



Housing construction productivity: Can we fix it?

Research paper

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The Productivity Commission

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Publication enquiries:

Phone 03 9653 2244 | Email publications@pc.gov.au

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Legislative requirements to ensure privacy and secrecy of these data have been followed. For access to PLIDA and/or BLADE data under Section 16A of the *ABS Act 1975* or enabled by section 15 of the *Census and Statistics (Information Release and Access) Determination 2018*, source data are de-identified and so data about specific individuals has not been viewed in conducting this analysis. In accordance with the *Census and Statistics Act 1905*, results have been treated where necessary to ensure that they are not likely to enable identification of a particular person or organisation.

The Commission also acknowledges the staff who worked on this paper. The work was overseen by Chair Danielle Wood, Commissioner Julie Abramson and Assistant Commissioner Jared Dent. The team comprised Shane Chisholm, Erin Turner, Colin Burns, Holly Creek, Louisa Borland, Sean Sutton, Lachlan O'Neil and Mark Bryant.

Executive summary

Improving productivity can help fix housing affordability

Australian housing is increasingly unaffordable. Decades of inadequate supply coupled with high demand has driven this outcome.

In response, Australian governments have committed to build 1.2 million homes over 5 years – 240,000 homes each year. In the 12 months to June 2024, just 176,000 homes were built.

Governments have focused on alleviating constraints to new supply via changes to planning regimes. These are important reforms. But the speed and cost of new building is also a constraint on new housing supply.

Increasing the productivity of the construction process would lower construction costs – meaning more approved projects would be viable, increasing housing supply – even with no change in the size of the workforce, interest rates or the cost of materials.

But dwelling construction productivity has been stagnant at least for 30 years.

Fixing productivity will require a genuine focus on prioritising housing supply and affordability. This report provides policy directions for improving housing construction productivity by reducing the regulatory burden, streamlining and speeding up approval processes, supporting innovation and improving workforce flexibility to help turn the dial on this persistent policy challenge.

New estimates reveal persistently slow productivity growth

The Productivity Commission's new estimates of housing construction productivity tell a story of decades of poor performance.

This set of proxy measures for dwelling construction productivity encompass the entire homebuilding process, from site preparation and project management to the installation of fixtures and fittings. They indicate that over the past 30 years:

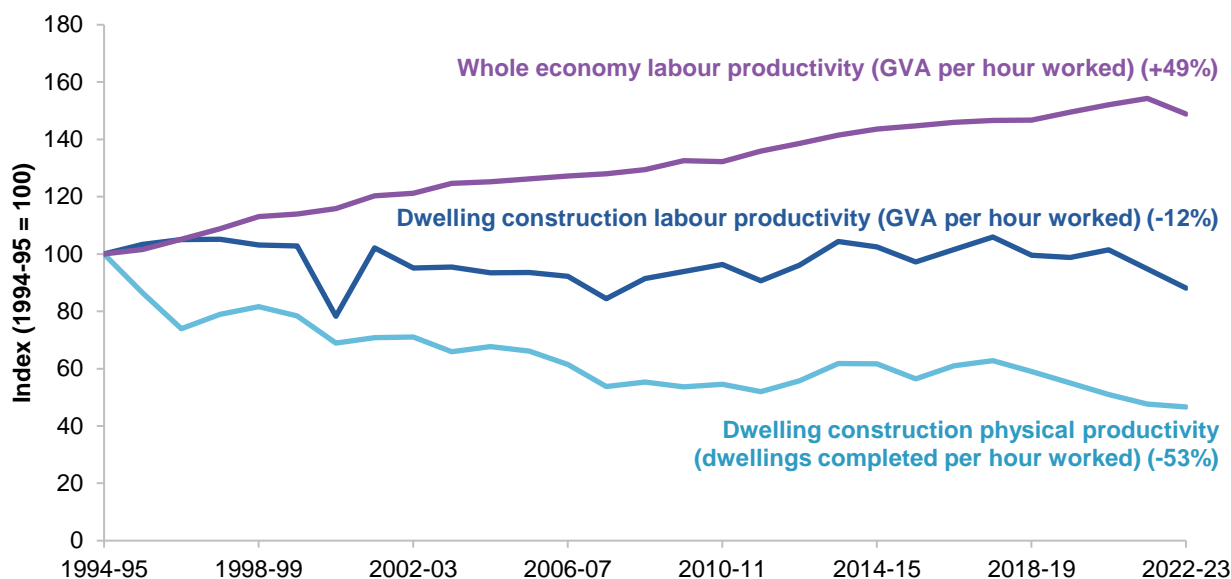
- the number of dwellings completed per hour worked by housing construction workers has declined by 53% (physical productivity)
- gross value added per hour worked – a more comprehensive measure that controls for quality improvements and increases in the size of housing – has declined by 12% (labour productivity) (figure 1).

