

# Bulletin

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# Recent Trends in Australian Productivity

Angelina Bruno, Jessica Dunphy and Fiona Georgiakakis<sup>[\*]</sup>

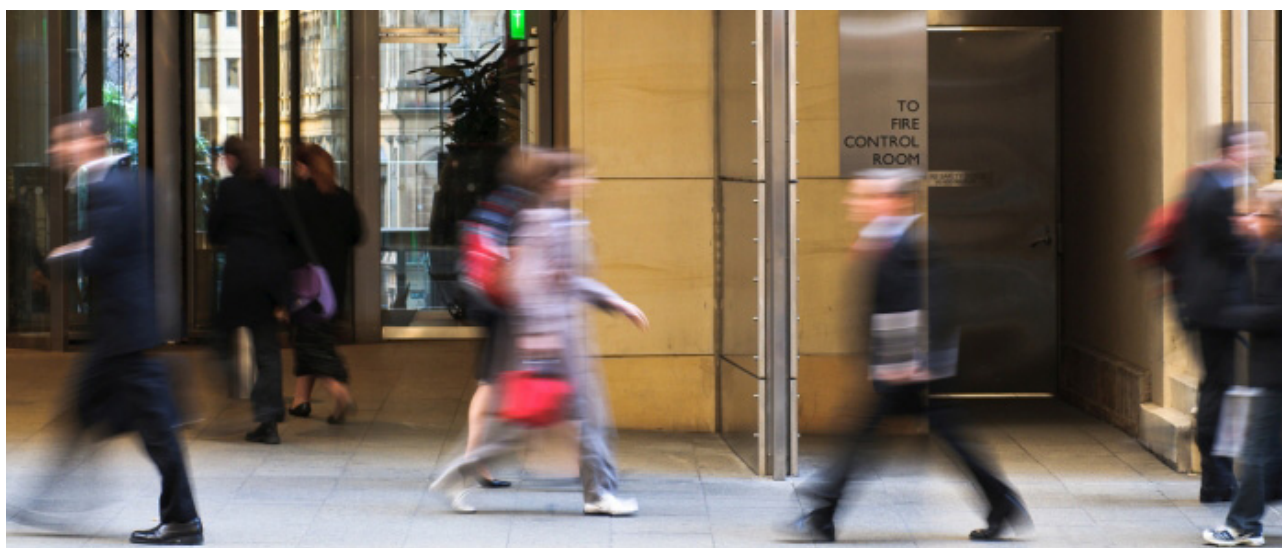


Photo: georgeclerk – Getty Images

## Abstract

Productivity growth enables rising living standards and is needed for real wages growth to be consistent with stable inflation over the medium term. Prior to the COVID-19 pandemic, productivity growth in Australia and other advanced economies had been low, because business dynamism, job mobility, global trade and policy reform all slowed. Over the past few years, the pandemic and other shocks distorted productivity outcomes. Even if these shorter term fluctuations wash out, the longer term (and apparently structural) weakness in productivity growth could persist. This would have implications for the rate of nominal wages growth that is consistent with inflation returning to the target band. This article discusses the trends in Australia's productivity growth before, during and since the pandemic and the implications for the economic outlook.

## Introduction

Productivity growth is a key driver of economic growth and higher living standards. Labour productivity growth is defined as the amount of real production (GDP) per labour hour worked. It is determined by, among other factors, the amount of capital available to each worker, the rate of technological progress and how efficiently resources (like labour and capital) are used to produce goods and services. Multifactor productivity (MFP) measures the amount of output for a given amount of both labour and capital

inputs. When labour productivity is rising, wages can sustainably increase faster than the general rate of inflation in the price of goods and services. Equivalently, positive productivity growth allows firms to increase the prices of their own products more slowly than the rate of increase in the price of labour and other inputs, or even to reduce prices. This implies that over the longer run, real wages growth, productivity growth and growth in living standards tend to track each other (Productivity Commission 2020).

For this reason, the trend rate of productivity growth is an important input into assessments of the economic outlook, along with nominal wages growth. The difference between growth in hourly labour costs and growth in productivity – which is the growth rate in *unit labour costs* – affects firms’ pricing decisions and so the overall rate of inflation.

Recently, unit labour costs have been increasing strongly, reflecting higher nominal wages growth and subdued productivity growth (Graph 1). If sustained, this strong unit labour cost growth would contribute to ongoing inflationary pressures. The Reserve Bank’s current forecast for labour costs is consistent with inflation returning to the Bank’s target over the forecast horizon, provided productivity growth picks up back to pre-pandemic trends. However, productivity growth has been weak over the past few years and continued weakness in productivity growth is a key risk to the outlook.

This article explores recent trends in Australia’s productivity growth and the implications for income growth and inflation. It considers Australia’s longer term productivity performance and how this compares to other advanced economies, before delving into productivity outcomes during the COVID-19 pandemic and subsequent shocks, and commenting on the post-COVID outlook.

## The pre-pandemic productivity landscape

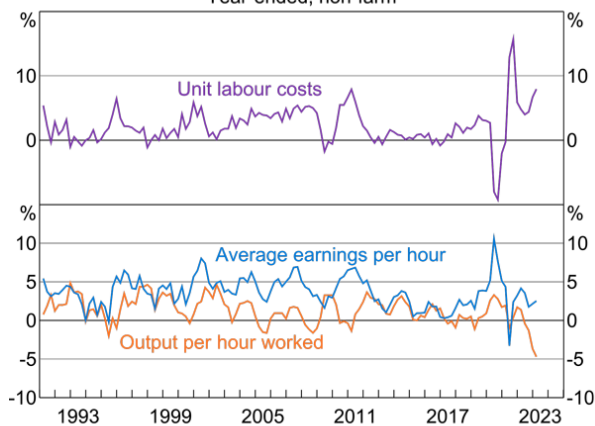
Internationally, trend productivity growth has slowed across advanced economies, after a strong period of growth in the 1990s and early 2000s (Graph 2). The drivers of this productivity slowdown have been explored extensively in the literature: a declining rate of technological diffusion, measurement issues, slowing global trade growth, weakening business dynamism and ageing population structures have all been cited as potential causes (see Andrews, Criscuolo and Gal 2016; Adler *et al* 2017; Goldin *et al* 2022). Scarring effects from the global financial crisis (GFC) may have also led to persistent productivity losses, in part because investment in many economies declined to very low levels. This meant that workers had less capital to work with and therefore were less productive. The net result of this combination of factors was that average labour productivity growth in the decade prior to the pandemic was around 1.3 percentage points lower than in 1999–2004.

Like other advanced economies, Australia’s trend productivity growth has slowed in recent decades (Graph 3). From the 1990s to mid-2000s, productivity growth averaged 2.1 per cent, with the economy benefiting from deregulation and pro-competition policy reforms, the rapid uptake of new digital technologies and strong global productivity growth throughout this period (Productivity Commission 2020). This led to a sustained period of

**Graph 1**

### Unit Labour Costs Growth

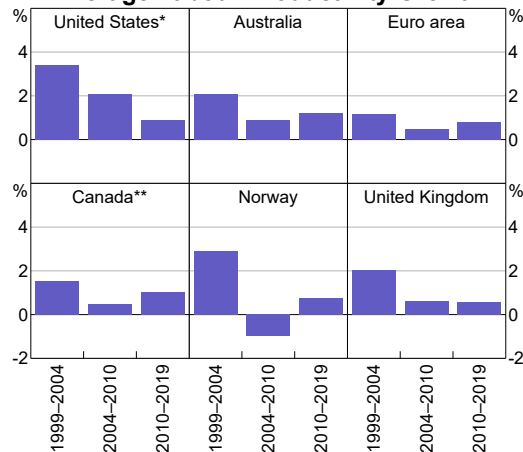
Year-ended, non-farm



Source: ABS.

**Graph 2**

### Average Labour Productivity Growth



\* Non-farm business sector.

\*\* Business sector.

Sources: ABS; RBA; Refinitiv.

strong income growth (Productivity Commission 2021).

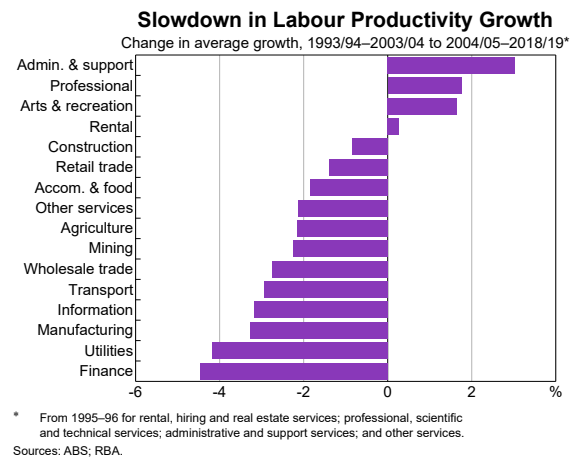
Since then, average productivity growth has fallen, averaging just 1.2 per cent over the 2010s. This decline has occurred across the market sector, rather than being driven by a particular industry (Graph 4). Widespread declining competition and slowing regulatory and economic reform are often cited as explanations for this broad-based slowdown (Hambur 2021; Daley 2021; Queensland Productivity Commission 2021; Banks 2012). The OECD (2021) suggests that Australian regulatory procedures are relatively complex and the licensing and permit system is cumbersome compared with other OECD countries. However, the global nature of the productivity slowdown suggests economies must be dealing with common shocks, not only country-specific regulatory developments.

Normally, slower average growth in productivity would imply slower growth in real incomes, and – without an implausibly large reduction in profit margins – also slower real wages growth. However, the high prices for Australia’s commodity exports prevailing from the mid-2000s to the mid-2010s lifted Australia’s terms of trade, which are defined as the ratio of the price of an economy’s exports to those of its imports. This meant that national income increased more quickly when measured in terms of the goods and services actually consumed in Australia than measured productivity growth would imply (Graph 5). Real wages and living

standards were therefore able to grow faster than productivity, offsetting the latter’s slowdown (Davis, McCarthy and Bridges 2016; Lowe 2015).

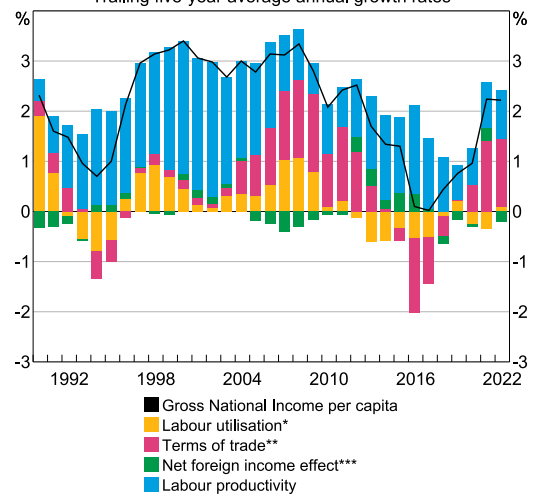
However, terms of trade reflect global economic conditions and are unlikely to be a sustainable source of long-term income growth (Lowe 2015). From the mid-2010s, the terms of trade eased and no longer drove increases in per capita income growth, and even weighed on it in some years (Treasury 2017). This meant the subdued productivity growth contribution to lower wages growth was no longer being offset in the lead up to the pandemic.

**Graph 4**



**Graph 5**

**Contributions to Per Capita Income Growth**  
Trailing five-year average annual growth rates

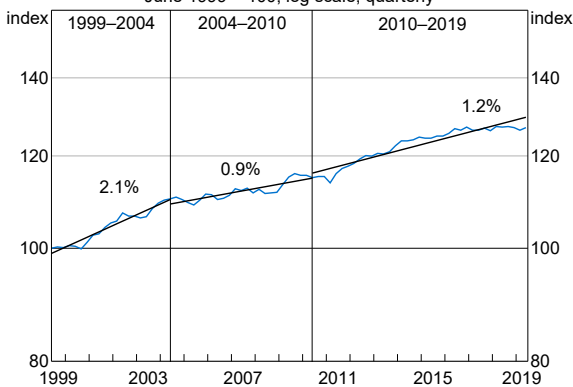


\* The difference between GDP per capita and labour productivity growth.  
 \*\* Defined as the difference in GDP and GDI growth.  
 \*\*\* Difference between GNI and GDI.  
 Sources: ABS, RBA.

**Graph 3**

**Labour Productivity\***

June 1999 = 100, log scale, quarterly



\* Total GDP per hour worked; black lines denote linear trend; labels show average annual growth.  
 Sources: ABS, RBA.

### The productivity landscape since 2020

Headline productivity growth increased at the onset of the pandemic as hours worked fell faster than output (Graph 6). This increase was driven by a significant *compositional* effect, as hours were cut in low productivity sectors to a far greater extent than in higher productivity sectors. Movement restrictions and lockdowns led to a declining share of hours worked in the (lower productivity) high-contact services sectors, and an increase in the share of hours worked in the (higher productivity) business services sectors where working from home was feasible (Graph 7) (Lopez-Garcia and Szörfi 2021; Gordon and Sayed 2022; Thwaites *et al* 2021).

The positive between-industry effect helped to offset productivity declines within goods-producing and contact-intensive industries, where it was difficult to transition to remote work (Graph 8) (Fernald and Li 2022). These declines likely reflected social distancing requirements, supply chain disruptions and shortages of inputs, including labour. Businesses also introduced containment measures to limit the spread of the virus, increasing intermediate costs and weighing on within-sector productivity (Thwaites *et al* 2021; Bloom *et al* 2022).

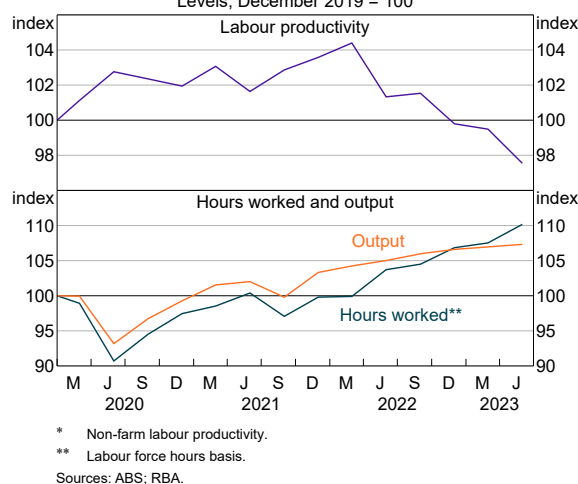
With the acute phase of the pandemic over, the compositional changes have largely unwound (Graph 7). On net, productivity has fallen in the three years to June 2023 (Graph 6). Significant shocks in 2022, following the acute pandemic phase, could still be weighing on productivity in Australia and in other economies. In particular, China’s zero-COVID-19 policy, which led to large-scale lockdowns, affected global supply chains, and might still be affecting Australian industry. Moreover, the effects of Russia’s invasion of Ukraine on global supply chains and energy supply could also be lingering. These shocks affected many industries, especially the construction industry, which is heavily reliant on global supply chains to import materials. Wet weather in Australia also constrained production in many industries, including construction, mining and agriculture. These shocks continue to weigh on the productivity level. As they continue to dissipate, productivity can be expected to recover further.

### Labour productivity since the pandemic

While productivity remains broadly in line with its pre-pandemic trend in the United States, euro area and Norway, it is now below trend in the United Kingdom, Australia and Canada (Graph 9). Moreover, the effects of the pandemic and subsequent shocks might be having lingering impacts on the productive capacity of advanced economies; for example, through labour market hoarding or the transition to remote work practices. The following section discusses other structural and cyclical factors that may be driving recent productivity growth outcomes.

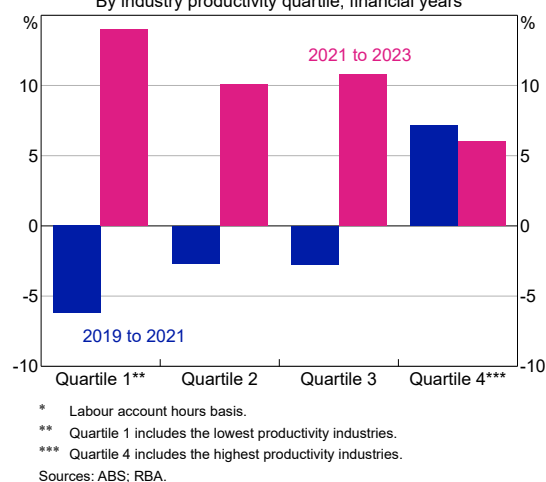
**Graph 6**

**Labour Productivity\***  
Levels, December 2019 = 100



**Graph 7**

**Change in Hours Worked\***  
By industry productivity quartile, financial years



### High labour market turnover and labour market hoarding

High job turnover in advanced economies may be affecting labour productivity growth, though the direction of the overall effect is ambiguous. On the one hand, the increase in job mobility could boost labour productivity growth if it results in better job matching and increased labour reallocation to more productive firms (Andrews and Hansell 2021). On the other hand, higher job mobility could weigh on labour productivity growth in the near term. More workers in the economy have recently started new jobs and so may be less productive as they are still in a learning or training phase. Tight labour market conditions, staff shortages and a higher average

incidence of personal and other leave may also be leading to a higher rate of labour hoarding (Schnabel 2022; Cook 2022). Labour hoarding occurs when firms hold on to more workers than necessary, resulting in labour underutilisation and hence weighing on labour productivity growth.

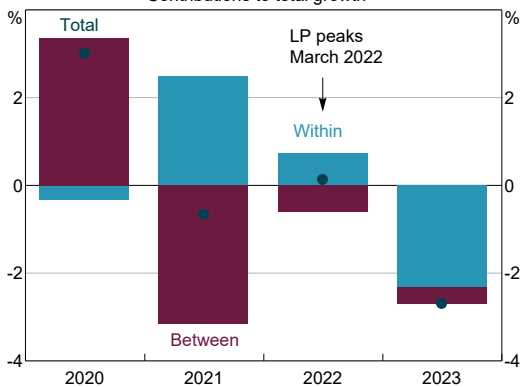
### Weakness in business investment

Weak business investment may be contributing to below-trend labour productivity growth in some advanced economies, though recent trends vary across countries (Graph 10). Lower business investment leads to slower growth in the capital stock per worker (capital deepening) and hence weaker labour productivity growth. In the United Kingdom, where productivity growth has stagnated, business investment has been very subdued since 2016, in part due to Brexit (Bank of England 2023). Throughout Europe, high energy prices associated with the Russian invasion of Ukraine have also weighed on business investment (Battistini, Bobasu and Gareis 2023).

### Declining economic dynamism and competition

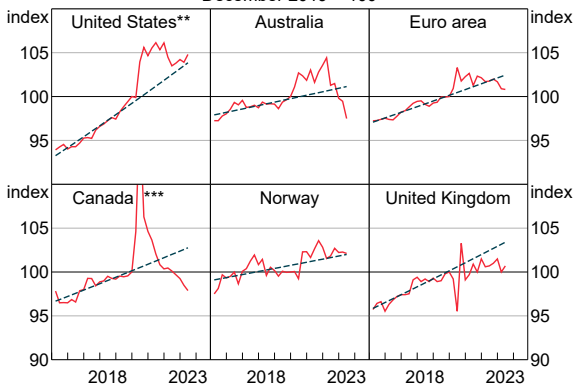
*Economic dynamism* refers to all the ways in which an economy can reinvent itself through the entry of new firms, through workers moving to higher paying firms and the downsizing or exit of less efficient activities. From the mid-2000s, Australia and other advanced economies experienced a decline in business entries, slowing capital and labour reallocation and declining competition (Hambur and Andrews 2023; Andrews and Hansell

**Graph 8**  
**Labour Productivity Growth\***  
Contributions to total growth\*\*



\* Labour Account hours basis. Decompositions will not aggregate to national accounts data.  
\*\* 12 months to June.  
Sources: ABS; RBA.

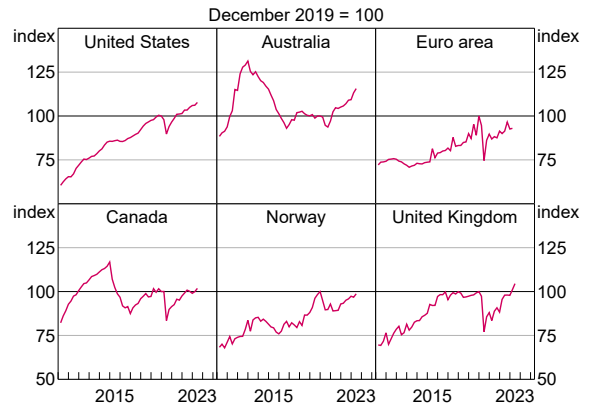
**Graph 9**  
**Labour Productivity\***  
December 2019 = 100



\* Hourly, seasonally adjusted. Dotted lines show pre-pandemic (2015–19) trend.  
\*\* Non-farm business sector.  
\*\*\* Business sector.  
Sources: ABS; RBA; Refinitiv.

**Graph 10**

**Business Investment\***  
December 2019 = 100



\* Non-residential investment.  
Sources: ABS; RBA; Refinitiv.



2021; Hamubr 2021; Bakhtiari 2019). This trend contributed to Australia’s weak productivity performance before the pandemic. However, it reversed during the pandemic for business entry rates and job-switching rates (Graph 11), though this may be due to a mixture of ‘payback’ for low mobility during the early part of the pandemic, alongside cyclical strength in the labour market, rather than an underlying improvement in economic dynamism. Business entry rates peaked in mid-2021 and have since fallen for employing firms. Both the actual and expected job mobility rates declined in the two quarters to May 2023, indicating job mobility has likely peaked.

**The outlook**

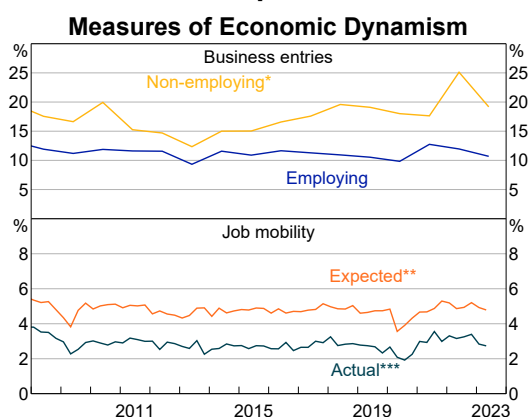
While the pandemic appeared to temporarily disrupt some of the causes of the global slowdown in productivity growth, it has also exacerbated or introduced others. In addition to structural headwinds, Australia’s post-pandemic productivity performance will depend on the balance of several factors, including the following:

- **Slowing growth in global trade:** International trade increases competition, improves the reallocation of resources to more productive firms and reduces the costs of production by increasing the availability of intermediate inputs (Melitz 2003). The slowdown in global trade growth since the GFC could therefore have constrained productivity growth in advanced economies (Goldin *et al* 2022). Further declines

in trade – whether due to cyclical, structural or geopolitical factors – could also weigh on future productivity growth going forward.

- **Slowing knowledge spillovers:** Global trade openness facilitates knowledge spillovers and technology diffusion. Foreign direct investment also provides a direct channel for the diffusion of global frontier technologies (Kerr 2017). Therefore, restrictions that reduce the flow of skilled workers, technology and investment across international borders are likely to slow the pace of global innovation. This channel is likely to be particularly important for Australia’s productivity future, given Australia is a net importer of technology.<sup>[1]</sup>
- **Climate change and natural disasters:** Climate change will have a direct impact on the productivity of several industries, such as agriculture, forestry and fishing and tourism (Productivity Commission 2023). The related increase in the frequency and severity of natural disasters also has implications for productivity growth, although the overall net effect depends on the exact model used (Botzen, Deschenes and Sanders 2019). In general, natural disasters destroy productive resources and thereby reduce short-term productivity growth. Over the longer term, however, the impact of climate change and natural disasters on productivity growth will depend on what assumptions are made about investment to increase resilience to disasters.

**Graph 11**



\* Non-employing businesses are made up primarily of sole traders and partnerships.  
 \*\* Expected job changes over the next 12 months.  
 \*\*\* Actual job changes over the past 3 months.  
 Source: RBA.

- **The energy transition:** The transition to renewable energy and lower emission technologies is another key risk. Abatement measures will generally increase production costs for firms, weighing on productivity growth (Productivity Commission 2023). Over the longer term, as the benefits of these technologies are realised, the net impact on productivity may improve.
- **The net impact of COVID-era innovations:** While many businesses shifted resources away from innovative activities during the pandemic to focus on survival rather than growth, some firms adapted their business models by

speeding up adoption of digital technologies. Australian innovation investments remained robust during the pandemic, with a temporary increase in patent and trade mark applications filed in Australia in 2021 (IP Australia 2023). The pandemic also influenced the direction of innovation, with a notable shift towards technologies and innovations that supported remote work, mitigated the health impacts of the pandemic and responded to changes in household demand (Fink *et al* 2022). There was an unprecedented surge in adoption of cloud computing technologies during the pandemic, although adoption rates quickly returned to their pre-pandemic levels (Hambur and Nguyen 2023). Now that the pandemic is over, it is unclear whether businesses face the same pressures to innovate. However, there remains optimism in the longer term for productivity gains from widespread adoption of transformative technologies such as artificial intelligence (Brynjolfsson and McAfee 2011).

- **Demographic developments:** Demographic trends, such as population ageing, may also have an impact on labour productivity growth, though research on the relationship between population ageing and labour productivity growth is mixed (Commonwealth of Australia 2023). Some international research suggests that labour productivity decreases as the share of older workers increases, reflecting lower levels of innovation, entrepreneurship and take-up of new technologies (Maestas, Mullen and Powell 2023; Aiyar, Ebeke and Shao 2016). However, Australia's entrepreneurs tend to be older than in other advanced economies (Steffens and Omarova 2019). Further, population ageing is likely to put pressure on labour supply and increase the incentive for firms to adopt new labour-saving techniques, which will have an offsetting impact.

## Conclusion

Productivity is important to central banks given the links to economic growth, wages growth and inflation. Currently, wages growth forecasts are consistent with inflation returning to the Reserve Bank's target band if productivity growth returns to its pre-pandemic trend. Recent productivity outcomes have been weaker than this and continued weakness is a key risk to the economic outlook. That said, in the short term, productivity growth may be supported by the unwinding of cyclical drags, such as high labour market turnover and labour hoarding. Further unwinding of supply chain disruptions is likely to improve production, particularly for construction firms. More generally, trend growth could rise above the pre-pandemic rate if innovations implemented by firms during the pandemic begin to pay dividends. How these factors net out will determine whether productivity growth returns to its pre-pandemic trend.

The long-term productivity outlook is even more uncertain. On the one hand, productivity growth has slowed further for some advanced economies than in the decade prior to the pandemic, indicating there may have been a further structural decline in productivity growth. Without further economic and regulatory policy reforms, the same growth in productivity experienced in past reform decades is unlikely. Further slowing in global trade and the energy transition threaten the revival of strong productivity growth in these economies. On the other hand, the pandemic influenced the take-up of existing technologies and changed the direction of innovation, which may pay dividends over the medium to longer term. The shock to energy prices may also provide further incentives for decarbonisation over the medium to longer term. Emerging economies face greater opportunities to experience higher productivity growth as living standards converge to that of advanced economies – 99 per cent of the Indian population now has access to electricity, a rapid increase from 59 per cent in 2000 (World Bank 2023). ❖



## Endnotes

[\*] Angelina Bruno and Fiona Georgiakakis are from Economic Analysis Department; Jessica Dunphy completed this work while in Economic Analysis Department.

[1] Less than 2 per cent of innovations by Australian businesses are new-to-the-world – most innovations are new-to-the-business, new-to-industry or new-to-Australia (ABS 2021). Additionally, 92 per cent of patents in Australia are filed by non-residents (IP Australia 2023).

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# Adoption of General-purpose Technologies (GPT) in Australia: The Role of Skills

Kim Nguyen and Jonathan Hambur<sup>[\*]</sup>



Photo: Surasak Suwanmake – Getty Images

## Abstract

General-purpose technologies (GPT) have the potential to transform how we work, to change the skills we need and to drive productivity growth. It is therefore important to understand the conditions that lead to the successful adoption of GPT. Using a novel database on the adoption of cloud computing and artificial intelligence/machine learning by Australian-listed firms, this article finds that the COVID-19 pandemic led to a short-lived surge in adoption of cloud computing technologies. In addition, there is evidence that profitable adoption is more likely to occur in firms where the Board has members with relevant technological backgrounds, and that firms adopting GPT are more likely to seek staff with related skills. These findings highlight the importance of workers' and managers' skills in technology adoption, and the impact this can have on productivity growth.

## Introduction

Productivity growth is the key driver of living standards over the medium term. The discovery of new technologies helps drive productivity growth, by revealing better ways for businesses to operate. A key step in this process is when the technology moves beyond the inventor and firms begin adopting it for themselves. This step is particularly

important for Australia, which tends to be a technology importer – while only a very small share of Australian firms create a 'new-to-the-world' innovation each year, around half incorporate an existing technology (Productivity Commission 2023).

Over recent decades, Australian firms have fallen further and further behind the global productivity

frontier, providing indirect evidence that the pace at which Australian firms adopt new technologies has slowed (Andrews *et al* 2022). Direct evidence on technology adoption is scarce, particularly on the drivers of and barriers to adoption.

This article attempts to fill this gap by developing a new database on technology adoption using references to technologies from Australian-listed firms' earnings calls and annual reports. It combines this database with information on firms' performance, management and hiring to get a clearer picture of the drivers of and barriers to adoption. The focus here is on cloud computing and artificial intelligence/machine learning (AI/ML) – two emerging digital general-purpose technologies (GPT) – though the approach could be extended to other technologies. These technologies have the potential to alter the way firms do business. Use of these technologies also tends to require highly skilled and educated workers, which has the potential to affect demand for skilled labour (Burgess and Connell 2020; Ellis 2021). As a result, particular emphasis is placed on the role of manager and worker skills in the analysis.

### GPT adoption over time

In the early and mid-2010s, the share of firms mentioning cloud computing for the first time – a sign of GPT adoption – remained steady at around 1–2 per cent (Graph 1). Towards the end of the 2010s, there was a slight increase in the share of firms adopting cloud computing, though this remained below the share observed in the United States (Bloom *et al* 2021). The share of firms adopting cloud-related technologies jumped sharply during the COVID-19 pandemic. However, the rate quickly reverted, indicating that this was a temporary boost in the adoption rate and a level shift up in the number of firms that had adopted these GPTs, but not a long-term change in the trend. This suggests that some of the optimism around the potential for the pandemic to lead to an ongoing increase in digital adoption and therefore productivity may be somewhat overstated, though the story will become clearer as more data become available. It is also important to highlight that this

analysis only captured listed firms, and patterns for other firms could differ.

Regarding AI/ML, adoption rose steadily from 2015 to 2018 before stabilising at around 3 per cent of firms newly adopting this technology each year, which was slightly below the share in the United States (Bloom *et al* 2021). Overall, the cumulative share of firms that appear to have adopted AI/ML-related technology remains low. However, recent advancements in generative AI like ChatGPT could potentially lead to an increase in future.

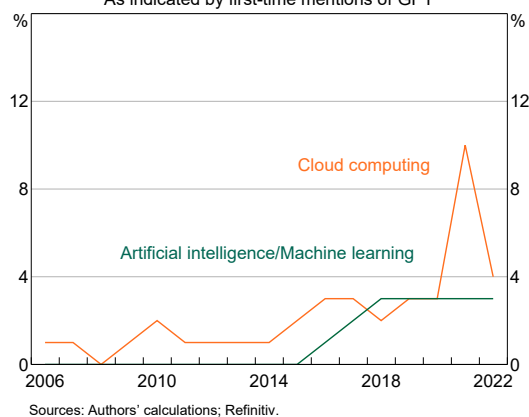
Adoption trends have varied across industries (Graph 2). The IT and communication sectors were early adopters of both technologies, as were the financial and healthcare sectors, particularly of AI/ML. On the other hand, the sharp increase in cloud computing adoption during the pandemic was quite widespread.

### Board skills and adoption

Many previous studies have shown that management capabilities are important for firm performance (Bloom *et al* 2019; Alekseeva *et al* 2021; Calvino *et al* 2022). As such, we set out to determine whether having Board members with certain skillsets is associated with greater adoption of GPTs. To do so, we used data from S&P Capital IQ on the Board members at Australian-listed companies – specifically, information on their demographic, educational and professional backgrounds – to identify whether a firm had any Board members

**Graph 1**

**Share of Firms Adopting GPT**  
As indicated by first-time mentions of GPT



with relevant attributes. The analysis was based on a snapshot of Board members as of March 2023.

