application under freedom of information legislation (DoD, *FOI 145/15/16 statement of reasons under the Freedom of Information Act*, [online](#)).
- 5 One of the more intriguing issues associated with measuring economic impact is whether exports of vessels and vehicles or parts thereof add more to the economy than if the same domestically produced items are destined for consumption by Defence. In short, do exports provide more 'bang for each buck' than an otherwise equivalent form of production for use in Australia? A relatively high impact might help to support the case for government export assistance for industry. This includes the case for paying a price premium to facilitate initial production for Defence, from which an export capability can evolve. Exports destined for final use overseas are paid for by foreign customers. In relative terms, that creates an economic benefit by providing Australia with a source of inward foreign investment. But, compared to vessels or vehicles produced for use by Defence, exports might be associated with a higher economic cost by placing upward pressure on the exchange rate. A higher Australian dollar can reduce the competitiveness of Australian exporting and import competing industries. Although the net effect of these factors is difficult to predict *a priori*, a net positive effect is difficult to discount. Unfortunately, there don't appear to be any published studies that gauge the difference in economic impact between an item of equipment produced in Australia for Defence and the same item produced for export. This remains an obvious and important gap in our understanding of how projects affect the economy. For an example of the problems this creates see Mark Thomson, 'Defence exports – best bang for buck', *The Strategist*, 23 May 2017, [online](#). Thomson's analysis is complicated by the sales and jobs data associated with the export project he uses for comparative purpose (JSF global supply chain participation) appearing to be estimated incorrectly – see Appendix 3.
- 6 Marcus Hellyer, *The cost of Defence: ASPI defence budget brief, 2018–2019*, ASPI, Canberra, 24 May 2018, 55–57, [online](#), *The cost of Defence: ASPI defence budget brief, 2019–2020*, ASPI, Canberra, 6 June 2019, 64, [online](#) and *Going nuclear: would US submarines be a cheaper option?*, ASPI, Canberra, 24 September 2018, [online](#).
- 7 Comparing the size of projects and their price premiums is complicated by a lack of transparency around exactly what's included in the published costing figures to which price premium percentages are applied. Accordingly, all that can be done for the purpose of this paper is to assume that: the costing methodology for projects is similar; estimates of cost contain relatively small amounts for Defence project management; and, published price premium percentages apply to the total published project cost. Project costs expressed in today prices aren't generally available publicly. I have estimated these in very broad terms using a 2.5% annual rate of inflation and project periods drawn from the following information. For the future frigates a production period of 2020–2041, see Nigel Pittaway, 'Australia officially announces \$26B frigate contract: here are the details', *Defense News*, 29 June 2018, [online](#). For the future submarines a production period

of 2030–2057, see Mark Thomson, *The cost of Defence: ASPI defence budget brief 2017–18*, ASPI, Canberra, 25 May 2017, 224, [online](#); Marcus Hellyer, *Thinking through submarine transition*, ASPI, Canberra, October 2018, 14, [online](#) and ‘Senate estimates, submarine escalates’, *The Strategist*, 6 June 2018, [online](#). For the OPVs a production period of 2018–2030, see Wikipedia, *Arafura-class offshore patrol vessels*, [online](#). For LAND 400 Phase 2 a production period of 2021–2026, see Wikipedia, *Boxer (armoured fighting vehicle)*, [online](#). For LAND 400 Phase 3 a production period of 2022–2030, see DoD, *LAND 400 Phase 3 Indicative Timetable*, Canberra, [online](#).

- 8 John Birkler et al., *Australia’s naval shipbuilding enterprise: preparing for the 21st century*, RAND Corporation, Santa Monica, 2015, 131, [online](#). It’s of some interest to compare these premiums against those of earlier projects. For historical details of the published premium for the Anzac-class frigates, see Tasman Asia Pacific, *Impact of major defence projects: a case study of the Anzac ship project: final report*, Canberra, February 2000, 9–10, [online](#). A published premium of 3.5% at the completion of the Anzac project relates to Australian relative to German production. In RAND’s later report on naval shipbuilding, the price premium for the Anzac ship project was estimated at 36–48% at project completion relative to production in the US (Birkler et al., *Australia’s naval shipbuilding enterprise*, Table 5.9, 117). Three issues in relation to this dichotomy in the estimated price premium for the Anzac-class frigates arise. First, RAND’s 2015 benchmarking analysis didn’t include German-made frigates. This prevents the published premium of 3.5% being verified directly using an additional source of data on a Germany–Australia basis. Second, the price premium of 3.5% was used to estimate the economic impact of the Anzac frigate project. Had a premium of 36–48% been used instead, the project’s economic impact would almost certainly have been negative. Third, with a published price premium of 3.5% and an apparently valid Australian content figure of 72% (Note 60), the Anzac frigate project appears to demonstrate that Australian naval shipbuilding can be both internationally competitive and dominated by domestic inputs, based on a batch rather than a more continuous form of production, an overseas design and an Australian-based builder not originally involved in the design process. In this case, the way the project is managed by DoD is the key to a successful project outcome. In particular, project success comes from taking early steps to re-engineer overseas designs to suit potential Australian component and service providers, ensuring that workshop drawings and work orders are created in a way that facilitates efficient construction in Australia, strictly auditing Australian industry content targets, imposing heavy penalties for content noncompliance and working under a suitably structured fixed-price contract. Based on the Anzac frigate experience, these measures appear to have the potential to break any nexus between high Australian content and high price premiums. This line of argument—which has also been used for the future submarines in Goran Roos, ‘How to make sure Australia’s submarines pay for themselves’, *The Conversation*, 26 April 2016, [online](#)—implies that Australian industry is intrinsically competitive and that the principal impediment to demonstrating that competitiveness is Australian-based companies not being given a reasonable opportunity to bid for work. None of these three issues has been addressed in detail or, where appropriate, reconciled under the government’s Naval Shipbuilding Plan and its associated documentation. The situation in relation to the price premium for the AWDs is more straightforward although not without contention. Insight Economics, *Australia’s future submarine*, 114 advocates a premium of 30–40% or more, based on RAND benchmark data—the RAND figure for the AWDs was 24–39% (Birkler et al., *Australia’s naval shipbuilding enterprise*, Table 5.10, 118)—and the difficulties associated with the AWD project. This seems the most likely outcome from the project. The Auditor-General (ANAO, *Air warfare destroyer program*, performance audit report n. 22, Canberra, 6 March 2014, paras 16–18, 19–20, [online](#)) indicates a price premium at the start of the AWD project of a little over 13%. This is based on an expected Australian build price of \$8.5 billion, an overseas build price of \$7.5 billion and therefore a price premium of \$1 billion. The Economics References Committee (ERC), *Part III: Future of Australia’s naval shipbuilding industry: long-term planning*, The Senate, Canberra, 28 June 2018, 61, [online](#) notes that the AWD project price had increased by \$1.2 billion during the course of the project. Assuming no further price increases apply and that those price increases wouldn’t have occurred had the vessels been built overseas, the Australian price becomes \$9.7 billion, the overseas price remains the same at \$7.5 billion, the price premium increases from \$1 billion to \$2.2 billion and the premium shifts from 13% to around 30%. However, two points of clarification should be noted. First, the published estimates of cost increases for the AWDs have attracted considerable controversy for being overly conservative because of what appears to be a benchmark based on building the AWDs in Spain rather than other, possibly more efficient, countries with a naval shipbuilding capability (Mark Thomson, ‘What on earth is going on with the air warfare destroyer program’, *The Strategist*, 19 June 2015, [online](#); Mark Thomson, ‘Saving the AWD project—too little, too late?’, *The Strategist*, 27 May 2015, [online](#); Mark Thomson, ‘The costs of cutting steel’, *The Strategist*, 5 November 2014, [online](#); Hugh White, ‘Naval Shipbuilding: a strategic necessity?’, *The Strategist*, 31 August 2015, [online](#) who noted that ‘the cost and risk difference between local and overseas builds can be huge, as the AWD project shows. We could have bought Arleigh Burkes off the US production line for not much more than US\$1 billion each, and we would have them at sea by now. The AWDs are coming in at US\$3 billion each and counting, and delivery is still years away’). Second, Robert Macklin (*Air warfare destroyer: the game-changer*, ASPI, Canberra, 29 August 2018, 75, [online](#)) refers to an ‘effective price premium’ of 30% for the AWDs based on the Auditor-General’s report. However, the Macklin article seems to confuse the price premium for the project with the project’s effective rate of assistance (ERA) which was quoted by the Auditor-General as 30%. The price premium and the ERA are related in the sense that the ERA relies in part on price premium data but nevertheless don’t measure the same thing. The ERA is explained in Note 84.
- 9 ANAO, *Future submarine—competitive evaluation process: department of defence*, performance audit report n. 48, 2016–17, Canberra, 27 April 2017, 25, 47, [online](#) and *Naval construction programs—mobilisation*, para 4.31, footnote 72, 47. A higher figure was mooted in Productivity Commission, *Trade and assistance review 2014–15*, 29, 38.
- 10 Ben Coleman, *Australia’s offshore patrol vessels: missing an opportunity?*, ASPI, February 2018, 8–9, [online](#).
- 11 Ben Coleman, ‘Taking one for the team: the OPV split-build’, *The Strategist*, 21 November 2017, [online](#).
- 12 Hellyer, *The cost of Defence: ASPI defence budget brief, 2018–2019*, 86–88. Of special interest is his discussion of the net costs of upgrading ageing vessels, 86–87. For a slightly different view on the net costs of upgrading ageing vessels see James Mugg, Alistair Cooper, *Upgrade or replace: a cost comparison of Australian warship service lives*, ASPI, Canberra, 13 April 2017, [online](#).
- 13 Neither the contractually agreed Australian content figures nor details of their effect on price premiums have been released publicly for SEA 5000, SEA 1000, SEA 1180 or LAND 400 Phase 2. However, the low initial base from which content is to be developed—suggests that the projects begin more as a form of assembly than of manufacture. Low Australian content creates a policy conundrum. To begin, it indicates that industrial self-sufficiency of the kind applying in countries such as the US (US Department of Defense, *Assessing and strengthening*