In contrast, labour productivity in the broader economy has increased by 49% over the same period. To put this 'productivity gap' in perspective, had labour productivity in the broader economy moved in line with the housing construction sector, average incomes in Australia would be about 41% lower than they are now.

Productivity performance varies by housing type. Labour productivity in house construction has fallen by 25% since 2001-02. In contrast, labour productivity in higher-density housing construction – townhouses, units, and apartments – increased by 5% over the period, including a short period of rapid productivity growth between 2005-06 and 2013-14.

Some participants argued that uncaptured improvements in housing quality are a reason for relatively poor measured productivity in the housing construction sector in Australia. But the ABS applies significant effort to identify and quantify quality improvements in housing construction, and these efforts likely capture most of the important quality changes. If anything, we consider that the greater risk is overestimation of quality improvements, and productivity.

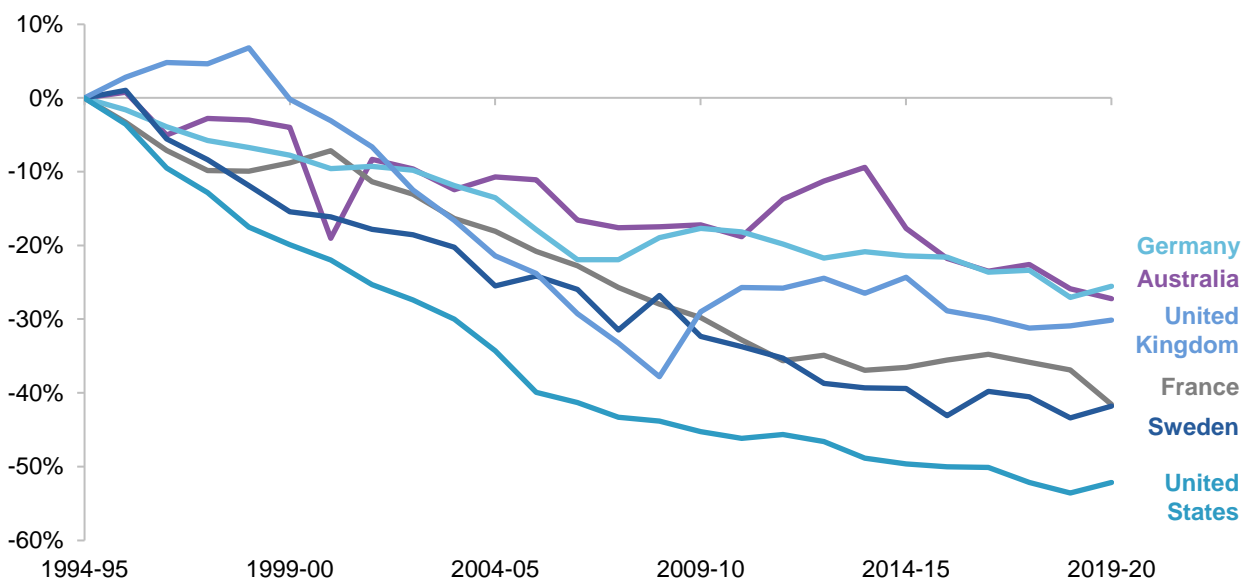
Figure 1 – Dwelling construction productivity in decline



Australia’s housing productivity woes are not unique

A lack of data means cross-country comparisons of productivity outcomes are not possible for the housing construction sector. But at the aggregate level (residential, commercial and civil), we can say that poor productivity growth in the broader construction sector is not unique to Australia. Many other advanced economies had poor measured construction productivity relative to their broader economies over the past 30 years (figure 2).

Figure 2 – In advanced economies, construction sector productivity was slow^a
Cumulative difference in construction and market sector productivity growth



a. Significant data limitations mean construction productivity may be underestimated in some other advanced economies. Appendix D has more detail.

This suggests that there are common factors across countries driving the productivity decline, although definitively pinning down those factors is difficult (due to different sectoral definitions, measurement standards and regulatory and governance approaches).

There is no one driver of poor productivity performance

Housing construction is complicated. There are many factors that make it difficult to improve construction delivery, including: lack of standardisation in the build process (each building is mostly unique); the sequential nature of builds; and the substantial safety and quality of life issues that often justify (but do not necessarily require) a degree of government involvement.

However, there is still scope to innovate and deliver 'more with less' over time. Indeed, there have been periods both overseas and in Australia where construction productivity has outpaced that of the broader economy, suggesting that construction is not an inherently slow productivity growth sector.