### Skilled Board members and GPT adoption

We first considered whether firms with certain types of Board members are more likely to adopt these GPTs, focusing on firms outside of the IT sector (see Appendix A for details). We found the following:

- Firms with a Board member *with prior experience in the IT industry* were 30 percentage points more likely to adopt GPT.
- Firms with a Board member *with some experience in GPT* were 8 percentage points more likely to adopt GPT.

There are two potential explanations for these findings. One is that having directors with relevant skills influences the decision to adopt a GPT. Alternatively, firms could hire directors with these skills because they *intend* to adopt a GPT, so the decision to adopt influences the Board composition rather than the other way around. While the data do not allow us to differentiate between these two possibilities, both explanations suggest that having Board members with relevant knowledge is important for GPT adoption.

### Skilled Board members and profitability of GPT adoption

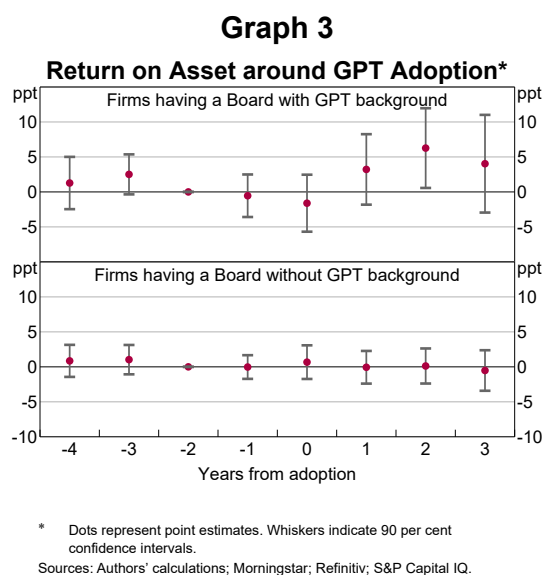
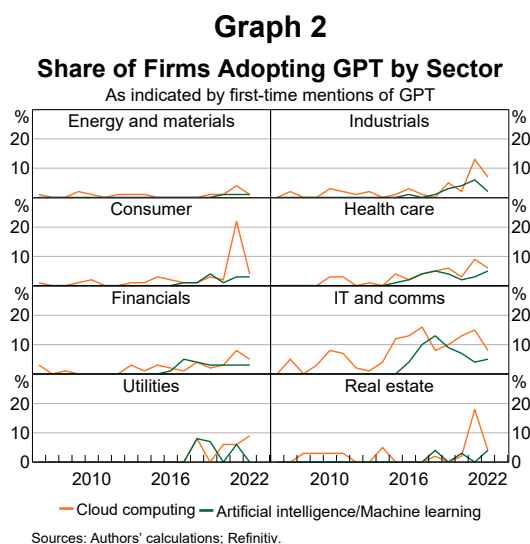
We next considered whether firms with technologically skilled Board members are more likely to experience an increase in profits post-adoption, compared with other firms. To do so, we

split the sample into those that had a Board member with a GPT background and those that did not and traced out the profitability (return on assets) of firms in each group before and after adoption using a panel event study (see Appendix B for details). We found the following:

- Firms with at least one Board member with GPT background saw moderate increases in profitability after GPT adoption (Graph 3 – top panel).
- Firms without any Board members with a GPT background did not see increases in profitability after GPT adoption (Graph 3 – bottom panel).

This suggests that having Board members with relevant technological experience may facilitate profitable GPT adoption. This aligns with previous studies showing that technological skills, including those at management level, are highly valued by firms (Alekseeva *et al* 2021; Calvino *et al* 2022).

That said, we cannot rule out the possibility that there are other factors at play here. For example, it could be that some firms generally have a greater focus on IT transformation, and these firms are both more likely to adopt GPT in a way that increases profitability and to appoint technologically skilled Board members. Although, this would still suggest that the skilled Board member provides some benefit, given the choice to appoint them.



## Adoption and demand for workers skilled in GPT

While the skills of Board members were found to be significant for GPT adoption, workers' skills are also likely to be important. Information about the employees at these firms was not available; however, we were able to look at firms' job advertisements to understand what skills they were trying to bring in using the dataset created by Bahar and Lane (2022). The dataset was constructed using online job ads collected by Lightcast (previously known as Emsi Burning Glass) over the period 2012 to 2022 and indicates whether the firm mentioned a GPT in their job advertisements – a sign that the firm was trying to hire people with GPT-related skills. Based on this analysis, we found the following:

- Firms that adopted GPTs at some point were 16 percentage points more likely to advertise for GPT skills compared with other firms, controlling for other factors (see Appendix C for details).
- The likelihood that a firm advertises for GPT skills tends to rise following adoption, especially for firms with Board members experienced in GPT (Graph 4). These firms also showed the most evidence of increased profitability post-adoption, as discussed above.

Taken together, our findings indicate that GPT adoption is linked to a higher demand for skilled workers, and that these skills can play an important role in profitable adoption. However, more comprehensive information on the workforce in these firms could provide a more complete picture and could be explored in future research.

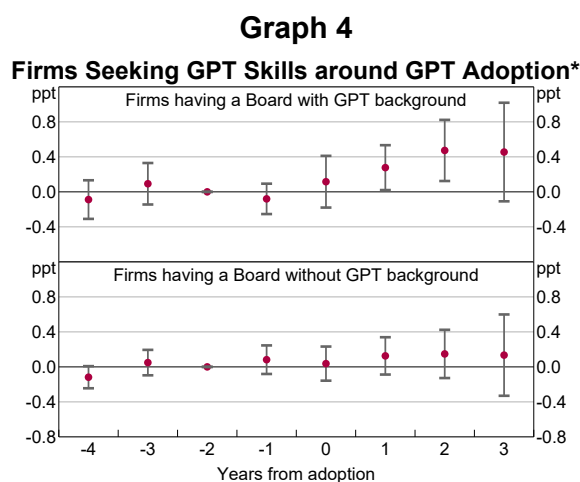
## Conclusion

Against the backdrop of slowing productivity growth and technology diffusion, it is crucial to understand the factors that can drive or hinder adoption of emerging digital GPT, as well as how adoption affects firms. This study used a unique dataset derived from annual reports and earnings calls of Australian firms to examine these issues, focusing on cloud computing and ML/AI.

The study revealed that, while the pandemic caused an unprecedented surge in GPT adoption, adoption rates quickly returned to their pre-pandemic levels. This suggests that some of the initial optimism that the pandemic could lead to an ongoing increase in digital adoption and productivity growth may be overstated. That said, more data on the post-pandemic period will be needed to better assess the longer term implications.

The study also found that workers' and managers' skills appear to play an important role in the profitable adoption of GPT. To the extent that GPT-related skills are becoming more prevalent over time, this may make it easier for firms to adopt GPTs, and hence support productivity growth. More generally though, it also underscores the importance of developing a skilled workforce in Australia to foster GPT adoption and support productivity growth moving forward.

This analysis represents a first step in understanding the drivers of, and barriers to, technology adoption. Given the importance of these issues, further work could explore other aspects of adoption, or other technologies, such as green technologies. Further analysis could also look to combine adoption data with administrative data on the workers at these firms to provide a more detailed picture of how skills and training feed into technology adoption. ✎



\* Dots represent point estimates. Whiskers indicate 90 per cent confidence intervals.

Sources: Authors' calculations; Bahar and Lane (2022) using Lightcast data; Morningstar; Refinitiv; S&P Capital IQ.



## Appendix A

**Table A1: Determinants of Adoption – Board Members’ Characteristics**

Estimates from linear probability regression, non-IT firms in 2022

|                           | Without size control | With size control    |
|---------------------------|----------------------|----------------------|
| Experience in IT industry | 0.249***<br>(0.0564) | 0.313***<br>(0.0741) |
| Experience with GPT       | 0.112**<br>(0.0396)  | 0.0831**<br>(0.0421) |

Note: All explanatory variables are dummies indicating whether the firm has any Board members with these characteristics. \*, \*\*, \*\*\* indicate significance at the 10, 5 and 1 per cent level, respectively. All regressions control for industry\*time effects. Errors clustered at the industry level. Number of observations is roughly 1,250.

Sources: Authors’ calculations; Morningstar; Refinitiv; S&P Capital IQ.

## Appendix B

We employed a panel event study framework to estimate the effect of GPT adoption on firm-level outcomes. The framework allowed us to analyse changes in firm outcomes before and after the adoption of GPTs, which can happen at different points in time across different firms. A similar approach has been undertaken by Babina *et al* (2023) for AI adoption.

The variable  $Adopt_i$  indicates the period when the technology was first referenced by firm  $i$ . The outcome of interest is denoted as  $y_{it}$ , and the panel event study specification is as depicted below:

$$y_{it} = \alpha + \sum_{2 \leq j \leq J} \beta_j (Lagj)_{it} + \sum_{1 \leq k \leq K} \beta_k (Leadk)_{it} + X'_{it} \Gamma + \mu_i + \theta_s + \epsilon_{it}$$

Where:

$$(Lagj)_{it} = 1 \{t = Adopt_i - j\} \text{ for } j \in \{1, \dots, J\}$$

$$(Leadk)_{it} = 1 \{t = Adopt_i + k\} \text{ for } k \in \{1, \dots, K\}$$

The adoption event’s lags and leads are defined as binary variables indicating that a specific firm was a given number of periods away from the adoption event. The coefficients of interest are the betas related to the lags and leads. We focused on up to four years before adoption and three years after. While a longer post-adoption window could be appropriate if these investments have very long payoff windows, we were constrained by the sample period available. Control variables included firm size, firm-fixed effects, and industry\*time-fixed effects.

## Appendix C

**Table C1: Regression of Hiring on Technology Adoption**

Estimates from linear probability regression, non-IT firms

|                  | With no controls | With industry controls | With industry and size controls |
|------------------|------------------|------------------------|---------------------------------|
| Adopt            | 0.372***         | 0.397***               | 0.162**                         |
| (Standard error) | (0.0788)         | (0.0834)               | (0.0699)                        |

Note: \*, \*\*, \*\*\* indicate significance at the 10, 5 and 1 per cent level, respectively. Errors clustered at the industry level. Includes 215 firm observations.

Sources: Authors’ calculations; Bahar and Lane (2022) using Lightcast data; Morningstar; Refinitiv.



## Endnote

[\*] The authors are from Economic Research Department.

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# Green and Sustainable Finance in Australia

Cameron Armour, Declan Hunt and Jeremy Lwin<sup>[\*]</sup>



Photo: Sarayut Thaneerat – Getty Images

## Abstract

Australia has committed to achieving net zero greenhouse gas emissions by 2050. This will require significant amounts of investment and financing as we move away from a carbon-intensive economy. This article discusses financial market developments in Australia that are working to address this issue – specifically, the markets for green bonds, green loans and securitisations, and ethical equity funds. These markets have grown quickly over recent years, though they comprise only a small share of the total market for each type of asset. That said, they will be supported in coming years by various measures underway to develop Australia's sustainable finance framework, including reforms to climate-related disclosures and the development of a sustainable finance taxonomy.

## Introduction

Climate and other sustainability-related factors are increasingly being incorporated into the investment decisions of retail investors, fund managers and the lending decisions of banks. This is being driven by several interrelated factors. As the global transition to a less emissions intensive energy system gains momentum, investors are increasingly recognising the need to adjust their portfolios to address the risks that will arise as some economic activities become less profitable and others (eventually) take their place. At the same time, many jurisdictions are taking steps to assist market participants in

considering sustainability when making financial decisions, including through reforms to sustainability reporting. Notably, demand for sustainable investments has grown despite mixed evidence on the financial performance of such investments. This points to a possible change in investor preferences over and above the traditional decisions regarding risk and returns – that is, investors may place a higher weight on responsible investments or take a broader view of the factors that might affect the long-term resilience of companies (including climate-related risk).

In response, markets for assets with environmental, social and governance (ESG) benefits have developed over the past decade, and grown rapidly in recent years, both internationally and in Australia. Examining these markets is complicated by the fact that frameworks for identifying assets with ESG benefits are still developing, and there is not one single global definition. Labels like ‘green’, ‘sustainable’ or ‘ESG’ can be applied by issuers or investment managers, or assigned by providers of ESG ratings, and can sometimes be applied inconsistently. Uncertainty around the consistency of these labels can hinder the ability of many investors to adequately price climate-related risks in these markets. Ultimately, greater transparency in these financial markets can improve the flow of financial capital between investors and ‘green’ issuers and assist the transition to net zero or broader sustainability objectives.

Green and sustainable financial markets in Australia have developed quickly over the past decade. However, they still comprise only a small share of the total market for each asset class. Further development of these markets, along with Australia’s sustainable finance framework, will be important for the transition to a lower emissions economy. This article provides an early survey, focusing on developments in four of these asset classes that are relevant for the Australian market: green bonds; green loans; green securitisations; and ethical equity funds. The term ‘green’ refers to assets that fund projects with environmental benefits; this is a subset of the broader category of ‘sustainable’ assets. ‘Ethical’ funds (sometimes labelled ‘sustainable’ funds) refer to managed funds that advertise a commitment to incorporate green aims and investment strategies as part of a broader ethical mandate. While other financial products with sustainable benefits exist, such as sustainability-linked bonds, the article focuses on these four asset types to illustrate broader trends. It also briefly compares the Australian experience with that in other economies.

## Green bonds

### Definition and guidelines

Broadly speaking, green bonds are bonds that are issued to fund projects that are beneficial to the environment or climate. Standardised definitions for what constitutes a green project, or green bond, are still in development both in Australia and in many other international jurisdictions. Therefore, classifications can differ between issuers depending on their individual sustainability frameworks. However, in lieu of a centrally administered definition, investors and issuers have tended to assess a green bond’s credibility based on voluntary guidelines developed by international not-for-profit organisations. One of the most commonly used guidelines – the International Capital Market Association’s ‘Green Bond Principles’ – is built broadly on four main criteria:

1. The **use of proceeds** from a green bond issuance should fund projects that have clear environmental benefits.
2. The issuer should disclose their **process for project evaluation and selection**, such that investors can clearly assess the environmental objectives of any eligible project and how the issuer determined its ability to meet sustainability criteria.
3. The issuer should provide a transparent and visible way for investors to track the **allocation of proceeds** from the bond issuance, including how the funds are being used on the project and any temporary investments undertaken until the funds can be used on the green project.
4. The issuer should publish **annual reports** that detail the full set of projects funded by green bonds, along with their progress, the amounts allocated to them and their expected environmental impacts.

The ‘Green Bond Principles’ recommend, but do not require, that green bonds are subject to an external review to confirm their alignment with these criteria. In practice, this has become an effective requirement for most Australian green bonds to gain broad market acceptance. The objective of these classifications is to minimise ‘greenwashing’ –

that is, the misrepresenting of bonds as ‘greener’ than they in fact are.

### The Australian market

The Australian green bond market is small compared with total fixed-income issuance but has grown quickly since its inception in 2014 (Graph 1).<sup>[1]</sup> Around \$13 billion of green bonds were issued in the first half of 2023, which is already the highest annual amount on record.

The main issuers of green bonds in the Australian market include:

- Australian state treasury corporations
- major Australian banks
- ‘kangaroo issuers’ – non-resident organisations that issue bonds denominated in Australian dollars into the Australian market (such as supranational development banks).

Kangaroo green bonds are the largest segment in the domestic green bond market, constituting around one-third of total issuance since 2014. The share of green bonds issued in the domestic market (as opposed to offshore markets) has been high and largely driven by issuance by state treasury corporations and kangaroo issuers. Green bond issuance by financial corporations has primarily been in offshore markets. The Australian Government recently announced plans for an inaugural sovereign green bond issuance in mid-2024 (Treasury 2023a).

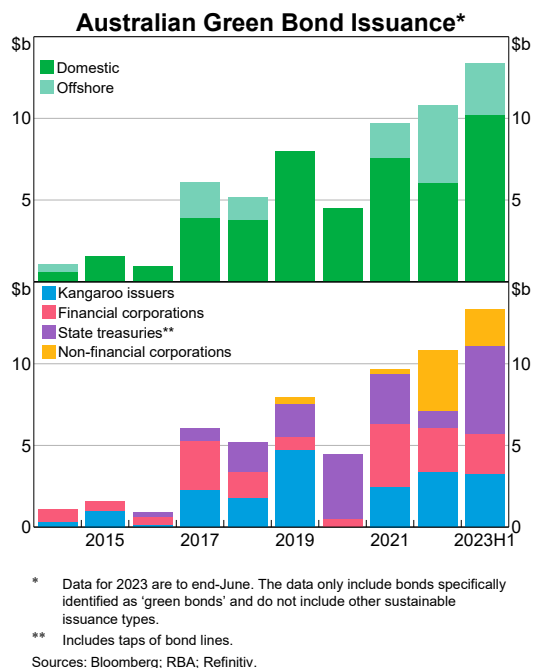
Australian green bonds are mostly used to fund clean transportation projects, energy efficiency projects and green construction and/or buildings (Graph 2).<sup>[2]</sup> Apart from this, funds are split widely between different uses of proceeds. Some of the projects funded by green bonds issued by state treasury corporations include Melbourne Water’s Western Treatment Plant, the Sunshine Coast Solar Farm and the Parramatta Light Rail.

### Pricing and liquidity

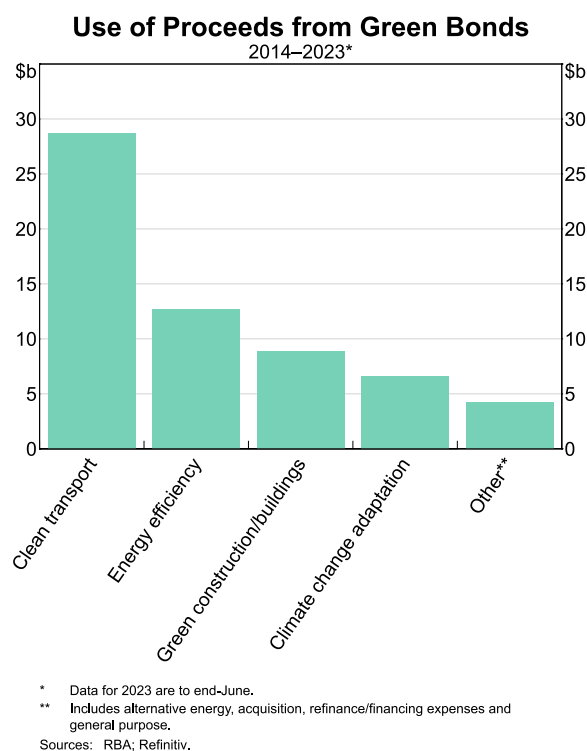
The pricing of green bonds is an important consideration for both issuers and investors. There is debate in international literature on whether the unique characteristics of green bonds could generate different pricing outcomes for these

bonds compared with their conventional counterparts. While evidence of any pricing difference is mixed, there is some evidence from international markets that green bonds can attract investors at lower yields than their non-green counterparts. This implies that investors are willing

**Graph 1**



**Graph 2**



to pay a higher price for green securities – a so-called ‘greenium’ (Ando *et al* 2023).<sup>[3]</sup> Demand for green bonds might be higher than their conventional counterparts due to investor preference for socially responsible investments or lower exposure to climate-related risks. That said, investors’ fiduciary duty and the presence of arbitrage in competitive markets may tend to minimise any pricing difference between green and non-green securities.

As a high-level approximation of how green bonds price relative to conventional bonds, we compared the secondary market pricing of green and non-green bonds issued by AAA-rated kangaroo issuers, using a fairly simple approach.<sup>[4]</sup> The resulting data suggested some evidence of a small greenium for AAA-rated kangaroo bonds (Graph 3).<sup>[5]</sup> That said, there is considerable scope for more rigorous exploration of the impact of a bond’s green label on its pricing, particularly as markets continue to evolve.

There is some international evidence that green bond markets are less liquid than their conventional counterparts, meaning these bonds are likely to trade less frequently on secondary markets (Fender *et al* 2019). To investigate this for Australian green bonds, we looked at turnover ratios between December 2021 and December 2022 using transaction-level data from Austraclear (the settlement system for Australian dollar fixed-income securities in Australia).<sup>[6]</sup> The data show that the

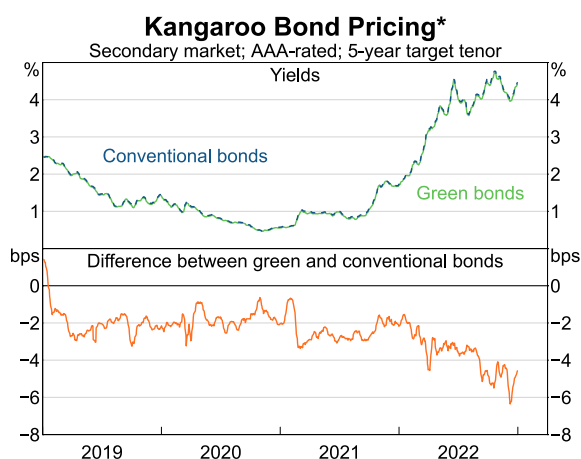
bulk of green bond turnover is due to trading in state treasury corporation and kangaroo bonds. For these two issuer types, turnover levels are roughly similar regardless of whether bonds are classified as green or not (Graph 4). As such, the secondary market for green bonds appears to be no less liquid than their conventional counterparts.

## Green loans

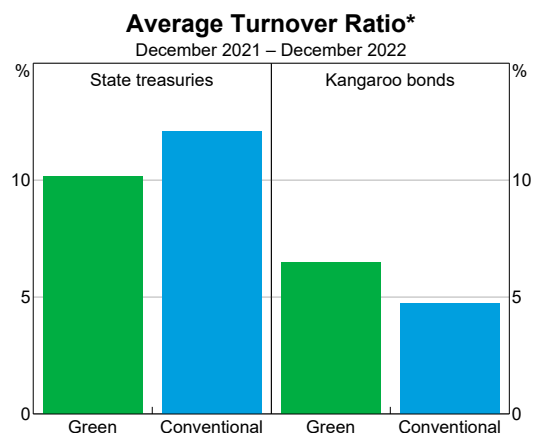
Green loans are offered by some Australian bank and non-bank lenders to finance residential property, automobiles, commercial property and equipment, and ‘personal’ expenditure. To receive a green loan, the asset to be funded (e.g. a house) must meet eligibility criteria. In exchange, borrowers might receive a discount on their interest rate, relative to the lender’s standard product. As with green bonds, there is currently no centrally administered definition for what constitutes a green loan in Australia, so classifications can differ between lenders depending on their own sustainability framework. However, Australian lenders’ green loan definitions have coalesced around similar criteria within three of the broad loan types.

- **Green mortgages** are available for the purchase of green homes or renovations to satisfy green criteria. Lenders’ criteria commonly include requirements for properties to have solar systems or restrictions on a building’s age. In addition, many lenders’ criteria require an

**Graph 3**



**Graph 4**



\* Average of monthly turnover ratios, weighted by the face value of bond transactions.  
Sources: ASX Information Services; RBA; Refinitiv.

external property certification to provide further assurance. There are three commonly used external certifications, all of which evaluate the energy usage and efficiency of buildings. One of these is the Nationwide House Energy Rating Scheme, which is administered by the Australian Government. While this certification currently provides energy ratings only for new dwellings, the government has committed to expand its coverage to include existing homes.

- **Green automotive loans** are available for the purchase of new green vehicles. The National Transportation Commission defines an emissions threshold below which a vehicle is considered green. Electric, hybrid and some internal combustion engine vehicles can achieve emissions below this threshold. Some lenders use this threshold in their eligibility criteria, while others have their own thresholds. Many lenders also apply power source criteria (e.g. electric, plug-in hybrid) when evaluating green automotive loans.
- **Green personal loans** are extended to fund improvements to the energy efficiency of a home. Common eligible improvements include the installation of solar panels and batteries, and the installation of water tanks and greywater systems. These loans can be either secured or unsecured.

## Green securitisations

### Definition and structure

Green loans are the collateral for green asset-backed securities (ABS). Green ABS volumes and their proportion of total issuance have grown following the first green ABS issuance in 2016 (Graph 5). Since then, at least seven securitisers have issued green ABS, with four being repeat issuers. A record \$1.4 billion of green-labelled ABS were issued across seven transactions in 2022, representing 3 per cent of total securitisations.<sup>[7]</sup>

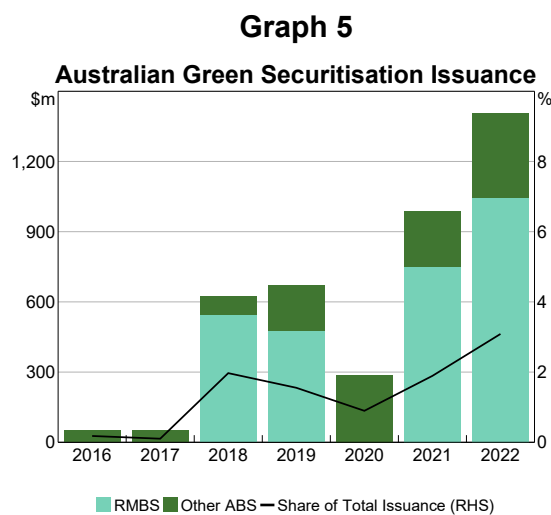
Green securitisations usually have two structures. In the first, the entire pool of collateral is formed of green loans, so the entire structure is labelled green. However, due to low originations of green loans relative to overall loans, issuers might have

insufficient green collateral to issue a transaction backed entirely by green loans. Thus, the second and more common structure includes green-labelled *tranches* within a larger transaction, where only a portion of the pool of collateral is green, and a corresponding proportion of securities are marketed as green. As collateral pools cannot be partitioned, these green tranches are exposed to both green and non-green loans.

### Guidelines

The Australian Securitisation Forum's 'Market Guideline on ESG Disclosure', released in May 2022, sets out industry guidelines to standardise green securitisations. The Guideline is principles based and suggests best practices and disclosures for green-labelled issuance. It makes no recommendations on the criteria used for green classification, leaving these to the issuer's discretion. Instead, the Guideline recommends that issuers disclose the attributes of the green loans being securitised. This method allows for securitisation of green loans originated under the existing criteria of different lenders. For all loans, the issuer should disclose the green lending criteria and the criteria of any external certification used. At the issuer level, reporting on emissions reduction, utility or fuel cost savings, and renewable energy installation (where appropriate) is encouraged.

The availability of securities with differing green criteria could promote investor choice. A potential concern is that discretionary criteria result in





convergence to the lowest cost or least rigorous certification scheme accepted by investors. That said, convergence to weaker criteria might not be in the best interest of issuers since it would make these securities less appealing to investors with strict green criteria, including overseas investors that often have more strict mandates and reporting requirements. In fact, some Australian securitisers have identified ongoing access to international capital markets as a key consideration behind establishing ESG issuance programs.

### Pricing

As with bonds, a 'greenium' might develop if investors' increasing demand for green-labelled securities exceeds the limited supply of green ABS. Additionally, international evidence suggests mortgage default risks are lower for energy-efficient properties (which are eligible for green loans) (Billio *et al* 2022; Kaza, Quercia and Tian 2014). If default risks are lower for green loans, it follows that credit risk would be lower for ABS wholly collateralised by green loans. As a result, these securities could potentially command a greenium.

However, under the tranche approach to green securitisations commonly used in Australia, the green tranches are typically co-ranked with another tranche, most commonly the senior non-green tranche. They are also exposed to the same collateral, which is a mixture of green and non-green loans. As a result, the credit risk of the green and non-green tranches is identical. Therefore, under the tranche approach to green securitisation, a greenium would not reflect differences in risk pricing. Instead, a greenium would likely reflect the need to meet mandates to invest in green securities or investors' preferences for these securities.

To examine whether there is preliminary evidence of a greenium in ABS, we compared the secondary market pricing of green and non-green tranche pairs in our database.<sup>[8]</sup> These pairs included residential mortgage-backed securities and personal loan ABS. The data showed mixed evidence of a greenium in secondary ABS markets, with some positive and some negative yield differentials.<sup>[9]</sup> That said, this is a high-level

comparison based on a small sample, so it should be treated with considerable caution.

## Ethical equity funds

### Definition

In equities markets, there is no equivalent concept to green bonds and loans. Green bonds and loans can be identified via the direct link to the characteristics of the underlying asset. An equity, by contrast, is a share of a company, which may have green and non-green activities. An equity-focused mutual fund includes a range of equities to maximise returns. Some funds also apply other criteria. In Australia, a category called 'ethical funds' has developed to meet retail investment demand for investment options that have green and social objectives.

'Ethical funds' are managed funds that advertise a commitment to ethical, sustainability-related or ESG objectives, and so provide an indication of interest in green equities.<sup>[10]</sup> The ethical fund category is narrower than the sometimes used 'ESG integrators', which are funds that apply various approaches to integrating ESG criteria into the selection of investments, but make no specific advertised commitment to invest in an environmentally conscious manner. The discussion here focuses on the narrower category of ethical funds.

### The Australian market

In Australia, ethical funds first emerged in the 1980s as mutual funds. From the mid-1990s, some pension and super funds began to emerge with ethical labels. Since then, the number of ethical funds launched each year has continued to increase. In the past five years, more than 70 funds were launched – about a 50 per cent increase on the previous five years. In addition, ethical Exchange Traded Funds (ETFs) emerged in the past decade, with about 30 ethical ETFs currently trading on Australian exchanges.

Of the 15,367 funds registered as domiciled in Australia between 2006 and 2023, 222 can be classified as ethical funds.<sup>[11]</sup> In total, these funds currently hold approximately \$45 billion in assets. Most of these assets are held by mutual funds, but superannuation providers also make up a significant



share, along with a growing share held by ETFs. Over the past decade and a half, ethical funds – as a share of total managed funds – have grown significantly. Despite this, ethical funds make up less than 2 per cent of all assets managed by Australian fund managers (Graph 6).

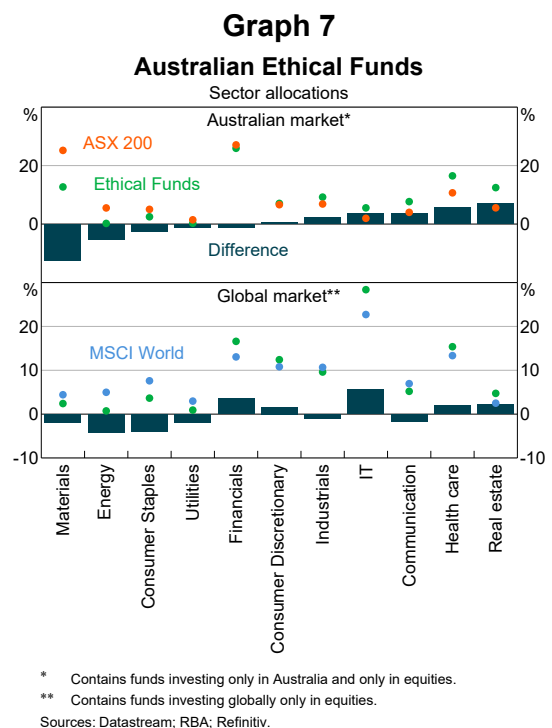
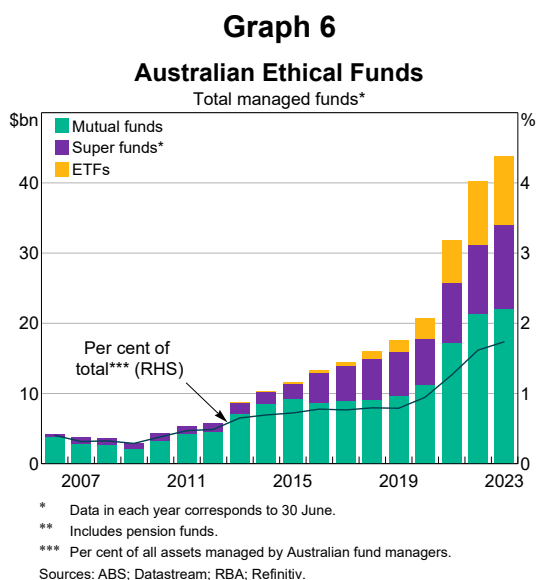
Ethical funds primarily invest in equities, but they also maintain smaller investments in fixed-income, property and alternative assets.<sup>[12]</sup> In comparison with other funds, ethical funds tend to have a higher share of global equities. Furthermore, there are differences in how ethical and other funds tend to allocate their investments across sectors – in comparison with the market index, ethical funds that invest exclusively in Australian equities are overweight in real estate, health care, communications and IT, and underweight in materials and energy (which are dominated by companies operating in the ‘resources’ sectors) (Graph 7, top panel). Similarly, ethical funds that have a global equities focus invest more in IT, financials and healthcare companies and less in materials and energy companies (Graph 7, bottom panel). Notably, ethical funds, investing in both domestic and global markets, have a near zero weighting towards the energy sector.