- the manufacturing and defense industrial base and supply chain resiliency of the United States*, report to the President, Washington D. C., September 2018, [online](#)) may be an unrealistic goal given that so many of the inputs required for projects need to be imported. Any attempt to remedy the problem by substantially increasing rates of Australian industry participation could put upward pressure on prices and price premiums. In turn, this diminishes the purchasing power of the defence budget and the broader military capability it can support. And high prices and premiums—or low levels of Australian content—reduce the much-vaunted contribution of projects to ‘jobs and growth’ across the economy. Low content reduces the size of technology and labour skills project spillovers (Note 74 provides more detail on the source of spillovers and their effects) and limits the opportunities for Australian-based companies to export through participation in global supply chains. There are no universally agreed definitions of industrial self-reliance and industrial self-sufficiency. However, for consistency, I follow the definition used by Insight Economics which defines industrial self-reliance in the following terms: ‘Self-reliance means that Australia has the sovereign capability to sustain defence assets in-country, to undertake upgrades when required and to repair damage and return them to operational availability as quickly and efficiently as possible’ (Insight Economics, *Australia’s future submarine: getting this key capability right*, 115). This suggests that industrial self-sufficiency can be defined simply as the sovereign capability to build those assets. This overall approach to definition appears to accord with that adopted in another recent discussion of the issue, see Paul Dibb, ‘Why we need a radically new defence policy’, *The Strategist*, 29 September 2018, [online](#). A similar definition was used by the Industry Commission in its 1994 review of *Defence procurement*, 192. If building defence capital equipment in Australia is necessary for that equipment to be sustained in-country, the concepts of industrial self-sufficiency and industrial self-reliance will overlap.
- 14 ANAO, *Army’s protected mobility vehicle—light and Australian Defence Force’s medium and heavy vehicle fleet replacement (Land 121 Phase 3B)*, performance audit report n. 52, 2014–15, Canberra, 25 June 2015, [online](#); DoD, ‘Project Overlander, LAND 121 armoured vehicle contract awarded’, media release, *Defence IQ*, 13 December 2011, [online](#).
- 15 The official prediction for Australian content for the future frigates is 65–70% (DoD, ‘Joint media release—Prime Minister, Minister for Defence Industry, Minister for Defence and Minister for Finance—the Hunter class—defending Australia and our shipbuilding sovereignty’, Australian Government, Canberra, 29 June 2018, [online](#)). However, considerable speculation has surrounded this figure given an apparent 50% target set in associated project documentation (Amelia McMahon, ‘50% industry participation target for SEA 5000 slammed’, *Defence Connect*, 30 January 2018, [online](#)). This compares with an Australian content figure of around 72% (excluding offsets) normally ascribed to its predecessor, the Anzac-class frigate. The Anzac-class frigate figure appears to be reasonably realistic, given that the project was managed in a way that avoided many of the pitfalls associated with the AWD project mentioned in Note 8—keeping in mind that the two types of vessels are not the same physically and cross-project comparisons can be challenging. Nonetheless, the estimate of 65–70% for the future frigates seems questionable on several fronts, without placing upward pressure on prices and premiums. Together, these factors suggest an outcome below the targeted amount unless higher price premiums are incurred. First, other than hull fabrication and fit-out, most aspects of the future frigate project seem to depend heavily on imported inputs. For example, other than the CEA Technologie CEAFAR radar, Saab combat system interface and perhaps the Nulka missile decoy and some elements of initial prototyping work that have been designated for Australian-based companies, it seems that most of the typically high cost weapons systems, ship operating systems and propulsion systems for the vessels will be sourced from overseas. This includes an Aegis combat system. Second, the future frigate project is being progressed at a relatively swift pace, with what appears to be strict adherence to the core original overseas design of the vessels and after BAE (the prime contractor) appears to have already established much of its own supply chain for supply of corresponding Type 26 frigates in the United Kingdom where production has already begun. Third, BAE is wholly foreign-owned and should therefore remit its profits overseas. Together, these factors could limit, perhaps substantially, the scope for Australian industry participation and content. Although some design work for the vessels will be undertaken in Australia to facilitate the incorporation of items unique to Australia’s requirements—including the combat system, anti-air missiles, phased array radar, tactical interface and helicopter landing capability—three issues should be noted. First, the bulk of design work will still be undertaken overseas including initial work on Australian adaptations. Second, design work in Australia might come with a price premium. Third, most of the design work is aimed at incorporating items of equipment produced overseas including the Aegis combat system, SM-2 and Seasparrow missiles and MH-60R helicopters. See Julian Kerr, ‘How Hunter frigates will ride on wake of British experience’, *The Australian*, 25 May 2019, [online](#). Unfortunately, the Australian content for the OPVs and Pacific Patrol Boats is difficult to deduce from publicly available data.
- 16 The 30% Australian content figure for AWDs is cited in Insight Economics, *Australia’s future submarine: getting this key capability right*, 114. The official figure for Australian content for the AWDs is 55–56%, excluding the content associated with extraordinary rectification work, and 65% when that work is included (Macklin, *Air warfare destroyer: the game-changer*, 26, 75). The figures of 55–56% and 65% appear to be based on the total cost of the vessels including their Aegis combat system. A figure of 60% Australian content for the AWDs on total project cost is referenced in ERC, *Part III: Future of Australia’s naval shipbuilding industry: long-term planning*, para 5.55, 112. Clearly, there’s a substantial difference between the Insight Economics and DoD and Senate estimates. However, five factors suggest that a figure towards the lower end of the spectrum of available data could reflect the project’s final outcome. First, ASC’s role in relation to the AWD build relates primarily to hull fabrication, assembly, outfitting and commissioning. Those functions typically account for no more than 15–20% of the total cost of producing a vessel of this kind efficiently, excluding the substantial cost of the Aegis combat system. And, as Macklin notes, part of the hull of the AWDs had to be built in Spain despite initial plans to have the work done in Australia—Macklin, 64. Second, it’s clear that most key components going into the AWDs are imported, including high-cost components relating to the ships’ propulsion, operating and weapons systems. A list of those components is provided on page 114 of the Insight Economics report. This includes the fully-imported Aegis system which should, by itself, account for a substantial proportion of the overall cost of the vessels. Although not available publicly, the cost of that system could be in the order of 20–30% of the total cost of the AWDs, see Davies et al., *Should Australia build warships? An economic and strategic analysis*, 8 and DoD, *Building submarines in Australia: aspects of economic impact*, Table 34, 97. Third, the Spanish supply chains for components and specialist services were already well established before the AWD project began in Australia. It’s unclear what effort was made subsequently to re-engineer the AWD’s overseas design to suit potential Australian component and service providers. Both factors could have substantially limited the scope for Australian industry participation. Fourth, there’s little evidence to suggest that strict contractual procedures were introduced for auditing Australian content targets—to avoid overseas-made components being rebadged as Australian-made—or for imposing strong penalties for noncompliance with contractual commitments for

Australian content, including liquidated damages. Fifth, the rise in Australian content from 55–56% to 65% represents a form of industrial inefficiency, which drove up the cost of the vessels. It shouldn't be considered a project benefit. The increase in Australian content due to rectification work seems to have been due partly to the difficulties experienced by the AWD project in modifying Spanish workshop drawings and work orders to facilitate efficient construction in Australia. Indeed, such were the problems associated with this aspect of the project that the 'shipyard hours' required for hull fabrication, assembly, outfitting and commissioning in Australia appear to have been well above international best-practice, see ERC, *Part III: Future of Australia's naval shipbuilding industry: long-term planning*, 53–60. This raises the question of whether cost increases due to inefficiency were greater than the published difference between 55–56% and 65% Australian content would suggest.

- 17 Publicly available data, in the form of the Australian industry participation plan for the future submarines taken from the competitive evaluation process, provides limited insight into the actual level of Australian content that can reasonably be expected from the future submarine project because the plan is so heavily redacted (DCNS, *17: Australian industry plan*, DoD, Canberra, 10 May 2018, [online](#)). This mirrors considerable uncertainty on the issue discussed in ERC, *Part III: Future of Australia's naval shipbuilding industry: long-term planning*, paras 5.53–5.54, 112 and 113–117. More recently, the uncertain nature of the level of Australian content associated with the project was emphasised in Rory Callinan, 'No set figure for Australian work on new subs: defence boss', *The Australian*, 20 February 2019, [online](#). It's sometimes the case that the Australian content for the future submarines is taken to equal or exceed that of the Collins-class vessels. However, estimates of the level of Australian content for the Collins-class submarines vary widely. A figure of 80% plus has recently been quoted at Ministerial level (Sky News, *Defence Debate*, 8 March 2019). However, this is substantially higher than the official figure of 67% identified by DoD and presented in some detail in DoD, *Building submarines in Australia: aspects of economic impact*, attachment G, 94–102. As discussed in Note 18, the official figure of 67% may be substantially overstated by including imported inputs registered as Australian-made.
- 18 Dr Ohff was the CEO of ASC during the Collins-class submarine build. The possibility of low Australian content in that build is given some additional support by evidence cited in ERC, *Part III: Future of Australia's naval shipbuilding industry: long-term planning*, para 5.26, 105. The problem of the Australian content of naval vessels built in Australia being overstated is recognised widely. The potential causes include imported inputs being registered as built in Australia by either being recorded by DoD in Australian dollars rather than an overseas currency or simply passing through an Australian-registered company with minimal value-adding. When comparing the difference in Australian content between a domestic and overseas build it's important to recognise that even for an overseas build there might be some Australian content. For details of the level of Australian industry content potentially associated with an overseas Collins-equivalent submarine build, see DoD, *Building submarines in Australia: aspects of economic impact*, 91–93. In relation to the Collins-class submarines, Dr Off quotes an actual figure of less than 40% domestic content for an Australian build. But if the vessels had been built overseas, Australian content could quite possibly have been in the range 5–20%, the lower figure relating to what was required to set the submarines to work in an Australian operating environment and the higher figure relating to the scope for this and reasonably competitive Australian-based companies to potentially participate in an overseas build through component manufacture and service provision. From this, the net Australian content for the project could have been as low as 20% of the total cost of the project. This net Australian content is the correct figure against which the price premium for the project should be compared.
- 19 The price premium for the submarines is based on a comparison of Australian prices against French prices, while the premium for the frigates compares Australian prices against US prices. Nonetheless, a comparison of the 15% premium for the future submarines against the 15–20% premium for the future frigates seems appropriate given data indicating that Australian naval shipbuilding costs are higher than French naval shipbuilding costs, which are both higher than US naval shipbuilding costs. In its 2015 study on Australian naval shipbuilding, RAND excluded any mention of submarines. However, its international cost benchmarking of frigates indicated a price premium of around 17% for Australian sourcing compared to French sourcing. This was based on an average cost index of 1.21 for the French D650FREMM frigates built in France and an average cost index of 1.42 for the Anzac-class frigates built in Australia, with an average index of 100 representing US costs (Birkler et al., *Australia's naval shipbuilding enterprise*, 117). The Anzac-class frigate project seems to have enjoyed an unusually high level of productivity in an Australian naval shipbuilding context. Consequently, the historical 17% premium for an Australian versus a French frigate build might be indicative of the premium applicable to Australia's future frigate project after planned productivity improvements for the project have been considered.
- 20 Productivity Commission, *Trade and assistance review 2014–15*, 37.
- 21 The price premium for the Collins-class submarines is difficult to determine from public sources. The early cabinet submission on the issue did not give a clear indication of the premium although preliminary (but heavily qualified) estimates were provided indicating \$2.681 billion in 1985 prices for an all-Australian build and \$2.363 billion for an all-overseas build—a premium of 15%. See Kim C Beazley Minister for Defence, *New Construction Submarine*, cabinet submission n. 2816, 30 April 1985, attachment H (41–44) and attachment I (45–51), [online](#). Subsequently, the principal cabinet decision relating to the project provided little information on the size of the premium for the project, see Kim C Beazley Minister for Defence, *New Submarine Project*, cabinet submission n. 4870, 8 May 1987, attachments G and K, [online](#); cabinet minute, *New Submarine Project*, decision n. 9580, Canberra, 18 May 1987, 64, [online](#). In 1994, the Industry Commission was unable to determine a price premium for the Collins project, based on testimony from industry witnesses (*Defence procurement*, 41–42). In 1999, McIntosh and Prescott commented that a 2.5% contingency built into the original Australian build price for the Collins-class submarines was 'quite inadequate'. They suggested a figure of 10–15% instead (MK McIntosh, JB Prescott, *Report to the minister for defence on the Collins submarines and related matters*, Australian Government, Canberra, June 1999, 17, [online](#)). Using 1985 cabinet cost data and assuming all the added contingency suggested by McIntosh, Prescott was required for an Australian build but none for an overseas build, the price premium for the Collins-class submarines could have approached 30%. Surprisingly, no clear reference to the price premium issue was made in seminal research on the Collins-class project by P Yule, D Woolner, *The Collins submarine story: steel, spies and spin*, Cambridge University Press, Cambridge, UK, 2008. Nor was the issue addressed clearly in D Woolner, *Getting in early: lessons of the Collins submarine program for improved oversight of defence procurement*, research paper n. 3, Foreign Affairs, Defence and Trade Group, Parliament of Australia, Canberra, 18 September 2001, [online](#). However, the Yule, Woolner study (41–59 and 326–327) gave the impression that, such was the enthusiasm for assembling the Collins-class submarines in Australia for economic reasons, comprehensive data on the