There are a range of issues that have contributed to falling productivity in the housing construction sector:

- **Complex, slow approvals** – working through the often-extensive development and construction approval process can mean that the timeline for major housing development projects, such as new housing estates and apartment complexes, can stretch to ten or more years. Often only a small part is time spent building. Even after approvals are granted, delays can continue as projects seek construction certificates and wait for essential infrastructure connections. Because construction is highly sequential, delays and disruptions can create 'cascading failures', which push up costs.
- **Lack of innovation** – innovation activity and spending in the construction sector is low compared to other sectors. Only 35% of all construction firms are 'innovation-active' and the sector has been slow to take advantage of digital technologies and new processes like prefabrication. Low levels of innovation arise because of fragmentation, industry culture, lack of direct benefits to firms from innovation and the 'chilling effect' of frequent regulatory changes.
- **Lack of scale** – the construction industry is one of the least concentrated in Australia. The combined market share of the largest four firms was just 12% in 2017, the lowest of any sector. The average residential building construction firm employs less than 2 people, much smaller than the average firm size in Australia. To some degree this appears to be a function of the development and building process and in particular the tendency to manage projects via subcontracting arrangements. But jurisdictional differences, in the way building standards are implemented, and planning is undertaken and regulated, may also reduce the capacity and appetite for successful firms to scale up.
- **Workforce issues** – the sector struggles to attract and retain some skilled workers. Reasons for this include stagnating apprenticeship commencements and completions, restrictive and inflexible training pathways for trades, and competition for labour from public infrastructure projects in recent years (at least for the higher-density housing sector). Shortages directly impact housing supply but can also impact productivity through not having the right skill mix. A range of regulatory settings contribute to low labour mobility, including inconsistent occupational licensing accreditation requirements across jurisdictions and limited pathways for migrants to join the construction workforce.

Policy settings have contributed to poor productivity

Policy weighs on housing construction productivity in a number of ways.

One is through the sheer volume of regulation.

Three levels of government make rules that affect where housing can be built, how it should be built and what it should look like. And industry groups, community members and others will also get involved in various parts of the process with their own objectives. The volume of planning regulations in some locales has increased markedly over past decades and can run into the thousands of pages. The National Construction Code (NCC) – whilst a positive development that remains sound in principle – has grown to more than 2,000 pages. Some aspects of the code and the way it is implemented impose unnecessarily high costs on building construction. Indeed, some updates to the NCC have been implemented notwithstanding regulatory assessments estimating that they impose net costs on society.

Policymakers must balance the benefits of regulation – including neighbourhood amenity, reducing carbon emissions, building accessibility, build quality and safety, liveability and environmental protection – against the decrease in construction productivity and housing affordability that such regulations cause. Currently, policymakers do not get this balance right, and one of the consequences is poor construction productivity and less affordable housing.

A second way that policy can weigh on housing construction productivity is through slow and poorly coordinated regulatory processes.

The sequential nature of housing construction means that regulatory issues and other interactions with government can create significant delays at key points of the construction process. This is exacerbated by poor coordination between and across levels of government, and under-resourcing of key approvals agencies, including local governments. This leaves developers to navigate – or even coordinate themselves – a regulatory process that can require decisions from local governments, utilities, and state government departments with responsibility for planning, biodiversity conservation and bushfire risk (among others).

The third is through inconsistency across jurisdictions. Unjustified inconsistencies increase compliance costs for business, reduce labour mobility and are barriers to scaling up.

The implementation of the NCC varies across states and territories. There are deviations from the agreed NCC ruleset across jurisdictions as well as differences in how compliance is assessed. This has resulted in inconsistency in construction standards. Similarly, local government planning regulations can also influence the design and construction of dwellings in addition to the NCC requirements.

Whilst automatic mutual recognition has helped improve labour mobility by effectively removing some of the complexities and geographical inconsistencies imposed by occupational licensing systems, not all jurisdictions have signed up. Many exemptions and conditions still exist. This is inconsistent with the spirit and intention of automatic mutual recognition and so the ability of construction workers to move across jurisdictions (and from overseas) to quickly meet market demand remains constrained.

The fourth way policy settings have contributed to poor productivity is by chilling innovation. Regulatory constraints can directly inhibit a firm's ability to do things differently, for example by creating barriers to the adoption of prefabricated housing. But more commonly, the frequent 'shifting of the goal posts' on regulatory settings deters investment in innovation because of the fear that new approaches will be quickly out-of-step with new requirements. Industry participants have noted that frequent updates to the NCC can create a reluctance to try new materials or processes for fear that future updates will make any benefits short-lived.