**Performance**

As ethical funds place a higher weighting on certain sectors, it is likely that their aggregate performance will deviate from other funds, particularly in the

short term, as some sectors tend to be more cyclical than others. However, there is debate in the literature on whether ethical funds underperform or outperform other funds, all else equal. The most common critique of ethical funds is that imposing non-financial objectives restricts investment opportunities, reduces diversification benefits and thereby adversely impacts performance (Trinks and Scholtens 2017). Some studies counter this by pointing to a positive correlation between the ‘ethical characteristics’ of firms and financial performance, but the extent and nature of this relationship is still debated (Halbritter and Dorfleitner 2015). Notably, an early Australian study found no significant difference in risk-adjusted returns of ethical funds between 1992 and 2003 but acknowledged that this result was sensitive to the chosen time period (Bauer, Otten and Rad 2006).

Data from Refinitiv suggests that, over the past 20 years, the performance of Australian ethical funds in our sample that invest solely in Australian equities was comparable to other funds (Graph 8). The average annual return during the period was 9.2 per cent, which compares with 9 per cent for other funds.<sup>[13]</sup> Ethical funds also had similar volatility of returns over this period, with an annualised standard deviation of returns of



13.5 per cent, compared with 13 per cent for other funds. In our sample, we found substantial periods of ethical fund outperformance and underperformance, which reinforces the idea that the chosen time period is important for comparative analysis.

## International comparisons

The growth of green and sustainable financial markets in Australia has largely followed global trends, with both domestic and international markets growing rapidly in recent years.

Over US\$450 billion of **green bonds** were issued globally in 2022, contributing to over US\$2 trillion of cumulative green bond issuance since their inception in 2007. Despite this, green bonds represent only a small portion of total fixed-income issuance internationally. Issuance in recent years has been led by the United States and jurisdictions where green projects can be defined in accordance with a centrally administered green bond taxonomy, like China and the European Union.

The EU Taxonomy also prescribes **green loans**, such as residential mortgages (including small personal loans for renovations) and lending for cars. For green mortgages, the Taxonomy imposes highly prescriptive criteria around a property's energy demand, water use, recycling during construction and land use. In the United States, government-sponsored mortgage purchasers, like Fannie May and Freddie Mac, have criteria to purchase green

mortgages from banks. As in Australia, there is no central framework for what constitutes a green home, and American lenders' criteria depend on external property certifications.

**Green securitisation** in Europe is governed by the requirements of the EU Taxonomy. US green securitisation is similar to that in Australia as issuers report on the definition of assets considered green in each collateral pool.

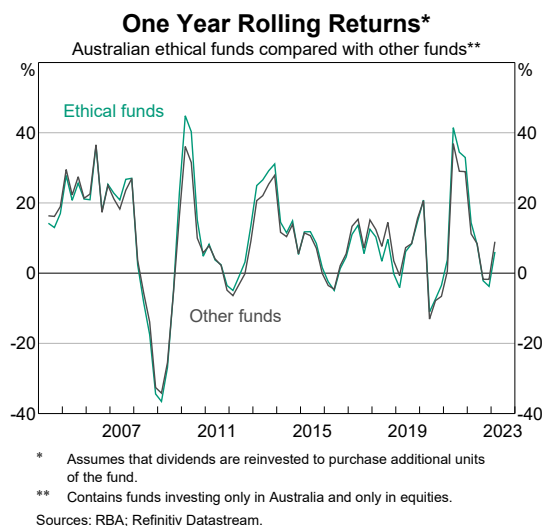
Due to the differences in definitions of green, sustainable and **ethical funds** across jurisdictions, creating a like-for-like estimate of the assets managed by what in Australia are labelled as 'ethical funds' internationally can be challenging. That said, by one estimate there are approximately US\$2.7 trillion worth of assets currently under management by ethical fund managers worldwide (Morningstar 2023). This reflects recent strong growth in the asset class but still represents only a small share of global assets in managed funds. Based on this measure, EU ethical funds have the largest share of total fund assets among peer economies at around 3.6 per cent.<sup>[14]</sup>

## Australian Government initiatives to support sustainable finance

The Australian green bond and loan markets are likely to benefit from the Australian Government's recent announcement of plans to issue a sovereign green bond in mid-2024 and to expand the Nationwide House Energy Rating Scheme. Similarly, Australian ethical equity funds will be supported by government-led initiatives to minimise greenwashing among funds and allow consumers to identify their characteristics more easily (Treasury 2023a).

Measures underway to develop Australia's sustainable finance framework should also support the quality and consistency of sustainability-related information. This includes the Australian Government's proposed implementation of mandatory climate-related financial disclosures for large businesses and financial institutions (Treasury 2023b). Additionally, the Australian Government has announced its intention to co-fund the initial development phase of an Australian Sustainable

**Graph 8**



Finance Taxonomy, in partnership with industry through the Australian Sustainable Finance Institute.<sup>[15]</sup> Ultimately, these initiatives will assist financial markets to manage climate-related risks and opportunities.

## Conclusion

Green and sustainable financial markets can assist in funding Australia's transition to a lower emissions economy. These markets have grown quickly over recent years, mirroring trends seen internationally. However, green bonds, green loans, green

securitisations and ethical equity funds currently constitute only a small share of their total respective markets. While this article has outlined the characteristics of each asset type, including preliminary evidence on their financial performance, there remains considerable scope for further analysis of Australian sustainable finance markets, particularly as they continue to develop in coming years. Looking ahead, their development will be supported by a number of government-led initiatives underway to develop Australia's sustainable finance framework more broadly. ✕

## Endnotes

- [\*] The authors undertook this work while in the Domestic Markets Department and would like to thank Ashley Vicary, Nina McClure and Anna Park for their help with this research.
- [1] We define Australian green bond issuance to include both green bonds issued in domestic or offshore markets by Australian entities, as well as green bonds issued by kangaroo issuers.
- [2] Energy efficiency projects should minimise energy wastage. Eligible projects include, but are not limited to, new and refurbished buildings, energy storage, district heating and smart grids. To be classified as 'green buildings and/or construction', the project must meet recognised standards for environmental performance, of which energy efficiency may be a criterion.
- [3] Bond prices and yields have an inverse relationship, so a higher price implies a lower yield (RBA 2021).
- [4] Investors tend to see issuers within this group as broadly having the same characteristics, with the majority of AAA-rated kangaroo issuers being supranationals. The method of aggregation used accounted for differences in tenors and face values between the series (Arsov, Brooks and Kosev 2013). The sample was restricted to only include previous green bond issuers to avoid the influence of unobserved differences in firm characteristics between those that have issued green bonds and those that have not (such as lower exposure to climate-related risks). On any given day, to further promote comparability, the sample was further restricted to only include conventional bonds whose size was bounded by the largest and smallest green bonds outstanding on that day.
- [5] This finding was supported by regression results, following a similar approach to Pietsch and Salakhova (2022).
- [6] A security's turnover ratio is defined as the value of the security traded over a given period divided by the total value outstanding for that security. While we acknowledge that turnover ratios may not directly capture all aspects of liquidity, they can be used as an indicator of liquidity. Additionally, this analysis only includes trades that are settled through Austraclear, which may not represent all Australian green bond trading.
- [7] This includes both green-labelled tranches and wholly green-labelled transactions.
- [8] Our database does not contain secondary pricing data on any ABS collateralised fully by green loans.
- [9] There have been two primary market transactions in 2023 that suggest the possibility of a small primary market greenium. In each transaction, the spread (yield) for the green-labelled senior tranche priced lower than the spread for the non-green-labelled senior tranche with identical credit characteristics.
- [10] Exact standards vary across funds, but most funds have green aims and objectives related to promoting investment in companies that have better climate change credentials.
- [11] Based on data obtained from Refinitiv, through a process of applying textual analysis on both the advertised name and investment strategy of individual funds.
- [12] Around 60 per cent of funds in our dataset reported sectoral breakdowns for underlying investments.
- [13] Assumes that dividends are reinvested to purchase additional units of the fund after fees are taken out.
- [14] Under the EU Taxonomy, these are referred to as Article 9 funds.
- [15] The Australian Sustainable Finance Institute was created in 2021 to coordinate and drive the implementation of its Australian Sustainable Finance Roadmap. Its members include Australian banks, asset owners, asset managers, insurers and financial services companies.

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# Economic Literacy in Australia: A First Look

Madeleine McCowage<sup>[\*]</sup>



Photo: Witthaya Prasongsin – Getty Images

## Abstract

Those who are economically literate make more informed economic choices, better understand the world around them and can influence public discourse and the actions of government. Given the importance of economic literacy for individuals and society at large, the Bank commissioned a large-scale survey of Australian adults testing their understanding of some core macroeconomic topics. The results enabled compilation of simple literacy scores that represent the Bank's first attempt to gauge economic literacy in Australia. Being male, older, of higher income, having a degree, having studied economics or finance, or being engaged with economic news are associated with higher scores. By contrast, persons aged 18–24 years, unemployed persons and those without a degree had the lowest scores. Questions that tested abstract macroeconomic concepts appeared more difficult than those about more relatable issues that draw on lived experience. These findings speak to the importance of simple and targeted communication by the Bank and other policymakers to support the understanding of economic concepts across the community.

## Introduction

Economic literacy is important. An economically literate populace make more informed economic choices, better understand the world around them and can influence public discourse and the actions of government.<sup>[1]</sup> Economically literate citizens can also contribute to the effectiveness of public policy

by aligning their expectations or behaviour with it (McCowage and Dwyer 2022).

Understanding the level of economic literacy in the community requires consideration of what we mean by 'economic literacy' and how we can measure it. Both are difficult. Economic literacy encapsulates many concepts, it may differ according to the type of activity an individual is

undertaking, and it is 'lifelong' in nature (McCowage and Dwyer 2022). As such, there are many methodological issues to consider.

This article builds on McCowage and Dwyer's (2022) working definition of economic literacy,<sup>[2]</sup> and explores the results of the Bank's first attempt to measure the level of economic literacy in the Australian community. The article proceeds as follows. First, it reviews some approaches to measuring economic literacy in other jurisdictions. Second, it describes the survey of Australian adults commissioned by the Bank to test their understanding of six macroeconomic topics and explains how the results of these questions were translated into a final literacy score for each individual. Finally, it presents analysis of significant differences in economic literacy scores across socio-demographic groups in the survey sample.

## Approaches to measuring economic literacy in different jurisdictions

### US Test of Economic Literacy

Arguably, the most thorough attempts to measure economic literacy have been undertaken by the Council of Economic Education (CEE) in the United States, which regularly conducts the Test of Economic Literacy (TEL). Developed in the late 1980s, the TEL is a comprehensive standardised testing program of high school students, consisting of 45 questions corresponding to the 20 Voluntary National Content Standards in Economics (hereafter, the 'Standards').<sup>[3]</sup> These Standards specify the essential economic content an economically literate student should know and be able to apply at different grade levels in high school.<sup>[4]</sup> The 2012 iteration of the TEL tested almost 11,000 grade 12 students across 480 public and private schools in the United States (National Center for Education Statistics 2013). The results showed higher economic literacy among males compared with females, among private school students compared with public school students, and among white students compared with other racial/ethnic categories.

Being the 'gold standard' for measuring economic literacy, the TEL has been used in many other countries. For example, Happ, Kato and Rüter (2021)

ran versions of the TEL in both Germany and Japan, with some adaptations to adjust for the different country contexts. They also found strong differences in economic knowledge between male and female students in Germany, but no sex-specific differences in Japan.

### The Australian context

A large-scale survey testing economic literacy of Queensland high school students was conducted in 1998, also based on the TEL, as detailed in Leitz and Kotte (2000). The researchers found that students in Queensland performed at least as well as their counterparts in US high schools, and that there were higher economic literacy scores among males compared with females, students in urban areas compared with those in rural areas, and students from independent schools compared with those from Catholic or government schools. The researchers also found higher economic literacy among students who had higher expectations regarding their tertiary studies and positive attitudes towards economics, and among those who did well in English and mathematics.

Aside from the work by Leitz and Kotte (2000), we are not aware of any other large-scale attempts to measure economic literacy in Australia. By contrast, much has been done to assess *financial* literacy<sup>[5]</sup> – it is measured on a regular basis, including in formal large-scale surveys (most notably the Household Income and Labour Dynamics in Australia (HILDA) survey<sup>[6]</sup>), and government departments have dedicated roles in support of it.<sup>[7]</sup>

### What are we trying to measure?

In seeking to gauge economic literacy in Australia, what precisely are we trying to measure? Having identified common ground in a large and unsettled literature, McCowage and Dwyer (2022) proposed a working definition of economic literacy:



### Proposed Working Definition of Economic Literacy

Someone attains economic literacy if, years after they have been taught, they can apply the four essential principles of economics in situations relevant to their lives and different from those encountered in the classroom. They will use these principles as the basis of economic analysis and decision-making, and they will understand the basic aspects of seven core economic topics that explain the economic system in which they participate.

The four essential principles of economics are: the cost-benefit principle; the opportunity cost principle; the marginal principle; and the interdependence principle.

The seven core topics of economics are: scarcity; economic behaviour; the ways in which goods and services are allocated; the structure and operation of markets; the use of factors of production; core macroeconomic variables and features of a business cycle; and the role of government and economic institutions in influencing economic outcomes.

To measure economic literacy, many questions could be asked about the four essential principles and seven core topics. However, for the Bank's first look at economic literacy, we did not have the ambition of comprehensive testing, as is done in the US TEL. Instead, we honed in on the topic of 'core macroeconomic variables and features of the business cycle' – something of direct relevance to a central bank – and explored this through a survey.

### The data

#### A novel dataset

To tackle the issue of measuring economic literacy, the Bank recently acquired a novel dataset from a survey conducted on the Bank's behalf by the Behavioural Insights Team (BIT).<sup>[8]</sup> A representative sample of around 3,000 Australian adults were surveyed in January 2023. The respondents engaged in an experiment and answered a range of questions, generating a novel dataset about adult perceptions and understanding of economics, along with the factors that influence these.<sup>[9]</sup> The

dataset will support multiple lines of enquiry. Of relevance to this article, respondents answered six multiple choice questions specifically designed to test their economic literacy. Responses from individuals who completed the questions implausibly quickly were removed, along with incomplete or invalid surveys, resulting in observations from 2,682 respondents.

#### The survey questions

The chosen questions had a macroeconomic focus because the Bank is most interested in the extent to which the public understands concepts that relate to its remit – particularly its conduct and communication of monetary policy. These questions also enabled us to get a sense of the aspects of economic literacy that equip individuals to participate in discussion about the macroeconomy and related public policy debates. As detailed in McCowage and Dwyer (2022), the topic of 'core macroeconomic variables and features of a business cycle' deemed essential for economic literacy includes five sub-topics: unemployment and inflation; money and inflation; economic fluctuations; interest rates; and fiscal and monetary policy. (Each of these correspond to one of the content Standards assessed in the US TEL.)

The survey included multiple-choice questions on each of these five sub-topics (Table 1). The specific questions used were adapted from the 2012 US TEL. As questions for the TEL are thoroughly vetted, with eminent economists involved in their design, they were a valuable template for questions in the Bank's survey. Question 2 on the 'money illusion' is also very similar to one that appears in the 2016 and 2020 waves of HILDA; it is a question that touches on both financial and economic literacy.<sup>[10]</sup> A question testing knowledge of the Bank's inflation target was also included; this is not from the TEL but is instead a knowledge-based question relevant to awareness of economics.

#### Other survey features

Another feature contributing to the novelty of the survey data is the rich socio-demographic information collected about the respondents. In addition to commonly collected metadata (on sex, income, age, level of education and geographic



**Table 1: Survey Questions Testing Economic Literacy**

Correct answers indicated in bold

| Sub-topic tested                       | Question  | Question shorthand |
|--|---|--------------------|
| Unemployment and inflation             | 1. As far as you know, during a recession in an economy, there would normally be an increase in:<br>a) imports<br><b>b) unemployment</b><br>c) economic growth<br>d) business spending  | UnemplInfl         |
| Money and inflation ('money illusion') | 2. Say wages in the economy increased by 5 per cent and prices increased by 7 per cent. As far as you know, in terms of the goods and services they can buy, a worker would be:<br>a) better off<br><b>b) worse off</b><br>c) neither better nor worse off  | MoneyInfl          |
| Economic fluctuations                  | 3. As far as you know, all else equal, which would usually increase total spending in the economy? An increase in:<br>a) tax rates<br>b) consumer caution<br>c) the savings rate<br><b>d) business investment</b>   | EcoFluctuations    |
| Interest rates                         | 4. As far as you know, all else equal, a decrease in interest rates provides an incentive for people to:<br>a) save more and borrow more<br>b) save less and borrow less<br>c) save more and borrow less<br><b>d) save less and borrow more</b>   | Rates              |
| Fiscal and monetary policy             | 5. As far as you know, which monetary policy would the RBA most likely adopt if the economy moved into recession during a period of low inflation?<br>a) increase income taxes<br><b>b) lower the cash rate</b><br>c) decrease purchases of government bonds<br>d) reduce spending on public infrastructure projects                  | Monetary           |
| RBA's inflation target                 | As far as you know, what is the Reserve Bank of Australia's target range for inflation?<br>(a) 0–1 per cent<br>(b) 1–2 per cent<br><b>(c) 2–3 per cent</b><br>(d) 3–4 per cent<br>(e) 4–5 per cent<br>(f) 5–6 per cent<br>(g) 6–7 per cent<br>(h) 7–8 per cent<br>(i) 8–9 per cent<br>(j) 9–10 per cent<br>(k) don't know / uncertain | InflTarget         |

Source: RBA.

location), respondents were asked if they had a mortgage and details of their labour market status. Importantly, they were also asked whether they had studied economics, finance or a similar subject, and how frequently they read or visited websites about

economics or business news (this was used as a proxy for engagement with economic news). Appendix A shows the composition of the sample across these variables; for the purposes of presentation, some categories within socio-

demographic variables have been collapsed to higher level groupings.

Before turning to the results, it should be acknowledged that time-bound access to the panel of Australian adults made it necessary to choose only a short number of questions, so that knowledge of a wider range of other economic topics or concepts was not tested. The questions were confined to multiple choice – a specific mode of examination with benefits and drawbacks. Furthermore, in multiple-choice surveys, some respondents may guess answers randomly, but it is difficult to quantify how many did so on average. We also lack a time series of responses to form a benchmark. It is possible that survey outcomes reflected circumstances particular to January 2023 – a time of high inflation, monetary policy tightening and relatively active media coverage of macroeconomic developments that might have made respondents more aware of economic issues than if the survey had been conducted at another time. The results, therefore, can only be considered as a simple snapshot of Australian economic literacy in January 2023 rather than across time.

## The results

### Correct responses by question

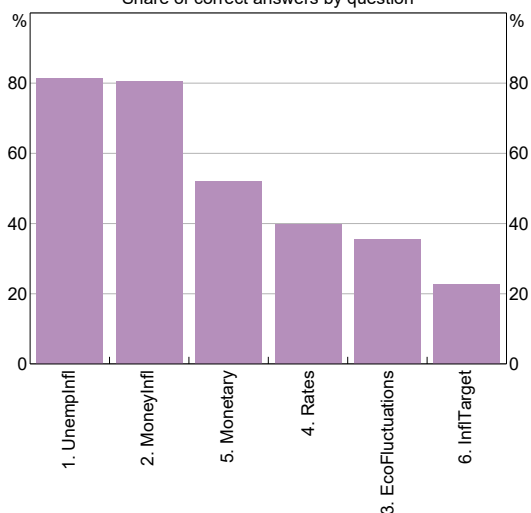
The share of correct responses to the questions testing economic literacy varied markedly (Graph 1). Around 80 per cent of respondents correctly answered Question 1 on the relationship between unemployment and inflation (specifically, during a recession) ('UnemplInfl') and Question 2 on the money illusion ('MoneyInfl'). By contrast, only around half of the respondents correctly answered the question on monetary policy ('Monetary'), 40 per cent correctly answered the question on how interest rates impact saving and borrowing decisions ('Rates'), and little more than one-third correctly answered the question on economy-wide fluctuations ('EcoFluctuations'). Only around 20 per cent of respondents could identify the Bank's inflation target ('InflTarget').

The data do not tell us why the responses are so varied, but there are some possible explanations. The high correct response rate for the first question on the relationship between unemployment and

inflation during a recession might arise because the terms 'recession' and 'unemployment' are often used in conjunction with one another and so respondents could easily make an association, or because the experience of being employed or unemployed is one that individuals can directly relate to. The high correct response rate for the second question on the money illusion may also reflect individuals' lived experiences of changes in purchasing power: households can very much 'feel' how their purchasing power is affected by relative changes in income and inflation. Interestingly, a similar money illusion question in the 2016 and 2020 HILDA surveys showed similar results, so it is not just that this issue is salient at times of high inflation like January 2023.<sup>[11]</sup>

The low correct response rates for the remaining questions may reflect that they touch on more abstract macroeconomic concepts and issues that are not as easily grasped because they have a less direct effect on individuals, or because they draw on pre-existing knowledge (particularly the question about the Bank's inflation target). The lower share of correct responses for the inflation target question may also reflect the greater number of answer options; it would have been more difficult for a 'random guesser' to answer this question correctly.

**Graph 1**  
**Economic Literacy Survey – Results**  
Share of correct answers by question



Source: RBA.

### Correct responses by question and socio-demographic group

Graph 2 shows how each socio-demographic group performed across the survey questions, with questions presented in order of increasing difficulty from left to right, as in Graph 1. Within each socio-demographic group, Questions 1 and 2 consistently accounted for the highest share of correct answers. Graph 2 also reveals some initial clues about relative economic literacy across these groups: compared with other groups, 18 to 24-year-olds, those without a degree and unemployed persons had lower shares of correct responses for all questions (seen in the lighter bars for these groups across questions).

### Economic literacy scores

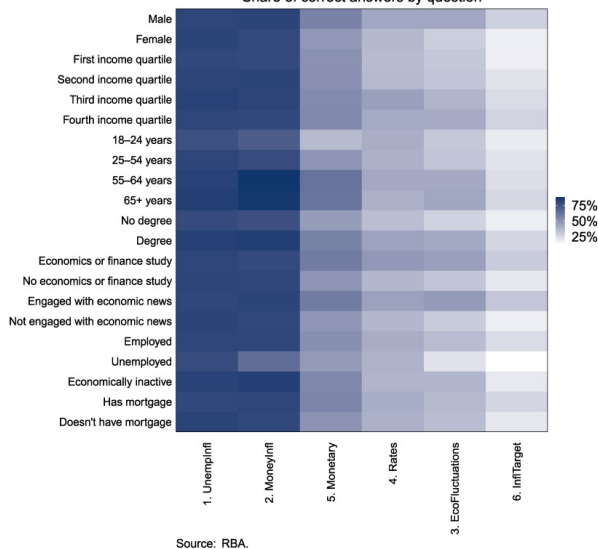
As a summary indicator of economic literacy, we devised a simple score for each respondent based on how many of the five questions on macroeconomic relationships they answered correctly, so that their score ranged from 0 to 5. (The question on the Bank’s inflation target was not included in this score as it tests specific factual knowledge as opposed to understanding and application of a macroeconomic concept; however, it is explored in more detail in a forthcoming *Bulletin* article.) Average literacy scores for groups of respondents were then calculated.

Average literacy scores ranged from 2.5 to 3.2 across demographic groups, with an average of 2.9 across the full sample (Graph 3; Table 2). Males, older Australians, those with higher incomes, those with degrees, those who had studied economics or finance, those who were either employed or in the ‘economically inactive’ category, and those who reported to being engaged with economic news (by reading or visiting websites for economics or business news every day or once a week) had higher average economic literacy scores. Those aged 18–24 years, unemployed persons and those without a degree had the lowest economic literacy scores. Differences in mean scores across groups were statistically significant for almost all socio-demographic categories (Table 2).

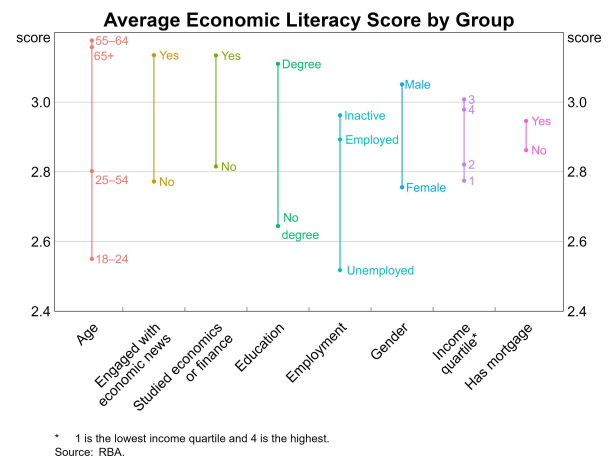
Not shown in the graph or table is that high scores among ‘economically inactive’ respondents were driven by those in the ‘retired’ category; perhaps being retired and likely to be older means these respondents have had greater lived experience of major economic events. Older Australians are also more likely to have studied economics, given its greater availability as a subject in earlier decades than today.

Perhaps one surprising result is that overall scores did not differ – in an economically or statistically significant way – according to whether respondents had a mortgage.<sup>[12]</sup> However, on a question-by-question basis, those with a mortgage performed better on questions related to the Bank and monetary policy, with 56 per cent of those with a mortgage responding correctly to the question on

**Graph 2**  
**Economic Literacy Survey – Results by Question and Group**  
 Share of correct answers by question



**Graph 3**



**Table 2: Economic Literacy Scores by Socio-demographic Group<sup>(a)</sup>**

|  | Average economic literacy score |
|--|---------------------------------|
| <b>Gender***</b>   |                                 |
| Male   | 3.1                             |
| Female   | 2.8                             |
| <b>Income quartiles***</b>   |                                 |
| Lowest   | 2.8                             |
| Second   | 2.8                             |
| Third  | 3.0                             |
| Highest  | 3.0                             |
| <b>Age range***</b>  |                                 |
| 18–24  | 2.6                             |
| 25–54  | 2.8                             |
| 55–64  | 3.2                             |
| 65 and over  | 3.2                             |
| <b>Education***</b>  |                                 |
| No degree  | 2.6                             |
| Degree   | 3.1                             |
| <b>Economics or finance study***</b>                               |                                 |
| Yes  | 3.1                             |
| No   | 2.8                             |
| <b>Engaged with economic news***</b>                               |                                 |
| Yes  | 3.1                             |
| No   | 2.8                             |
| <b>Employment status***</b>  |                                 |
| Employed   | 2.9                             |
| Unemployed   | 2.5                             |
| Economically inactive (includes retirees, students and homemakers) | 3.0                             |
| <b>Location*</b>   |                                 |
| Rural  | 2.8                             |
| Suburban   | 2.9                             |
| Urban  | 2.9                             |
| <b>Mortgage</b>  |                                 |
| Yes  | 2.9                             |
| No   | 2.9                             |
| Total  | 2.9                             |

(a) Asterisks indicate results of two-sided t-tests for categories comprising two groups or Kruskal-Wallis H Tests for categories with more than two groups; \* if  $p < 0.05$ , \*\* if  $p < 0.01$ , \*\*\* if  $p < 0.001$ .

Source: RBA.

the likely actions of the Bank in a period of recession, compared with 50 per cent of those without a mortgage. And 26 per cent of those with

a mortgage knew the Bank's inflation target, compared with 20 per cent of those without one. Both differences were statistically significant.

### Econometric model of economic literacy scores by group and results

Regression analysis can be used to investigate which of the socio-demographic factors (controlling for other characteristics of survey respondents) have a statistically significant relationship with measured economic literacy scores. Economic literacy scores were modelled as a function of the socio-demographic variables captured in the survey.<sup>[13]</sup> The details of the model and full results can be found in Appendix B.

The results confirm that having a degree, having studied economics or finance, being male, being in a higher income bracket, being engaged with economic news, and being older are all associated with higher economic literacy scores – in line with the descriptive statistics presented above. These relationships are all statistically significant. Graph 4 shows the results from one of the model estimation approaches (Ordinary Least Squares, or 'OLS'). It shows the marginal effect of different characteristics on the overall economic literacy score, all else equal. Some interesting results are as follows:

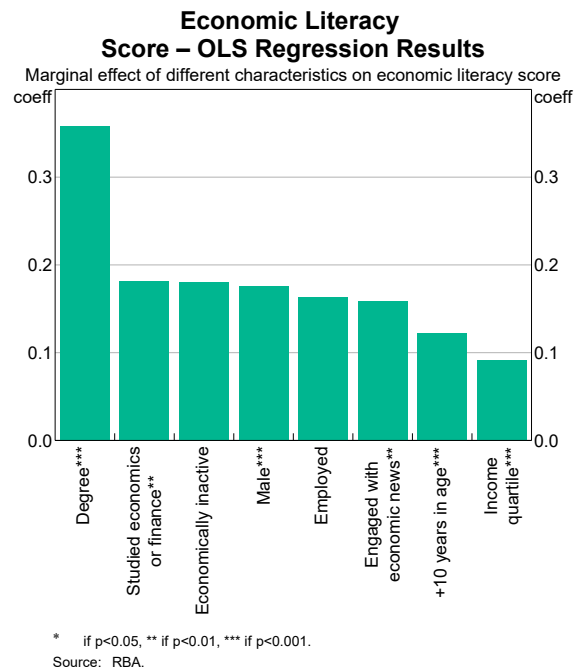
- Having a degree is associated with an economic literacy score that is 0.36 units higher than for someone without a degree, all else equal (or 12.5 percentage points higher than the mean score).
- Being male, or having studied economics or finance, is associated with a score that is just under 0.2 units higher, all else equal (or around 6 percentage points higher than the mean score).
- Older respondents tend to have higher economic literacy scores. For every 10 extra years in age, economic literacy scores are 0.1 units higher on average. So, a 60-year-old might be expected to have a score that is over 0.4 units higher than a 20-year-old (on average).
- Similarly, for each increase in income quartile, economic literacy scores increase by around 0.1 units. So those in the highest income

quartile would have scores that are 0.4 units higher than those in the lowest, on average.

- Employment status, after controlling for respondents' other socio-demographic characteristics, does not appear to have a statistically significant relationship with economic literacy scores. This might suggest that it is not employment status (e.g. being unemployed) that can statistically explain economic literacy scores, but other characteristics associated with employment status as well as economic literacy (such as age or level of education).

Future research may consider question-by-question regressions utilising these data. With two of the questions in the survey appearing relatively easy for respondents, much of the variation in economic literacy scores is driven by responses to the remainder. This warrants a deeper investigation into what factors might explain the propensity of different socio-demographic groups to get these correct. There may be interesting variation to explore, as in the earlier example of mortgage-holders outperforming on specific questions.

**Graph 4**



## Conclusion

This article has presented novel data that provide a first read on Australian adults' measured proficiency to grapple with some core areas of macroeconomics. While most survey respondents found questions testing understanding of issues that were relatable or touched on lived experience relatively easy, questions about economic fluctuations, interest rates and monetary and fiscal policy were more challenging – possibly reflecting their more abstract nature. Being male, older, of a higher income, having a degree, having studied economics or finance, or being engaged with economic news were all associated with higher measured economic literacy scores. Persons aged 18–24 years, unemployed persons and those without a degree had the lowest scores. These data are a rich source for future study of other areas of economic literacy, as will be explored in

forthcoming work by the Bank. Initial results also point to the benefits of widening the scope of questions asked and collecting data as a time series, so that societal norms in economic literacy can be better identified along with changes in literacy over time.