- price difference between building the vessels in Sweden and building them in Australia may not have been collected by DoD or the issue not considered in detail by government. Interestingly, these economic reasons later turned out to be highly questionable when reviewed in detail as an adjunct to the future submarine project competitive evaluation process, see DoD, *Building submarines in Australia: aspects of economic impact*. Based on averaged international benchmarking data for a range of submarine projects across different countries, Pacey concluded in 2012 that no premium applied for building the Collins-class submarines in Australia (Brice Pacey, *Sub judge: Australia's future submarines*, Kokoda Papers n. 17, Canberra, January 2012, v, 48 and 52, [online](#); Peter Briggs, 'Decisive action needed to avoid a submarine capability gap', *The Strategist*, 13 December 2018, [online](#)). Unfortunately, the Pacey data did not indicate separately Australian and French build costs. And the data is difficult to reconcile with RAND's 2015 international benchmarking of French against Australian build costs for frigates (Note 19), noting that the RAND study excluded any specific data for submarines (Birkler et al., *Australia's naval shipbuilding enterprise*, 117). In 2016, DoD's study on the economic impact of assembling Collins-equivalent vessels in Australia suggested the department's inability to identify accurately the price premium for the Collins-class project from its internal historical records. The study tested a range of hypothetical scenarios relating to premiums, without indicating which scenario was the most likely (DoD, *Building submarines in Australia: aspects of economic impact*, 26 and 38).
- 22 As Insight Economics has noted in relation to the future submarines 'going forward with just one design has resulted in Defence gifting to Naval Group almost complete market power over capability, price and delivery' (Insight Economics, *Australia's future submarine: getting this key capability right*, 11).
 - 23 Drawing from *The Economist*, 30 April 2016, 48, Gunnar Eliasson noted that France's DCNS was 'not known for its experience with international partnership work' (Gunnar Eliasson, *Visible costs and invisible benefits: military procurement as innovation policy*, Springer, Berlin, November 2017, 199, [online](#)).
 - 24 Aidan Morrison, *A reply to the government's response to the question of the pumpjet*, prepared for Submarines for Australia, Trendlock Consulting, September 2018, [online](#).
 - 25 David Uren, 'Homemade subs may give Australia a sinking feeling', *The Australian*, 7 March 2019, [online](#); Robert Gottliebson, 'Politics threatens to force disastrous submarine decision', *The Australian*, 1 October 2018, [online](#).
 - 26 Hellyer, *Thinking through submarine transition*; Greg Sheridan, 'We might sink decades before those submarines fly', *The Australian*, 14 February 2019, [online](#) and 'As threats mount, we must start taking defence seriously', *The Australian*, 2 March 2019, [online](#).
 - 27 Hellyer, 'Senate estimates, submarine escalates'; ERC, *Part III: Future of Australia's naval shipbuilding industry: long-term planning*, para 2.21, 13; Paul Maley, 'Cost, tech pose dangerous subplot for Defence chiefs', *The Australian*, 3 June 2019, [online](#).
 - 28 DoD, *2018 defence industrial capability plan*, Australian Government, Canberra, 2018, 37, [online](#). All this occurs in the absence of a clear public explanation of why sovereignty should apply. According to Insight Economics, the future submarine project was submitted to cabinet for approval without a recommendation from DoD in relation to whether the vessels should be assembled in Australia or abroad (Insight Economics, *Australia's future submarine: getting this key capability right*, 111). If so, the notion that domestic assembly is a military-strategic imperative and that a significant price premium must therefore be incurred might be questioned. If that imperative doesn't exist for submarines, which was also canvassed in a recent discussion of a nuclear submarine option for Australia (Peter Briggs, *Can Australia afford nuclear propelled submarines? Can we afford not to?*, ASPI, Canberra, October 2018, [online](#)), the idea that it should apply to other vessels or to vehicles is even less plausible. However, resolving this issue lies outside the scope of this paper. Placing any defence industry capability under a sovereignty umbrella prior to the production phase of a project raises the question of whether companies bidding for the project will provide Defence with a realistic estimate of the price of overseas supply—and therefore a realistic estimate of any price premium. As the Industry Commission has noted, once the government has signalled a preference for assembly in Australia, bidders for a project have less of an incentive to submit a realistic price for a competing overseas build (Industry Commission, *Defence procurement*, 40).
 - 29 ANAO, *Naval construction programs—mobilisation*, para 4.31, 47. It's of some interest to note that Canada has experienced sharp increases in the estimated costs of its National Shipbuilding Strategy introduced in 2010, see J F Collins, *Overcoming 'boom and bust'? analysing national shipbuilding plans in Canada and Australia*, Canadian Global Affairs Institute, Calgary, January 2019, [online](#).
 - 30 ANAO, *Naval construction programs—mobilisation*, para 4.31, 47.
 - 31 Based on RAND's estimates of the lower levels of labour input for future frigate production from bridging a gap between the current AWD and future frigate projects by constructing OPVs, ASPI concluded in 2015 that the scale-related gains of shifting from batch to continuous production were relatively small (Mark Thomson, 'The 2015 RAND report on Australian naval shipbuilding', *The Strategist*, May 2015, [online](#)). Although that conclusion was keenly contested by RAND (John Birkler, 'RAND responds to ASPI', *The Strategist*, 11 May 2015, [online](#)), the apparently correct figures still haven't been released publicly. More recently, ANAO has added support to the ASPI arguments by highlighting evidence from DoD that the 'OPV bridge' would not make any material difference to any resourcing problems faced by the future frigate project (ANAO, *Naval construction programs—mobilisation*, paras 3.15–3.20, 30–31).
 - 32 Price premium data appears not to have been collected by DoD at the tender stage of the future frigate project, meaning it could not be used to help verify earlier benchmarking data (ANAO, *Naval construction programs—mobilisation*, para 4.31, 47). For the future frigates, the size of the price premium that productivity improvement must help to overcome has been estimated based on a benchmark comparison between Australian and US prices. However, the future frigates have been awarded to a UK designer and builder, BAE. If the size of the premium estimated using a benchmark comparison between Australia and the UK is relatively small, it might be argued that productivity improvement will have a greater impact in reducing the premium associated with the project. However, although limited in scope, the relevant benchmarking data does not support this argument. The data suggest that UK and US costs are similar (Birkler et al., *Australia's naval shipbuilding enterprise: preparing for the 21st century*, 103–124).
 - 33 Birkler et al., *Australia's naval shipbuilding enterprise: preparing for the 21st century*, 103–124.
 - 34 Birkler et al., *Australia's naval shipbuilding enterprise: preparing for the 21st century*, 106, 131. Data for oil, chemical and gas construction reveals a 20%, rather than a 30–40%, disparity in aggregate costs between Australia and the US. The stated rationale for using this information is that oil, chemical and gas construction draws on skills similar to the skills required for naval ship repair and, by implication,

for naval shipbuilding. But, unlike naval shipbuilding, markets for this form of construction are highly competitive. Apparently, that difference in competition proxies the scope for productivity growth available to companies building Australia's future frigates and destroyers. The intrinsic problems associated with benchmarking, and applicable to all RAND's estimates of premiums, are described in Birkler et al., 100.

- 35 At this stage, it's not clear whether recent plans by DoD to develop a new set of performance metrics and benchmarks applicable to the post-tender phase of its naval ship assembly projects will be based on more exacting methods of productivity measurement. Benchmarking for productivity growth is more complex than benchmarking for the overall price of vessels, partly by requiring more detailed data inputs (ANAO, *Naval construction programs – mobilisation*, paras 3.36 to 3.39, 36–37).
- 36 Alistair Cooper, 'Don't miss the forest for the trees (part 1): value for money from continuous shipbuilding', *The Strategist*, 23 January 2019, [online](#) and 'Don't miss the forest for the trees (part 2): critical mass for continuous shipbuilding', *The Strategist*, 1 February 2019, [online](#).
- 37 The ANAO's May 2016 review of Defence's industry support programs—including those for leveraging, export marketing and innovation—found it difficult to determine program outcomes due to the absence of adequate performance indicators. Where suitable indicators existed and the review could assess performance, the results were generally poor. ANAO, *Defence industry support and skill development programs*, performance audit report n. 20 2015-16, Canberra, February 2016, [online](#).
- 38 The Productivity Commission has concluded that the justification for providing subsidised access for the defence industry to export finance 'appears to be simply about a desire to sustain and grow an industry that has historically been an expensive failure in Australia'. Productivity Commission, *Trade and assistance review 2016–17*, 63.
- 39 The prospects for global supply chain participation are discussed in Michael Shoebridge, '\$35 billion for frigates: BAE wins—has Australia won too?', *The Strategist*, 29 June 2018, [online](#).
- 40 Rob Bourke, 'Exports and expectations: aspects of the new defence export strategy', *The Strategist*, 19 February 2018, [online](#); Davies, Thomson, *An enterprise-level naval shipbuilding plan*, 7–9.
- 41 Henry Ergas, Flavio Menezes, 'The economics of buying complex weapons', *Agenda*, 2004, 11(3):247–264, [online](#).
- 42 Shoebridge, '\$35 billion for frigates: BAE wins—has Australia won too?'.
- 43 As a prime contractor, ASC has recently claimed to be 'smashing the notion' of a 40% price premium under the AWD project (ERC, *Part III Future of Australia's naval shipbuilding industry: long-term planning*, 59). This implies that workplace reform alone may be sufficient to obviate many, or perhaps even most, of any productivity disadvantage Australian shipbuilders experience vis-à-vis their overseas rivals. However, there are several issues to consider. The improvements to which ASC refers should already have been factored by RAND into final frigate and destroyer price premiums of 15–20%. And it's not clear whether the gains apparently achieved in ASC extend beyond its own shipyard into the AWD's Australian or even overseas supply chains, including the combat system provider. In addition, the claim might warrant closer scrutiny given that the average annual rate of growth in multifactor productivity (MFP) for the Australian manufacturing sector—with industrial relations frameworks presumably comparable to those of ASC—was only 0.3% over the period from 1989–90 to 2013–14 (Productivity Commission, *PC productivity update 2015*, Australian Government, Canberra, 2015, Figure 1.1, [online](#)). Growth in MFP is the growth of output over and above the growth of labour and capital inputs. Put simply, an increase in MFP suggests that more output is being achieved from the same amount of inputs.
- 44 For a definition of market power see 'Re Queensland Co-op Milling Association Limited and Defiance Holdings Limited (QCMA), (1976) 8 ALR 481; (1976) ATPR 40–012', *ACL: Australian Competition Law*, [online](#).
- 45 The companies involved in assembling vessels and vehicles in Australia are likely to enjoy considerable market power in the longer term. One source of that power is companies having a closer understanding of the costs of building equipment than DoD can hope to achieve. Another is the high direct and indirect costs of replacing poorly performing companies after assembly commences—a situation that's considerably more difficult to manage for Australian than for overseas supply. The problem is well recognised in ANAO, *Future submarine—competitive evaluation process*, 38. The higher risk associated with dealing with problems in relation to domestic versus foreign equipment builds are noted in Davies et al., *Should Australia build warships? An economic and strategic analysis*, 16 and DoD, *Building submarines in Australia: aspects of economic impact*, 16. The new defence industry policy hasn't explained how shipbuilders, vehicle assemblers or, for that matter, any other defence manufacturer can be 'encouraged' to minimise their costs and share the benefits equitably with DoD through price regulation. Most of Australia's defence industry has sovereign status and therefore has a high degree of immunity from direct import competition. But, in response to that immunity, there are few signs that Defence has strengthened its policies and procedures for regulating the profits and costs of builders to minimise the department's exposure not only to inflated initial estimates of project prices but to project cost overruns. That exposure is especially high for equipment sporting new designs, which now includes submarines, frigates and offshore patrol vessels.
- 46 The Pacific patrol boats have been awarded to Austal, the offshore patrol vessels to Lürssen and the future frigates to BAE. In all probability, the future submarines will go to Naval Group. Military vehicle build projects are currently divided between Thales and Rheinmetall. In April 2019, the Morrison government committed to bringing forward a replacement for the Huon-class coastal minehunters from the mid-2030s to the mid-2020s and assigning that work plus the construction of a new hydrographic vessel to Henderson in Western Australia, probably to shipbuilder Austal (Primrose Riordan, 'Federal Election 2019: PM commits to build three naval ships in WA', *The Australian*, 29 April 2019, [online](#)). This would presumably provide Austal with some continuity of workload follow the company's completion of the Pacific patrol boats in 2023. However, if implemented, it would also consolidate a high degree of industry fragmentation. A recent report on the AWD project quotes a DoD official suggesting that, for the future frigate project, it's feasible to replace a poorly performing company—'You leave. Adios' (Macklin, *Air warfare destroyer: the game-changer*, 75). This line of reasoning appears to be based on a situation in which a project's infrastructure is government-owned, much of the design work is done in Australia and the background intellectual property and the information technology network foreground intellectual property are both owned and held by the Australian Government. However, the Davies et al. analysis suggests that the situation may be considerably more complex, and uncertain, than this kind of advocacy for replacement suggests (Davies et al., *Should Australia build warships? An economic and strategic analysis*, 16).

