

A 'moonshot' strategy of manufacturing semiconductors: Can Australia 'chip' in?

Marina Zhang

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Chipmaking is an American innovation, but its development is the collective effort of countries with competitive and comparative advantages working on a global value chain (GVC). Australia has little direct presence on the GVC, and chipping in to semiconductor manufacturing will not be straightforward.

The GVC for semiconductors (chips) has maximised efficiency by incorporating the best suppliers of each individual component to cocreate value which has been the foundation of modern society. Australia has benefited from this network as a consumer of products embedded with cost-efficient chips. However, supply chain disruptions caused by the COVID-19 pandemic exposed significant vulnerabilities in the GVC.

To minimise future disruptions, countries with high stakes in chips have plans to build self-sufficiency in chipmaking. 'Having unfettered access to microchips,' a recent Australian [report](#) contended, 'is a matter of economic and national security...almost on par with other basic necessities such as food and water...' The report, thus, called for Australian taxpayers to make a A\$1.5 billion 'moonshot' investment to '...build its own semiconductor manufacturing capability.' However, policymakers in Canberra need to be cognisant of the economic obstacles and geopolitical implications of pursuing this strategy.

Economic obstacles

On the economic front, Washington is now investing [US\\$53 billion](#) to 're-shore' chip manufacturing, which it let go three decades ago in pursuit of an [innovation economy](#), outsourcing manufacturing jobs to countries with lower labour costs. Today, the value-added activities related to intangible assets on the chipmaking GVC, including design, research and development (R&D), intellectual property, and branding, are largely held by the US and EU countries, but value-added activities related to manufacturing are concentrated in [East Asia](#) – 64 percent in Taiwan, 16 percent in South Korea, and 10 percent in China. Behind the localities that dominate each activity is an interdependent '[spider](#)' [network of suppliers](#) of capital, talent, technology, and components.

China is the largest consumer of semiconductors. In 2021, Chinese manufacturers built [35 percent](#) of the world's chips into products such as smartphones, PCs, and cars. China has never tried to hide its ambition of achieving self-sufficiency in chipmaking. In 2014, the central government committed to invest over US\$50 billion through its [Big Fund](#) to support innovation in chipmaking. Since then, over 1900 start-ups in semiconductors have been funded, [144](#) of which have been listed on stock exchanges. However, Washington's growing effort to [clamp down](#) on China's access to chip technology is crippling to China's ambition for self-sufficiency in high-end chips.

Is it feasible for the US to re-shore chip manufacturing? Yes, but at a considerable cost, given higher manufacturing costs and a lack of local talent and complementary clusters. So, if the US will struggle to ramp up its manufacturing of chips, and China has a long way to catch up, what hope is there for Australia?

Globally, the chipmaking and pharmaceuticals industries attract the highest R&D investment. Australia's proposed A\$1.5 billion doesn't seem a lot in this game. As a country better at innovation inputs, Australia is relatively weak in diffusing its technology into market at mass scale. Technology only advances when it has a market. The lack of a sizable domestic market, very few global technology enterprises, and low path-dependent collaborative partnerships with countries that complement Australia's strengths are reasons for its low innovation efficiency.

For any newcomer to gain entry to the semiconductor GVC, capital is necessary but not sufficient. Finding the optimal engineering precision in manufacturing chips takes highly skilled workers years to achieve, and such talent takes decades to develop. Cracking and rebuilding long-lasting client-supplier relationships, which are essential in chipmaking, takes even longer to accomplish.

In a best-case scenario, even if Australia could insert itself into the semiconductor GVC, it would focus on producing 'trailing-edge' rather than cutting-edge chips. Trailing-edge chips remain important for myriad functions, and it is this market segment where China's share is expected to grow rapidly. Australia's chip strategy will not be an economic solution.

Geopolitical implications

Geopolitically, a [chip war](#) is gaining significant momentum. It is, however, naïve to assume that it opens an opportunity for newcomers to chip in. Certainly, the US is intent on thwarting China's advancement and carving it out of technology supply chains. Although holding nearly half of the global market share in chipmaking, mainly in intangible activities, US can't do it alone. Thus, Washington must recruit geopolitical allies. This is the premise of 'friend-shoring' and the basis for the '[Chips 4](#)' alliance involving Japan, Korea, and Taiwan.

However, even trusted friends can have different interests and may prefer to maintain a degree of strategic ambiguity. Consider Korea's predicament. In 2021, 60 percent of Korea's semiconductor [exports](#) went to China. Korean companies also have enormous investments in chipmaking plants in China and are planning to expand their capacity. Not surprisingly then, a senior Samsung executive [remarked](#) that Seoul 'should seek understanding from China first and then negotiate with the US.'

In short, there is little evidence of a coherent, geopolitically inspired opportunity for Australia to chip in. But even if there was, without unique advantages that cannot be easily replaced, Australia would be in a marginal capacity at best were it invited to participate in a friend-shored value chain. As a [middle power](#) country in highly interdependent relationships with both the US and China, if Canberra takes a position of unequivocal [strategic alignment](#) with Washington based on political convergence and shared values, Australia will suffer economic and geopolitical consequences.

What are Australia's strategic options?

Building self-sufficiency in chipmaking by sacrificing efficiency marks the beginning of deglobalisation. The move from global to regional or local value chains, and toward re-shoring or friend-shoring solutions, is fracturing the global order that the world relies upon. The question is, can such plans increase the resilience in semiconductor supply chains?

Resilience, as an [ecological concept](#), should first consider survival and self-generation to maintain its functions and structures facing disturbance. It comes from three conditions: diversity in species, agility to respond to external changes, and an open boundary. These conditions apply in innovation ecosystems as well. As shown in its relatively rapid recovery from external shocks in the past three decades, the GVC has achieved a certain level of resilience. If pan-politicising semiconductor GVC in the name of national security and technology sovereignty is realised, we are facing serious technology decoupling divided by political values. Giving up market efficiency in GVC will not necessarily increase resilience in segregated ecosystems as this reduces diversity and interactions with outsiders, and potentially chances of survival.

We are living in a very challenging time. [The trust](#) holding the global order together is waning rapidly. As former Prime Minister [Kevin Rudd](#) has argued, the great powers should pursue 'managed competition.' Australia can contribute by seeking to smooth geopolitical divisions and helping to restore trust so that an open-boundary collaborative ecosystem can be enacted. In such a scenario, China's rise can be positive for all parties.

Dr Marina Zhang is Associate Professor – Research at the Australia-China Relations Institute, University of Technology Sydney.