The findings in this article have implications for how the Bank and other public policymakers might tailor their communication about macroeconomic concepts, policy objectives and decisions across different segments of the community. Specifically, they speak to the importance of communicating economic information in a simple and targeted way to support understanding of and engagement with economics and the economic policies that affect people's lives. ✎



## Appendix A: Survey sample composition

Table A1: Sample Composition – Survey Respondents<sup>(a)</sup>

|   | Number | Percentage |
|---|--------|------------|
| <b>Gender</b>                             |        |            |
| Male                                      | 1,240  | 46.2       |
| Female                                    | 1,428  | 53.2       |
| Another                                   | 14     | 0.5        |
| <b>Income quartiles<sup>(b)</sup></b>     |        |            |
| Lowest                                    | 723    | 27.0       |
| Second                                    | 671    | 25.0       |
| Third                                     | 778    | 29.0       |
| Highest                                   | 510    | 19.0       |
| <b>Age range<sup>(b)</sup></b>            |        |            |
| 18–24 years                               | 309    | 11.5       |
| 25–54 years                               | 1,491  | 55.6       |
| 55–64 years                               | 368    | 13.7       |
| 65 years and over                         | 514    | 19.2       |
| <b>Location</b>                           |        |            |
| Australian Capital Territory              | 36     | 1.3        |
| New South Wales                           | 827    | 30.8       |
| Northern Territory                        | 9      | 0.3        |
| Queensland                                | 590    | 22.0       |
| South Australia                           | 221    | 8.2        |
| Tasmania                                  | 54     | 2.0        |
| Victoria                                  | 723    | 27.0       |
| Western Australia                         | 222    | 8.3        |
| <b>Highest level of education</b>         |        |            |
| No degree                                 | 1,252  | 46.7       |
| <i>o/w TAFE certificate</i>               | 545    | 20.3       |
| <i>o/w TAFE diploma</i>                   | 338    | 12.6       |
| <i>o/w High school graduate (Year 12)</i> | 195    | 7.3        |
| <i>o/w Year 10 graduate</i>               | 161    | 6.0        |
| <i>o/w Less than year 10</i>              | 13     | 0.5        |
| Degree                                    | 1,430  | 53.3       |
| <i>o/w Bachelor's degree</i>              | 440    | 16.4       |
| <i>o/w Master's degree</i>                | 734    | 27.4       |
| <i>o/w Doctorate degree</i>               | 234    | 8.7        |
| <i>o/w other</i>                          | 22     | 0.8        |
| <b>Employment status<sup>(b)</sup></b>    |        |            |
| Employed                                  | 1,802  | 67.2       |
| Unemployed                                | 139    | 5.2        |

|  | Number | Percentage |
|--|--------|------------|
| Economically inactive  | 741    | 27.6       |
| <i>o/w retired</i>   | 441    | 16.4       |
| <i>o/w student</i>   | 88     | 3.28       |
| <i>o/w full-time homemaker</i>   | 144    | 5.4        |
| <i>o/w other</i>   | 68     | 2.5        |
| Urban location status  |        |            |
| Urban  | 622    | 23.2       |
| Suburban   | 1,669  | 62.2       |
| Rural  | 391    | 14.6       |
| Mortgage status  |        |            |
| Mortgage holder  | 978    | 36.5       |
| No mortgage  | 1,704  | 63.5       |
| Studied economics, finance or a similar subject  |        |            |
| Yes  | 650    | 24.2       |
| No   | 2,032  | 75.8       |
| Engagement with economic news ('How often do you read or visit a website for economics or business news?') |        |            |
| Every day  | 264    | 9.8        |
| Once per week  | 628    | 23.4       |
| Once per month   | 520    | 19.4       |
| Never or hardly ever   | 1,270  | 47.4       |
| Total  | 2,682  |            |

(a) BIT collected information on age, gender, education, location, income and employment status using the pre-screening questions in their platform; there was little scope to change the question on gender to directly match the current ABS Standard (which specifies sex at birth or an alternative title).

(b) More granular categories are available for these variables than displayed.

Source: RBA.

## Appendix B: Regression model specification and output

The regression models of economic literacy scores were specified as follows:

$$EconomicLiteracyScore_i = \alpha + \beta_1 Female_i + \beta_2 Age_i + \beta_3 IncomeQuartile_i + \beta_4 Degree_i + \beta_5 StudiedEcon_i + \beta_6 EmploymentCategory_i + \beta_7 EconEngaged_i + \varepsilon_i$$

where, for each respondent  $i$ :

- $EconomicLiteracyScore_i$  is the economic literacy score between 0 and 5
- $Female_i$  is 1 if the respondent is female (and 0 if they are male)
- $Age_i$  is the respondent's age in years
- $IncomeQuartile_i$  is a categorical variable between 1 and 4 for the respondent's income quartile
- $StudiedEcon_i$  is 1 if the respondent has studied economics or finance
- $EmploymentCategory_i$  is 1 if the individual is unemployed, 2 if economically inactive, 3 if employed
- $EconEngaged_i$  is 1 if the respondent reports that they read or visit websites for economics or business news every day or once a week (and 0 if they responded once a month or never/hardly ever).

As average scores did not vary significantly according to whether respondents held a mortgage or according to geographic location, these variables were not included in the model.

**Table B1: Economic Literacy Score – Regression Results**

Model (1) results

| Outcome<br>Estimation method   | Economic literacy score<br>OLS | Economic literacy score<br>Ordered probit <sup>(a)</sup> | Economic literacy score<br>Ordered logit <sup>(b)</sup> |
|--|--------------------------------|--|---|
| Female   | –0.176***<br>(–3.51)           | –0.154***<br>(–3.69)                                     | –0.260***<br>(–3.60)                                    |
| Age (years)  | 0.0122***<br>(7.05)            | 0.00992***<br>(6.77)                                     | 0.0189***<br>(7.64)                                     |
| Income quartile  | 0.0917***<br>(3.40)            | 0.0777***<br>(3.45)                                      | 0.157***<br>(4.09)                                      |
| Degree   | 0.358***<br>(7.32)             | 0.300***<br>(7.39)                                       | 0.535***<br>(7.65)                                      |
| Studied economics or finance   | 0.182**<br>(2.83)              | 0.163**<br>(2.98)  | 0.368***<br>(3.82)                                      |
| Economically inactive  | 0.181<br>(1.63)                | 0.152<br>(1.69)  | 0.188<br>(1.22)   |
| Employed   | 0.163<br>(1.56)                | 0.132<br>(1.57)  | 0.184<br>(1.28)   |
| Engaged with economic news   | 0.159**<br>(2.82)              | 0.144**<br>(3.04)  | 0.282***<br>(3.41)                                      |
| Constant   | 1.757***<br>(12.75)            |  |   |
|  | (1.63)                         |  |   |
| Observations   | 2,668                          | 2,668  | 2,668   |
| R <sup>2</sup><br>(Pseudo R <sup>2</sup> for ordered probit and logit) | 0.0787                         | 0.0256   | 0.0285  |

\* if  $p < 0.05$ , \*\* if  $p < 0.01$ , \*\*\* if  $p < 0.001$ .

(a) Results are ordered log-odds (base 10) coefficients. For a one unit change in the predictor variable, the odds that respondents in that group would have a higher economic literacy score compared with another group are  $10^{\text{coefficient}}$ . Average marginal effects were also assessed but are not shown.

(b) Results are ordered log-odds (base  $e$ ) coefficients. For a one unit change in the predictor variable, the odds that respondents in that group would have a higher economic literacy score compared with another group are  $e^{\text{coefficient}}$ . Average marginal effects were also assessed but are not shown.

Source: RBA.

## Endnotes

- [\*] The author is the current manager of the Bank's education program. The author would like to thank Jacqui Dwyer for establishing and supporting research on economic literacy in Australia at the Reserve Bank, and for her invaluable support in drafting this article. The author would also like to thank Peter Rickards for initiating the data collection exercise with BIT and collaborating on the analysis of results.
- [1] A key channel through which the Reserve Bank supports economic literacy in Australia is through its public education program, the strategic objective of which is to increase the size and diversity of the economics student population in Australia. If realised, over the longer term, this should raise the collective ability of the economics profession, the quality of public policy and ultimately the level of economic literacy in the community (Dwyer 2018).
- [2] Importantly, the authors also explored how economic literacy differs to the well understood concept of 'financial literacy'.
- [3] See McCowage and Dwyer (2022) for more details on the TEL.
- [4] See Walstad, Rebeck and Butters (2013a) for a discussion of the latest revision of the TEL, and Walstad, Rebeck and Butters (2013b) for the latest Examiner's Manual, including all questions in the 4th edition of the TEL.
- [5] For recent research, see Preston (2020); Preston and Wright (2019).
- [6] HILDA is an annual panel study of 17,000 Australians relating to income, experiences in the labour market and family dynamics, which periodically includes questions testing financial literacy, including in the 2016 and 2020 surveys. In 2021, the Australian Government also began surveying Australians about their sense of financial capability and testing their understanding of financial literacy topics (Australian Government 2021). The ANZ has also run large-scale surveys of financial literacy since the early 2000s (ANZ 2021).
- [7] The Treasury is responsible for the National Strategy on Financial Capability, and the Australian Securities and Investments Commission is responsible for provision of the services and tools for its implementation.
- [8] BIT is based in the United Kingdom and collects data for 'social purpose' research, working with universities, private consultancies, international agencies, government agencies and central banks.
- [9] This included an experiment to test how their understanding of economic concepts was influenced by the information source and context provided, which will be the subject of a future publication.
- [10] 'Money illusion' refers to the tendency of individuals to think about their incomes and wealth in nominal terms, rather than inflation-adjusted (or real) terms.
- [11] The HILDA survey asks: 'Suppose that by the year 2020 your income has doubled, but the prices of all of purchases have also doubled. In 2020, will you be able to buy more/the same/less than today?' (Respondents could also answer 'refused/not stated', or 'don't know!') See Melbourne Institute of Applied Economic and Social Research (2022).
- [12] The 2016 and 2020 HILDA data showed significant differences in the share of mortgage-holders who answered the financial literacy questions correctly compared with other Australians. On average, the share of mortgage holders who got each of the five questions correct was around 10 percentage points higher compared with non-mortgage-holders.
- [13] Three methods of estimation were utilised: ordinary least squares (OLS), as well as ordered probit and ordered logit, which are suitable for data like these where the dependent variable (the economic literacy score) is ordinal with scores ranked between 0 and 5. See Greene and Hensher (2008) for more information.

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HILDA Disclaimer

# Recent Developments in Small Business Finance and Economic Conditions

Patrick Chan, Andre Chinnery and Peter Wallis<sup>[\*]</sup>



Photo: AsiaVision – Getty Images

## Abstract

The economic environment has become more challenging over the past year, including for small businesses. High inflation, slower growth of demand and difficulties in finding suitable labour have contributed to declines in small business conditions and confidence. Demand for business finance has slowed, consistent with the rise in interest rates and slower growth in economic activity. Small businesses report that accessing funding through banks remains a challenge. The article considers these recent developments, drawing on the discussions of the Small Business Finance Advisory Panel and information from the Bank's liaison program.

## Introduction

In July 2023, the Reserve Bank convened its 31st Small Business Finance Advisory Panel to better understand the challenges faced by small businesses.<sup>[1]</sup> This year's panel focused on economic conditions for small businesses, their appetite to take on external funding and the challenges they encounter in accessing finance. The annual panel discussion complements other sources of information the Bank receives on small business conditions, including from its liaison program and private sector surveys.<sup>[2]</sup> This article draws on these sources and other data to provide an update on economic conditions for small

businesses and recent developments in small business finance.

## The contribution of small business to the Australian economy

There are around 2.6 million businesses in Australia. The vast majority of these – 97 per cent – have fewer than 20 employees, which the Australian Bureau of Statistics (ABS) uses as its definition for a small business.<sup>[3]</sup> Small businesses make up a large share of businesses across all industries (Graph 1). The largest shares of small businesses are in the construction, and the professional, scientific and



**Table 1: Distribution of Small Businesses in Australia, by Industry**

Share of the total number of small businesses; 2022

|   | Per cent | Per cent                                   |     |
|---|----------|--|-----|
| Construction                                    | 17.6     | Accommodation and food services            | 4.1 |
| Professional, scientific and technical services | 13.0     | Manufacturing                              | 3.4 |
| Rental, hiring and real estate services         | 11.4     | Wholesale trade                            | 3.2 |
| Transport, postal and warehousing               | 8.4      | Education and training                     | 1.5 |
| Agriculture, forestry and fishing               | 6.9      | Arts and recreation services               | 1.4 |
| Health care and social assistance               | 6.7      | Information, media and telecommunications  | 1.0 |
| Retail trade                                    | 6.0      | Electricity, gas, water and waste services | 0.3 |
| Other services                                  | 5.1      | Mining                                     | 0.3 |
| Administrative and support services             | 4.7      | Public administration and safety           | 0.3 |
| Financial and insurance services                | 5.1      |  |     |

Sources: ABS; RBA.

technical services industries, which together make up more than 30 per cent of the total number of small businesses in Australia (Table 1). The rental, hiring and real estate services industry has the third largest number, representing 11 per cent of Australian small businesses.

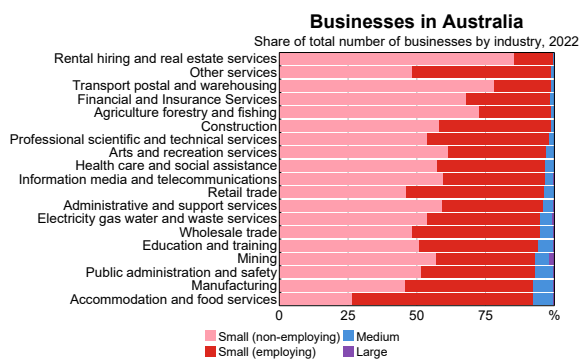
Small businesses make up a substantial share of output, employment and income in the Australian economy. They account for around one-third of gross value added (which measures the production of goods and services, less intermediate inputs) (Graph 2). The estimated contribution of small businesses to private-sector employment is larger at around 42 per cent. Bakhtiari (2019) suggests that small, young firms contribute strongly to job creation, typically in their first two years of operation, and that four out of every five jobs added

to the Australian economy have historically been created by these firms. Small businesses' share of total income has increased slightly over the past decade.

Outside of their directly measurable contribution to the economy, small businesses also play an important role in communities, particularly in regional areas. Small businesses provide goods and services to areas where larger firms may choose not to operate (since smaller markets might not generate enough revenue to cover the fixed costs of doing business there). On average, just over 30 per cent of small businesses are located outside of greater capital city areas, compared with around one-quarter of large businesses (Graph 3).

Small businesses, particularly sole traders, generally have lower survival rates compared with larger firms. Businesses may not survive due to several reasons, such as the retirement of the owner or business failure leading to insolvency. Data from the Australian Securities and Investments Commission indicate that, from 2013–2022, between 65 per cent and 70 per cent of firms that became insolvent in a given financial year had less than five full-time employees. For very small firms, recent experience has shown their survival rates are noticeably lower than that of larger firms (Graph 4). Since 2019/20, more than half of new sole traders did not survive beyond three years. Survival rates were higher for

**Graph 1**



Sources: ABS; RBA.

new small businesses with up to 20 employees, though still below the survival rates of medium and large businesses. Over this period, survival rates for established businesses were slightly better than for new businesses: around 60 per cent of sole traders that were already established in June 2019 (and around 75 per cent of established small businesses with employees) were still operating four years later.

### Economic conditions for small businesses

Panellists from the Small Business Finance Advisory Panel highlighted a range of challenges for small businesses in the current economic environment, consistent with information from the Bank's liaison

program and broader macroeconomic trends. Demand has eased as high inflation and the increase in interest rates have placed pressure on household budgets. However, the availability of labour has remained tight and, in some cases, has constrained firms' operations while also placing upward pressure on wages. In addition, the broad-based increase in costs and prices has contributed to cash flow problems for some firms and an increase in business insolvencies (from low levels during the COVID-19 pandemic).

Survey measures of current operating conditions for small businesses have declined since mid-2022. Reported conditions for smaller businesses are weaker compared with large firms (Graph 5). Business conditions are weakest for the smallest of firms as well as for retail businesses, with smaller firms in the retail sector finding conditions notably more difficult compared with larger retailers. Over recent quarters, small business confidence, which measures firms' views on their operating outlook for the next three months, has been slightly below both its long-run average and that of large firms. Business confidence is lower among retail firms relative to other industries; confidence levels are similar for small and larger retail firms.

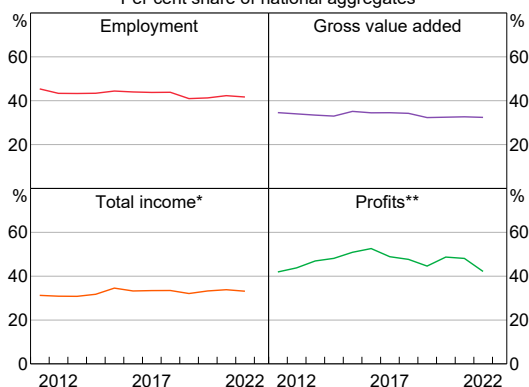
### Demand

High inflation, higher interest rates and earlier declines in household wealth have weighed on consumption growth over recent quarters. Growth in aggregate retail sales values has also slowed

**Graph 2**

**Small Business Share of the Economy**

Per cent share of national aggregates



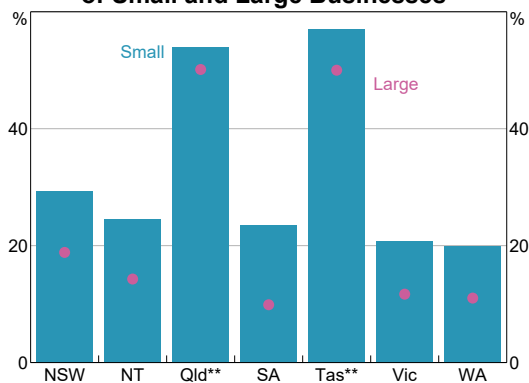
\* Sales and service income, interest income, funding from government for operational costs and other income.

\*\* Operating profits before tax.

Sources: ABS; RBA.

**Graph 3**

**Regional Share of the Number of Small and Large Businesses\***



\* Share outside greater capital cities.

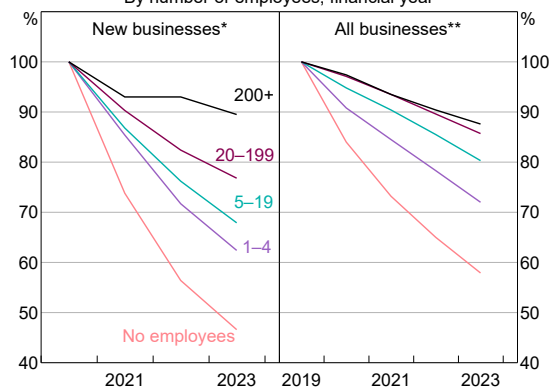
\*\* In Queensland and Tasmania, the relatively higher share of businesses outside greater capital cities reflects firms operating in the Gold Coast, the Sunshine Coast and Launceston; if these three areas are excluded, the shares are similar to the other states.

Source: ABS; RBA.

**Graph 4**

**Business Survival Rates**

By number of employees, financial year



\* Firms commencing operation in 2019/20.

\*\* Firms operating at end June 2019.

Sources: ABS; RBA.

considerably over the past year and sales for small retailers have declined a little in year-ended terms (Graph 6). This slowing is consistent with recent messages from retailers in the Bank’s liaison program, with firms reporting that household consumption has been subdued (RBA 2023b). Demand for new residential dwellings has also declined. Conditions have weakened for firms serving businesses, but to a lesser extent than for those serving households.

Consistent with information from liaison, the small business finance panellists described household and business customers as being more cautious with spending recently. Several panellists shared observations of their own customers seeking additional hours of work or a second job to maintain their level of consumption as living costs increased.

**Labour market conditions**

Panellists generally reported that acquiring labour had become a little easier in recent months, consistent with information from business surveys and the Bank’s liaison program. Panellists thought that the increase in labour supply had been supported by the reopening of Australia’s borders to inbound migration.

In contrast to the prior year, the appetite among panellists to increase the number of staff they employ in the year ahead was very low. They also noted that a number of businesses in the technology industry had already made, or were

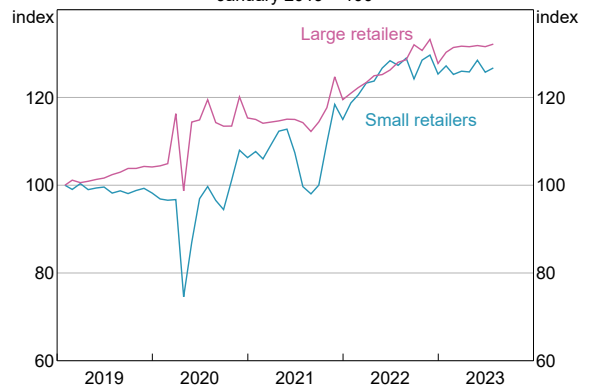
intending to make, redundancies following strong recruitment during the pandemic. The share of firms in the Bank’s liaison program looking to increase staff headcount over the next 12 months has also declined over the past year, although most firms are still looking to either increase or maintain headcount over the year ahead (Graph 7).

Several panellists reported that their business had been affected by the recent increase in the award rate by the Fair Work Commission, including because some staff who are not on awards received a commensurate increase in wages. Some contacts report that wage pressures in the technology

**Graph 6**

**Retail Sales Values by Size\***

January 2019 = 100



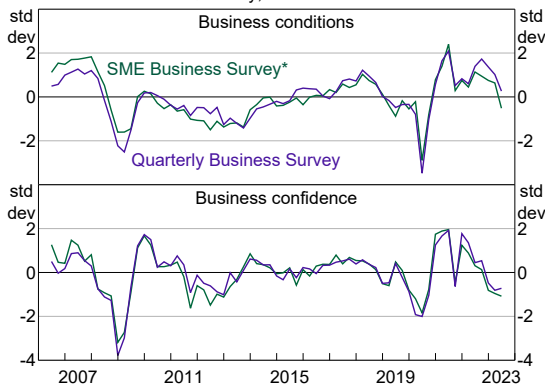
\* The survey uses annualised turnover, based on the ATO’s Business Activity Statement item Total Sales, as the measure of business size. Around 700 ‘large’ businesses are included in the survey every month, while a sample of around 2,700 ‘smaller’ businesses is selected. The ‘large’ business’ contribution represents approximately 69 per cent of the total Australian turnover estimate.

Sources: ABS; RBA.

**Graph 5**

**NAB Business Surveys**

Quarterly; standardised



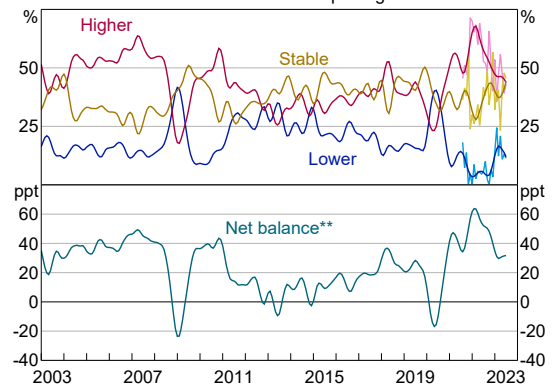
\* NAB classifies small and medium businesses as having annual turnover of between \$2 million and \$10 million.

Sources: NAB; RBA.

**Graph 7**

**Employment Intentions\***

Share of contacts reporting



\* Over the year ahead; lighter lines in the top panel are monthly data for the past two years; all other lines are 13-month Henderson trends.

\*\* Net balance = higher minus lower.

Source: RBA.

industry have eased significantly from the previous year.

### Input costs, price-setting and cash flow pressures

Panellists generally characterised input price pressures as remaining elevated, with sharply higher insurance costs highlighted as one example. Higher interest rates were also adding to cost pressures for some panellists, though it was noted that this was not a main factor. In liaison, which covers firms of all sizes, many firms have reported an easing in growth in input costs over recent months due to a decline in the cost of imported goods. This was partly offset by continued growth in domestic input costs, particularly from higher energy prices, labour, transport and insurance.

In response to rising input costs and wage pressures, most panellists stated they had passed through higher prices to their customers, at least to some extent; some had less scope for this, however, because demand for their product was more price sensitive. Information from liaison has indicated that some small businesses have found it difficult to set prices in the current high-inflation environment and have consequently experienced unanticipated margin compression.

Panellists noted that there were other contributors to cash flow pressures. Late payments to small businesses were said to have become more common, and some commercial landlords had started to request large bonds to account for the risk of lost revenues if businesses stopped trading. Liaison with industry bodies has also indicated that the end of the Australian Taxation Office’s tax arrears holiday has resulted in cash flow pressures for some small businesses, with some finding it difficult to repay tax that has accrued since the pandemic. Liaison also suggests some small businesses are conserving liquidity rather than investing, amid challenging business conditions.

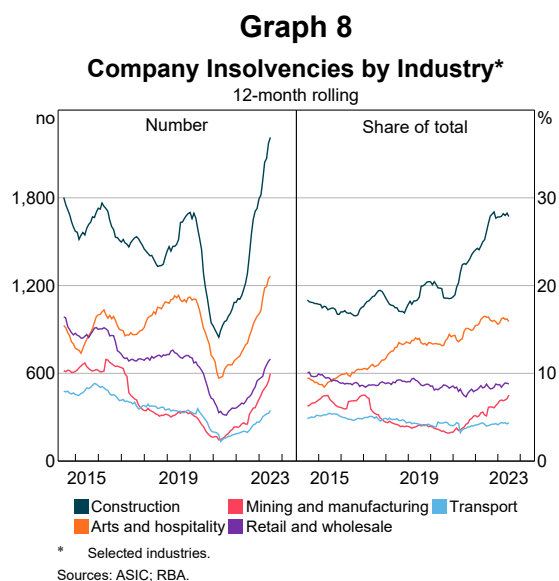
The number of company insolvencies has risen sharply over the past year from very low levels; in several industries, they are currently around or above pre-pandemic levels (Graph 8). The construction sector has accounted for around 30 per cent of insolvencies over the past year, partly reflecting margin pressures as builders work

through fixed-price contracts that were written before costs rose substantially over the past two years. Labour and materials shortages and poor weather conditions have also added costly delays, and while completion times have improved modestly of late, a return to more normal building times is not anticipated until 2024 (RBA 2023b). Business-related personal insolvencies – which capture insolvencies for unincorporated small businesses (e.g. sole traders) – have increased recently but remain near historical lows.

### Demand for small business finance

Loans to small and medium enterprises (SMEs) account for just over half of outstanding business loans in Australia. Lending to SMEs increased by 6 per cent over the past year; however, this was driven entirely by lending to medium businesses (Graph 9). Lending to small businesses has been little changed for the past decade.

Growth in overall business credit has slowed significantly since October 2022, although business credit growth and commitments for new business loans have been relatively stable in recent months. Lending to SMEs grew more slowly than lending to larger businesses over most of the past year (Graph 10). Slower growth for smaller businesses over the past year was most noticeable among the property services, retail and wholesale trade industries. Growth in lending to SMEs has increased



in recent months, partly reflecting a seasonal pick-up in lending to the agriculture industry.

Consistent with these trends, the appetite for new finance among panellists was weaker than in the prior year. Panellists were not seeking finance to fund growth, although some panellists reported they were in the process of seeking working capital facilities for general operating expenses or to fund purchase of equipment.

### Borrowing costs for SMEs

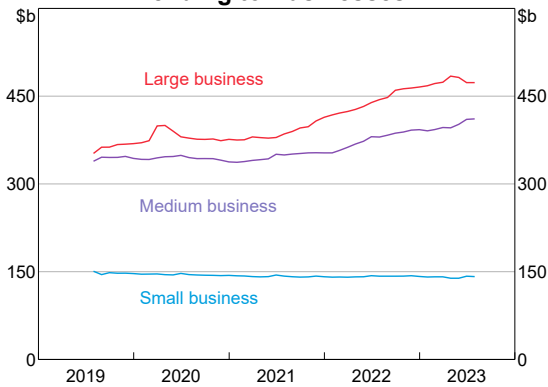
Interest rates on business loans have risen over the past year, reflecting increases in the cash rate and bank bill swap (BBSW) rates (BBSW rates are the standard benchmark rates used to price loans to medium and large businesses). The average variable

rate on new loans to SMEs has risen by around 360 basis points since the start of monetary tightening in May 2022; this is slightly lower than the 400 basis point increase for larger businesses (Graph 11). Panellists generally reiterated messages from previous years that the price of lending is not the biggest impediment to accessing finance, although some noted they had been unwilling to take on debt at the interest rates they had been offered (partly due to their unwillingness to use residential property as collateral, as discussed below).

Smaller businesses typically face higher borrowing costs than larger businesses. In part, this is because small businesses are more likely to default on average than large businesses; modelling by banks suggests that, on average, small businesses are around twice as likely to default as large businesses.<sup>[4]</sup> Average outstanding interest rates for SMEs were around 65 basis points higher than for large businesses in June 2023, well below the average of around 150 basis points in the decade prior to the pandemic (Graph 12). This historically low spread between interest rates for large and small businesses mainly reflects the fact that a higher share of SME credit was fixed at low interest rates during the pandemic and some of these loans are yet to roll off onto higher interest rates. Around one-third of small business credit is currently fixed rate; by comparison, less than 10 per cent of large business credit is fixed (although large businesses are also more likely to hedge their interest rate

**Graph 9**

**Lending to Businesses\***



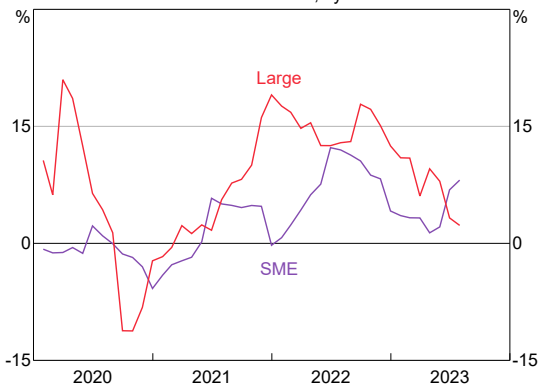
\* Data cover financial institutions with \$2 billion or more of business credit; not seasonally adjusted. Excludes loans to financial businesses. Data in April 2023 break-adjusted for revised definition of business sizes for IRB reporting institutions.

Sources: APRA; RBA.

**Graph 10**

**Business Credit Growth\***

Six-month-ended annualised; by business size



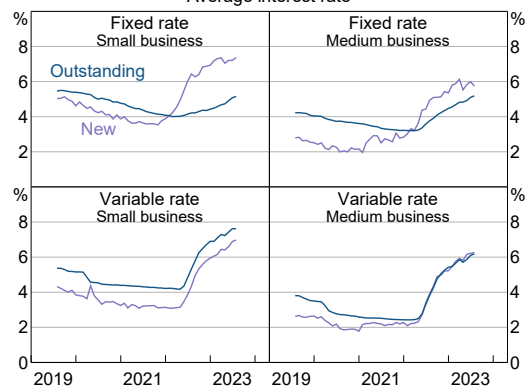
\* Not seasonally adjusted.

Sources: APRA; RBA.

**Graph 11**

**SME Lending Rates**

Average interest rate



Sources: APRA; RBA.

exposure and/or borrow using fixed-rate bonds) (RBA 2023a).

### Access to credit from banks

For many years, small businesses have reported that they find it difficult to access finance from traditional lenders with terms that suit their needs. A recent survey of SMEs found that around half had faced difficulties when trying to obtain funding, with the most common challenge being the time taken to process applications (Banjo Loans 2023). Panellists stated that access to bank finance had become more difficult recently, reflecting the slowing economic environment. Panellists believed banks were tightening lending standards by scrutinising business financial statements more closely. In liaison, banks have reported being more cautious with lending to sectors that are more exposed to a slowing economy, such as those that rely more heavily on discretionary spending.