- 47 Regulation may be made more difficult for the future submarines, OPVs and vehicles because these projects have been, or will be, awarded on an individual basis. In the absence of the prospect of follow-on work, it can be argued that the companies undertaking these projects have less of an incentive to complete efficiently the work they've already been assigned.
- 48 Navantia's intervention to assist with the completion of the troubled AWD project provides a recent example of where changing management part way through a project has applied (Macklin, *Air warfare destroyer – the game changer*, 60–64). However, this kind of intervention is by no means a common occurrence and seems to have been only partial in terms of its injection of managerial and other expertise. It seems to have left the original contracting parties with ultimate responsibility for the project's outcome. The intervention's overall effects on project efficiency have yet to become clear. Perhaps most importantly, Navantia was the original designer of the hull for the AWDs and had built similar vessels before. But, in the foreseeable future, vessels and vehicles will be built in Australia by their overseas designers. Although this should reduce the risk of project failure, the fact remains that if failure does occur replacing these companies would mean bringing in an entity not especially familiar with the attributes of the equipment involved. In addition, while some within government might regard changing suppliers a routine task, the view from industry might be more realistic. In this context, the Collins-class submarine experience has some relevance. Here, the following observations of the assembler of the vessels may be as prescient now as they were decades ago 'as an experienced contractor we could have treated the navy like "lamb to the slaughterhouse" because in a \$5 billion project the client is captive as the contractor cannot be sacked—it would be politically and financially impossible to cancel the contract and start again. A contractor could always take advantage of the client in that sort of relationship because the client is so big and bureaucratic and unable to watch everything' (Yule, Woolner, *The Collins Submarine Story: Steel, Spies and Spin*, 196).
- 49 The military-strategic justifications for paying a price premium to build naval vessels in Australia have already been considered by a number of commentators. Appendix 8 summarises the generic arguments used, which might also be applicable to vehicles. However, this paper makes no comment on whether those justifications are valid or not.
- 50 Repairs and maintenance performed in Australia on equipment produced overseas can help to build the skills required for more complex domestic upgrade programs. An obvious option to overcome problems of transferring intellectual property from an overseas designer and builder to an Australian-based sustainer of equipment to ensure efficient sustainment is to award the overseas designer/builder the Australian sustainment contract. The problem with this approach is, of course, that it gives the Australian sustainer an extended monopoly at least in the short to medium-term. Given that most of the whole-of-life costs of equipment—comprising the costs of acquisition and sustainment—involve sustainment, granting an extended monopoly can cause problems. Unfortunately, the current DoD defence industry policy provides no insights into this issue.
- 51 The theory of real options is discussed in K T Yeo, F Qiu, 'The value of management flexibility—a real option approach to investment valuation', *International Journal of Project Management*, 21, 2003, 243–250, [online](#) and P J Weston, 'Defence research and development: Encouraging private venture R & D with 'option' strategies', *Defence and Peace Economics*, 7, 1996, 313–324, [online](#). How real options might apply in an Australian context is discussed in ACIL Allen Consulting, *Naval shipbuilding and through-life support*, Canberra, December 2013, 35–40, [online](#). However, the discussion is of a general nature and does not include mention of the practical constraints that might apply.
- 52 Office of Best Practice Regulation, *Cost-benefit analysis: guidance note*, Department of the Prime Minister and Cabinet, Canberra, February 2016, 6–7, [online](#). For a discussion of the discount rate used see Mark Harrison, *Valuing the future: the social discount rate in cost-benefit analysis*, visiting researcher paper, Productivity Commission, Canberra, April 2010, [online](#).
- 53 DoD, *Building submarines in Australia: aspects of economic impact*, 68. It's important to note that the estimate of sustainment savings of approximately 40% is predicated on an official estimate of around 70% Australian content for the submarines. High Australian content should make it easier to achieve sustainment savings and vice versa. However, the actual Australian content appears to have been well below the 70% level (Note 18). This suggests that savings of 40% would be more difficult to achieve than the figure alone indicates. The figure of 40% is estimated based on batch production. It can be argued that, under a more continuous form of production, a lower figure would apply given that continuous production would help to avoid a loss of expertise over time. However, even under continuous production, the transfer of expertise from building vessels to sustaining vessels can still occur if these two tasks don't coincide or occur at different locations. That's an issue requiring further research.
- 54 ANAO, *Army's protected mobility vehicle—light*, 38–39, 55 and *Naval construction programs—mobilisation*, 49–50; Industry Commission, *Defence procurement*, 243–254, 264–287; Productivity Commission, *Australia's Automotive Manufacturing Industry*, inquiry report n.70, 31 March 2014 (released publicly in August 2014), 2, 237–238, [online](#) and *Trade and assistance review, 2014–15*, 36–38; DoD, *Building submarines in Australia: aspects of economic impact*; Insight Economics, *Australia's future submarine: getting this key capability right*, 112–115; Davies et al., *Should Australia build warships? An economic and strategic analysis*; Henry Ergas, Mark Thomson, 'On economics and submarines', *The Strategist*, 29 October 2014, [online](#); Mark Thomson, 'Defence projects, jobs and economic growth', *The Strategist*, 8 July 2014, [online](#); Birkler et al., *Australia's naval shipbuilding enterprise: preparing for the 21st century*, 133–138, 147–148; Keating et al., *The economic consequences of investing in shipbuilding: case studies in the United States and Sweden*; Andrew Davies, 'Australia bets big on defence, but is it necessary?', *Australian Financial Review*, 20 February 2018, [online](#) and 'Can Australia fight alone? The cost of the military's US dependency', *Australian Foreign Affairs*, February 2018, 2, [online](#); Europe Economics, *The Economic case for investing in Europe's defence industry*, London, 2013, [online](#); Eliasson, *Visible costs and invisible benefits: military procurement as innovation policy*, 135–171, 173–223; Marcus Hellyer, 'The riddle of steel', *The Strategist*, 22 March 2018, [online](#); Robert J Barro, Veronique de Rugy, *Defense spending and the economy*, Mercatus Center, George Mason University, 7 May 2013, [online](#); Benjamin Zycher, 'Economic effects of reductions in defense outlays', *Policy Analysis*, 8 August 2012, [online](#); and, J Paul Dunne, Nan Tian, 'Military expenditure and economic growth: a survey', *Economics of Peace & Security Journal*, 2013, 8(1), [online](#). Also see Notes 55, 56 and 60.
- 55 The computable general equilibrium (CGE) modelling for submarines and frigates covered in some of this evidence on economic impact includes the effects of the added tax revenue that government gains directly from assembling equipment in Australia rather than overseas. However, it excludes a factor likely to overstate any net benefits involved: tax distortion effects. Imposing higher taxes to pay for equipment can lead to distortions in the incentive of taxpayers to save, invest and work. These distortions are relevant to any price premium that might be paid for producing equipment in Australia and are variously estimated at around one-third of the value of the

(additional) tax itself. For more detail on this issue, see C Findlay, R Jones, 'The marginal cost of Australian income taxation', *Economic Record*, 1982, 58:253–262. On top of this is the fact that the studies also exclude profits remitted overseas by foreign-owned companies operating in Australia, because most studies have covered Australian-owned firms. The future frigates, future submarines and military vehicles will all be built domestically by wholly foreign-owned entities. Their profits should be in the range of at least 7–10% on sales. By excluding the tax distortion and profit remittance factors, previous CGE modelling for vessels and vehicles will tend to overstate—perhaps substantially—economic impact if used to infer the impact of future projects of this kind. It can be argued that this largely offsets the fact that CGE models normally exclude the technology and labour skills spillover benefits that projects might deliver (Note 74). In its report on the economic consequences of naval shipbuilding in Australia (Keating et al., *The economic consequences of investing in shipbuilding*, 7–12), RAND challenged the reliability of CGE modelling on submarine economic impact on the basis of RAND's perception that the modelling encompassed a 'full-employment assumption'. That is, RAND thought that the modelling assumed that assembling the vessels in Australia wouldn't provide work for any unemployed people. That perception is not correct for several reasons. The modelled employment figures aren't simply the result of one factor. Included are the effects of how vessels are paid for and the differences in productivity between submarine assembly and the industries from which it might draw resources including labour. The modelling allows for that construction to provide unemployed people with work in the short-term of around five years. In effect, this is done using a mix of two labour market assumptions: a short-run assumption (in which real wages remain unaffected by vessel assembly and national employment adjusts) and a medium to long-run assumption (in which real wages adjust so there's no effect on national employment). Finally, the assumptions are based on actual labour market data for Australia and are made for most studies of DoD projects in Australia (Note 60 reviews some prominent examples). A useful description of how CGE models of the kind of concern to RAND function in relation to labour market adjustment can be found in DoD, *Building submarines in Australia: aspects of economic impact*, footnote 6, 21. That note states: 'For example, any increase in employment arising from the construction of submarines might in the short run lead to increased employment, but in the long run lead to a higher real wage rate which reduces the incentive generally for producers to employ. Employment is demand determined, with supply adjusting to match demand at the going real wage rate. This is a medium to long-run assumption, made in nearly all economic forecasts of the labour market. Initially there are employment gains at the national level, but over time real wage adjustment steadily eliminates the short-term gains. In the long run, the benefits of the submarine project in the national labour market accrue as an increase in the real wage rate, rather than as a change in employment. Note that in terms of simple add ups of the annual changes in employment there's a positive gain, due to the short to medium term increases.'

