Australian Government
IP Australia
Office of the Chief Economist

Analytical note

THE STRUCTURAL CHANGE IN PATENTING BEHAVIOUR IN AUSTRALIA

Domestic patenting has shifted from large firms to SMEs.

In Australia, small and medium enterprises (SMEs) are an increasingly important engine of innovation. As research and development (R&D) spending by large firms has retreated, the SME share of national R&D spend has risen to 55% in 2022 from around 30% in 2007.[1] At the same time, there has been a fundamental shift in who holds patents, from large firms to SMEs, linked to change in who innovates, how and to what end.

At a glance:

- From 2002 to 2022 (fiscal years), the number of patent-holding SMEs in Australia increased at a rate 5 times faster than the number of SMEs without patents.
- The same pattern is not observed for large firms: the number of large firms without patents has increased nearly 3 times faster than those with patents.
- On average, the rate at which patent-holding firms scale from SMEs to large firms more than halved through the 2000s and 2010s.
- These trends may reflect macroeconomic conditions and structural barriers to growth. They may also reflect an increasing division of innovative labour, with small firms and startups generating IP that is acquired and commercialised by large firms.

About the study

The study used data in the Australian Bureau of Statistics Business Longitudinal Analysis Data Environment (BLADE), providing information on the full population of active Australian businesses between 2002 and 2022 (fiscal years). BLADE includes the *Intellectual Property Longitudinal Research Dataset* (IPLORD) providing data on firms' stocks and flows of intellectual property (IP) applications and grants. Small and medium enterprises are defined as employing between 1 and 199 full-time equivalent (FTE) employees, and large firms as employing 200+ FTEs.

Key highlights

The share of Australian firms granted patents has significantly risen over the past two decades

Over the past 2 decades, the number of active employing firms in Australia has significantly increased, by an annual average of 0.4%, from 756,412 in 2002 to 823,665 by 2022. The number of employing firms holding patents has grown faster, by an annual average of 1.9%, from 1,257 to 1,829 over the same period. Faster growth among patent-holding firms compared to the general firm population has resulted in a rise in the rate of

patenting amongst employing firms, from 0.17% in 2002 to 0.22% in 2023.

Both the rapid growth in the number of patenting SMEs and the more subdued growth in the number of large patenting firms have slowed in recent years, with an apparent break in these trends around 2017-19. As a result, the total number of patenting firms has grown at an annual average of just 0.2% in the past five years.

Patent holdings in Australia has shifted toward smaller firms

Firms of different size show noticeably different trajectories for relative growth in the number of patenting and non-patenting firms.

The number of patent-holding SMEs has increased 5 times faster than those without patents.

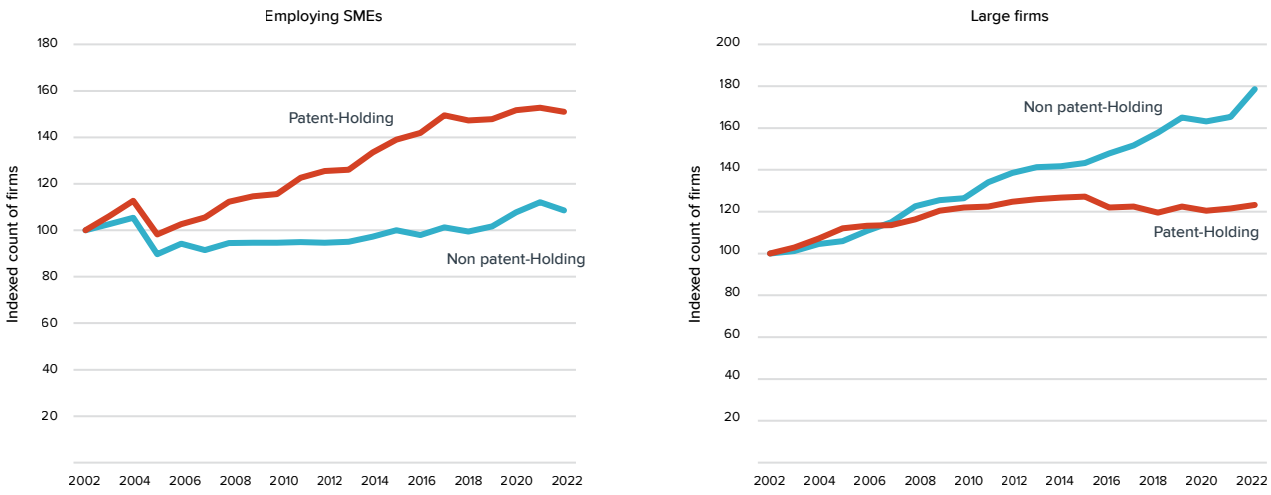
From 2002 to 2022, the overall number of SMEs in the Australian economy grew at an average annual rate of 0.4%. Over the same period, the number of patent-holding SMEs increased five times faster, at an annual average rate of 2.1%.