The requirement to provide residential property as collateral has long been cited as the key constraint on access to finance for some SMEs.<sup>[5]</sup> This can also heighten the challenges faced by First Nations business owners in accessing finance, as First Nations people have around half the home ownership rate of other Australians (National Indigenous Australians Agency 2021).<sup>[6]</sup> Similar to previous years, some panellists noted they were unable to secure finance at an acceptable interest rate or in sufficient volumes without providing

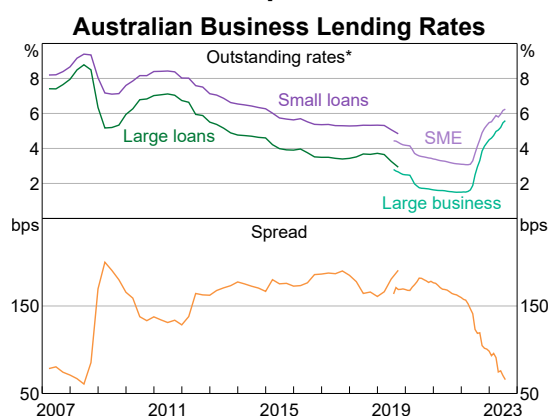
residential property or other physical assets as collateral. Some panellists were unwilling to provide residential property as collateral and did not have other physical assets to use instead (such as commercial property or equipment). This meant they faced much higher interest rates on their loans. Interest rates on small business loans secured by residential property are around 50 basis points lower than loans secured by other assets on average, and roughly 3 percentage points lower than unsecured loans (Graph 13). Residentially secured loans are also larger on average, and account for just under half of total outstanding small business loans by value.

Reductions to the Australian Prudential Regulation Authority’s capital requirements for banks’ SME loans became effective from January 2023. These changes lowered the risk weights on loans to SMEs, reducing the amount of capital banks are required to hold against these loans. They also revised the definition of retail SMEs, which attract lower capital requirements than loans to non-retail SMEs, to include loan exposures of up to \$1.5 million. Lower capital requirements reduce the cost to banks of funding SME loans (all else equal), which may support lending to small businesses.

### New lenders and other sources of finance

Several lending options beyond traditional property-secured loans have become available to SMEs in recent years, which have helped improve some SMEs’ access to finance (Productivity

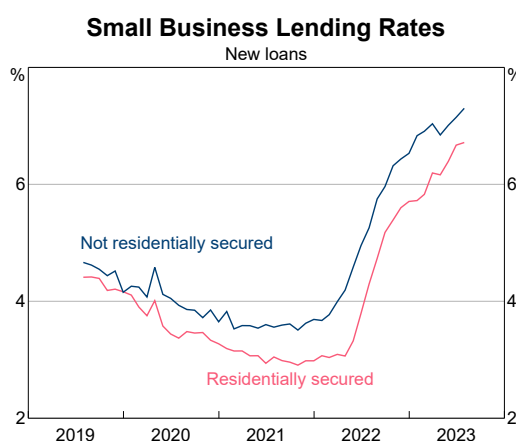
**Graph 12**



\* Small loans data up to June 2019 reflect loans valued less than \$2 million; large loans data up to June 2019 reflect loans valued \$2 million or more; from July 2019 new data are used from the Economic and Financial Statistics (EFS) collection (see Statistical Table F7).

Sources: APRA; RBA.

**Graph 13**



Sources: APRA; RBA.



Commission 2021). A range of non-bank lenders are offering tailored loans and services to SMEs, commonly using new technologies to assess creditworthiness and allow SMEs to access finance more quickly and/or with less collateral than through banks. While these products have provided businesses with alternative sources of finance, the amount of funding obtained through these sources remains modest compared with bank lending.

### Private equity finance

Small businesses typically have access to a narrow pool of equity funding compared with larger companies. Private (i.e. unlisted) companies in Australia can only raise equity investments from professional and sophisticated investors, small-scale personal offers or crowd-sourced equity funding. Nevertheless, several panellists noted a preference for equity over debt, including because it provided greater flexibility during the early stages of a business and because of the strategic guidance offered by some private equity investors.

Panellists noted that conditions in private equity markets had tightened over the past year. Equity valuations had declined, particularly for technology companies. Private equity and venture capital investors were also described as more risk averse, particularly for businesses with considerable exposure to consumer spending. As a result, due diligence had become more intensive and was very time consuming. For some panellists, these factors had caused them to withdraw from the process of seeking private equity finance. Data on private capital markets – which are heavily skewed towards investment in larger businesses – indicate that investment activity declined slightly in 2022 (Preqin and Australian Investment Council 2023) (Graph 14).

### Non-traditional finance

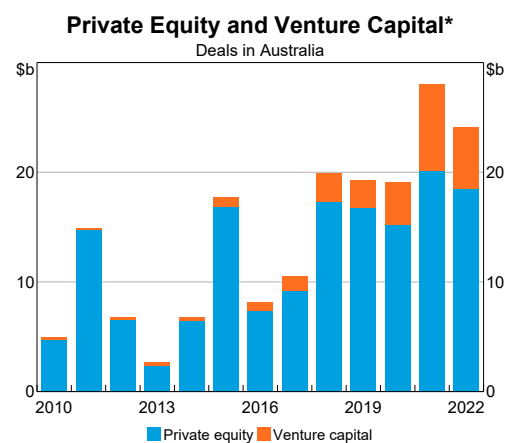
Consistent with global trends, Australia's non-traditional finance market has grown in recent years. One source of this is balance-sheet lending by technology or payments firms, whereby these firms use their transactions data to identify creditworthy business borrowers and then provide loans and trade credit from their own balance sheets. These lenders typically have higher funding costs and charge higher interest rates than banks.

Crowd-sourced equity funding allows SMEs to issue shares to the public via online platforms. The panel's experience here was that public investors were less likely to challenge valuations relative to sophisticated private equity investors, and they were largely passive (requiring less time from business owners). While crowd-sourced equity funding has grown in Australia over recent years, aggregate amounts of this remain small. Australian SMEs have raised around \$219 million via this channel since 2018, with around \$70 million raised through 91 deals in 2022 (Birchal 2022).

### Conclusion

Small businesses play an important part in the Australian economy, both through their economic contributions and their role in local communities. Small business conditions and confidence have declined over the past year reflecting weaker demand, rising input costs and continued difficulty in finding suitable labour. Demand for business finance has eased following the increase in interest rates and the slowing in economic activity, with lending to SMEs growing more slowly than large business lending until recently. Small businesses report that accessing finance through traditional lenders remains difficult. While new lenders and products are providing businesses with alternative sources of finance, the amount of funding obtained through these sources remains modest compared with bank lending. ✖

**Graph 14**



\* Excludes add-ons, grants, mergers, secondary stock purchases, and venture debt.

Sources: Australian Investment Council; Preqin; RBA.

## Endnotes

- [\*] The authors are from Economic Analysis and Domestic Markets departments. They would like to thank the members of the Small Business Finance Advisory Panel for their participation in this year's discussion.
- [1] The 2023 panel comprised nine entrepreneurs, covering New South Wales, Victoria, Queensland, the ACT, Western Australia and South Australia as well as multiple industries (hospitality, insurance, advertising, construction, retail, IT and household services), including one First Nations member.
- [2] See RBA (2022) for further information on the Bank's liaison program.
- [3] The ABS defines a medium-sized business as having between 20 and 199 employees (inclusive), and a large business as having more than 200 employees. In APRA's lending data, for the largest reporting entities a business is classified as small or medium if it has an annual turnover of less than \$75 million; within this, a business is considered small if it has an exposure to the reporting lending entity of less than \$1.5 million.
- [4] For this modelling, the definition of a small business is the SME retail and SME corporate categories in APRA's capital framework, which includes businesses with annual turnover of less than \$75 million. Large businesses are those with more than \$75 million in annual turnover.
- [5] The Reserve Bank's liaison with lenders and businesses has highlighted that the availability of housing collateral by small business borrowers has a significant effect on the cost and availability of debt finance. See Connolly, La Cava and Read (2015).
- [6] Information from the finance industry, Australian Government publications and Reserve Bank liaison suggest several possible reasons for lower rates of home ownership for First Nations Australians, including differences in demographics, geographic location, access to mortgage advisors and brokers, and income levels. See Australian Government (2010).

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# Financial Stability Risks from Commercial Real Estate

Jin Lim, Matthew McCormick, Siddarth Roche and Emma Smith <sup>[\*]</sup>



Photo: joe daniel price – Getty Images

## Abstract

Current conditions in global commercial real estate (CRE) markets are challenging. Weak leasing demand and higher interest rates are weighing on CRE owners' loan servicing ability and asset values. Globally, appetite to lend to CRE investors is softening and signs of financial stress are emerging especially among office owners in the United States. While CRE markets are less likely to pose risks to the banking system given improved lending standards following the global financial crisis (GFC), systemic risks are higher in jurisdictions where the banking system is more exposed to CRE, such as in the United States and Sweden. Australian CRE markets face similar challenging fundamentals, though signs of financial stress appear low at present and systemic risks are lower than in the past. This is a result of Australian banks' reduced CRE exposures as a share of their total assets and tighter lending standards since the GFC. However, risks would increase in the event of a sharp economic downturn or if systemic risks were to spill over from overseas CRE markets.

## Introduction

Commercial real estate (CRE) markets have historically been one of the main sources of banks' losses during periods of banking sector difficulties (Ellis and Naughtin 2010). This is because CRE markets tend to be more exposed to the business and credit cycle relative to other bank assets, and supply imbalances can build due to long construction times. Commercial property investors

are often dependent on rental income, such that weak leasing conditions decrease owners' income (and therefore the ability to service their loans) and the value of the underlying asset at the same time. CRE investors are also heavily exposed to refinancing risk, as their loans are mostly interest only and for relatively short terms. In addition, CRE loan terms generally impose ongoing conditions on borrowers, which can exacerbate price cycles if

widespread covenant breaches trigger property sales.

This article outlines developments in global and domestic CRE markets, with a focus on the relatively large office market and overseas CRE markets that are connected to Australia, including the United States, Hong Kong and Europe. It concludes with an assessment of risks in Australia, including how stress in overseas markets could transmit to the Australian CRE sector.

## Current conditions in the CRE sector

### CRE market fundamentals are weak

Investors in global CRE markets are experiencing challenging fundamentals, especially in the office sector. Leasing demand for commercial property, particularly in the large office segment, is being affected by structural and cyclical headwinds partly brought on by the COVID-19 pandemic. A shift towards working from home has reduced office attendance rates globally, to around 60–70 per cent below pre-pandemic levels in some major cities (Graph 1). In the retail segment, the shift to online shopping has weighed on demand for many years, with the transition to online shopping gathering further momentum during the pandemic. At the same time, the industrial segment has benefited from the associated increase in demand for logistics space. While there is some uncertainty over the outlook for these structural trends in leasing demand, the forecast slowdown in employment growth and consumption in advanced economies over the coming years is expected to weigh on demand across all CRE markets.

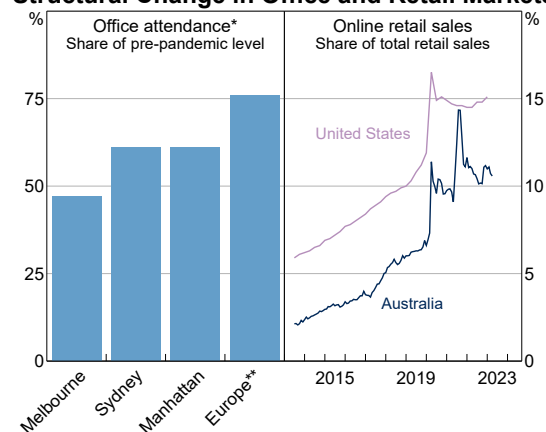
Lower leasing demand for office space has led to an increase in vacancy rates. Office vacancy rates in the United States and Hong Kong are now above levels seen during the global financial crisis (GFC) (Graph 2). In the United States, vacancy rates have increased the most in the largest cities and are expected to remain high as new projects currently under development reach completion. In Europe, the increase in prime office vacancy rates has been less pronounced as there has been an undersupply of prime office space in many cities alongside a greater return-to-office rate following the pandemic.

In Australia, the central business district (CBD) office vacancy rate is around its highest level since the mid-1990s, with vacancy rates around 14 per cent across both prime and secondary grade CBD offices. While strong growth in employment has helped sustain demand for prime grade office space, this has been more than satisfied by a large amount of new supply in recent years. The prime office vacancy rate is expected to remain high over the next few years as the pipeline of already commenced office construction projects reach completion. As in other countries, leasing conditions for secondary grade offices are even more challenging. There has been no growth in demand for secondary grade stock over recent quarters. Information from the Reserve Bank’s liaison program suggests that many employers’ preferences are shifting to higher quality office space (which often have higher sustainability ratings) over secondary to encourage workers back and to meet environmental goals.

### Owners’ profitability and asset valuations are declining

Higher vacancy rates and debt-servicing costs are weighing on office returns. High vacancy rates have reduced landlord income, through both higher levels of vacant stock and downward pressure on ‘effective’ rents (which are adjusted to include incentives attached to leases, such as rent-free

**Graph 1**  
**Structural Change in Office and Retail Markets**



\* Sydney, Melbourne and Europe data as at February 2023; Manhattan is at March 2023.

\*\* Europe is the average of Paris CBD, Madrid, Stockholm, Dublin, Prague, London West End, London City and Warsaw.

Sources: ABS; Property Council of Australia; RBA; Real Estate Board of New York; Savills; U.S. Census Bureau.

periods and fitouts) on new (including renewed) leases. In Australia and the United States, effective rents on new leases remain around 5–10 per cent below pre-pandemic levels (Graph 3). Office market conditions are significantly weaker in Hong Kong, where effective rents are 25 per cent below pre-pandemic levels. In Europe, where a comparable measure of effective rents is not available, market commentary suggests effective rents have been more resilient, reflecting lower new supply, stronger tenant demand and stable lease incentives.

Alongside weak rental income, higher interest rates are adding to indebted CRE owners' debt-servicing costs. Combined, these factors are lowering interest-coverage ratios (ICRs) (earnings over

interest expenses) and placing pressure on the returns accruing to indebted commercial property owners. That said, some owners have been at least partially shielded from these developments to date, through fixed or inflation-linked rent increases on existing leases, longer term fixed-rate debt or interest rate hedges.

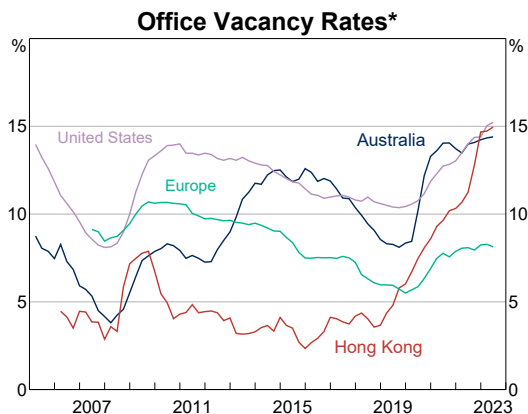
In addition to increasing debt-servicing costs, higher interest rates weigh on CRE valuations as CRE assets are valued by discounting expected future income. Aggregate CRE valuation measures have begun to fall across most countries. In the United States, Europe and the United Kingdom, aggregate CRE valuation measures have fallen by around 10–20 per cent since mid-2022 depending on the valuation measure used (Graph 4).<sup>[1]</sup> The large fall in Europe partly reflects that the interest rates used to discount asset valuations have risen by more than in other jurisdictions. In Asia, Hong Kong has seen the largest decline in valuations; in other markets, such as Singapore, valuations have been more resilient as vacancy rates have remained low and rental growth positive.

In Australia, aggregate valuation measures have fallen by around 10 per cent in the office segment and by around 8 per cent in the retail and industrial segments since mid-2022. This is broadly consistent with recently announced revaluations of CRE assets by some listed Australian real-estate investment trusts (A-REITs) and superannuation funds.

Further falls in valuation measures are likely, though the magnitude and pace are uncertain. Discount rates on CRE valuations have not yet fully reflected higher interest rates as valuations typically take some time to reflect changes in fundamentals. This is because transactions are infrequent (particularly during periods of heightened uncertainty) and costly, and they have long lead times so sale prices tend to lag actual conditions.

The share prices of listed real-estate investment trusts (REITs) can provide more timely (albeit imperfect) information on valuations, as REIT shares are highly liquid and their value largely reflects estimates of the value of trusts' underlying holdings of CRE. These have fallen by around 30–40 per cent

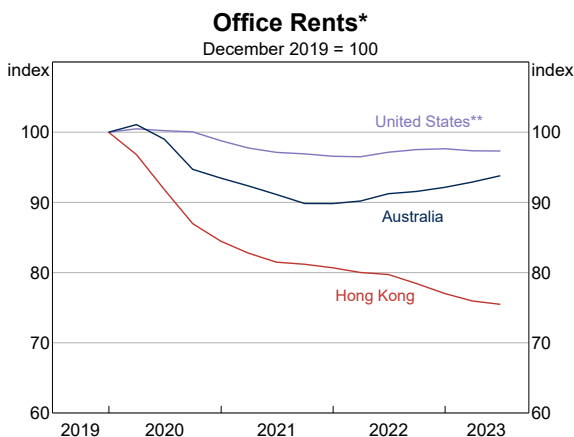
**Graph 2**



\* Europe is the average across London, Paris, Amsterdam, Berlin, Frankfurt, Madrid, Rome and Stockholm; United States is the average of New York, San Francisco and Los Angeles; Australia is national CBD office.

Sources: Bloomberg; Colliers; JLL Research; RBA; REIS.

**Graph 3**



\* Net effective rents.

\*\* United States is the average of New York, San Francisco and Los Angeles.

Sources: Bloomberg; Colliers; JLL Research; RBA; REIS.



in most jurisdictions – including Australia – since interest rates started to rise (Graph 5).

### Conditions and risks in overseas CRE markets

#### Lending conditions have tightened

Lenders to CRE markets are becoming increasingly cautious as declining asset values and weaker owner profitability have increased risks in the segment. In the United States, a large share of banks (which hold around half of US CRE debt) have tightened standards, including by reducing maximum loan sizes, widening the spread of loan interest rates to benchmark rates, lowering

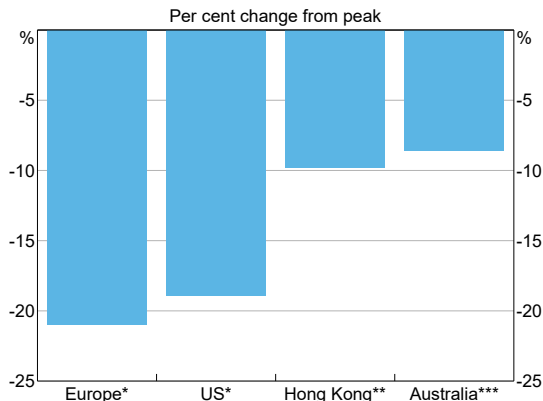
maximum loan-to-valuation ratios (LVRs), and increasing minimum debt-service coverage ratios for loans secured by CRE (Graph 6). The tightening has been broadly based across large and small banks. Lending standards and the availability of credit funded by US commercial mortgage-backed securities (CMBS) markets (accounting for around 12 per cent of US CRE lending) have also tightened. This reflects that investors in CMBS – which includes pension funds and insurers – have reduced appetite to hold these securities.

Banks in Europe are also tightening lending standards for CRE loans. In the United Kingdom, lenders reported reduced credit availability for CRE over the past year and further contraction is expected, which has been partly attributed to declines in CRE valuations.

While a tightening of lending standards at this point in the cycle can reduce risks for lenders and the financial system in the future, it can increase near-term risks. This is because tighter lending standards make it more difficult for borrowers to meet minimum leverage and serviceability standards on a loan when refinancing is due. Indeed, combined with falling income and valuations, more borrowers could face a funding gap when refinancing. If these constrained borrowers are unable to refinance and are forced to sell their CRE assets, valuations could fall even further than implied by weak fundamentals, constraining even more borrowers.

**Graph 4**

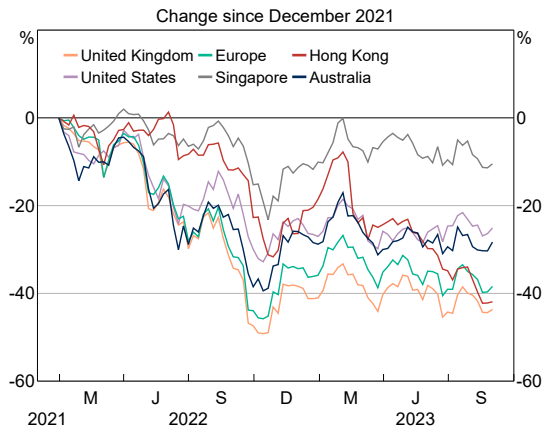
#### Commercial Real Estate Valuations



\* Latest data is June 2023. Represents average institutional-grade assets typically held by REITs and is equally weighted between office, retail, industrial and residential. Calculated based on appraisal-value.  
 \*\* Latest data is June 2023. Equally weighted between office and retail properties.  
 \*\*\* Latest data is June 2023. Equally weighted between office, retail and industrial properties.  
 Sources: ABS; Green Street; Hong Kong Rating and Valuation Department; JLL Research; RBA.

**Graph 5**

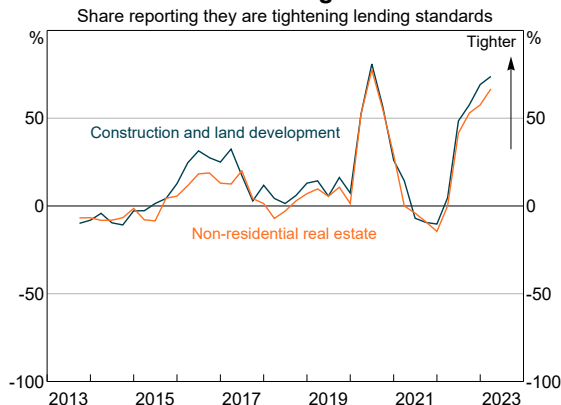
#### REIT Share Price Index Performance



Sources: Bloomberg; RBA.

**Graph 6**

#### US Banks' Lending Standards



\* Refers to the net percentage of loan officers in the US Senior Loan Officer survey that are tightening lending standards for loans secured by non-residential real estate and construction and land development loans. Source: Federal Reserve.



## Financial stress is emerging

The quality of CRE loans has started to deteriorate in the United States, albeit from a historically strong level. In the United States, several large CRE owners have recently defaulted on their loans, largely due to rapidly increasing interest rates on variable-rate loans. Most of the defaulted loans were secured by older office properties, which are experiencing a particularly challenging leasing environment. However, overall arrears rates remain relatively low. Arrears rates on loans in US CMBS (which is the timeliest measure of arrears available) have increased by around 1¼ percentage points since mid-2022 (though they are still well below levels seen in the GFC and 2020). By sector, arrears rates in offices have more than tripled over this period, while rates in retail and other segments have remained broadly steady. Arrears rates on US bank loans (which are less timely) also ticked up in the first two quarters of 2023, but from a very low level (Graph 7). Charge-off rates – which capture loans that are removed from banks' books and charged against loss reserves – also remain low, although these typically lag arrears rates. Non-performing loans to CRE remained at historically low levels in Europe in the first quarter of 2023 (the latest available data).

With arrears rates expected to increase further, US and European banks have increased provisioning on CRE loans. Given lending standards have become more prudent over the past decade, CRE arrears and non-performing loans are unlikely to reach the heights recorded in the 1990s or during the GFC. However, loan quality could still deteriorate sharply if borrowing costs increase further or stay higher for longer, and/or economic or funding conditions deteriorate markedly.

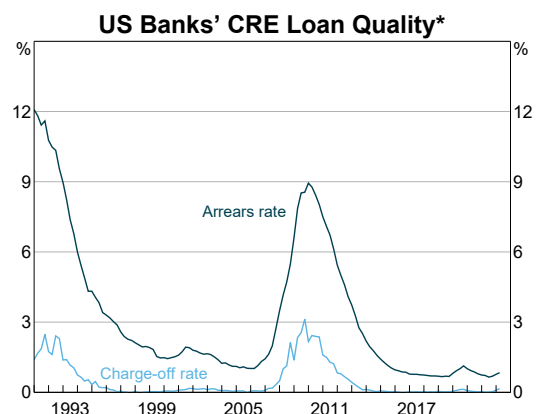
## Policymakers in a number of jurisdictions are alert to financial stability risks

Banking supervisors and central banks in a number of jurisdictions are increasingly drawing attention to the financial system risks posed by CRE, particularly where banking exposures are high – such as in the United States, Sweden and Norway (Graph 8) (Federal Reserve 2023; Riksbank 2023; Norges Bank 2023). In the United States, CRE loans make up

around 11 per cent of banks' assets; smaller US banks have even larger exposures at 22 per cent. As seen during March 2023, stress among some smaller banks can quickly spread to other similar banks (Federal Reserve 2023). While the US authorities are alert to US banks' relatively high CRE exposures, they also note that lending standards have become more prudent over the past decade and banks' starting positions for capital and asset quality are collectively much higher than in past CRE downturns; these factors should in principle provide some buffer for banks against deteriorating conditions. Central banks in Norway and Sweden have also highlighted the risks from CRE given banks' exposures in these jurisdictions are relatively high on average and some banks have much larger exposures. While bank exposures tend to be lower elsewhere in Europe, relatively high levels of loans at LVRs greater than 80 per cent in some countries is a concern for regulators (European Systemic Risk Board 2023; ECB 2023).

Overseas regulators are also drawing attention to vulnerabilities inherent in non-bank financial institutions, including liquidity mismatches in unlisted property funds (European Systemic Risk Board 2023; IMF 2023). If investors in these funds abruptly withdraw their funds, the fund may be forced to sell assets quickly to meet redemptions; this would likely entail steep price discounts in the current environment of low transaction liquidity and falling valuations. Evidence of fire sales resulting

**Graph 7**



\* Arrears rates are those past due 30 days or more and still accruing interest as well as those in nonaccrual status. Charge-off rates are the value of loans and leases removed from the books and charged against loss reserves. Excludes farmland loans.

Source: Federal Reserve.

from redemptions have been limited so far. The use of liquidity management tools, such as redemption limits and liquid asset buffers, have become more commonplace since the GFC. These tools help limit disorderly selling in response to redemptions, but work is still underway to enhance their operation (FSB 2023).

### Conditions and risks in domestic CRE markets

#### There have been limited signs of financial stress among owners of Australian CRE

Available information shows few signs of financial stress among owners of Australian CRE. In aggregate, listed A-REITs – which own roughly 10 per cent of office space and 60 per cent of retail space in Australia – continue to maintain balance sheets with relatively low levels of leverage and ICRs of more than three times their earnings (Graph 9). High ICRs, in particular, provide A-REITs with headroom to absorb weaker rental income or further debt-servicing increases as interest rate hedges roll off.

There is less information available on the financial health of other types of trusts (e.g. unlisted trusts and foreign listed trusts), which estimates suggest own roughly 35 per cent of office space in Australia. Information from liaison suggests that Australian unlisted trusts (excluding superfund-related products) have higher leverage than A-REITs. Signs

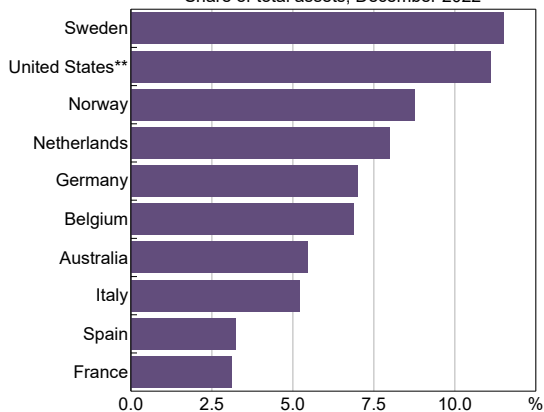
of financial stress among unlisted trusts have increased in recent months; some have experienced an increase in redemption requests from unit holders. As discussed above, this can lead to forced sales and sharp price declines in the absence of prudent liquidity management practices; to manage liquidity, some trusts have suspended distributions and limited redemptions, which have likely occurred after drawing down buffers of liquid asset holdings. Since the GFC, the unlisted trust sector in Australia has become smaller and investors better understand that unlisted property funds can limit access to withdrawals through redemption limits. To date, this has meant that unlisted trusts appear not to have been forced to rapidly sell assets at steep discounts.

Other commercial property owners in Australia include high net worth individuals, companies, sovereign wealth funds and pension funds. Sovereign wealth funds and pension funds are less likely to be forced to sell CRE assets in a downturn given they tend to have low leverage and hold commercial property as long-term investments. Indeed, Australian superannuation funds (which in aggregate hold around 5 per cent of total assets in unlisted property including direct ownership or indirect ownership via unlisted trusts) tend not to be leveraged on their direct ownership of properties.

Smaller leveraged commercial property owners in Australia are more likely to source funding from

**Graph 8**

**Bank Loan Exposures to CRE\***  
Share of total assets, December 2022



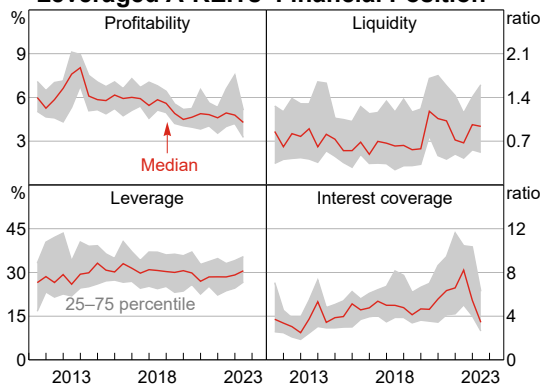
\* For European countries, this refers to commercial real estate loans and advances made to non-financial corporates.

\*\* For the United States, this includes both residential and non-residential real estate, and excludes construction and land development, and farmland.

Sources: APRA; European Banking Authority; Federal Reserve; RBA.

**Graph 9**

**Leveraged A-REITs' Financial Position\***



\* Profitability measured by annual EBITDA over assets, liquidity by current assets over current liabilities, leverage by debt over assets, and interest coverage by annual EBITDA over annual interest expenses. There is a gradual structural break in ratios in late 2019 to early 2020 due to an accounting change.

Sources: Morningstar; RBA.

banks. Non-performing rates on Australian banks' commercial property lending remain negligible across all bank types and segments – and are far below the levels seen during the GFC (Graph 10). Information from liaison suggests that some landlords are struggling to meet ICR requirements; however, banks are willing to work with existing borrowers provided they can demonstrate a path back to meeting minimum loan requirements. While indicators of financial stress among owners that borrow from banks are low at present, they are expected to increase over the coming quarters as incomes and valuations are likely to decline further.

**Stress could spill over from overseas markets to Australia**

Even if developments in domestic CRE markets remain relatively orderly, there is a possibility that stresses in overseas CRE markets could spill over to affect the Australian CRE market through common ownership and funding sources. Widespread financial stress among owners of CRE overseas could increase the risk of a disorderly fall in domestic valuations if (realised or unrealised) losses on foreign assets force owners to sell and lead lenders to reduce lending to the Australian CRE market. Indeed, global CRE prices have become more correlated since the GFC (BIS 2020).

**Common funding sources**

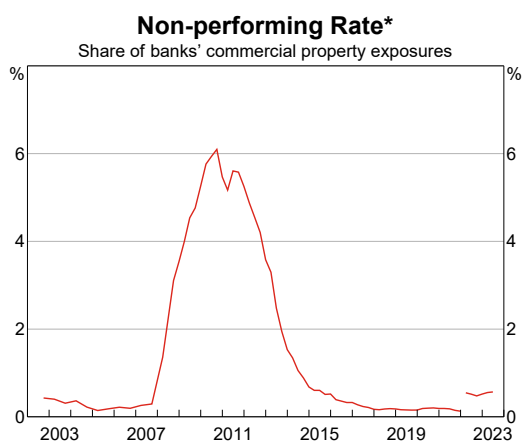
Large commercial property owners in Australia – in particular, listed A-REITs – rely heavily on foreign investors for debt funding. Around 45 per cent of

total debt borrowed by the large A-REITs is sourced from overseas funding markets, predominantly the United States, which accounts for around one-quarter of total debt (Graph 11). Foreign investors are also key participants in local corporate bond markets, from which around 20 per cent of large A-REIT debt is sourced. If reduced appetite for lending in US CRE markets broadens out to a reduction in willingness to lend to other CRE markets including Australia, A-REITs would need to refinance at higher interest rates than otherwise, turn to other (potentially more expensive) funding markets and/or issue shares to cover maturing debt. If these options were not available, A-REITs may be forced to sell properties, potentially at a steep discount.