- 56 For a more complete list of welfare indicators, see DoD, *Building submarines in Australia: aspects of economic impact*, 29. Highly relevant to the broader economic context in which the defence industry policy was formulated, including its implicit approach to the issue of economic impact, is Lawrence Summers, 'What to do about secular stagnation', *Foreign Affairs*, March/April 2016, [online](#) and Jason Furman, Lawrence H. Summers, 'Who's Afraid of Budget Deficits?', *Foreign Affairs*, March/April 2019, [online](#). In his 2016 article, Summers discusses how governments might best respond to sluggish economic recovery after the 2008 global financial crisis or events of a similar nature. In the 2019 article, Furman, Summers discuss the issues associated with governments borrowing money to support their expenditure programs. The solutions proffered by the authors in both articles do not involve increased investment in defence. In an Australian environment, a similar line of argument has been offered more recently by Tony Makin, 'Lets sharpen three fine spears of economic reform', *The Australian*, 28 May 2019, [online](#).
- 57 BIS Oxford Economics, *The economic contribution of BAE Systems in Australia*, Sydney, November 2018, [online](#); KPMG, *The economic contribution of Lockheed Martin to Australia*, Canberra, May 2018, [online](#); Boeing, *2017 Boeing Australia – economic impact summary*, BIS Oxford Economics, [online](#).
- 58 DoD, 'Naval shipbuilding a boon for Australian economy', media release, 28 November 2018, [online](#).
- 59 The conceptual limitations of a benefits-only approach to modelling the economic impact of DoD projects are detailed in Productivity Commission, *On input-output tables: uses and abuses*, staff research note, Canberra, September 2013, [online](#). The conceptual difference between economic models which do and don't account for economic costs is summarised in Industry Commission, *Defence procurement*, 264–266.
- 60 Over the past 25 years, the economic impact of price premiums is best illustrated from studies covering three DoD capital equipment acquisition projects—the Anzac-class ships, the Huon-class coastal minehunters and the Collins-class submarines—although these are by no means the only sources of information to consider when examining the impact issue. The studies use a computable general equilibrium (CGE) approach to modelling that examines economic benefits (except spillovers) and economic costs. In each case, three facets of the projects have largely determined the studies' national results in terms of comparing Australian against overseas sourcing: the level of Australian content, the price premium and what economists refer to as model closure. In essence, closure reflects the way in which economic models attempt to capture the nature of the economy surrounding projects. In very simple terms, short-run closure is characterised by significant rigidity in the economy. It allows for unemployment. Among other things, this form of closure assumes that as DoD projects progress few of the resources they require are drawn from other productive areas of the economy. In effect, this means that the project's workforce is made up predominantly of people with no other opportunities for gainful employment (i.e. the workforce consists of people who would be unemployed if the project did not progress). Short-run model closure is sometimes associated with DoD projects stepping in to bolster an ailing economy with substantial unemployment and therefore having a positive, countercyclical economic effect. Long-run model closure assumes a higher degree of flexibility in the economy. Among other things, it assumes that a DoD project might draw a significant proportion of the resources it needs—including labour—from other industries rather than using resources which would otherwise be under-utilised. In these circumstances, DoD projects tend to impose a resource cost on the economy, and that (opportunity) cost results in smaller positive estimates of economic impact. Long run closure recognises that rises (falls) in DoD project expenditure don't necessarily coincide with falls (rises) in activity across the economy and therefore do not necessarily have a balancing or countercyclical impact. A mix of short-run and long-run closure is often used for large DoD projects spanning many years and for large and enduring non-defence infrastructure projects in the mining, construction and other industries. For a more detailed description of what the different types of model closure entail see Industry Commission, *Defence procurement*, 266–267 and Tasman Asia Pacific, *Impact of major defence projects: a case study of the Anzac ship project – final report*, 82–83. With these points in mind, the economic impact of projects

tends to be positive when Australian content is high, the price premium is low and short-run model closure is most applicable. Conversely, a lower and perhaps even negative economic impact is more likely when Australian content is low, the price premium is high and long-run model closure dominates. The report covering the Anzac ship project was based on Australian content of 72% (high) and a price premium of 3.5% (low). The report tested both long-run and short-run forms of model closure, despite long run closure being more applicable given the project's 15 year duration. Under both forms the economic impact was positive, although much smaller under the long-run scenario (Tasman Asia Pacific, *Impact of major defence projects: a case study of the Anzac ship project – final report*, 47 and 82–83). A similar difference between short-run and long-run closure for the Anzacs was reported earlier in Industry Commission, *Defence procurement*, 269–270. The report covering the minehunter project indicated a significant positive economic impact. This result was based on a level of Australian content of 68% (high), a price premium of zero (low) and short-run model closure. However, unlike the price premium for the Anzac-class frigate project, the premium for the minehunters is unusually difficult to verify. Ostensibly, short-run closure was preferred over long-run closure on the basis of unusually high national unemployment (8.3%) during the project, significantly higher regional unemployment (12.6%) in and around Newcastle where much of the project was concentrated, the relatively short duration of the project of nine years—over which the bulk of industrial activity was confined to a period of just five years—and what appears to be a heavy concentration of material and other inputs for the vessels being provided from the surrounding region (Tasman Economics, *Impact of major defence projects: a case study of the minehunter coastal project – final report*, Canberra, January 2002, especially vi, footnote 7, 72 and 72–73, online). The strategy for modelling the economic impact of the minehunters was similar to that subsequently adopted in 2009 for the Bushmaster and Hawkei military vehicles (ACIL Tasman, *The economic impacts of the Bushranger project*, Canberra, October 2009, online). In this third ACIL Tasman report a form of model closure closer to short-run than long-run appears to have been preferred, due in part to the production phase of projects for each type of vehicle being concentrated over a relatively short period and Bendigo—the geographic epicentre of the projects—experiencing a slightly higher historical rate of unemployment than the national average. However, although the study showed a positive economic impact, the reliability of its results is difficult to determine for two reasons. One is that the report provided no details of the level of Australian content associated with assembling either type of vehicle in Australia. The other is that although a price premium of zero (low) was indicated for the Hawkei project (ACIL Tasman, ix including footnote 1 and x), the price premium for the Bushrangers is difficult to discern. The report's results in relation to Hawkei were subsequently challenged by DoD on these and other grounds through a separate study based on modelling by Monash University and ostensibly more detailed project data. That study appears to have provided a more reliable basis for analysis and to have indicated a much lower economic impact. The DoD report on Hawkei has not been released publicly but some of its key findings are summarised in ANAO, *Army's protected mobility vehicle – light*, para 23, 11, para 13, 10, para 3.32, 38 and para 3.33, 39–40. It's important to note that the ANAO report (10–11) references a price premium for the Hawkei of 33% (high)—consisting of a 23% premium directly associated with the project and another 10% premium associated with having to extend production of the Bushmasters to help facilitate subsequent Hawkei production. A premium of 33% has the potential to alter substantially the earlier ACIL Tasman estimates of economic impact where a price premium of zero appears to have been used. Finally, neither of two major published studies conducted for Collins-class submarine assembly or its equivalent using CGE analysis have indicated a significant positive economic impact (Industry Commission, *Defence procurement*, especially 285 and 287 and DoD, *Building submarines in Australia: aspects of economic impact*). Testing both long-run and short-run forms of model closure, the Industry Commission found a 'negligible' economic impact for the Collins-class project—although the Australian content and price premium assumptions associated with the modelling are difficult to discern. The report by DoD was based on an official Australian content figure of 67% (high) and a mix of short-term model closure for the first five years of the project and long-run closure for the remaining project duration of 11 years. The study is useful and perhaps unique by testing various price premium scenarios, given the difficulty faced by DoD in determining the Collins-class project's actual premium. It found that, as premiums became significant, economic impact moved from being marginally positive to negative. In the context of this paper, the studies above have three implications. First, when attempting to estimate economic impact, it's important to measure with reasonable accuracy—and ideally to make transparent—the levels of Australian content and price premiums associated with projects. Understating the actual premium for projects or overstating actual Australian content can seriously distort the results from economic modelling. Second, the choice of model closure can have a significant effect on estimates of impact. And finally, the government's current defence industry policy advocates a very long-term approach to future vessel and vehicle assembly in Australia. Consequently, it seems appropriate to apply to this assembly a mix of short-run and long-run model closure similar to the mix applied most recently by DoD to the estimation of economic impact for Collins-equivalent submarines.

61 'Naval spend a potential gold mine for South Australian economy', media release, PwC Australia, 11 October 2017, [online](#).

62 For an example of DoD's response to issues associated with economic impact see ANAO, *Naval construction programs—mobilisation*, 49–50. For an example of the Senate response see ERC, *Part III: Future of Australia's naval shipbuilding industry: long-term planning*, para 3.76, 57–58. It's worth noting that the government hasn't released economic impact reports held by DoD covering SEA 1000 and Land 121 Phase 4, even in a redacted form. A list of economic impact reports sponsored by DoD over recent decades is provided in Senate Standing Committee on Foreign Affairs, Defence and Trade, Additional Estimates, 3 March 2016, 'Answer to question on notice, topic: Macroeconomics report—studies', [online](#).

63 ANAO, *Naval construction programs—mobilisation*, para 4.46, 50. The Deloitte Access Economics report has not been released publicly by DoD.

64 Productivity Commission, *Trade and assistance review 2014–15*, 37.

65 DoD, *Building submarines in Australia: aspects of economic impact*, 47.

66 Productivity Commission, *Australia's automotive manufacturing industry—supplement to inquiry report, economy-wide modelling of automotive industry change*, Australian Government, Canberra, April 2014, 22, [online](#).

67 DoD, *Building submarines in Australia: aspects of economic impact*, 40.

68 DoD, *Building submarines in Australia: aspects of economic impact*, 8. At a price premium of zero, a tax revenue gain averaging \$73 million per annum equates to approximately 8% of the total annual average price of the submarines. This figure of 8% compares with a figure of 36% from the UK research that's often cited by advocates of Australian-based DoD capital equipment build projects. That research looked

only at the economic benefits of projects and not their potential economic costs (Trevor Taylor, John Louth, *The destinations of the defence pound*, briefing paper, Royal United Services Institute, January 2012, 88–89, [online](#)).