Almost all growth for both SMEs and patent holding SMEs occurred between 2002 and 2017, with the number of patenting SMEs stable in the last 5 years to 2022. Interestingly, until 2017, growth in the number of patent-holding SMEs tracked with growth in the number of SMEs within scientific services – among Australia's most patent-intensive industries. After 2017, scientific research services continued to grow rapidly in its number of SMEs, even as growth in patenting has tapered (see Appendix, Figure A1).

The number of large firms without patents has increased nearly 3 times faster than those with patents.

The overall number of large firms grew at an average annual rate of 2.8% from 2002 to 2022. Meanwhile, the number of patent-holding large firms increased at just 1% per annum. That growth has significantly tapered since 2015.

Figure 1 | Growth trajectory of patenting and non-patenting employing firms, indexed 2002=100



This has also resulted in the share of employing SMEs that hold patents increasing from 0.13% in 2002 to 0.19% in 2022. Conversely, the share of large firms with patents has fallen from 7.58% to 5.36% during the same period.

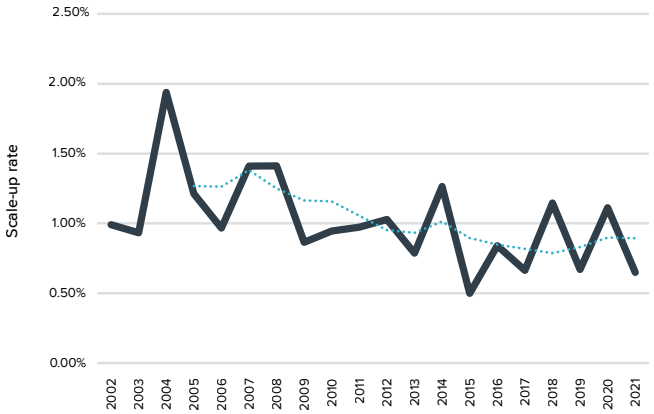
The rate at which patent-holding SMEs scale into large firms has declined

A reduced number of large patent-holding firms doesn't necessarily mean there are fewer large firms selecting into patenting. Further analysis shows that the shift in patent-holding from large firms to SMEs is largely due to a decline in the firm growth rate.

As Figure 2 shows, between 2002 and 2008 on average 1.3% of patent-holding SME firms expanded to become large firms per year between 2002 and 2008. This scale-up rate fell to an average of 1.0% per year between 2009 and 2014. It fell further to 0.8% per year between 2015 and 2022. In comparison, the scale-up rate for non patent-holding firms (although still much lower at just 0.06% per annum) slightly increased from 2002 to 2022.