However, most A-REITs are well placed to manage any temporary dislocation in global commercial property debt markets. Very little debt issued by A-REITs is maturing in the near term (Graph 11). Market research also suggests that most A-REITs have ample liquidity in the form of undrawn debt facilities to cover all debt maturities to mid-2024.<sup>[2]</sup>

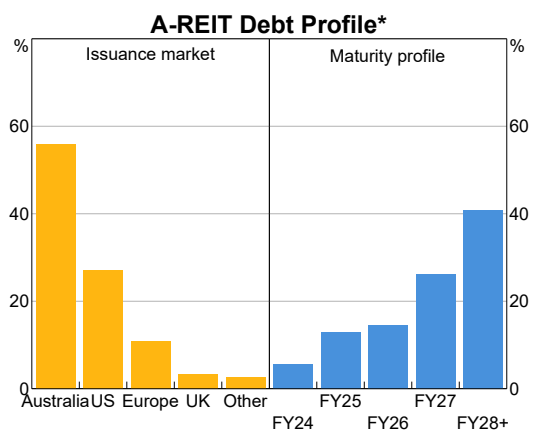
Australian CRE markets are also linked to global markets through the increased participation of foreign banks in Australia. Asian banks, in particular, have increased their exposures to Australian commercial property in recent years. Lending by Asian banks accounts for around 14 per cent of bank lending to CRE in Australia, while European banks provide around 7 per cent (Graph 12). If foreign banks sustain losses on their commercial property exposures overseas, they may impose

**Graph 10**



\* Excludes overseas exposures. Prior to 2022, data reported as impairment rates.  
Sources: APRA; RBA.

**Graph 11**



\* As at December 2022. Coverage include the large A-REITs and is different across panels. Includes drawn-down and undrawn debt.  
Sources: Company Reports; JP Morgan; Morgan Stanley; RBA.

mandates to reduce exposures and tighten lending standards across their commercial property portfolios – including in Australia. This could reduce the supply of credit to commercial property markets, which would make it more difficult for some investors to refinance their loans. There is some evidence that this occurred during the GFC when European banks reduced their exposures to Australian CRE following years of strong growth.

**Common ownership of global CRE assets**

Owners of Australian CRE assets that also own CRE assets overseas can be a channel for stress in overseas markets to propagate locally. On the one hand, if large losses are realised on foreign commercial property holdings, investors may be forced to divest other commercial property assets – including those in Australia – to satisfy covenants on existing debt or to allow refinancing (Lane, Sinclair and Orsmond 2014; Zhu and Lizieri 2021). On the other hand, concerns around fundamentals and valuations in overseas CRE markets could push foreign capital towards jurisdictions where investors perceive fundamentals to be stronger. There is some evidence that this occurred in Australia during the pandemic, when strong demand from foreign investors at pre-pandemic prices supported office valuations over this period.

The risk of foreign stress being transmitted to Australia through this channel has increased over the past decade as foreign investors (which are more likely to own CRE assets in other countries)

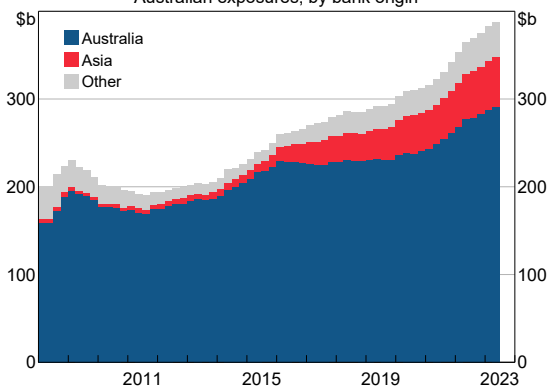
have become more active in the Australian commercial property market, particularly for offices (Graph 13). Some of the large foreign owners of Australian commercial property include global real estate funds and trusts that hold commercial property assets globally. Estimates from commercial property transactions, construction and withdrawals data since 2007 show that roughly 30 per cent of Australian offices are owned by foreign investors and these owners are concentrated in relatively few jurisdictions. The top five jurisdictions of domicile are Singapore, China, the United States, Hong Kong and Canada.<sup>[3]</sup>

**In Australia, banks’ conservative CRE lending practices and small exposures limit systemic risks**

Banks operating in Australia have conservative lending practices that reduce the potential for systemic risks arising from commercial property markets. Lending practices have improved since the GFC in part due to increased regulatory oversight from the Australian Prudential Regulation Authority (APRA) following bank losses on CRE exposures during the GFC. The early 1990s period also saw even larger CRE losses experienced by some banks, and some of the lessons learned from this episode continue to inform bank risk appetite in the CRE sector. Over recent years, most commercial property bank loans have been written with a LVR of less than 65 per cent and have requirements that borrowers have earnings that cover twice their interest expenses (equivalent to an ICR greater than

**Graph 12**

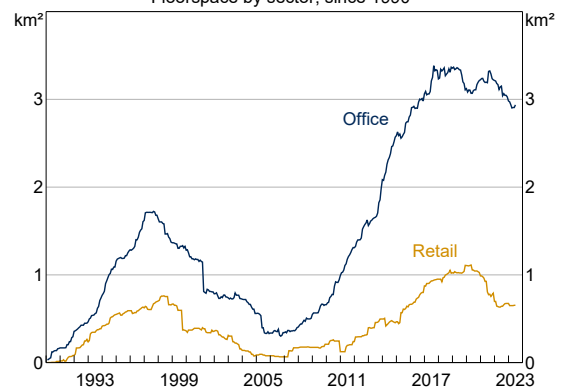
**Banks’ Commercial Property Exposure Limits\***  
Australian exposures, by bank origin



\* Total limits on facilities committed by banks. Sources: APRA; RBA.

**Graph 13**

**Cumulative Net Foreign Purchases**  
Floorspace by sector, since 1990\*



\* Building floorspace from transactions data. Only includes transactions greater than \$5 million. Sources: JLL Research; RBA.

2). Many institutional customers borrow at much lower LVRs due to their internal leverage limits.

The limited CRE exposures of banks in Australia also help mitigate potential systemic risks from a downturn in commercial property. Having declined since the GFC, banks' aggregate exposures to commercial property markets are small, making up around 5 ½ per cent of total assets (Graph 14). This figure is low both by historical standards and compared with a number of other countries. Foreign bank branches have the most concentrated exposures to Australian commercial property, reflecting the specialised nature of their Australian banking operations. However, this exposure likely makes up a small share of total international group assets. And despite strong growth in lending from foreign bank branches in recent years, information from liaison suggest lending standards at these banks are broadly in line with standards at domestic banks.

In line with developments overseas, the share of banks operating in Australia that have reported reduced lending appetite to CRE markets and tightening lending standards has increased over the past year. However, as mentioned above, banks appear willing to continue to extend credit, including refinancing loans, to creditworthy customers, even where they fall short of minimum ICR requirements.

Non-bank lending in Australian commercial property markets tends to be focused on the riskier

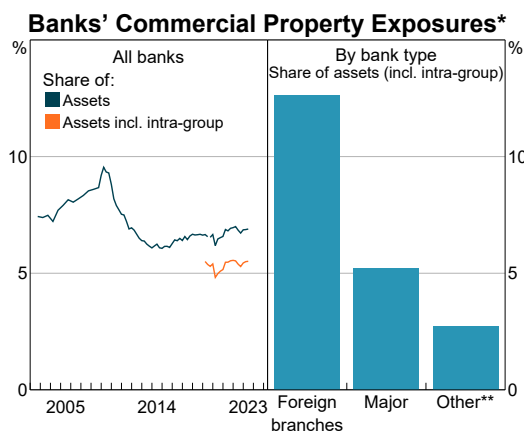
financing of construction and development rather than buy and hold investments in established properties. Information from liaison suggests that lending standards at non-banks are more accommodative than at banks. For example, non-banks typically have appetite for higher LVR loans, and some do not impose minimum ICRs.<sup>[4]</sup> However the risks to financial stability in Australia from non-bank lending in the CRE sector are low as non-banks make up a small share of total lending and do not have large connections to the banking system (Hudson, Kurian and Lewis 2023). However, stress could transmit from non-banks to other commercial property lenders if there were to be extensive defaults among non-banks' borrowers, triggering wide-spread fire sales.

## Conclusion

Conditions in global CRE markets are currently weak. Low leasing demand and higher interest rates are putting pressure on landlords' cash flows and asset valuations. Some signs of financial stress among CRE owners have emerged. In response to this and expected future stress, there has been a fall in the appetite of banks and investors to lend to CRE markets, particularly in the United States. If many CRE owners are unable to refinance or service their debts, owners may be forced to sell their CRE assets at a steep discount, which could exacerbate falls in valuations. Although lending standards have generally strengthened since the GFC, bank exposures remain relatively high in some jurisdictions, raising concerns about wider financial stability risks in these countries.

The Australian CRE market faces some similar headwinds. While signs of financial stress among owners of Australian CRE remain low, pressure on the asset class is likely to continue for some time. Links between the Australian and global CRE markets through common ownership and funding could also mean stress in foreign CRE markets spills over to Australia. Investors in CRE could realise large losses, but broader systemic risks appear limited. Banks in Australia have conservative lending practices for CRE loans and exposures to the segment are small. Indeed, lending standards have strengthened and exposures as a share of total

**Graph 14**



\* Excludes overseas exposures.

\*\* Includes non-major Australian banks and Australian subsidiaries of foreign banks.

Sources: APRA; RBA.

assets have declined since the GFC. There is some evidence to suggest that riskier lending could have shifted to non-banks, but this poses little systemic risk to financial stability in Australia as non-banks account for a small share of total credit and banks

have relatively limited exposures to non-bank lenders. ✖

## Endnotes

- [\*] The authors are from Financial Stability Department. They would like to thank Eden Hatzvi and Natasha Cassidy for their contributions.
- [1] The estimate of US CRE valuations is based on Green Street's US Commercial Property Price Index (CPPI), which uses an appraisal-based estimate of prices. Alternative measures of US CRE valuations, such as Real Capital Analytics' repeat-sales CPPI or NACREIF's appraisal-based Property Index, show declines of around 6–10 per cent since their mid-2022 peaks.
- [2] Analysis by Morgan Stanley and JP Morgan, which covers the large A-REITs.
- [3] Many owners domiciled in Canada and Singapore are pension funds or connected to the country's sovereign wealth fund. As discussed above, these types of owners are less likely to be forced to sell their CRE assets in a downturn.
- [4] This, at least in part, reflects that non-bank lenders operate with fewer regulatory constraints than banks. It is important to note, however, that if non-bank lending in Australia were to pose a risk to financial stability, APRA could avail its reserve powers to regulate the sector. For more detail on non-bank lending in Australia, see Hudson, Kurian and Lewis (2023).

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# New Timely Indicators of Wages Growth

Nalini Agarwal, James Bishop, Matthew Fink, Jessica Geraghty and Yahdullah Haidari <sup>[\*]</sup>



Photo: Klaus Vedfelt – Getty Images

## Abstract

Monitoring developments in wages is important for assessing the inflation outlook, as labour costs are a major factor in firms' pricing decisions. Over recent years, the Reserve Bank has developed a suite of timely wages indicators based on surveys and administrative data. Together with externally developed indicators, these measures provide a fuller view on wages developments ahead of the release of official statistics. This article explains the methodology behind these indicators and what they reveal about labour costs in Australia.

## Introduction

Timely monitoring of wages growth is an important part of assessing the outlook for inflation, as labour costs are a major component of input costs for most firms and greatly influence pricing decisions for goods and services. Wages are also the largest source of household income, meaning wages growth has a significant impact on household consumption. Previously, most wages growth measures have been sourced from official quarterly releases published with two to three months' delay, supplemented by partial and forward-looking measures derived from the Bank's liaison program.

To get a more timely read on wages and broader earnings growth, in recent years the Reserve Bank

has developed a suite of measures derived from surveys and administrative data and increased its use of other externally developed measures. This article describes these measures in turn.

## Official measures of labour costs

The Bank monitors a range of official measures of labour costs constructed by the Australian Bureau of Statistics (ABS), including the following:

- **The Wage Price Index (WPI)** measures changes in wage rates for a given quantity and quality of labour. The WPI tracks changes in the hourly base wage rate of a fixed basket of jobs – as such, it should be unaffected by changes in labour force composition. The ABS also adjusts

the WPI to exclude any changes in wages resulting from changes in a job's nature or the quality of work performed.

- **Average earnings from the National Accounts (AENA)** is wider in scope than the WPI, as it includes non-wage costs, such as superannuation and redundancy payments, along with pay increases resulting from worker promotions. For this reason, AENA is often viewed as a better indicator of inflationary pressures in the economy, at least at a conceptual level (Graph 1).

The WPI and AENA remain two of the most important labour costs measures for the Australian economy and are the focus of historical and econometric wages analysis. A key limitation is that both measures are published quarterly, with a two to three month delay relative to the period they relate to. Moreover, AENA measures are not adjusted for changes in labour market composition over time. The resulting volatility in the AENA measures can make it difficult to separate noise from signal, as has been the case over the past few years due to shifts in labour market composition that occurred during the pandemic.

## New indicators of wages growth

To help address these limitations, the Bank has recently developed several new indicators, including:

- two adjusted measures of base wages growth from a household survey
- a composition-adjusted measure of broader earnings growth from administrative data (i.e. single touch payroll data).

The development of these measures has been made possible by the increased availability of rich and timely microdata, facilitated by the ABS and other organisations such as the Melbourne Institute. These measures, in conjunction with a growing range of externally developed indicators, have improved the Bank's ability to monitor developments in wages and labour costs in a timely way.

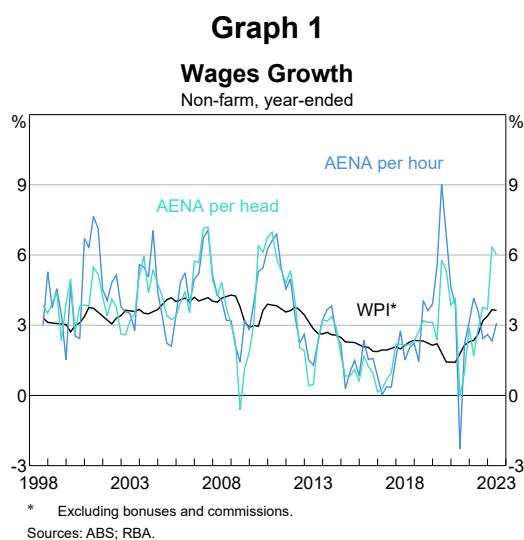
### Measures based on household survey data

The Melbourne Institute Consumer Attitudes, Sentiments and Expectations in Australia Survey is a representative monthly survey of around 1,200 Australian households. The survey collects information on households' actual wage growth outcomes over the past year and their expected wage growth for the year ahead.<sup>[1]</sup> We use the microdata underlying the survey to construct average measures of actual and expected wages growth for households, and find that after some adjustments they are closely aligned with trends in the WPI.<sup>[2]</sup> These measures can be updated by the end of each month, providing a timely signal on wage pressures in the economy.

### The survey reveals a downward bias in self-reported wages growth

The average of actual and expected wage increases reported by Australian households in the survey have been persistently below wage outcomes observed in the WPI (Graph 2). Households' actual wage growth and expectations averaged in the range of 1–2 per cent over the sample period, while year-ended growth in the WPI averaged around 3 per cent. Though there is a large gap between the survey measures of wages growth and the WPI, the series tend to move together. For example, the household survey measures and the WPI both moved higher prior to the global financial crisis (GFC), before declining over the 2010s.

The downward bias in household survey measures of wages growth is largely due to a significant share



of people reporting wage freezes and wage cuts. On average, a little over 40 per cent of respondents reported that their wages were ‘the same’ as a year ago. Similarly, around half of respondents reported that they expect their wages in a year’s time to be ‘the same’. As such, the survey records their actual or expected wage growth as zero (Graph 3). This is much higher than the 22 per cent of jobs on average in the WPI that experienced wage freezes over the same period (Graph 4). Similarly, a higher share of households reported wage cuts in the Melbourne Institute survey compared with in the WPI.

The greater prevalence of wage freezes reported in the household survey could reflect several factors, including respondents misunderstanding the question (e.g. by reporting ‘the same’ they may mean that their wages *growth* will be the same), rounding down their responses as rounding is common in consumer surveys (e.g. reporting 1 per cent wage growth as zero), or carelessness.

**Adjusting the measures to address the downward bias**

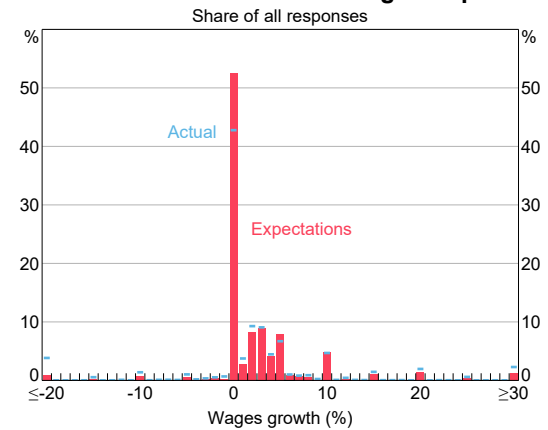
One way to address the gap between the survey measures of wages growth and WPI growth is to adjust the household survey measures so that the share of jobs with wage freezes is consistent with the WPI data.<sup>[3]</sup> The resulting measures bring the levels closer to the WPI outcomes (Graph 5). In addition, the wage expectations measure appears to lead the WPI by one to two quarters at major turning points such as during the GFC and the

COVID-19 pandemic – this is the case both with and without the adjustment. This leading property of the data is likely to exist because employees are sometimes informed of their wage changes several months before they come into effect. Over recent months both the actual and expected survey measures of wage growth have increased alongside the higher WPI, though the increase for the expectations-based measure has been smaller.

These adjusted measures are a valuable addition to the Bank’s suite of indicators to monitor wage pressures in the economy; they are more timely (available by month end) and provide information from the perspective of households, supplementing existing indicators like the Bank’s liaison program with firms.

**Graph 3**

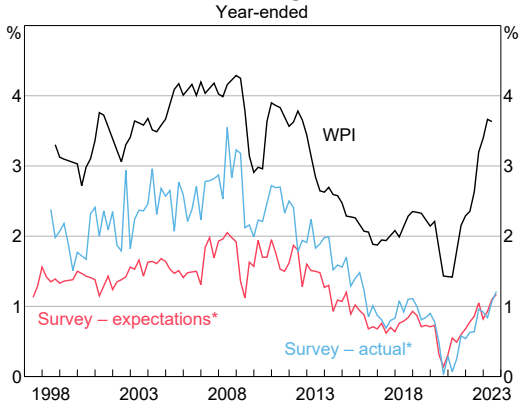
**Distribution of Households’ Wage Responses**



Sources: Melbourne Institute; RBA.

**Graph 2**

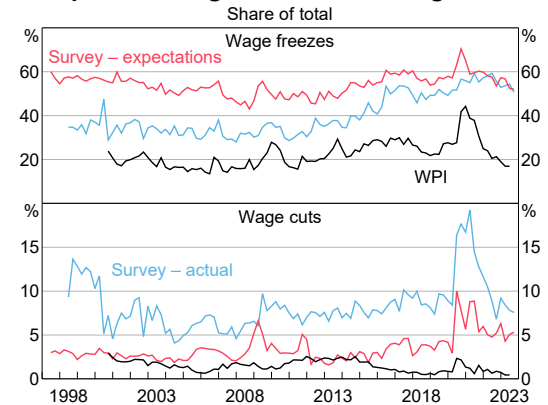
**Measures of Wages Growth**



\* Based on a 30 per cent trimmed distribution. Sources: ABS; Melbourne Institute; RBA.

**Graph 4**

**Reports of Wage Freezes and Wage Cuts**



Sources: ABS; Melbourne Institute; RBA.

## Measures of broader labour costs from single touch payroll data

Wages measures (such as the WPI or those derived from household surveys) typically focus on growth in base wages, which is the largest component of labour income for most workers. However, firms often use non-base wages, such as bonuses and allowances, to attract and retain workers, particularly when the labour market is tight (Leal 2019). This means that broader measures of employment earnings can provide a fuller picture of the state of the labour market, firms' costs and inflationary pressures across the economy.

The main official measures of broader earnings are AENA per head and AENA per hour. These are available on a quarterly basis with two months' lag relative to the end of a given quarter. As discussed above, a shortcoming of these measures is that they can be volatile, reflecting compositional changes (such as low wage workers entering and leaving the workforce or worker flows across industries) that mask fundamental supply and demand dynamics in the labour market.

To overcome these limitations, we construct composition-adjusted earnings growth measures (on a per job and per hour basis) using the Australian Tax Office's (ATO) Single Touch Payroll (STP) database. STP data, which are available from 2020 onward, consist of payslip information reported to the ATO each time a worker is paid by their employer. Like AENA, STP covers a wide range

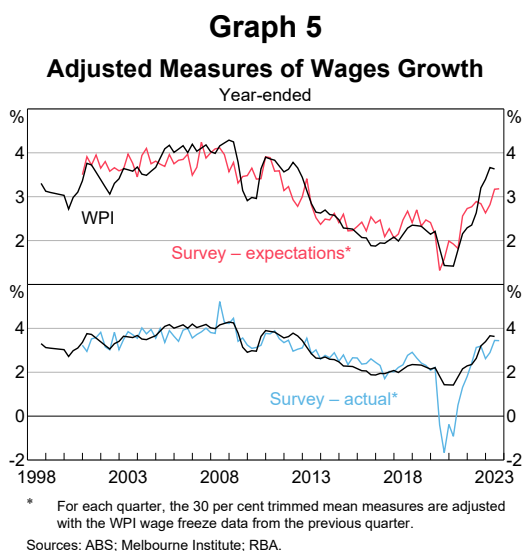
of earnings types (base wages, overtime, bonuses, superannuation and allowances) but is available at a weekly frequency and released with a one month lag. Our measures track a fixed basket of jobs over time and thereby abstract from compositional changes in the labour market.<sup>[4]</sup> In this sense, they are like the WPI.

### Smoothing out volatility by tracking earnings per job

We track earnings changes for workers in a given job over time to construct an STP earnings per job measure ('STPE per job'). By tracking earnings growth *within* jobs, we abstract from most of the compositional changes in the labour market that drive volatility in AENA.<sup>[5]</sup>

Growth in STPE per job provides a clearer signal on underlying momentum in average earnings per worker, especially during periods of significant compositional change. To demonstrate this, Graph 6 shows a measure of average earnings per job based on STP data that is *not* adjusted for compositional change (derived from publicly available information from the ABS's Weekly Payroll Jobs release). The unadjusted measure shows a sharp decline in labour income growth in mid-2021. This primarily reflects a compositional shift in the labour force, as many lower paid workers returned to jobs after having previously exited the labour market during pandemic-related lockdowns. STPE per job smooths through these compositional changes by focusing on those workers who continued to be employed and tracking their earnings growth over that time. More recently, growth in STPE per job has been higher than in the unadjusted earnings measure, suggesting that compositional effects have been weighing on earnings.

Although our composition-adjusted measure of average earnings has advantages over measures of AENA per head, a downside of the new measure is that it has a relatively short history, which makes it difficult to establish where a given reading sits relative to the long-run average for the series. The short history also means it is difficult to remove seasonal variation (as standard seasonal adjustment methods typically require several years of data to be effective).



### Adding LFS microdata to measure earnings per hour

Another limitation of the STP data is that it has no information on hours worked. This means that a measure of growth in earnings per hour, which is typically the preferred unit for wages analysis, cannot be constructed from the STP data alone. To partly address this, we use microdata from the Labour Force Survey (LFS) to estimate hours worked for those workers who remained in the same job over time.<sup>[6]</sup> The hours measure is combined with the STPE per job measure to create a timely, composition-adjusted STP earnings per hour measure ('STPE per hour'), which can provide a clearer signal on underlying growth in AENA per hour. The use of LFS microdata (based on a monthly survey) decreases the frequency at which the STP-based measure can be calculated, from a weekly to a monthly basis. The timeliness of the measure is unaffected, however, as the ABS releases the LFS microdata in a timely manner after each official LFS release.

After making compositional adjustments to the measure of hours worked (the denominator in STPE per hour), there is still a moderate amount of volatility in the STPE per hour measure; this may make it difficult to interpret changes in the measure from month to month. Focusing on the trend instead, the STPE per hour results suggest that growth in total take home pay for workers that

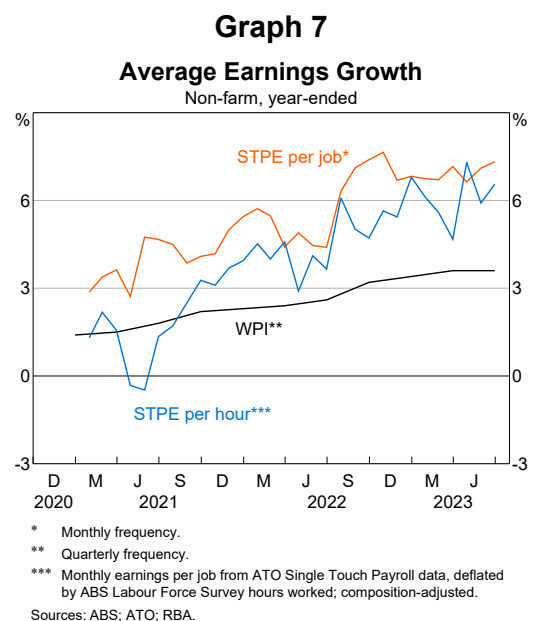
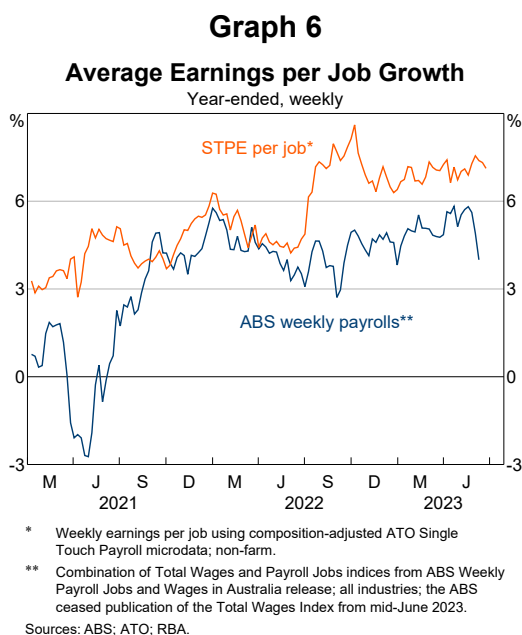
remained with the same employer has been around 5–6 per cent over the past year, well above recent readings for the WPI and similar to STPE per job (Graph 7).

Like with STPE per job, the short history of STPE per hour makes it difficult to be definitive about whether these recent outcomes are 'strong' in the context of the series itself. However, the upward trend is in line with the recent signal coming from WPI and would be consistent with the strong labour market and robust growth in non-base wage components of remuneration.

Changes to STP data collection over time will facilitate improvements to composition-adjusted STP-based earnings measures. For example, the ATO will soon start collecting data on casual and part-time worker status, along with separable data on ordinary time earnings, bonuses and paid leave (ATO 2022). The increasing length of the series over time will also facilitate the development of monthly and quarterly growth rates measures that can be seasonally adjusted.

### Other timely measures of wages growth

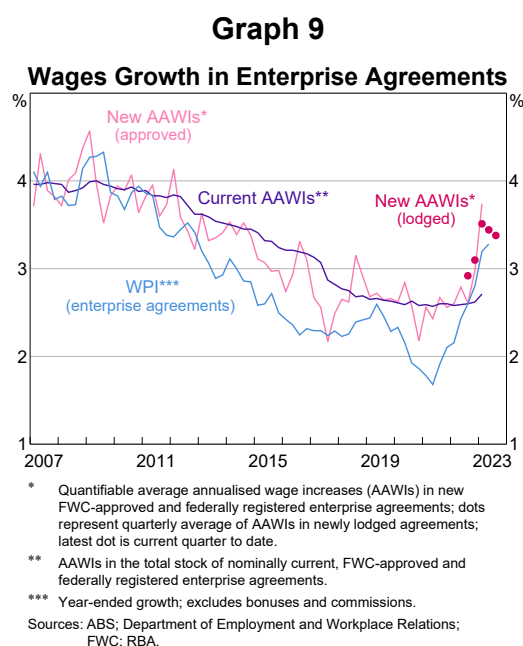
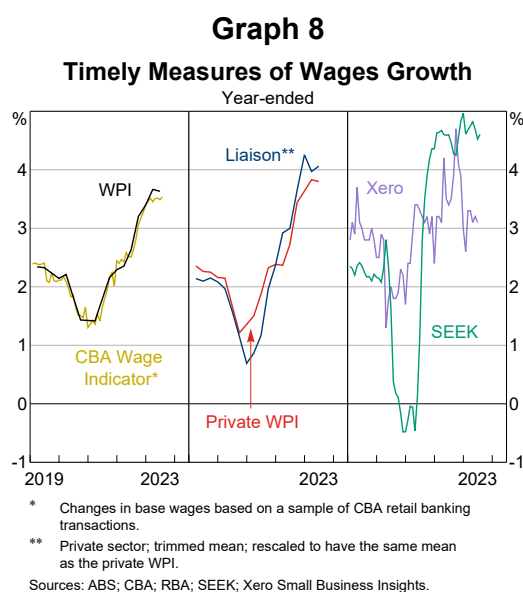
In addition to the newly developed measures discussed above, the Bank monitors several other wages growth indicators that provide additional sources of timely information. These measures are typically available less than one month after their





respective reference period and include the following:

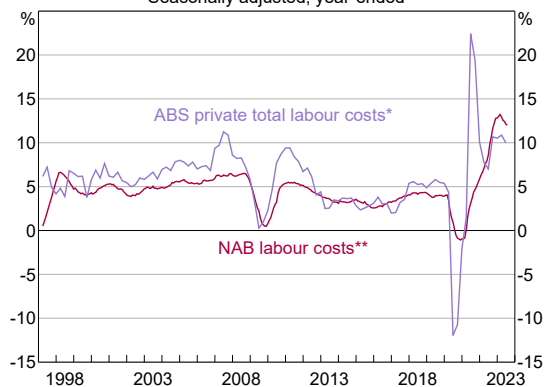
- The Reserve Bank produces a measure of **private sector wages growth** using insights drawn from its liaison program.<sup>[7]</sup> The measure describes actual average base wages growth, as reported by firms in liaison each month. It has historically tracked private sector WPI closely (Graph 8 – ‘Liaison’).
- The Commonwealth Bank of Australia (CBA) produces a monthly indicator that uses data on labour income paid into customer bank accounts to track **base wages growth** over time. CBA imposes restrictions on the data to filter out changes in earnings that are unlikely to relate to base wages (Graph 8 – ‘CBA Wage Indicator’).
- The SEEK Advertised Salary Index tracks **growth in advertised salaries** for jobs posted on the SEEK platform (Graph 8 – ‘SEEK’).
- Xero produces an indicator of **hourly wage growth for small businesses** using anonymised and aggregated data as part of its Xero Small Business Insights program, which covers hundreds of thousands of small businesses (Graph 8 – ‘Xero’).
- The Fair Work Commission (FWC) publishes an indicator of **average annualised wage increases** for enterprise agreement approval applications lodged with the FWC in the most recent fortnight (Graph 9). The indicator captures agreements covered by the federal workplace relations system, which includes the vast majority of private sector agreements and some public sector agreements in a handful of jurisdictions.<sup>[8]</sup>
- National Australia Bank (NAB) produces measures of growth in **total labour costs** from its monthly and quarterly business surveys (Graph 10 – ‘NAB labour costs’). These are designed to track growth in total labour costs, which is affected by the quantity of labour as well as growth in wages.





**Graph 10****Growth in Total Labour Costs**

Seasonally adjusted, year-ended



\* Compensation of employees plus payroll taxes, less employer subsidies.

\*\* Rate of growth in survey respondents' total wages bill.

Sources: ABS; NAB; RBA.