- 69 For a comparison between the treatment by government of automotive and submarine production see Insight Economics, *Australia's future submarine: getting this key capability right*, 115. For details of effective rates of protection for manufacturing and other sectors of the economy see Productivity Commission, *Trade and assistance review 2016–17*, 39. The Commission has estimated the ERA for the future submarine project as 300%, based on a 30% price premium—a rate of protection it considered 'perhaps a record high. See Productivity Commission, *Trade and Assistance Review 2017–8*, Canberra, June 2019, Box 2.3, 34, [online](#). My estimate of ERA for a Collins-equivalent build is based on the following assumptions: a price premium of 30%, Australian content of 67%, assistance on Australian material inputs of 5%, and a ratio of materials to labour and capital in unassisted value-added of 36:64. This delivers an ERA of 104%. If the Australian content figure is less than 67%, the ERA will increase. The Australian content figure of 67% is drawn from DoD, *Building submarines in Australia: aspects of economic impact*, Table 38, 99. The ratio of materials to labour and capital in unassisted value-added of 36:64 is drawn from the same report (Figure 3, Column 2, 99). Using a ratio of materials to labour and capital in unassisted value-added of 55:45 as indicated by the comments of Dr Ohff, but leaving all other parameters the same, I estimate the ERA to be 238%. If the level of Australian content ascribed to Dr Ohff's figures increases, the ERA of 238% will decline. However, if that rise in Australian content results in an increase in the price premium, the rise in premium will have a more than offsetting effect and push the ERA upwards. For comparative purposes, the ERA for the AWDs was 33% at an official figure for Australian content of around 60% and an original 15% price premium. However, based on an actual level of content that could be around half this amount (30%–40%) and an official premium at project completion twice as high (30%), the ERA figure for the AWDs of 33% will rise sharply if the figure is re-estimated using more accurate data. A published ERA of 36% applies for medium and heavy trucks and trailers under Land 121 Phase 3, and 69% for protected mobility vehicles light under Land 121 Phase 4. For details of all these comparative ERA estimates, see ANAO, *Army's protected mobility vehicle – light*, para 3.32, 38.
- 70 Productivity Commission, *Trade and assistance review 2014–15*, 38.
- 71 Industry Commission, *Defence procurement*, 40. This accords with more contemporary experience where a 15–20% price premium to ensure domestic assembly of the future frigates was accepted by government based on a combination of offsetting military-strategic and economic gains.
- 72 DoD, *Building submarines in Australia: aspects of economic impact*, Table 6, 8.
- 73 Eliasson, *Visible costs and invisible benefits: military procurement as innovation policy*, 196
- 74 A substantial body of evidence suggests that spillover effects are considerably smaller than first impressions suggest and that the potential for spillovers can be difficult to exploit: Davies et al., *Should Australia build warships? An economic and strategic analysis*, 24–25; Keating et al., *The economic consequences of investing in shipbuilding: case studies in the United States and Sweden*, 57–59; DoD, *Building submarines in Australia: aspects of economic impact*, 52–70; PwC, *Economic impact of Australian industry participation in the Joint Strike Fighter program*, Canberra, February 2017, 23–24, [online](#); Rob Bourke, 'Thrills, spills and industry spillovers', *The Strategist*, 18 August 2017, [online](#). As the Productivity Commission has pointed out (Productivity Commission, *Trade and assistance review 2014–15*, 37), it's far easier to assert large spillover effects than to deliver credible supporting evidence. This is consistent with the conclusions from Europe Economics, *The economic case for investing in Europe's defence industry*, 6 and 116. And, as noted by the commission and by the Australian authors identified immediately above, spillovers tend to be much smaller when military equipment is designed overseas, Australian content is limited (especially in relation to complex weapons, propulsion and operating systems and components and services whose development is generally accepted as offering far greater potential for spillovers than platform construction), and the export outlook for what's produced domestically is uncertain. In November 2017, Eliasson offered a more optimistic view of spillovers for Australia's Collins-class submarine project—after endorsing the broader view that other sources of economic benefit in the form of project-specific job creation and tax [revenue] gains represented 'a nonsense argument for indigenous warship building' (Eliasson, *Visible costs and invisible benefits: military procurement as innovation policy*, 196 and 222). However, 16 limitations associated with the Eliasson study should be noted. (1) The study's anecdotal evidence of labour skills spillovers from assembling the Collins-class submarines is far from compelling (Eliasson, 135–171). (2) The study excludes any data on technology spillovers from the Collins-class project. These kinds of spillovers were examined by DoD in 2015 (DoD, *Building submarines in Australia: aspects of economic impact*, 63–64) and, based on industry interviews, were found to be negligible—a result the Eliasson study does not mention. (3) In arriving at a quantitative measure of submarine spillovers in Australia, the study relied on an extrapolation from a Swedish military aircraft project (the Gripen) to an Australian submarine project (the Collins). See Eliasson, 207. This kind of extrapolation is something that DoD and RAND above both questioned. (4) The study's range of spillovers multipliers for the Collins-class submarine of between 1.1 and 1.6 (Eliasson, 210)—meaning that spillovers from the project equated to between 10% (0.1) and 60% (0.6) of the value of the project—is very broad which limits its utility. A range of 1.1 to 1.6 accords with a spillovers multiplier of 1.4 quoted in Roos, 'How to make sure Australia's submarines pay for themselves'. (5) The study does not mention that most, if not all, of this spillover effect of 1.1 to 1.6 could be offset if the taxes to pay for the vessels distorted efficient investment decisions across the economy (Note 55), the submarines had been built by a foreign-owned company (as the future submarines will be) and their profits are remitted overseas and the project had attracted a substantial price premium. In this context, the study advances the proposition that in future Australia should be willing to pay 'a somewhat higher direct cost' (Eliasson, 223) to assemble its submarines in-country given the spillovers likely to be generated. This suggests that the price premiums involved need to be reasonably modest. Absent from the study is a discussion of the merits of pursuing spillovers in the presence of high and rising premiums. (6) The study excludes any detailed reference to submarine spillovers in Sweden (Eliasson, 209–210). If spillovers from submarine assembly really are significant, Sweden with its long history of submarine design, development and production and advanced industrial structure, must surely be a country where spillover effects can be readily identified. But no relevant Swedish data are presented. (7) The study overlooks Australian content on the Collins-class acquisition project apparently being well below—quite possibly half—the 70% claimed publicly (Dr Hans Ohff, *Caveat emptor*, paper presented at the Australian Submarine Institute Conference, Adelaide, November 2015, 2, [online](#); Note 18). And it neglects to mention that even on an overseas build there may be some Australian content estimated by DoD at between 5% and 20% of the total price of the project (DoD, *Building submarines in Australia: aspects of economic impact*, 91–93). This means that the net Australian

content figure from which spillovers potential should be estimated is even lower than the Ohff remarks indicate, perhaps much lower. Substantially lower initial levels of Australian content would *a priori* indicate either substantially lower opportunities for spillovers to be created or higher price premiums against which spillover benefits need to be compared. (8) Eliasson clearly acknowledged that if Australia's future submarines are designed overseas—which they will be—and significant export markets for Australian assembled vessels of this kind or parts thereof subsequently fail to emerge—which is a definite risk if the experience of the Collins-class submarines is anything to go by—the potential for industrial spillovers is likely to be much reduced and even 'minimal' (Eliasson, 199). (9) In this context, the study's estimates of spillovers from assembling the Collins-class submarines are based on batch production of the vessels. This form of production assists with the dispersion of labour skills and new technologies given that, at some stage, the project draws to a close and closure releases some of the knowledge the project holds especially in the form of labour skills. However, the assembly of the future submarines and other naval vessels will occur under a more continuous form of production which does not have the same degree of closure and therefore may not have the same potential for spillovers. (10) The economics behind Australia becoming self-sufficient in the design and development of the complex weapons, propulsion and operating systems and other high-value components and services that go into submarines and other DoD capital equipment—and offer the greatest potential for spillovers—seems questionable. Designing and developing some minor systems or sub-systems may be within our financial reach. However, designing and developing others—like a Collins-class AN/BYG-1 combat system, Mark 48 heavyweight torpedo, Harpoon anti-ship missile, diesel engines, electric generators, batteries etc.—could prove too costly even with export orders, if Australia seeks to obtain a defence capability comparable to that of the US and other close allies. (11) When Eliasson talks of Australia developing its own technologies with spillovers potential, he seems to be talking about matching the technologies that a country like Sweden might develop. However, what Australia needs is the technologies the US is pursuing. The following quote from Beazley, 'Defence policy in an era of disruption', illustrates the point—'Most importantly for a nation that focuses on a high-technology defence like Australia, only the US, which leads the advance to next-generation weapons, can provide us with the relevant systems in all their complexity.' (12) The Eliasson study assumes significant exports of the systems Australia might develop for the future submarines can be achieved, without reference to past export experience or future export prospects. No supporting evidence is provided of any systems that were built domestically for the Collins-class submarines and subsequently exported. Nor is there mention of the fact that no Collins-class submarines in their finished form have ever been exported by Australia. (13) The study does not address the obvious issue of whether, if a high price premium for purchasing submarines did apply, more spillovers could be achieved by having these vessels assembled overseas and investing part of the savings from avoiding an assembly price premium in developing domestically weapons and other systems or parts thereof that address our unique defence needs or in which Australia has an economic comparative advantage. The study excludes any reference to avenues through which this approach might be promoted in the form of Australian participation in US-led technology development programs similar to those applying to the combat system and heavyweight torpedoes on the Collins-class submarines. (14) The study's broader analysis of spillovers does not explore the spillovers potential from the highest profile successes Australia has had in developing complex weapons and related systems including Nulka, CEAFAAR radar and the Saab combat system interface. These are obvious examples of where spillover effect from DoD projects might be significant. (15) It's not clear from the study whether a given amount of government investment in submarine or other forms of defence equipment assembly—especially in platform construction—would deliver larger spillovers than an equal amount of investment in other areas of the Australian economy like energy, water, transport, agriculture, medicine and environmental protection. The assumption behind the study seems to be that few reasonable, alternative investment opportunities exist. That's an issue requiring closer scrutiny. (16) Eliasson's review of the various methods for estimating spillovers excludes macro time series modelling. Although a less than perfect method of assessment, this form of modelling is still highly relevant. Its results lend little, if any, support to the case for significant spillovers from DoD capital equipment expenditure, in absolute terms or relative to other investment options (Barro, de Rugy, *Defense spending and the economy*; Dunne, Tian, 'Military expenditure and economic growth: a survey'). The upshot of the Eliasson and other analyses is that Australian proponents of strong, positive spillover effects providing the justification for submarines—and probably other DoD vessels and vehicles—to be sourced from Australia rather than overseas at a significant price premium should bear the onus of proof. It can be argued that that onus has not yet been met.

75 Ergas, Thomson, 'On economics and submarines'. For an alternative view see Goran Roos, 'RAN's future submarine: the case for an on-shore build', *The Strategist*, 24 August 2015, [online](#) and Economic Development Board of South Australia, *Economic analysis of Australia's future submarine program*, Adelaide, 2014, [online](#). The Board's report was subsequently critiqued by Ergas, Thomson, 'On economics and submarines' and by DoD, *Building submarines in Australia: aspects of economic impact*, 70–74. For a broad comparison of the type of economic modelling used by the Economic Development Board and the (ORANI) style of modelling on which the critiques are based see Industry Commission, *Defence procurement*, 244–245, 267–268.

76 By and large, the industry's workforce comprises people who—compared to most other Australian industries—are highly trained, highly experienced, highly motivated, non-indigenous males with reasonable English language skills, between the ages of 25 and 55, in reasonable health and located in or around metropolitan areas. Comprehensive data on the ability of defence industry workers to find alternative employment is difficult to find especially in an Australian context. However, reasonably high rates of general employment mobility in Australia are described in Productivity Commission, *Australia's automotive manufacturing industry – supplement to inquiry report, economy-wide modelling of automotive industry change*, appendix C, 22 and 83. More recently, the topic has been canvassed in a more general manner in Nick Toscano, 'Life after the plant closes down', *The Sun-Herald*, Sunday 19 June 2018, 34–35. Four of the more informative overseas studies, which also point to considerable mobility, are: H Hooper, B Butler, 'A case study of redundant defence workers' in K Hartley, T Sandler (eds.), *The economics of defence*, vol. III, MPG Books, Cornwall, 1996, 440–459, [online](#); N Ball, 'Converting the workforce: defence industry conversion in industrialised countries', *International Labour Review*, 1986, 125, 401–422, [online](#); C Gorhrband, J Gordus, 'Defence manufacturing in Michigan: possible effects of cuts in procurement' in L Paukert, P Richards (eds.) *Defence expenditure, industrial conversion and local employment*, International Labour Office, Geneva, 1991, 99–116, [online](#); Keating et al., *The economic consequences of investing in shipbuilding – case studies in the United States and Sweden*, 17–43. Additional contextual data is contained in P Gripaiois, R Gripaiois, 'The impact of defence cuts: the case of redundancy in Plymouth', *Geography*, January 1994, 79(1), 32–41, [online](#) and A Pike et al., 'Defence closure and job loss: the case of swan hunter on Tyneside', *Peace and Defence Economics*, 2000, 11(1), 301–312, [online](#).