What needs to happen?

If governments are serious about boosting housing supply, they need to rethink how they make decisions that affect housing development and construction. Impacts on project cost and approval timeframes should

be front of mind when policy makers are considering new regulations and resourcing service delivery and approval agencies.

To improve housing construction productivity, the PC has identified seven reform directions across our four main areas of focus:

- **Coordinated and transparent planning approvals and appropriately funded regulators** – governments need to continue to improve coordination between decision makers in the planning approval process. Governments should consider establishing coordination bodies to speed up the development and construction process and address delays. For example, the Queensland State Assessment and Referral Agency (SARA) provides a type of end-to-end service for developments that trigger a ‘state interest’ threshold. While SARA is not entirely comprehensive it provides a starting point for other states to look to when implementing such reforms. Governments also need to adequately resource regulatory and service delivery agencies to enable timely decisions, and ensure there is sufficient accountability, including by setting informative performance targets for planning approval decisions.
- **An independent review of building regulations** – governments should commission an independent review of building regulations. The focus should be the NCC and its implementation at the state and territory government level. A review should consider the NCC’s objectives, the regularity of code updates, options to improve consistency in implementation by state and territory governments, approaches to approvals, certification, compliance and enforcement, impediments to innovation and local government rules that relate directly to the construction of dwellings.
- **Removing impediments to, and invest in, innovation** – governments should address unnecessary regulatory impediments to the development and uptake of new building techniques, such as modern methods of construction. There are potential low-cost opportunities to increase diffusion of technology across the housing construction sector, similar to the government-funded extension services provided to agriculture. Governments should also consider the adequacy of public research and development funding for housing construction to improve productivity performance. And better information, including rating schemes, could improve building quality.
- **Improving workforce mobility and flexibility** – governments should continue work towards national consistency in occupational licensing and implement the PC’s previous recommendation that governments conduct regular, independent review of occupational licensing systems in their jurisdictions. In addition, governments should address barriers to migration to improve labour supply and improve support for apprentices to improve commencements and completions, as previously recommended by the PC.

Reform directions



Reform direction 4.1 – Coordinating housing development and construction approvals

Australian governments have made progress in improving coordination between decision makers in the planning approval process. But further efforts are needed to eliminate bottlenecks in the system and provide certainty to the residential building industry. Governments should consider:

- establishing coordination bodies to speed up the entire housing development and construction process (not just the planning process) and intervene in cases of long delays
- ensuring delivery agencies and regulators, particularly local governments, are adequately resourced to achieve the target timeframes
- setting performance targets for planning approval decisions that reflect the complexity of the planning decisions and extend performance reporting to capture the post development approval period.



Reform direction 4.2 – Effectiveness of building regulations

Governments should commission an independent review of building regulation. This review should cover the National Construction Code's effectiveness against its aims and objectives, its governance arrangements and membership. The review should also address the implementation of the NCC at the state and territory government level, including approvals, certification, compliance and enforcement, and local government rules that relate directly to the construction of dwellings, such as those related to the design of houses.

Until the independent review is completed there could be merit in pausing regularly scheduled updates to the NCC.



Reform direction 4.3 – Improving building quality

State and territory governments should continue implementing ratings systems that effectively improve information available to consumers about new (and existing) building quality. Better information could help create a price premium for higher quality builders and building.



Reform direction 4.4 – Extension services for housing construction

The Australian Government should trial providing extension services – potentially piloted through the Australian Government's AusIndustry program – modelled after those provided to agriculture, to the housing construction industry to promote the diffusion of innovation.



Reform direction 4.5 – R&D funding for housing construction

The *Strategic Examination of Research and Development* should consider the adequacy of research and development funding for housing construction to improve the productivity performance of the housing construction industry.



Reform direction 4.6 – Modern methods of construction

Governments should continue to reduce unnecessary regulatory impediments to greater uptake of modern methods of construction in housing construction, including prefabricated and modular construction.



Reform direction 4.7 – Improving workforce flexibility

Governments should adopt previous PC recommendations in *5-year Productivity Inquiry: Advancing Prosperity* and *National Agreement for Skills and Workforce Development Review* to improve occupational licensing, address barriers to migration and improve support for apprentices.

1. Australia's housing challenge

Affordable, safe and sustainable housing provides security, promotes economic participation, and has been linked with a range of health and social benefits. It can also reduce government spending on homelessness services, health, child safety, and criminal justice (PC 2022, pp. 3, 75).

However, the cost of housing is rising. Strong demand over many years is pushing up rents and housing prices and the rental vacancy rate is at a multi-decade low. Ownership rates are declining, particularly among younger Australians, homelessness is increasing and social housing wait lists are lengthening (NHSAC 2024, pp. 3, 5).