**Conclusion**

The new measures of wages and broader earnings discussed in this article are timely and frequent. In this way, they supplement existing official data sources. The Bank will continue monitoring these measures to understand the evolution of labour costs across the economy and their impact on inflation. Future work and improvements in how the data are collected, particularly for STP data, will allow for additional refinements, quality adjustments and further disaggregation of the data by firm and worker characteristics. ↗

**Endnotes**

- [\*] The authors are from Economic Group. They would like to thank Jonathan Hambur and Jess Young for their contributions in preparing this article.
- [1] For more information on this survey data, see Haidari and Nolan (2022). For actual wages growth, respondents are first asked if their 'pay' has increased, decreased or remained the same since this time last year. If they choose increase/decrease, they are then asked to provide a numerical answer in percentage terms; if they respond 'the same', they are automatically given zero. The format of expected wages growth for the following year is similar. While the wording of the questions may prompt information on broader labour income growth, the correlation with the WPI suggests that responses mostly relate to base wages growth (aside from the pandemic period).
- [2] Our analysis covers the period from when the series first became available (April 1997 for wage expectations and May 1998 for actual wages growth) to August 2023. While the survey is monthly, we transform the data to a quarterly basis. As is common with surveys and following the methodology of the Melbourne Institute, we apply a 30 per cent trimming to the data (cutting the largest 15 per cent and smallest 15 per cent of responses) to reduce the effects of extreme responses.
- [3] Another option is to exclude the zero responses when constructing the average. This approach yields measures that overestimate the WPI for most of the sample period. It also has the undesirable effect of systematically excluding genuine wage freezes, which contain legitimate economic information.
- [4] Unlike the WPI, our STP-based measures do not make adjustments for job 'quality' (i.e. within-job changes in the nature of work being performed over time).
- [5] The granularity of the STP data also allows impacts from government wage subsidies such as JobKeeper to be filtered out; such subsidies are included in published measures of labour income and obscure information about how the balance of labour market supply and demand is translating to changes in pay.
- [6] We identify workers with extended spells in the same job using proxy variables from the microdata, as there is no direct identifier of worker–firm relationships in the LFS. In addition, we adjust the hours worked measure to remove volatility associated with fluctuations in paid leave hours (such as annual or long service leave), given STPE per head (the numerator in STPE per hour) includes the income workers receive when they take paid leave.
- [7] For more information on the Bank's liaison program, see Dwyer, McLoughlin and Walker (2022).
- [8] This includes all agencies in the Commonwealth and ACT and most agreements in Victoria, the Northern Territory and Tasmanian local government.

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# Financial Health and Employment in the Business Sector: A Non-linear Relationship

Phil Grozinger <sup>[\*]</sup>



Photo: coldsnowstorm – Getty Images

## Abstract

This article examines how increased financial stress in the business sector negatively impacts employment through the behaviour of firms. It highlights the non-linearity of the relationship between firms' financial health and employment and identifies thresholds that can serve as useful reference points when assessing the resilience of the business sector and risks to macrofinancial stability. Using data at the individual business level, this article finds that employment outcomes are significantly worse for firms with a profit margin below 5 per cent or with a cash surplus (i.e. cash assets plus cash profit) of less than 10 per cent relative to sales.

## Introduction

It is important to understand how financial stress affects the employment decisions of individual businesses; if many firms experience and respond to stress at the same time, this can have implications both for the broader economy and macrofinancial stability. Firms typically respond to a fall in sales by scaling down their operations, resulting in job losses. These job losses are likely to be larger for firms that are constrained by their financial position. Accordingly, if a greater share of firms are in a vulnerable financial position, an economic downturn could lead to worse aggregate employment outcomes than otherwise. This could

mean higher rates of unemployment, placing stress on households via a loss of income.<sup>[1]</sup>

Previous work on Australian business sector resilience has mainly focused on the risk of business failure (Kenney, La Cava and Rodgers 2016; RBA 2020). However, business failure is only one way financial stress can lead to job losses. In many cases, the ability of a firm to scale down its workforce in a downturn may actually help it avoid insolvency.

This article explores how financial stress affects employment using firm-level microdata from the Australian Bureau of Statistics. It ultimately finds that poor financial health negatively affects

employment, and that this relationship is non-linear – the effect on employment is much stronger when financial health indicators are below certain thresholds. Monitoring where businesses are relative to these thresholds is useful for assessing broader risks to macrofinancial stability.

### Methodology and data

To undertake this research, I first modelled the dynamics between changes in nominal sales and changes in headcount and examined how they differ across industries and firm size. Then, I extended this model with indicators of financial health – namely, the profit margin and the cash surplus (cash assets plus the cash profit) – and observed how the relationship changes.

The analysis was based on annual data from the Business Longitudinal Analysis Data Environment (BLADE), which includes comprehensive financial information on Australian businesses sourced from tax and administrative records. The data cover the financial years 2006–2019. The analysis was limited to non-financial companies with at least five employees and more than \$1 million in annual sales. On average, the analysis covered 28,138 firms with a total of 3.3 million employees per year and captured roughly 35 per cent of non-financial private sector employment.

### The relationship between falling sales and job losses

The first part of this analysis focuses on understanding the relationship between falling nominal sales and employment. This can then be used as the foundation on which to explore the additional effect of financial stress.

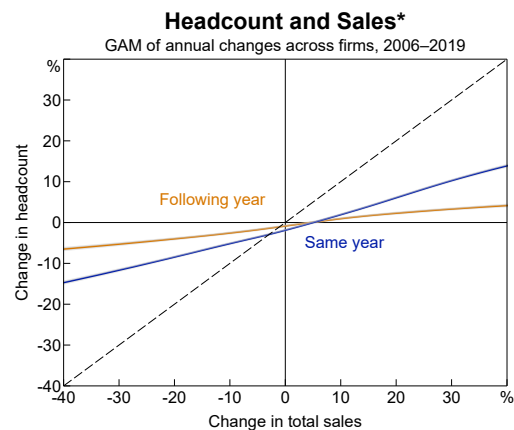
A simple way to illustrate the relationship between changes in sales and changes in headcount is to plot a smooth curve through the data. To estimate this curve, a generalised additive model (GAM) framework was used as it does not impose a specific model for the relationship and allows for lagged interactions – that is, the relationship between changes in sales in a given year and changes in headcount in the following year (see Appendix A). The estimated curves are plotted in Graph 1.

These curves capture the correlation between the two variables, rather than the causal effect of one variable on the other. From this, three key characteristics of the relationship between sales and headcount could be identified:

1. *The slopes of the curves are relatively flat.* Changes in headcount tend to be smaller relative to changes in sales. For example, a 20 per cent fall in sales is associated with an 8 per cent fall in headcount within the same year and a further 4 per cent in the following year. This suggests that most firms do not adjust employment fully in line with annual fluctuations in sales.<sup>[2]</sup>
2. *The horizontal intercepts are positive.* On average, firms hold their workforce constant if sales grow by around 5 per cent. This can be thought of as the effect of firm-level inflation (given the data measure nominal rather than real sales) and productivity growth, both of which increase sales without the need for a firm to expand its workforce.
3. *The relationship is approximately linear.* Job losses at the firm level tend to increase broadly in line with declines in sales, irrespective of how large that decline is. There is no general threshold for a fall in sales after which job losses intensify.

These observations are not overly surprising. However, they are useful in providing a verified baseline for the remainder of the analysis.

**Graph 1**



\* Changes in headcount associated with a change in annual total sales, using a generalised additive model with year fixed effects; adjusted  $R^2 = 0.103$ ; shaded grey is a 95% confidence interval; dashed line is where the change in sales equals the change in headcount.

Sources: ABS; RBA.

To examine which types of firms tend to have the largest decline in the size of their workforce for a given fall in sales, this model was applied to various industries and then to firms of various sizes.

**By industry**

Graph 2 shows the declines in headcount associated with a 20 per cent fall in sales, by industry.<sup>[3]</sup> It shows that job losses tend to be larger for firms in the accommodation and food services industry – a 20 per cent fall in sales is associated with a 17 per cent decrease in headcount over two years. Firms in the wholesale industry tend to have smaller decreases in headcount than other firms for a given fall in sales. However, more generally, the differences between industries are quite small.

**By firm size**

For a given fall in sales, Graph 3 shows the total associated change in headcount (i.e. over the current year and the next) by firm size. There are only slight differences in the relationship across firms of different size, and these are not statistically significant.

**Financial health indicators and employment outcomes**

The analysis now turns to the impact of a firm’s financial health – including profitability, cash reserves, and the new metric of ‘cash surplus’ – on its employment outcomes.

To do this, indicators of financial health were included in the previously estimated model (see Appendix A). By using the same framework as above, it is possible to estimate how these indicators correlate with changes in headcount while controlling for changes in sales.

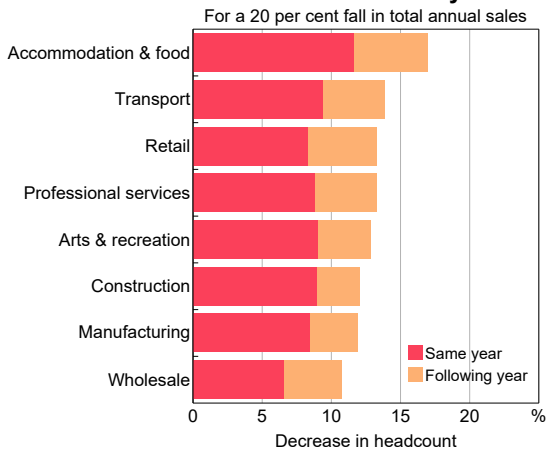
**Profitability**

To begin, the relationship between profit margins and changes in headcount was estimated. Unsurprisingly – since insufficient profitability is a common driver of financial stress – it was found that the level of profitability affects changes in employment. Graph 4 shows that firms with low or negative profit margins in the previous year tend to have larger job losses (or lower headcount growth) relative to firms with higher profit margins. For example, a profit margin of –10 per cent tends to subtract around 5 percentage points from the change in headcount, irrespective of the change in sales.

The relationship between firm-level profit margins and changes in headcount shown in Graph 4 is not linear. For firms with a profit margin below 5 per cent, a decline in profitability is correlated with a much greater effect on headcount than for those above this threshold. This suggests that if many firms are at or near this 5 per cent threshold, a further shock to profitability in a downturn could lead to an escalation in the pace of job losses. While broader business profitability is relevant for assessing risks to aggregate employment and

**Graph 2**

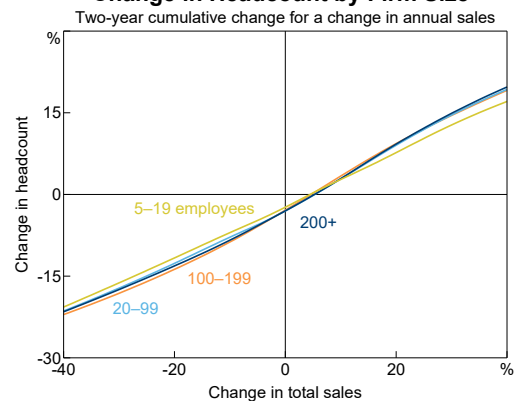
**Decrease in Headcount by Industry\***



\* Changes in headcount associated with a change in annual total sales, using a generalised additive model with year fixed effects; adjusted R<sup>2</sup> ranges from 0.051 to 0.141; selected industries; 2006–2019. Sources: ABS; RBA.

**Graph 3**

**Change in Headcount by Firm Size\***



\* Change in headcount (over two years) associated with a change in annual total sales, using a generalised additive model with year fixed effects; adjusted R<sup>2</sup> = 0.106; 2006–2019. Sources: ABS; RBA.

macrofinancial stability, this analysis suggests that the distribution of firms around this 5 per cent threshold is particularly important.

Beyond profitability, the size of a firm's cash reserves is also important to its financial health. Some unprofitable firms hold sufficient cash to avoid financial stress and therefore may not need to reduce their workforce. This includes start-ups, which tend to hold cash to cover losses in the short to medium term while they attempt to grow and become profitable over the longer term. These firms are likely to increase the size of their workforce even though they are unprofitable; this might explain why the very negative profit margins in Graph 4 are not correlated with even greater job losses.

**A new measure of financial stress – cash surplus**

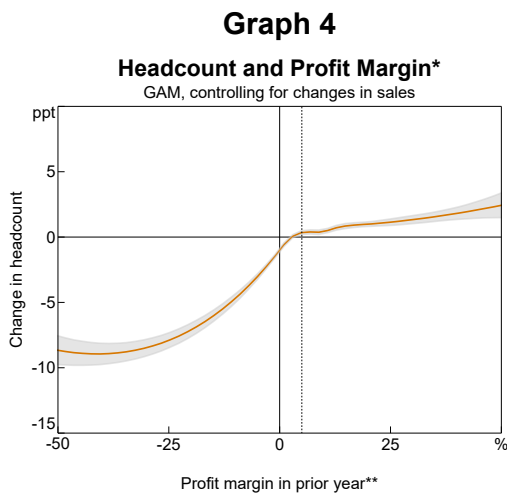
To observe the combined effect of low cash reserves and weak or negative profits, a new financial stress metric was constructed – the ‘cash surplus’ – calculated as liquid assets held by the firm at the start of the year plus net cash inflows (i.e. the cash profit) throughout the year (see Appendix B). A negative cash surplus signifies financial stress. That is, the firm did not have enough cash available to cover all of its expenses over a given year (including interest expenses) and was forced to finance the shortfall through at least one of the following three options:

1. increasing liabilities – for example, by drawing on credit facilities and/or extending payment times
2. liquidating non-current assets
3. receiving an equity injection – for example, via recapitalisation.

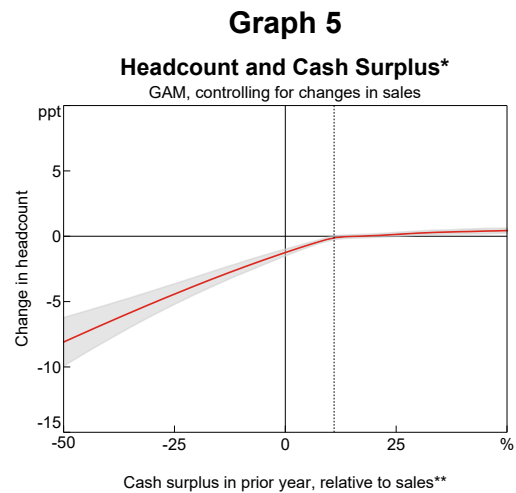
Graph 5 shows the relationship between the cash surplus and changes in headcount. As with profitability, firms with a low or negative cash surplus in the previous year tend to have greater job losses (or lower growth in headcount). It was also found that the cash surplus has little effect on headcount for values greater than 10 per cent of sales. This change in behaviour suggests that a cash surplus of 10 per cent is an informative threshold for measuring financial stress. Again, as with profitability, the distribution of firms near this threshold is important for understanding broader risks.

**Conclusion**

On average, firms tend to scale their workforce in line with changes in sales, but this relationship is significantly affected by financial stress. Indicators of financial health exhibit clear thresholds at which the behaviour of firms appears to change – that is, when firms become financially stressed. Employment outcomes are significantly worse for firms with a profit margin below 5 per cent and for



\* Change in headcount associated with the profit margin in the prior year, using a GAM with controls for changes in sales and lagged sales and year fixed effects; adjusted R<sup>2</sup> = 0.105; shaded grey area is a 95 per cent confidence interval; 2006–2019.  
\*\* Profit margin calculated based on earnings before tax, depreciation and amortisation.  
Sources: ABS; RBA.



\* Change in headcount associated with the cash surplus in the prior year, using a GAM with controls for changes in sales, lagged sales and year fixed effects; adjusted R<sup>2</sup> = 0.103; shaded area is a 95 per cent confidence interval; 2006–2019.  
\*\* Cash surplus calculated as cash assets at the start of the year plus the cash profit.  
Sources: ABS; RBA.

those with a cash surplus of less than 10 per cent relative to sales.

From the perspective of monitoring risks, the profit margin threshold is particularly useful because the relevant data are timely. Administrative data on income and expenses of most Australian firms are currently available at a quarterly frequency and generally within six months of the end of the quarter. The cash surplus focuses directly on financial stress and the identified threshold is therefore informative about the decision-making process by the firm. However, the required data are generally only available at an annual frequency and

with a two-year delay, making it less useful for monitoring.

Overall, the above results provide evidence that increased financial stress in the business sector – as would be expected in an economic downturn – can negatively impact employment through the behaviour of firms. The effect of financial health on employment is non-linear and exhibits threshold effects. Monitoring the distribution of firms around the identified profitability and cash surplus thresholds is therefore important for assessing risks to employment and macrofinancial stability. ✎

## Appendix A: The generalised additive model (GAM)

The estimates of the relationship between the change in sales  $y$  and change in headcount  $h$  for firm  $i$  in period  $t$  shown in Graph 1 were produced using a GAM (see Hastie and Tibshirani 1990), where  $f_0$  and  $f_1$  are smooth cubic spline functions,  $\alpha$  is a time fixed effect and  $\epsilon$  is normally distributed with zero mean.

$$\Delta h_{it} = \sum_{k=0}^1 f_k(\Delta y_{i,t-k}) + \alpha_t + \epsilon_{it}$$

For this analysis, headcount was measured as the number of individual pay-as-you-go statements reported by the firm for a given financial year. This measure will vary with the level of worker turnover and broader labour market factors. The time fixed effect should control for common changes in these factors.

The extended version of this model used for Graphs 4–6 added additional smooth functions of financial health indicators, such as the lag of the profit margin  $\pi$ .

$$\Delta h_{it} = f_{\pi}(\pi_{it-1}) + \sum_{k=0}^1 f_k(\Delta y_{i,t-k}) + \alpha_t + \epsilon_{it}$$

These models were estimated using restricted maximum likelihood (REML). For more details on estimating GAMs using REML, see Wood (2011) and Wood (2017).

## Appendix B: Cash surplus measure

The cash surplus in period  $t$  is calculated as the sum of cash assets at the start of the period (i.e. at the end of the previous period) and the cash profit over the period:

$$\text{cash surplus}_t = \text{cash assets}_{t-1} + (\text{cash income}_t - \text{cash expenses}_t)$$

Given the available data, this analysis measured cash assets as current assets less accounts receivable. Cash income was calculated as earnings before tax, depreciation and amortisation, less the change in accounts receivable. Similarly, cash expenses were calculated as total expenses (excluding depreciation or capital expenditure) less the change in accounts payable.

A negative cash surplus signifies that a firm was in financial stress during that period. This is because, by definition, the firm did not have enough cash available to cover all of its expenses over the given year and was



forced to finance the shortfall by either increasing liabilities, liquidating non-current assets, receiving an equity injection or through a combination of these.

## Endnotes

- [\*] The author is from Financial Stability Department.
- [1] Firms with a more flexible workforce will also be able to reduce total hours worked (see Bishop, Gustafsson and Plumb 2016). However, job losses have greater potential to cause financial stress for households than a marginal reduction in hours.
- [2] Firms' expectations about future sales are likely to play a role here. If firms expect a downturn to be temporary, firms might retain some surplus workers to avoid a costly rehiring process once sales recover. Similarly, firms might hesitate to hire if they expect that an increase in sales will be temporary.
- [3] The estimated curves at the industry level exhibited similar characteristics to those shown in Graph 1, though with slightly different slopes and intercepts. The variation across industries in Graph 2 partly reflects different behaviour, which could be due to differences in labour intensity, the number of casual workers, or the broader cost structure. But it also reflects small differences in inflation and productivity growth over the estimation period.

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# Reading through the Lines: Price-setting Indicators from Earnings Calls

Tomas Cokis, Callan Windsor and Max Zang <sup>[\*]</sup>



Photo: wakila – Getty Images

## Abstract

This article explores how information in earnings call transcripts from Australian firms can contribute to the Reserve Bank's understanding of their price-setting behaviour, as a complement to information gathered from the Bank's liaison program. A large language model is used to process and analyse earnings call transcripts and construct new sentiment indicators for input costs, demand, prices and supply shortages from them. These indicators, starting in 2007 and updated to capture the latest August earnings season, provide useful information about economic conditions and price-setting behaviour, including about developments during the recent period of unusually high inflation.

## Introduction

Consumer price inflation in Australia, as in other countries, has been unusually high in recent years. While demand conditions have played an important role, supply-side factors have been the biggest driver of the increase in inflation and have been front of mind for company executives and policymakers (Graph 1).<sup>[1]</sup> These pressures have moderated recently, and inflation has passed its peak; however, it is forecast to remain high for some time yet.

The impact of these upstream cost increases on consumer prices is not well captured by inflation models, and so other alternative and timely sources of information are important in assessing the inflation outlook. For this reason, the Reserve Bank has been monitoring firms' price-setting behaviour using insights from the Bank's liaison program. This article describes an approach involving use of a large language model to process and analyse earnings call transcripts and construct new sentiment indicators based on what firms have said about input costs, demand conditions, final prices and supply shortages. These indicators

complement other statistical information, including from the business liaison program. They also allow us to draw inferences about the determinants of firms’ pricing behaviour.

### Analysing earnings calls using a large language model

Earnings call transcripts are a rich source of information about firms’ own business conditions and economic and financial conditions more broadly. Earnings call transcripts also offer qualitative information that is not captured by traditional financial statements or other quantitative data. The sentiment and language used by executives during these calls provides additional context, nuance and insights that is valuable for economists trying to understand how firms make choices and how those choices affect prices.

Earnings calls typically take place a few hours after the release of earnings results. Most large listed Australian firms hold earnings calls during the February and August ‘earnings season’, covering results over the period to December and June, respectively, although there are several firms that release their results on a different schedule. During the calls, company executives deliver prepared remarks summarising the overall business position of the company and the operating environment. This is followed by a question-and-answer session where all interested parties – including institutional and individual investors and expert analysts – can

ask questions about the outlook or probe into other issues.

For our research, we process and analyse around 5,500 earnings call transcripts, involving over 750,000 paragraphs of text from 2007 to the most recent August earnings season.<sup>[2]</sup> The challenge in working with such a rich set of textual data is to systematically examine the transcripts in a way that incorporates the nuance and context of the discussions that took place. Techniques in natural language processing – a field that uses computers to process and analyse large amounts of text – have now advanced to the point where such discussions can be processed and analysed in a meaningful way. This allows us to construct informative quantitative metrics, which we can track over time to examine factors affecting firms’ price-setting behaviour.

To examine the text of the earnings call transcripts we use a large language model.<sup>[3]</sup> Broadly speaking, a large language model is an artificial intelligence algorithm that uses deep learning and was trained on massive amounts of textual data. For each paragraph in a transcript, the model assigns a probability over several pre-defined topic labels independently. To map from a probabilistic measure to an indicator variable, we assign a topic label to a paragraph by giving it a score of +1 if the probability for that label is greater than a pre-defined threshold. In the stylised example shown in Figure 1, the model classifies the paragraph as being about ‘hiring difficulties’ and ‘labour costs increasing’. To construct the ‘labour cost indicator’, we sum the number of paragraphs in the transcript labelled ‘labour costs increasing’, subtract the sum of those labelled ‘labour costs decreasing’ and divide the balance by the total number of paragraphs in the transcript. These scores are then aggregated across all transcripts in each period. In practice, we construct new indicators for a variety of input costs (including labour costs) as well as final prices, demand and references to supply shortages.

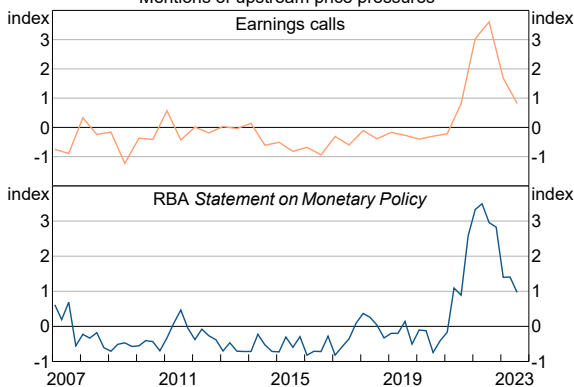
### New indicators complement existing soft information

Graph 2 overlays the new aggregated earnings call indicators for total input costs, demand, final prices

**Graph 1**

**Price Pressures are Front of Mind**

Mentions of upstream price pressures\*



\* Series are standardised to measure the number of standard deviations each series is from its average.

Sources: RBA; Reuters.

and labour costs with similar indicators obtained from the following two sources:

1. **The Reserve Bank’s liaison program** – this is a formal program of economic intelligence gathering established over 20 years ago, through which Bank staff meet frequently with firms from a pool of around 900 active contacts (Dwyer, McLoughlin and Walker 2022). Details of these discussions are systematically recorded in confidential ‘diary notes’. We use the text of these notes to construct indices for input costs, demand, final prices and labour costs using a similar approach as that applied to firms’ earnings calls.
2. **A monthly survey of around 400 firms from the National Australia Bank (NAB)** – this is a survey designed to produce statistical indices related to business conditions. We compare our text-based indices to the NAB survey-based indices for purchase costs, forward orders, selling prices and labour costs.

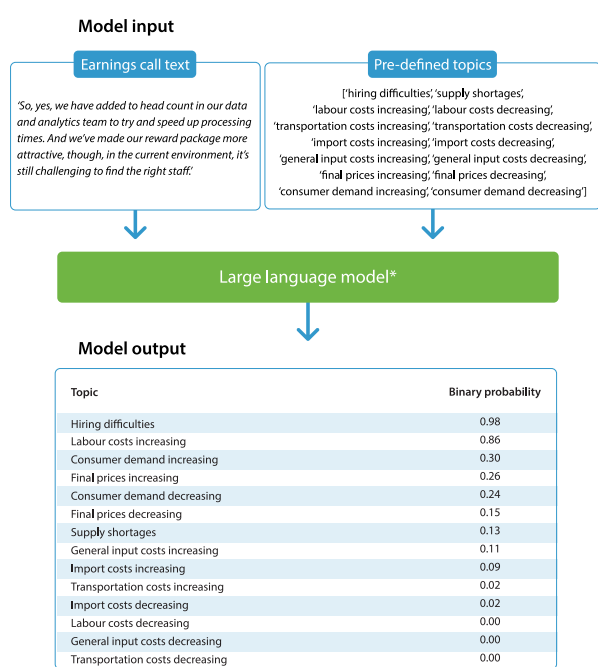
Each source paints a similar picture about recent developments in costs, prices and demand. This is useful for economic analysis, providing confidence

in the signal extracted from the liaison program. This is especially true given each source of information has its own strengths and weaknesses.

Earnings calls provide consistent firm-level information from many firms over time and allow for different indices to be constructed and monitored. However, earnings calls are limited to larger listed companies and most of the information is only updated during the earnings season. Information from the Reserve Bank’s business liaisons are timelier, but the composition of firms changes from period to period and responses are influenced by the topics that are covered. Finally, business survey indicators provide consistent information over time, but sample sizes tend to be smaller, firm-level information is not readily available and analysis is limited to a small number of pre-existing indicators.

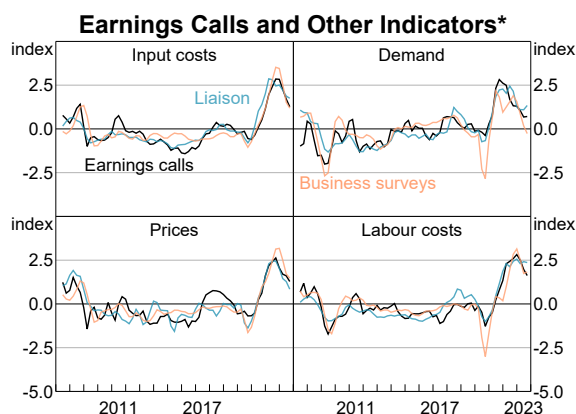
The more disaggregated measures of input cost indices from earnings calls also align with other relevant indicators. For instance, transportation bottlenecks, as well as other supply disruptions, resulted in the recent sharp rise in goods price inflation. The COVID-19 pandemic limited the capacity of domestic and global firms to produce and deliver products and Russia’s invasion of Ukraine led to sharp increases in the prices of energy and other commodities. Broadly in line with other indicators of shipping costs and delivery times, the earnings call indices confirm that supply disruptions and increased transport costs were prominent issues from 2021 onwards (Graph 3). The

**Figure 1: A Stylised Example Classification from the Large Language Model**



\* Zero-shot text classifier (bart-large-mnli). Source: RBA.

**Graph 2**



\* Series are standardised to measure the number of standard deviations each series is from its mean value; rolling quarterly six-month average.

Sources: NAB; RBA; Reuters.

more recent decline in these earnings call measures has been less pronounced, which could reflect coverage of past events in earnings calls, that earnings calls are capturing a broader sense of supply constraints than just those two factors, or that supply disruptions can impact firms with a long lag.

### New indicators track official statistical measures

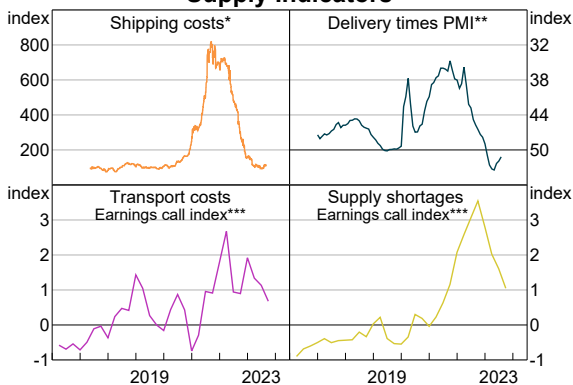
Our new aggregated indicators for input costs, labour costs and prices obtained after the February and August earnings seasons can be compared to official statistics for the growth in producer prices (PPI), compensation of employees (COE) and consumer prices (CPI) over the six months to March and September, respectively. Graph 4 shows the results of such a comparison. The correlations show that over the past 15 years or so, the highest associations between our new indicators and their related statistical counterparts occurs when the series are compared to each other in the same period, with peak correlations of between 0.75 and 0.5.<sup>[4]</sup> The exception is the earnings call indicator for prices, with the peak correlation occurring when the new indicator leads consumer price inflation by six months. This exercise suggests that information derived from earnings calls obtained immediately after the February and August earnings seasons correspond well to official statistics.<sup>[5]</sup>

Developments in the new earnings call indicators can also be compared to developments in the official statistics over the recent period of high inflation. The broader earnings call index for input costs seems better at capturing the role of global factors in recent inflation outcomes, relative to the more disaggregated index for import costs (Graph 5). In particular, the input cost index picked up the recent pressure on firms costs from global goods price inflation a little sooner, and more clearly than the import cost index. The later and smaller increase in the import costs index could reflect a tendency for discussions in earnings calls to focus on specific causes (e.g. the invasion of Ukraine, or the shortage of semiconductors), or perhaps even specific prices, rather than identifying and distinguishing the domestic versus imported origin of price pressures. It could also reflect that higher global goods prices impact Australian inflation through an increase in the prices of domestically produced materials, because of integration between the domestic and foreign markets. For instance, increases in global timber prices contributed to higher prices for Australian timber, which in turn contributed to strong inflation in new dwelling construction costs.

The earnings call indicator for labour costs is consistent with official data showing a substantial increase in labour costs over the past year. Graph 6 shows the sharp rise in average earnings per worker, and the substantial increase in market services inflation, which includes parts of the CPI

**Graph 3**

**Supply Indicators**

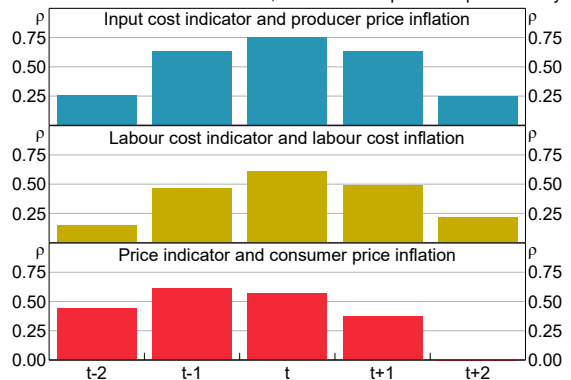


\* 2017–2019 average = 100.  
 \*\* Purchasing Managers' Index; inverted scale.  
 \*\*\* Series are standardised to measure the number of standard deviations each series is from its mean value; rolling quarterly six-month average.  
 Sources: RBA; Reuters.

**Graph 4**

**Earnings Call Indicators and Official Statistics**

Correlations with official statistics, March and September quarters only



Leads and lags of the earnings call indicators  
 Sources: RBA; Reuters.

where labour is the most important cost for businesses.

More broadly, supply factors and strong demand have contributed to the pick-up in CPI inflation since 2021, according to several methods for assessing their relative contribution (Beckers, Hambur and Williams 2023). The new earnings call indices support this evidence, confirming that a pick-up in demand contributed to stronger inflation outcomes from 2021, alongside disruptions to supply (Graph 7). More recently, the earnings call demand index has declined by more than some other indicators.