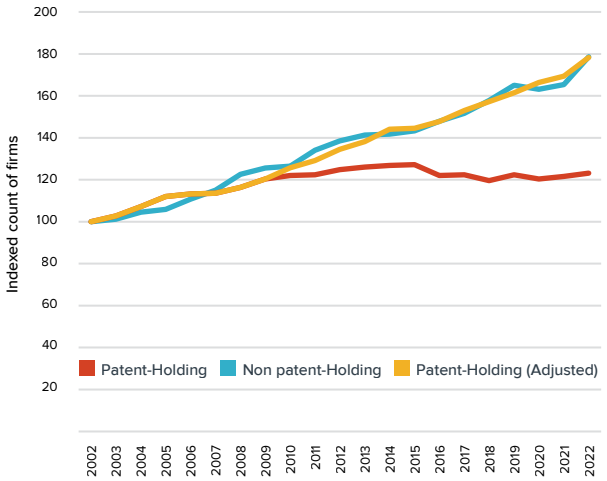
These results are consistent with prior research on high growth firms (HGFs) in Australia. As Majeed et al. (2021) notes, high growth firms tend to have a strong focus on innovation and generate greater returns from investment in research and development (R&D) than slower growing firms. From 2004 to 2014, the HGF proportion of all Australian firms fell from 17.6% to 14.0%, based on firm sales data.[2] Notably, factoring more recent years, this indicator has shown more volatility than other business dynamism measures, with a substantial recovery in 2016-18 (Hansell, forthcoming).

Figure 2 | Proportion of patent-holding firms that expand from SME to large each year



To illustrate the trend's impact on patent activity, the pre-2009 scale-up rate can be applied to patent-holding firms in future years, accounting for observed annual variation. Decline in the scale-up rate accounts for a reduction in the number of large patent-holding firms by around 10-20 firms per year from 2010 to 2021. With this 'lost growth', the total number of large patent-holding firms in Australia has held at around 300, where a constant scale-up rate would imply an additional 140 large patent-holding firms by 2022. In this hypothetical scenario, growth in the number of large patent-holding firms would align closely with what's been observed for large firms without patents (see Figure 3).

Figure 3 | Adjusted vs actual growth in large patent-holding firms, indexed 2002=100



Why did the scale-up rate fall?
Researchers have highlighted the importance of macroeconomic conditions in determining firm growth rates. Majeed et al. (2018) observe that a decline in the HGF proportion in Australia from 2004 to 2014 coincided with a decline in the growth rate of Australia's gross domestic product (GDP).

For entrepreneurial firms oriented to innovation, access to capital is vital to realise their high growth potential. Historically, such firms have faced difficulty funding operations through external debt, in the absence of tangible assets or stable cash flows. The 2010s saw a rapid expansion of the venture capital (VC) market and the emergence of new forms of financing and support programs. At the same time, international data suggests VC investment is increasingly concentrated on a narrow band of technology, notably in software and related businesses.[3]

Patent policy settings can also influence the structure of innovation. Studies from the US show over the past 40 years, the structure of innovation has changed, with an increasing division of innovative labour. Today, many successful innovations involve the input of:

- universities who conduct the bulk of basic research
- small firms and startups who identify its commercial applications
- large firms who may acquire and commercialise the applications.[4]

Small innovative firms face a strategic choice to either:

- compete directly with market leaders in the product market, commercialising their own inventions
- collaborate with market leaders by licensing or selling their IP.[5]

Arora et al. (2021) suggest that broader patent protections can spur cumulative investment in research within patent-holding firms. Moreover, the effect is more pronounced within smaller enterprise, as patents facilitate IP trading and provide them time to build commercialisation capability. As patent protection has strengthened in the US, this has not only encouraged investment in research, but also shifted the position of that investment from large firms toward smaller firms and startups.[6]

Significance and future research

IP Australia has an ongoing program of research to understand the changing structure of innovation in Australia and drivers of R&D investment, with focus on the potential influence of intellectual property rights.