Although Gripaouis, Gripaouis found lower rates of employment mobility than most other studies, the authors were also highly sceptical about the overall economic benefits of paying high price premiums for defence projects. For an interesting recent discussion of the regional employment effects of defence projects in the UK, see Ministry of Defence, *Industry for defence and a prosperous Britain: refreshing defence industry policy*, London, 2017, 19, [online](#).

- 77 The latest estimates of job creation for major naval shipbuilding projects are contained in DoD, *Naval shipbuilding strategic workforce – discussion paper*, Canberra, 15 February 2019, 7, [online](#). The job number for the future frigates of 4,000 compares to 4,140 jobs from industry-sponsored modelling—see BIS Oxford Economics, *The economic contribution of BAE Systems in Australia*, 22. The BIS study provides no details in relation to the Australian content of the future frigate project on which its estimate of 4,140 jobs is based. Differences in estimated project duration—of 27 years for 12 submarines versus 20 years for nine frigates—is taken from Thomson, *The cost of Defence: ASPI defence budget brief 2017–18*, 224. Anzac-class frigate assembly apparently supported 2,560 production jobs on an average annual basis (1,223 direct and 1,337 indirect) for 10 vessels over a total project period of 15 years (1989–2004) at 72% Australian content and a total project cost of \$3.8 billion in 1998–99 prices (Tasman Asia Pacific, *Impact of major defence projects: a case study of the Anzac ship project*, iv, 6 and 78), with each vessel weighing around 3,500 tons (Wikipedia, *Anzac-class frigate*, [online](#)). Assembling the Collins-class submarines apparently supported 2,934 jobs (1,078 direct and 1,886 indirect) on an average annual basis for six vessels over a 16 year project period (1987 to 2003) at 67% Australian content and a total project cost of \$4.3 billion in 1987 prices or around \$5.1 billion in 1998–99 prices (DoD, *Building submarines in Australia: aspects of economic impact*, 6), with each vessel weighing around 3,100 tons (Wikipedia, *Collins-class submarine*, [online](#)). Adding the jobs created by vehicle projects to the DoD job numbers for vessels seems unlikely to push the department's estimate of 8,200 above the 10,000 job mark at least for the next 15–20 years, after overlap issues are considered. Land 121 has been estimated to support around 230 jobs (Thomson, 224) and Land 400 Phase 2 to support around 640 jobs (Appendix 3). Neither of these projects appear to overlap with the future frigate and future submarines in their full production modes. But they might give a rough indication of the job numbers from Land 400 Phase 3 where overlapping appears more likely. Land 400 Phase 3 might be between twice to three times the size of Phase 2, suggesting that Phase 3 might support around 1,500 jobs on an average annual basis. Based on DoD data, that may not be enough to move aggregate job figures for vessels and vehicles from four digits to five digits.
- 78 Josh Frydenberg, 'Rising productivity vital to growth and higher incomes', *The Weekend Australian*, 22–23 June 2019, 22, [online](#).
- 79 ANAO, *Army's protected mobility vehicle—light*.
- 80 Michael Byers, *Smart defence: a plan for rebuilding Canada's military*, Canadian Centre for Policy Alternatives, Ottawa, 29 June 2015, [online](#).
- 81 Bourke, 'Exports and expectations: aspects of the new defence export strategy'.
- 82 DoD, *The Australian naval shipbuilding and repair sector strategic plan*, Australian Government, Canberra 2002, 6–7; Davies et al., *Should Australia build warships? An economic and strategic analysis*, 21–22.
- 83 For an explanation of the theory of economic comparative advantage as it applies to the Australian defence industry, see Davies et al., *Should Australia build warships? An economic and strategic analysis*, 7–11.
- 84 The effective rate of assistance (ERA) is a measure used to gauge differences in government assistance between industries, projects and companies. Basically, it measures the advantage that those stakeholders receive in the form of assistance from government, less any disadvantages they might suffer from having to buy inputs that also receive government assistance (the net value of assistance), expressed as a percentage of the value of what the industries, projects or companies themselves produce without assistance and relying on inputs from others (the unassisted value-added). For a description of the formula for the ERA, see Davies et al., *Should Australia build warships? An economic and strategic analysis*, 12. A simple stylised example of how the formula works, relevant to defence in the form of a submarine build, is provided in Productivity Commission, *Trade and assistance review 2014–15*, 38. The concepts and estimation methods underpinning the ERA are examined in detail in H Plunkett, R Wilson, S Argy, *The measurement of effective rates of assistance in Australia*, working paper n. 4, Industry Commission, Canberra, July 1992, [online](#).
- 85 'Re Queensland Co-op Milling Association Limited and Defiance Holdings Limited (QCMA), (1976) 8 ALR 481; (1976) ATPR 40–012'.
- 86 Ergas, Menezes, 'The economics of buying complex weapons'.
- 87 Bourke, 'Thrills, spills and industry spillovers'.
- 88 DoD, *Building submarines in Australia: aspects of economic impact*, 52–69. For an alternative, though less compelling view, see Tasman Asia Pacific, *Impact of major defence projects: a case study of the Anzac ship project: final report*, 13–35.
- 89 Note 121 provides more detail.
- 90 Publicly cited examples are: ANAO, *Army's protected mobility vehicle—light*; DoD, *Building submarines in Australia: aspects of economic impact*; Senate Standing Committee on Foreign Affairs, Defence and Trade, Additional Estimates, 3 March 2016, 'Answer to question on notice, topic: Macroeconomics report—studies'.
- 91 Rob Bourke, 'The ABCs of defence industry economics—the concepts (part 1)', *The Strategist*, 11 April 2018, [online](#).
- 92 The insurance policy arguments can be found in ERC, *Part I: Future of Australia's naval shipbuilding industry: tender process for the navy's new supply ships*, The Senate, Canberra, 27 August 2014, 72–73, [online](#). The spare parts argument can be found in ERC, *Part II: Future of Australia's naval shipbuilding industry: future submarines*, The Senate, Canberra, 17 November 2014, 31–32, [online](#).
- 93 The issue of flexibility is discussed in ACIL Allen Consulting, *Naval shipbuilding and through-life support*, 35–40. It's worth noting that, in the limited amounts of data available publicly, the issue of flexibility has been emphasised for naval shipbuilding to a much greater degree than it has for vehicle assembly (ACIL Tasman, *The economic impacts of the Bushranger project*; ANAO, *Army's protected mobility vehicle—light*, 56).
- 94 DoD's initiatives to help de-risk naval build projects are outlined in ERC, *Part III: Future of Australia's naval shipbuilding industry: long-term planning*, 62.
- 95 DoD, *2016 Defence industry policy statement*, Canberra, 2016, [online](#).

- 96 Mark Thomson, 'Making sense of the government's defence industry policy', *The Strategist*, 6 May 2016, [online](#); Rob Bourke, 'Sovereignty and self-reliance: the new defence industrial capability plan', *The Strategist*, 10 May 2018, [online](#).
- 97 Bourke, 'Exports and expectations: aspects of the new defence export strategy'.
- 98 Rob Bourke, 'Filling the void: estimating the defence industry's impact on jobs and growth', *The Strategist*, 29 November 2017, [online](#).
- 99 Mark Thomson, 'Driving the economy', *The Strategist*, 12 May 2017, [online](#).
- 100 Bourke, 'Exports and expectations: aspects of the new defence export strategy'.
- 101 Christopher Pyne, 'Keynote address: Australian Business Defence Industry Sovereignty Forum', DoD, Canberra, 27 July 2017, [online](#).
- 102 Rob Bourke, 'Planning for industrial sovereignty', *The Strategist*, 27 February 2018, [online](#).
- 103 Adding most forms of platform sustainment to the list of sovereign industry capabilities could more than double the proportion of the defence industry requiring in-depth assessments of whether DoD's current and planned demand for industrial capability can be matched by industry's capacity to supply (that is, its economic health). There's no point in assigning sovereign status to an industrial capability if DoD is unwilling or unable to then assess its health—and respond if capability shortfalls exist. Contrary to popular opinion, the policy covering PICs didn't falter because the definitions of what was a priority were inappropriate. Critics of that approach argued that two of the 12 PICs—combat clothing and ordnance—weren't priorities. From this, they seem to have concluded that the other 10 PICs were defined inappropriately. However, irrespective of the military-strategic arguments for or against the inclusion of combat clothing and ordnance, that criticism and what appears to have been deduced from it overlooked three crucial factors. First, detailed health checking undertaken after initial definition occurred validated the 10 PICs as being important to hold on in-country on military-strategic grounds and at least some aspects of the importance of holding a domestic industrial combat clothing and ordnance capability. Second, for political reasons, governments of all persuasions weren't willing to have clothing and ordnance manufactured overseas. Third, designating both capabilities as PICs at least ensured that relevant issues to do with industry assistance were reviewed thoroughly and systematically in a reasonably transparent manner through the PIC health checking process. Instead, the policy covering PICs faltered for two purely logistical reasons. These might appear to be routine or even prosaic, but in practice they turned out to be critically important. First, the PIC policy didn't 'come with money' to allow DoD to intervene if industry capability shortfalls emerged. Large sums were sometimes needed to overcome shortfalls, but the appropriate financial resources weren't factored into the budgets of relevant DoD capital equipment projects or into other areas of the department's budget. Finding the kind of money required proved to be not only administratively complex but time consuming—in situations where swift intervention was often needed to support declining industry capabilities. Second, with literally hundreds of projects and companies covered by PICs, many of which were subject to sudden and unpredictable changes in fortune, DoD struggled to initially assess their economic health and, more importantly, to then keep those assessments current. Put simply, the department couldn't keep pace with the changing status of myriad capital equipment projects and companies with the degree of certainty required for government to incur the very substantial direct and indirect costs of most forms of market intervention. Consequently, the problem with the PIC approach didn't lie with the intricacies of translating global strategic prognostication into capability solutions. Instead, it rested with the far more mundane issue of DoD not being able to recruit enough suitably qualified and experienced economic analysts to perform a reliable form of capability health checking. Health checking and intervention stretched the department's capacity for economic analysis to its very limits—a point not commonly appreciated. And that was when the proportion of the industry needing to be checked was around 20% (a smaller figure of 6-7% has also been used see Craig Stone, *Prioritising defence industry capabilities: lessons for Canada and Australia*, Global Affairs Institute, Ottawa, January 2014, notes 47 and 48, [online](#)). Now that percentage has more than doubled with a policy shift to sovereignty for most forms of platform sustainment and increased again to what I estimate to ultimately be around 80% with the addition of naval shipbuilding and military vehicle production under the same sovereignty umbrella, the logistical challenges and risks associated with health checking and intervention—including arriving at mistaken conclusions in relation to economic health and ineffective and inefficient intervention strategies—are greatly magnified.
- 104 DoD, *Naval shipbuilding plan*, Australian Government, Canberra, 2017, [online](#).
- 105 ANAO, *Naval construction programs—mobilisation*.
- 106 ANAO, *Naval construction programs—mobilisation*.
- 107 Andrew Davies, 'Shipbuilding—making it up as we go along', *The Strategist*, 18 May 2018, [online](#).
- 108 DoD, *Defence export strategy*, Australian Government, Canberra, 2018, [online](#).
- 109 David Uren, 'Defence firm's \$410m sale shoots down "fairy tale" jibe', *The Australian*, 30 January 2018, [online](#) and David Uren, 'Australia an arms superpower? They're dreaming', *The Australian*, 29 January 2018, [online](#); Rob Bourke, 'Exports and expectations: aspects of the new defence export strategy'; Andrew Davies, 'Top ten with a bullet?', *The Strategist*, 20 February 2018, [online](#).
- 110 Productivity Commission, *Trade and assistance review 2016–17*, 63.
- 111 For a discussion on the importance of transparency in public policy decision-making, see Ewen J Michael, *Public policy: the competitive framework*, Oxford University Press, South Melbourne, 2006, 221. For a discussion on some of the instances in which assistance might be required, see Peter Hall, Robert Wylie, 'Chapter 4: Arms export controls and the proliferation of military technology' in Benjamin E Goldsmith, Juergen Bauer (eds), *Contributions to conflict management, peace economics and development*, 2010, 53–68, [online](#).
- 112 Thomson, 'Making sense of the government's defence industry policy'; Productivity Commission, *Trade and assistance review 2014–15*.
- 113 Marcus Hellyer, 'The ASPI 2018–19 budget brief in brief', *The Strategist*, 25 May 2018, [online](#) and 'If not now, when? The ANAO's reporting on defence megaprojects', *The Strategist*, 27 June 2018, [online](#); Mark Thomson, 'Smart buyer: just saying it doesn't make it so', *The Strategist*, 24 May 2017, [online](#).
- 114 Confirmation of a lack of data collection on price premiums for OPVs and future frigates can be found in ANAO, *Naval construction programs—mobilisation*, para 4.31, 47.
- 115 DoD, *Defence procurement policy manual (DPPM)*, version 1.1, Capability Acquisition and Sustainment Group, Canberra, 19 December 2017, para 8, 13, [online](#).