### Firm-level insights into price-setting behaviour

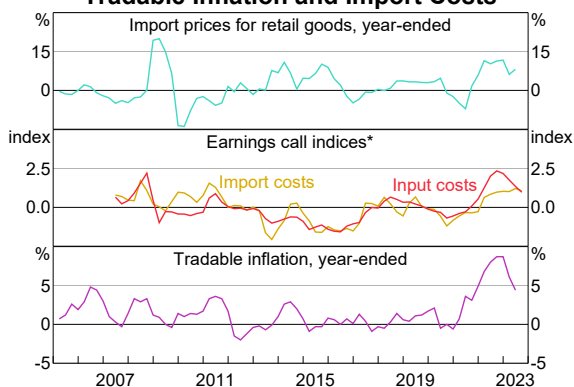
Because the new earnings call indicators are available at the firm level, we can use them to examine correlations between the sentiment of firms' discussions about final prices and the sentiment of their discussions about input costs and demand. This allows for inferences to be drawn about the determinants of firms' pricing behaviour that could be relevant for understanding the dynamics of the inflation process. To estimate these conditional correlations, we use the regression analysis outlined in Appendix A, with our full regression results provided there.

Three findings from this empirical exercise stand out:

1. Final price sentiment has a stronger association with sentiment about input costs compared to sentiment about demand, after controlling for changes in the operating environment that are common to all firms, including the effect of global supply shocks. This is consistent with survey-based findings that firms' predominant pricing strategy is to set prices as a mark-up over costs (Park, Rayner and D'Arcy 2010).
2. Discussions on final prices appear to have become more sensitive to (or at least more correlated with) sentiment about import costs in the post-COVID operating environment, after

**Graph 5**

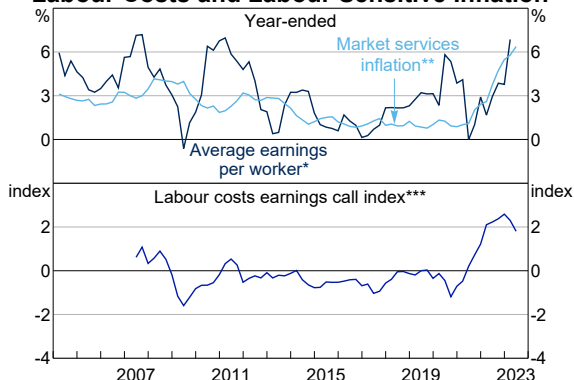
#### Tradable Inflation and Import Costs



\* Series are standardised to measure the number of standard deviations each series is from its mean value; rolling quarterly six-month average. Sources: ABS; RBA; Reuters.

**Graph 6**

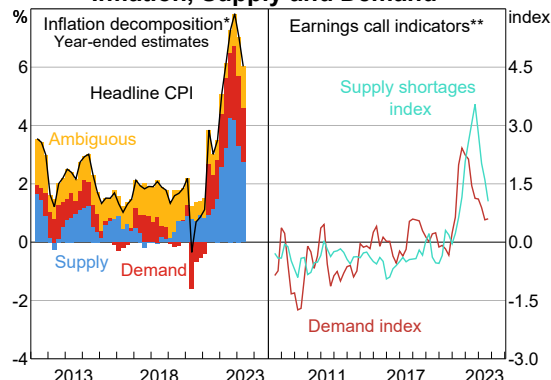
#### Labour Costs and Labour Sensitive Inflation



\* Non-farm.  
\*\* Excluding domestic holiday travel and accommodation.  
\*\*\* Series is standardised to measure the number of standard deviations it is from its mean value; rolling quarterly six-month average. Sources: ABS; RBA; Reuters.

**Graph 7**

#### Inflation, Supply and Demand



\* Based on the methodology of Shapiro (2022); 'ambiguous' indicates the contribution from components where the change in prices or quantities is within 25 per cent of the expected change and the contribution from unmodelled components due to data limitations.  
\*\* Series are standardised to measure the number of standard deviations away each series is from its mean value; rolling quarterly six-month average. Sources: ABS; RBA; Reuters.



controlling for changes in the operating environment that are common to all firms. This could indicate that firms have become more attuned to changes in import costs since 2021.

3. Final price setting sentiment has a stronger association with input costs when the change in sentiment is positive compared to when the change in sentiment is negative. This suggests that rising prices are likely to remain front of mind for company executives even as supply pressures moderate. This asymmetry is consistent with the type of firm-level behaviour reported for US firms in Pitschner (2020) from an analysis of the text of corporate filings.

Finally, we can run a similar regression to that in Appendix A but allow the correlation between demand and input costs with final prices to vary by industry. In this regression we control for changes in the operating environment that are common to all firms in an industry. We find the association between price-setting sentiment and input cost/ demand sentiment differs significantly across industries, suggesting there is significant heterogeneity in firms’ price-setting behaviour.

These experimental findings appear to indicate that aggregate price-setting behaviour could depend on the source of the shocks firms face (demand- or cost-driven), the direction of the shock (with firms’ reacting more to cost increases relative to decreases), and which industries are most affected.

### Appendix A: Regression analysis

The following panel regressions are run to estimate the association between the sentiment of firms’ discussions about final prices and the sentiment of their discussions about input costs and demand using data from 2007:

$$p_{it} = \alpha_i + \theta_t + \gamma_1 \text{dem}_{it}^{07-20} + \gamma_2 \text{dem}_{it}^{21-23} + \sum_{n=1}^N \beta_{1,n} \text{ic}_{n,it}^{07-20} + \sum_{n=1}^N \beta_{2,n} \text{ic}_{n,it}^{21-23} + e_{it}$$

Here  $p_{it}$  denotes the final price sentiment index for firm  $i$  in time period  $t$ , measured at a quarterly frequency.<sup>[6]</sup> The term  $\text{dem}_{it}^{07-20}$  is the demand sentiment index from firms’ earnings calls from 2007 to 2020, while  $\text{dem}_{it}^{21-23}$  is the index from 2021. Likewise,  $\text{ic}_{n,it}$  is the input cost sentiment index  $n \in N$ . Including separate coefficients for each time period allows us to examine if there is anything different about the period since 2021 – which has been characterised by sizable supply shocks – relative to the historical sample.

All regressions include firm,  $\alpha_i$ , and time,  $\theta_t$ , fixed effects. The firm fixed effects allow us to control for unobservable differences in the language used by each firm during their earnings calls. The time fixed effects control for changes in the operating environment that are common to all firms.<sup>[7]</sup>

Taken together, this underscores the importance of continuing to develop rich multisector models of the economy to better understand firms’ reactions to different types of shocks.

### Conclusion

This article introduces new sentiment indicators based on earnings call transcripts from Australian firms that are processed and analysed using a large language model. The model can classify text taking account of the subtleties and nuance of natural language. The signal from these indicators about input costs, demand, final prices and supply shortages tracks current economic conditions well. Regression analysis, uncovering conditional correlations between the sentiment of final price discussions and the sentiment of discussions about input costs and demand, allows for inferences to be drawn regarding firms’ price-setting behaviour. The results are consistent with firms using pricing strategies that focus on a mark-up over costs. They are also consistent with firms being more reactive to rising, rather than falling, input costs.

Going forward, the Reserve Bank will use these new sentiment indicators, together with other similar indicators, to monitor developments in current economic and financial conditions. Over time, these indicators will be developed and refined as the capabilities of large language models are further advanced. ✎

In the second regression below, instead of separate coefficients for each time period, we include separate coefficients for demand and input costs according to whether the change in sentiment was positive or negative. This allows us to examine whether price-setting sentiment changes asymmetrically in response to positive or negative changes in input costs or demand sentiment.

$$p_{it} = \alpha_i + \theta_t + \gamma_1 \text{dem}_{it}^{\Delta+ve} + \gamma_2 \text{dem}_{it}^{\Delta-ve} + \beta_1 \text{ic}_{it}^{\Delta+ve} + \beta_2 \text{ic}_{it}^{\Delta-ve} + e_{it}.$$

The full regression results are set out in Table A.1.

**Table A.1: Associations with Final Price Sentiment**

Differences in related coefficient estimates in parentheses, 2007–2023 (September quarter)

|                                       | Aggregate input costs | Aggregate input costs | Disaggregated input costs |
|---------------------------------------|-----------------------|-----------------------|---------------------------|
| Demand <sup>2007–2020</sup>           | 0.085***              |                       | 0.092***                  |
| Demand <sup>2021–2023</sup>           | 0.080***              |                       | 0.084***                  |
|                                       | (–0.048)              |                       | (–0.009)                  |
| Input costs <sup>2007–2020</sup>      | 0.199***              |                       |                           |
| Input costs <sup>2021–2023</sup>      | 0.162***              |                       |                           |
|                                       | (–0.037)              |                       |                           |
| Demand <sup>Δ-ve</sup>                |                       | 0.096***              |                           |
| Demand <sup>Δ+ve</sup>                |                       | 0.081***              |                           |
|                                       |                       | (–0.015)              |                           |
| Input costs <sup>Δ-ve</sup>           |                       | 0.152***              |                           |
| Input costs <sup>Δ+ve</sup>           |                       | 0.193***              |                           |
|                                       |                       | (+0.040*)             |                           |
| Import costs <sup>2007–2020</sup>     |                       |                       | 0.045                     |
| Import costs <sup>2021–2023</sup>     |                       |                       | 0.165**                   |
|                                       |                       |                       | (+0.120*)                 |
| Labour costs <sup>2007–2020</sup>     |                       |                       | 0.076*                    |
| Labour costs <sup>2021–2023</sup>     |                       |                       | –0.003                    |
|                                       |                       |                       | (–0.079)                  |
| Supply shortages <sup>2007–2020</sup> |                       |                       | 0.094                     |
| Supply shortages <sup>2021–2023</sup> |                       |                       | 0.117**                   |
|                                       |                       |                       | (+0.023)                  |
| Transport costs <sup>2007–2020</sup>  |                       |                       | 0.144*                    |
| Transport costs <sup>2021–2023</sup>  |                       |                       | 0.138**                   |
|                                       |                       |                       | (–0.006)                  |
| Sample                                | 5145                  | 4599                  | 5145                      |
| Within R <sup>2</sup>                 | 0.174                 | 0.183                 | 0.122                     |

Note: Standard errors are clustered at the industry level; \*\*\*, \*\* and \* denote statistical significance at the 1, 5 and 10 per cent levels, respectively.

Sources: RBA; Reuters.

## Endnotes

- [\*] The authors are from Economic Group. They would like to thank Tim Taylor, Yad Haidari and Ewan Rankin for their input.
- [1] See Beckers, Hambur and Williams (2023).
- [2] For more details on the textual data and model used to analyse the transcripts, see Windsor and Zang (2023).
- [3] The large language model we use is a zero-shot text classifier called bart-large-mnli (Lewis *et al* 2019), which is available on the open-source Hugging Face repository. Zero-shot learning is a machine learning approach where a model can classify text into unseen categories that were not present in the training data.
- [4] These correlations are a little weaker if the period since 2021 is excluded. This period has been characterised by sizable movements in the indicators and the official statistics.
- [5] For a more in-depth examination of these associations, see Windsor and Zang (2023).
- [6] The methodology used here is similar to that used in Young *et al* (2021).
- [7] For more details of the model used, see Windsor and Zang (2023).

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# Measuring Government Bond Turnover in Australia Using Austraclear Data

Cameron Armour, Leon Berkelmans and Laurence Bristow <sup>[\*]</sup>



Photo: Busakorn Pongparnit – Getty Images

## Abstract

This article provides new estimates using Austraclear data for monthly turnover ratios for Australian Government Securities (AGS) and semi-government bonds (semis). Previous Reserve Bank estimates used Austraclear data that included repo transactions, as acknowledged at the time. In November 2021 Austraclear implemented a change to reporting standards that excluded repo transactions more effectively. This change allows for more accurate estimates of turnover for AGS and semis. The new turnover estimates are considerably lower, suggesting repo activity was a significant part of the previous estimates. The new estimates, with repo transactions excluded, better align with survey data on turnover published by the Australian Office of Financial Management.

## Introduction

There are around \$1.3 trillion of government bonds outstanding in Australia issued by the Australian Government and the states and territories, which is equivalent to around 60 per cent of GDP. Government bonds play a pivotal role in the Australian financial system. Apart from their role of funding governments, their yields are reference rates that help to anchor yields on other securities. Government bonds are considered safe and liquid assets and are held by a variety of investors.

Liquidity is a difficult concept to measure. One indicator of liquidity is turnover – the amount bought or sold over a given time period. The Reserve Bank receives daily transaction-level data from Austraclear, the settlement system for Australian dollar fixed income securities in Australia, and turnover can be calculated using these data. Previous analysis using Austraclear data estimated a monthly turnover ratio for Australian Government Securities (AGS) of around 110 per cent and around

40 per cent for state and local government bonds (semis) (Guo and Zhang 2020).

However, as acknowledged in Guo and Zhang (2020), these estimates included some repurchase (repo) transactions, which had been recorded in Austraclear as outright trades. A repo involves one party selling a security to another party, with an agreement to buy back the security on a predetermined date and at a specified price. These transactions are akin to a collateralised loan, and so do not represent genuine secondary market trading. Government securities are frequently used in private repo transactions, and so the previous analysis overstated the secondary market turnover of these securities.

This article looks at the effects of a change in November 2021 to Austraclear reporting standards, resulting in repo transactions being excluded more accurately. This change coincided with an appreciable drop in measured turnover, suggesting repo activity was a significant part of previously estimated turnover. This is supported by an algorithm, designed to identify repo transactions, that suggests much of the turnover prior to November 2021 was accounted for by repo transactions.

This article also shows that the new estimates align with survey data on turnover published by the Australian Office of Financial Management (AOFM).

## Data and methodology

We use Austraclear settlement data to measure turnover. Security settlements are lodged in Austraclear when counterparties exchange a security registered in Austraclear for cash.<sup>[1]</sup> The Bank began receiving daily data from Austraclear in November 2020.

The data do not represent all trades in the wholesale debt market – they only include trades settled between counterparties that use separate Austraclear accounts.<sup>[2]</sup> Moreover, transactions of Australian dollar denominated securities may be settled through clearing systems other than Austraclear, such as Euroclear or Clearstream.

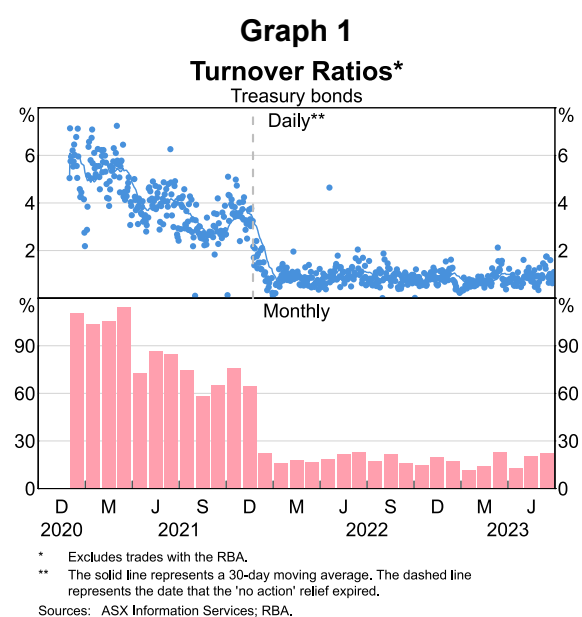
Our focus is on the longer term fixed income market, so we only consider securities with an

original maturity of over one year. We also exclude trades associated with monetary policy; between 2020 and 2022 the Bank was an active participant in government bond markets due to some of the policies introduced during the COVID-19 pandemic, but these interventions were temporary and do not represent typical activity in the market.

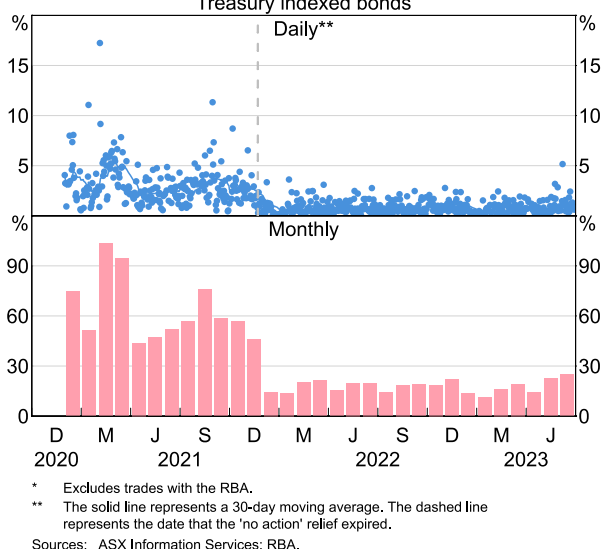
To identify repos prior to November 2021, we revise the detection algorithm described in Garvin (2018). The intuition behind the algorithm is to identify groups of cash movements that resemble a loan followed by a repayment with interest. Relative to Garvin (2018), our detection algorithm uses some revised conditions, specified in Appendix A.

## Excluding repo from turnover

Raw turnover data show that prior to November 2021, turnover in the AGS market averaged between 60 and 120 per cent per month (Graph 1). Turnover for inflation indexed bonds was a bit lower, while for semis it was around 30 to 40 per cent per month (Graph 2; Graph 3). A steep drop in turnover occurred on 22 November 2021 in response to Austraclear's change in reporting standards (see below). After that point, the monthly turnover ratio for AGS has been around 15 to 20 per cent and for semis it has been around 10 per cent.



**Graph 2**  
**Turnover Ratios\***  
Treasury indexed bonds



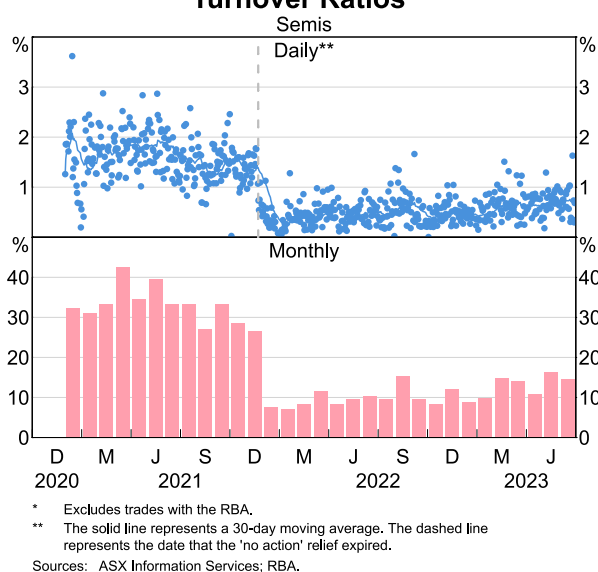
On 22 November 2021 a ‘no action’ relief expired that applied to Austraclear’s regulations. After that point, repo transactions could no longer be booked as outright trades without sanction.<sup>[3]</sup> The fall in turnover after that date can therefore be used to estimate the amount of repo transactions that were previously recorded as outright trades.

This conclusion is supported using the algorithm from Garvin (2018) to identify repo trades. The decline in turnover is accounted for mostly by the decline in trades identified by the algorithm as repo transactions (Graph 4). After the change, there are

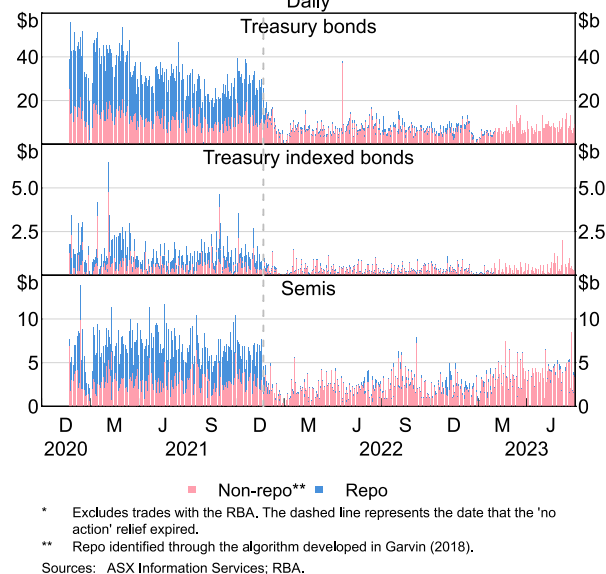
very few transactions left that the algorithm identifies as repos – those remaining are either repos conducted as outright trades in contravention of Austraclear’s regulations, or false positives from the algorithm.

Trades not identified as repo still decline after November 2021, which is most clearly seen when trades are aggregated at the monthly level (Graph 5). The most likely explanation for this is that prior to November 2021 the algorithm is failing to identify some repo transactions. Therefore, in what follows, we focus on the post-November 2021 sample. Given that the algorithm identifies a trivial number of repo transactions after that point, we use the raw data.

**Graph 3**  
**Turnover Ratios\***  
Semis



**Graph 4**  
**Turnover Amount\***  
Daily



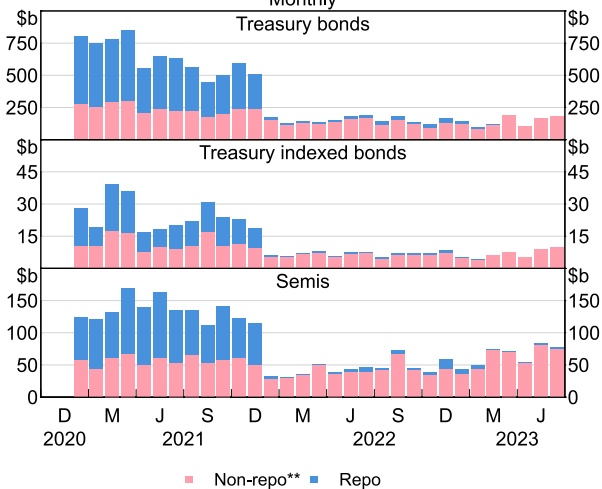


**Table 1: Government Security Turnover Statistics**  
Post-November 2021

|                        | Trades per bond line<br>Monthly average | Average trade size<br>(\$m) |
|------------------------|---|-----------------------------|
| Treasury bonds         | 358                                     | 14.7                        |
| Treasury indexed bonds | 235                                     | 4.0                         |
| Semis                  | 27                                      | 14.2                        |

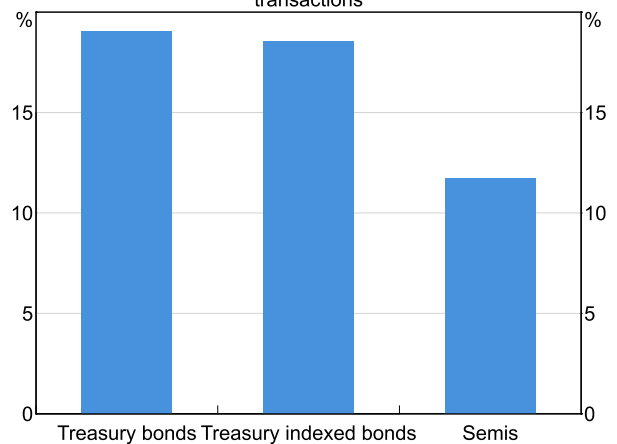
Sources: ASX Information Services; RBA.

**Graph 5**  
**Turnover Amount\***  
Monthly



\* Excludes trades with the RBA.  
\*\* Repo identified through the algorithm developed in Garvin (2018).  
Sources: ASX Information Services; RBA.

**Graph 6**  
**Average Turnover Ratio by Asset Class\***  
Monthly; weighted by outstanding value of bond line transactions



\* For data starting post-November 2021. Excludes trades with the RBA.  
Sources: ASX Information Services; RBA.

**New turnover estimates**

After November 2021, the average monthly turnover ratio for AGS is around 15 to 20 per cent, and for semis it is around 10 per cent (Graph 6). Trade frequency (i.e. for each bond line, the number of times that bond line is transacted over a period of time) is around 350 trades per month for Treasury bonds, about two-thirds that for Treasury indexed bonds, and 27 times per month for semis (Table 1). This is substantially less than estimated by Guo and Zhang (2020). The average trade size is also lower than estimated by Guo and Zhang (2020).

Guo and Zhang (2020) considered turnover ratios by size of the bond lines, concluding that turnover ratios increased by size. That does not seem to be the case for the post-November 2021 sample, where there is no strong relationship between size and turnover (Graph 7).<sup>[4]</sup> However, turnover in dollar terms is higher for larger bond lines. This is driven by a higher number of trades, with trade size again not varying much by the size of the bond line (Graph 8; Graph 9).

**Relationship to Australian Office of Financial Management estimates**

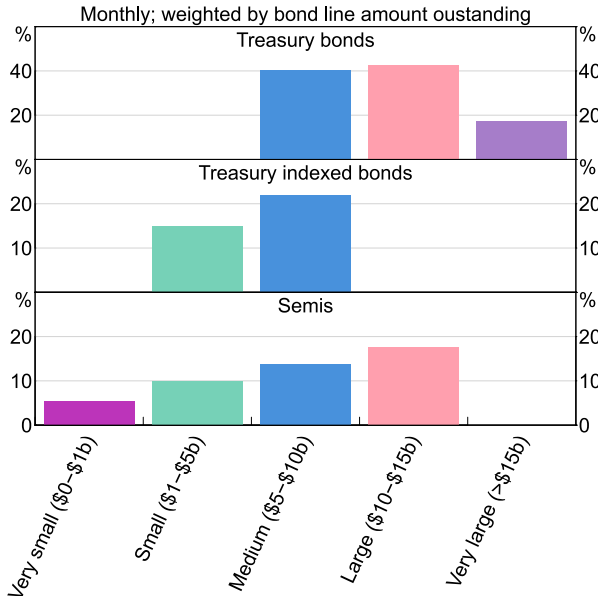
The AOFM conduct a survey of market intermediaries detailing their turnover in AGS every month. While the scope of the AOFM survey is a little different to that of the Austraclear data, the new estimates presented in this article are in line with the AOFM survey (Graph 10).<sup>[5]</sup>

## Conclusion

New estimates using Austraclear data for monthly turnover ratios for AGS and semis are considerably lower than estimates published previously. This is

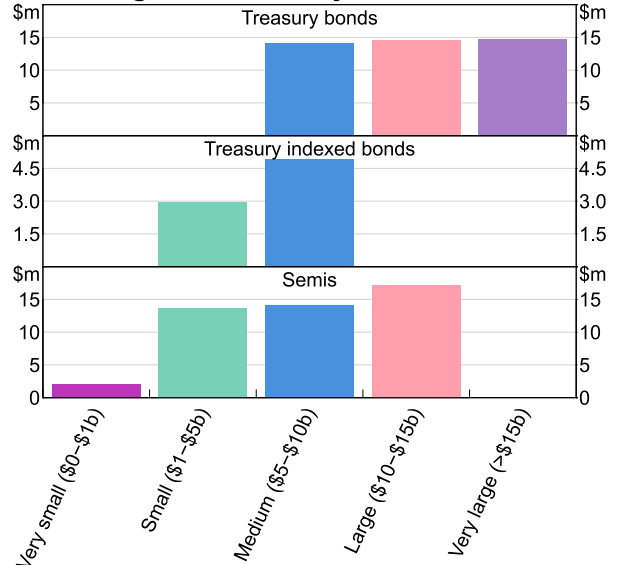
due to the earlier estimates being based on Austraclear data that included repo transactions at the time. A change to Austraclear reporting standards in November 2021 has resulted in repo transactions being excluded more accurately. A detection algorithm used to identify repo transactions from the Austraclear data supports the new turnover estimates, which also better align with turnover data from the AOFM. ↘

**Graph 7**  
Average Turnover Ratio by Bond Line Size\*



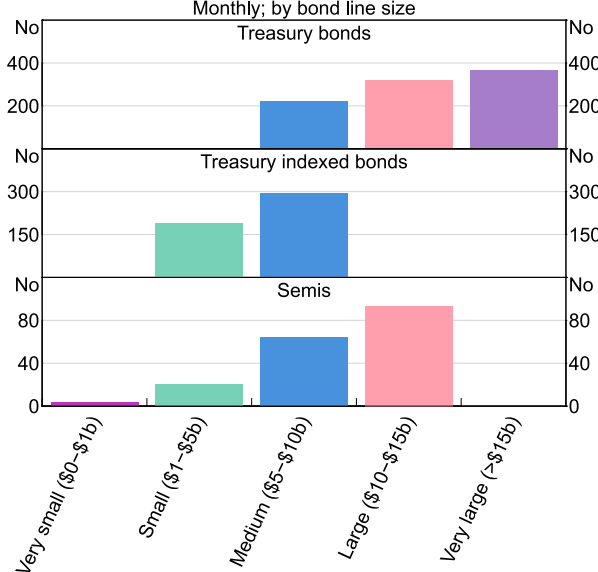
\* For data starting post-November 2021. Excludes trades with the RBA.  
Sources: ASX Information Services; RBA.

**Graph 9**  
Average Trade Size by Bond Line Size\*



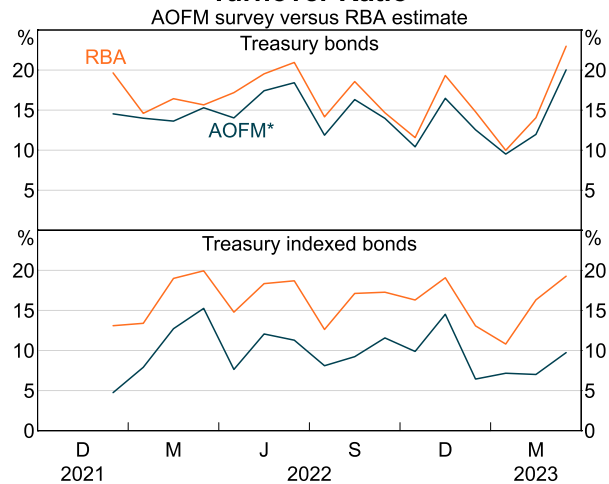
\* For data starting post-November 2021. Excludes trades with the RBA.  
Sources: ASX Information Services; RBA.

**Graph 8**  
Average Trades per Bond Line\*



\* For data starting post-November 2021. Excludes trades with the RBA.  
Source: ASX Information Services; RBA.

**Graph 10**  
Turnover Ratio



\* Includes trades made by the RBA. Excluding RBA trades is possible using the AOFM's quarterly survey. However, doing so does not materially impact the measure of turnover during this period.  
Sources: AOFM; ASX Information Services; RBA.

## Appendix A

Our detection algorithm uses the following conditions to detect repo transactions executed as two offsetting outright trades:

1. Transactions take place between the same two accounts.
2. Transactions involve movement of the same securities.
3. Intraday transactions are excluded.
4. Transactions involve a similar (as opposed to net-zero) transfer of securities; that is, the future value of securities provided as collateral is within  $\pm 10$  per cent of the future value returned.
5. The implied simple interest rate from all cash movements in a transaction falls within a  $\pm 3$  percentage point range of the exchange settlement remuneration rate.
6. If there exist overlapping potential repos satisfying Conditions 1 to 5 above, the repo with fewer transactions is selected.

Several of these conditions are slightly modified from those used by Garvin (2018).

## Endnotes

- [\*] The authors undertook this work while in Domestic Markets Department. They would like to thank Maureen Rocas for assistance in implementing the algorithm from Garvin (2018).
- [1] The data only include securities traded for cash (i.e. 'delivery versus payment' transactions). Austraclear also allows 'free of cash' transactions and 'delivery versus delivery' transactions but these are not included in the dataset used here. These transactions are used when pledging collateral or for securities lending.
- [2] For example, if a counterparty does not have an Austraclear account, then their securities are registered in a custodial Austraclear account (e.g. Commonwealth Bank Nominee Account). If this counterparty were to transact with another counterparty using the same custodian, the security may remain in the custodian's account. In this case, no transaction would appear in Austraclear. These missing transactions will tend to add a downward bias to our turnover estimates.
- [3] See ASX (2020).
- [4] Guo and Zhang (2020) also looked at different sized buckets than we do here, given their analysis also featured other bonds where the lines were not so large.
- [5] One difference between the two sources is that the Austraclear data cover more than the 18 dealers covered in the AOFM survey. However, the AOFM data captures transactions by the surveyed dealers even if they do not involve a transfer of bonds between two Austraclear accounts.

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## HILDA

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## BLADE

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