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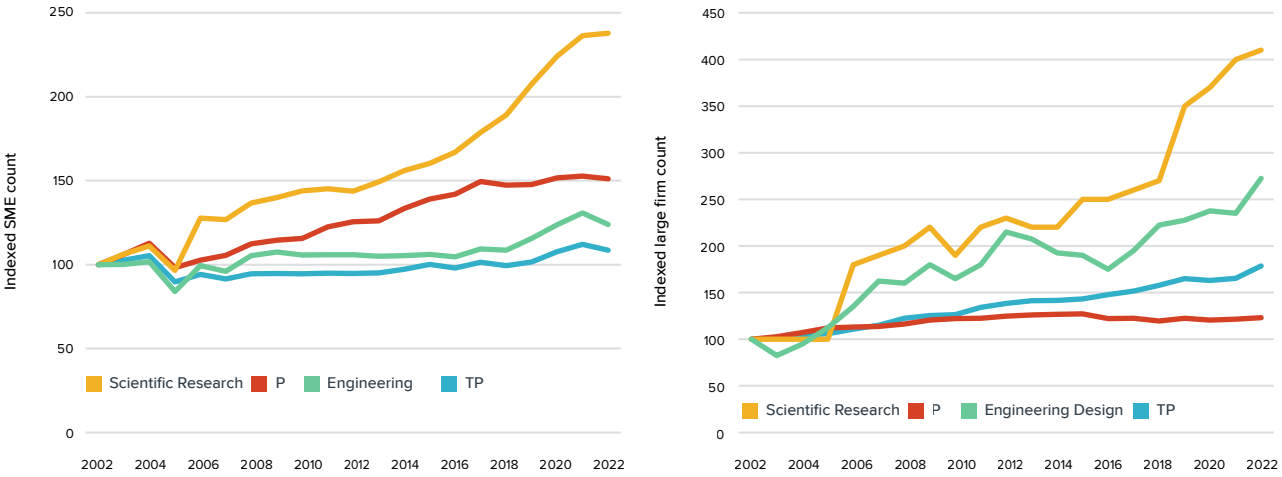
Appendix

Figure 4 shows relative change in the number of SMEs and large firms active in scientific and research services (orange line) and in engineering services (green line), Australia's two most patent-intensive industries. These growth trends are compared against trends for patent-holding firms (red line) and non patent-holding firms (blue line) in the economy more broadly.

The number of SMEs in scientific research services has increased dramatically over recent decades, continuing to 2022, even as growth in the number of patent-holding SMEs has tapered since 2017. In comparison, in engineering services, the number of SMEs remained relatively stable from 2002 to 2016, followed by moderate growth to 2022.

Interestingly, in these patent-intensive industries, growth over time in the number of large firms has not translated into meaningful growth in the number of large patent-holding firms.[7]

Figure 4 | Indexed number of firms, including comparisons to patent-intensive Australian and New Zealand Standard Industrial Classification (ANZSIC) classes



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Endnotes

1 | Jones, B. (2024, 4 April). Financing SME innovation in Australia – challenges and opportunities. Speech to COSBOA National Small Business Summit, 4 April 2024, Reserve Bank of Australia.

2 | Majeed, O., Balaguer, A., Hansell, D., Hendrickson, L., Latcham, A. & Satherley, T. (2021), What drives high growth? Characteristics of Australian firms. Economic Record, 97(318), 350–364.

3 | Lerner, J. & Nanda, R. (2020), Venture capitals role in financing innovation: What we know and how much we still need to learn. Journal of Economic Perspectives, 34(3), 237–261.

4 | Arora, A. and Belenzon, S. (2023). The changing structure of American innovation. NBER Reporter, No. 1, March 2023.

5 | Gans, J. S., & Stern, S. (2003). The product market and the market for "ideas": Commercialization strategies for technology entrepreneurs. Research Policy, 32 (2), 333–350.

6 | Arora, A., Belenzon, S., Marx, M. & Shvadron, D. (2021). (When) does patent protection spur cumulative research within firms? NBER Working Paper 28880.

7 | For example, the number of firms in scientific research services and engineering design and consulting industries (as classified under Australian and New Zealand Standard Industrial Classification (ANZIC)) increased by around 250% and 400% respectively, but this is not reflected in the increase in large patent-holding firms – see Figure.

Acknowledgements

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Suggested reference

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