- 116 The primary published profiles of the industry are contained in: Industry Commission, *Defence procurement*, 258–263, especially 255; ACIL Tasman, *A profile of the Australian defence industry*, Canberra, November 2004, [online](#); DoD, *Profile of Australian-based suppliers of defence materiel to DMO – FY 2007–08*, Defence Materiel Organisation (DMO), Canberra, 2009 (not available online); Thomson, *The cost of Defence – ASPI defence budget brief 2017–18*, 207–216. It’s interesting to note that in the UK similar problems apply in attempting to determine the overall economic impact of the defence industry. In both Australia and the UK, this is due primarily to the Departments of Defence ceasing to collect adequate raw data to enable appropriate economic modelling to be undertaken (Andrew Dorman, Mathew Uttley, Benedict Wilkinson, *A benefit not a burden—the security, economic and strategic value of Britain’s defence industry*, King’s College London, April 2015, 4–5, [online](#)).
- 117 Sabra Lane, ‘Christopher Pyne spruiks major defence industry projects as Joint Strike Fighters arrive in Avalon’, *ABC AM*, 3 March 2017, [online](#). The source for these remarks is the following statement by Minister Pyne: ‘For the December quarter 2016, defence spending has increased by 15.1% over the year and 34.2% in that quarter alone and is showing up [in the national accounts] as a major reason for the increase in growth [in the economy as whole].’
- 118 For the September quarter and December quarter 2016, the relevant figures are Δ\$641 million for the industry as defined in the minister’s statements and Δ\$4,531 million for GDP. For the December quarter 2015 and December quarter 2016, they are Δ\$331 million for the industry and Δ\$9,963 million for GDP. For the September quarter and December quarter 2016, they are Δ\$27 million for the industry and Δ\$1,276 million for GDP. For the December quarter 2015 and December quarter 2016, they are Δ\$419 million for industry and Δ\$7,984 million for GDP (ABS, *Australian national accounts: income, expenditure and production, December 2016*, cat. no. 5206, 1 March 2017, Table 2: Expenditure on gross domestic product (GDP) seasonally adjusted chain volume measures, 5206002_expenditure_volume_measures (2)).
- 119 The December quarter 2016 figure for defence industry as defined by the minister was \$2,518 million. It was exceeded in the June quarter 2008 (\$2,636 million), June quarter 2015 (\$2,559 million) and June quarter 2016 (\$2,628 million). In terms of the defence industry—as defined in the government’s statements—as a percentage of GDP, the December quarter 2016 figure of 0.60% was equalled or exceeded in the June quarter 2008 (0.77%), September quarter 2008 (0.65%), December quarter 2010 (0.60%), June quarter 2015 (0.63%) and June quarter 2016 (0.63%) (ABS, *Australian national accounts: income, expenditure and production, December 2016*, cat. no. 5206, [online](#)), 1 March 2017, Table 2: Expenditure on gross domestic product (GDP) seasonally adjusted chain volume measures, 5206002_expenditure_volume_measures (2)).
- 120 Thomson, *The cost of Defence – ASPI defence budget brief 2017–18*, Table 7.1 208 for materiel acquisition and 223 for facilities construction. I’ve added 10% to ASPI’s materiel acquisition figure to cater for exports.
- 121 Thomson, *The cost of Defence – ASPI defence budget brief 2017–18*, Table 7.1, 208. According to the data contained in this ASPI report, for 2017–18 the latest year for which all relevant data are available, materiel acquisition and sustainment expenditure in Australia totalled \$6.7 billion—\$2.4 billion for acquisition and \$4.3 billion for sustainment. If an additional 10% can be added to this acquisition spend to account for industry exports, the total size of the industry comes to around \$6.9 billion. The total DoD budget for 2017–18 was \$34.7 billion. This accounted for 1.9% of GDP (Thomson, vi). If \$34.7 billion of expenditure by DoD accounts for 1.9% of GDP, \$6.9 billion representing DoD’s spend on the industry plus exports would account for around 0.38%—or slightly less than four tenths of one percent—of GDP. However, this figure is likely to be an upper limit for three reasons. First, the DoD expenditure figure of \$6.7 billion may be based at least in part on the total value of sales contracts awarded to Australian-based companies. Such contracts typically include significant amounts of imported goods and services. Second, Thomson’s estimates of defence industry based on DoD data covering industry job numbers suggest that the industry contributes far less to the Australian economy than a figure of 0.38% indicates (Thomson, 209). Third, the industry draws a lot of what it needs from other Australian industries. What it draws is included in a figure of \$6.7 billion. It might be argued that what is drawn from other industries should be excluded from consideration on the basis that if the defence industry didn’t exist on the same scale the other Australian industries that support it would find alternative work elsewhere. From all this, a range for defence industry’s contribution to the economy emerges of between 0.25% or one quarter of one percent based on Thomson’s estimates of industry employment, sales and value-added (Table 7.1, 208) and my estimates set out in Attachment 3 and 0.38% from the above extrapolations. Where within this range the industry’s contribution is most likely to lie requires further investigation.
- 122 Australian Bureau of Statistics (ABS), *Australian industry, 2016–17*, cat. n. 8155.0, Table 1, Canberra, 25 May 2018, [online](#).
- 123 2015–16 is the latest full year for which comparative data covering defence as well as other areas of the economy is available. Sales data isn’t available for most industries on a quarterly basis. And DoD expenditure figures can only be adjusted for imports (and exports) of capital equipment using annual data, given that DoD budget data is also not presented in quarterly terms.
- 124 Value-added for the build component of the industry is proxied by the weighted value-added to sales ratio of 0.33:1 for Australia New Zealand Standard Industrial Classification (ANZSIC) two-digit codes 22 Fabricated Metal Product Manufacturing, 23 Transport Equipment Manufacturing and 24 Machinery and Equipment Manufacturing. Value-added for the sustainment component of the industry is proxied by the simple average value-added to sales ratio of 0.48:1 for ANZSIC two-digit codes 23 Transport Equipment Manufacturing (which includes related equipment servicing) of 0.42:1 and 24 Professional, Scientific and Technical Services of 0.55:1. The relevant manufacturing industry data is from ABS, *Australian industry, 2016–17*.
- 125 ABS, *Australian industry, 2016–17*. The figures relating to Notes 121–124 accord with those in Davies, ‘Australia bets big on defence, but is it necessary?’
- 126 Bourke, ‘Exports and expectations: aspects of the new defence export strategy’.
- 127 PwC, *Economic impact of Australian industry participation in the Joint Strike Fighter program*, 19–22.
- 128 Productivity Commission, ‘On input–output tables: uses and abuses’.
- 129 The job figures are for jobs created across the economy. However, because a substantial number of jobs are lost in other parts of the economy as a result of JSF global supply–chain participation through so-called crowding-out effects, at least the number of jobs cited above must have been created in production to support the JSF for the economy-wide figures to be correct.

- 130 Michael Owen, Paul Garvey, 'Turnbull tips 15,000 jobs from BAE ships deal', *The Australian*, 30 June 2018, [online](#).
- 131 DoD, 'Joint media release—Prime Minister, Minister for Defence Industry and Minister for Defence—new vehicles to protect our troops and create 1,450 jobs', Australian Government, Canberra, 14 March 2016, [online](#).
- 132 DoD, *Building submarines in Australia: aspects of economic impact*, 34.
- 133 DoD, 'Joint media release—Prime Minister, Minister for Defence Industry and Minister for Defence—new vehicles to protect our troops and create 1,450 jobs'.
- 134 Australian Parliament, *Future of Australia's naval shipbuilding industry*, [online](#).
- 135 Australian Parliament, *Principles and practice: Australian defence industry and exports*, [online](#).
- 136 Department of Finance, *Consideration of broader economic benefits in procurement*, Australian Government, Canberra, 16 February 2017, [online](#).
- 137 Bourke, 'The ABCs of defence industry economics—the concepts (part 1)'.
- 138 DoD, *Defence procurement policy manual (DPPM)*, 29–31.
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ACRONYMS AND ABBREVIATIONS

ABS	Australian Bureau of Statistics
ADF	Australian Defence Force
AIC	Australian industry capability
ANAO	Australian National Audit Office
ASC	Australian Submarine Corporation
ASLAV	Australian light armoured vehicle
AWD	air warfare destroyer
CEP	competitive evaluation process
CGE	computable general equilibrium
CPRs	Commonwealth Procurement Rules
Defence	Australian Department of Defence
ERA	effective rate of assistance
ERC	Economics References Committee
FSP	Future Submarine Program
GDP	gross domestic product
JSF	Joint Strike Fighter
MFP	multifactor productivity
OPV	offshore patrol vessel
PIC	priority industry capability
RAND	The RAND Corporation

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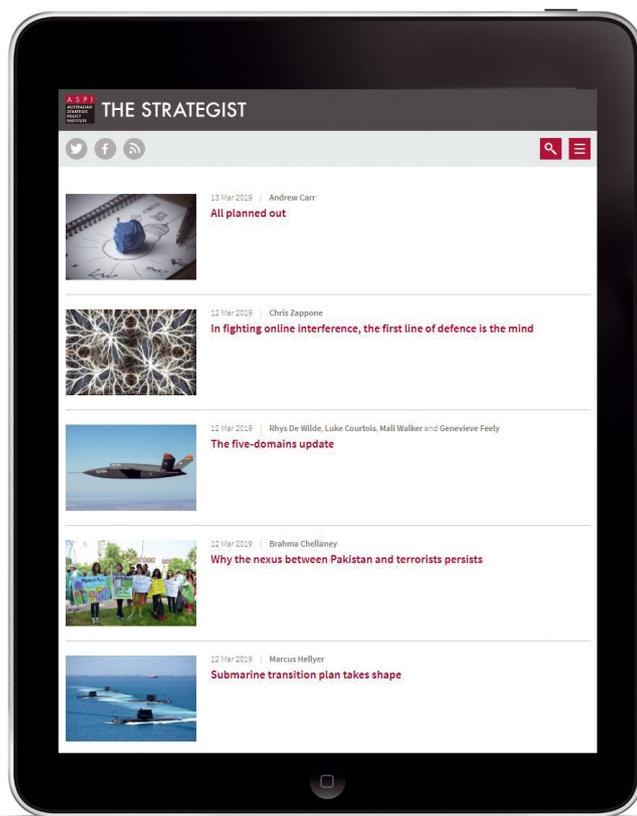


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