Australian governments have set ambitious targets for new housing supply and improving the productivity of the housing construction sector is critical for the government's ambition to achieve those targets. This report seeks to understand the scale of the productivity challenge and its causes. It makes the case for substantive reforms to increase supply of housing and improve construction productivity.

1.1 Housing supply in Australia

Australia spends a lot building homes. In the year to June 2024, total expenditure on housing construction was \$139 billion, of which \$83 billion was on new housing (ABS 2024d).¹ Over the past decade, dwelling construction² contributed about 3% to GDP annually.

As Australia's population grows, and average household size continues to fall,³ more housing is required.

In 2023, Australian governments agreed to implement the National Housing Accord and build 1.2 million new homes over five years – 240,000 homes per year – starting from July 2024. They also committed to land use, and planning and zoning reforms (The Treasury 2024a, 2024b).

In 2023-24, about 176,000 new dwellings were constructed, well below the National Housing Accord target and the decade average of about 192,000 dwellings (figure 1.1, left). Modelling by the National Housing Supply and Affordability Council predicts the Accord's five-year target will be missed by about 257,000 dwellings (NHSAC 2024, p. 7).

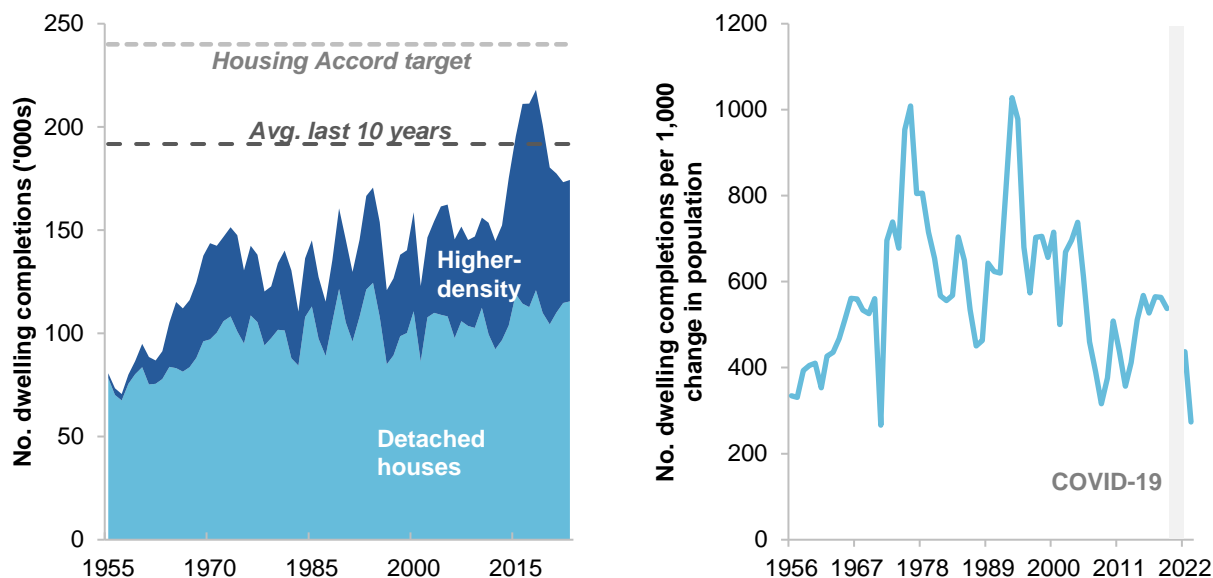
This is consistent with industry trends of building taking longer to complete, and fewer homes being built per person.

¹ These figures are published in the *national accounts* (expenditure on GDP) as 'dwelling investment'. The estimates can differ from the work done on residential buildings published in the *building activity survey*, due to the national accounts using additional data sources (ABS 2021b).

² Dwelling construction refers to the estimates of total value added on housing construction by combining the estimates for *residential building construction* with the residential portion of *construction services* (chapter 2 and appendix B).

³ Current household size is less than 2.5, compared to about 2.9 in the 1980s (Agarwal et al. 2023, p. 1).

Figure 1.1 – The number of homes built is well below the Housing Accord target, and per person completions are trending down^{a,b}



a. Right panel: Three-year centred moving average except at the first and last data point. b. Right panel: Data for 2020 and 2021 is excluded due to the impact of COVID-19 border closures on Australia’s population growth rate.

Source: PC estimates using ABS (2021d, table 1, 2024e, table 39, 2024l, table 1).

Australia is building fewer homes per person

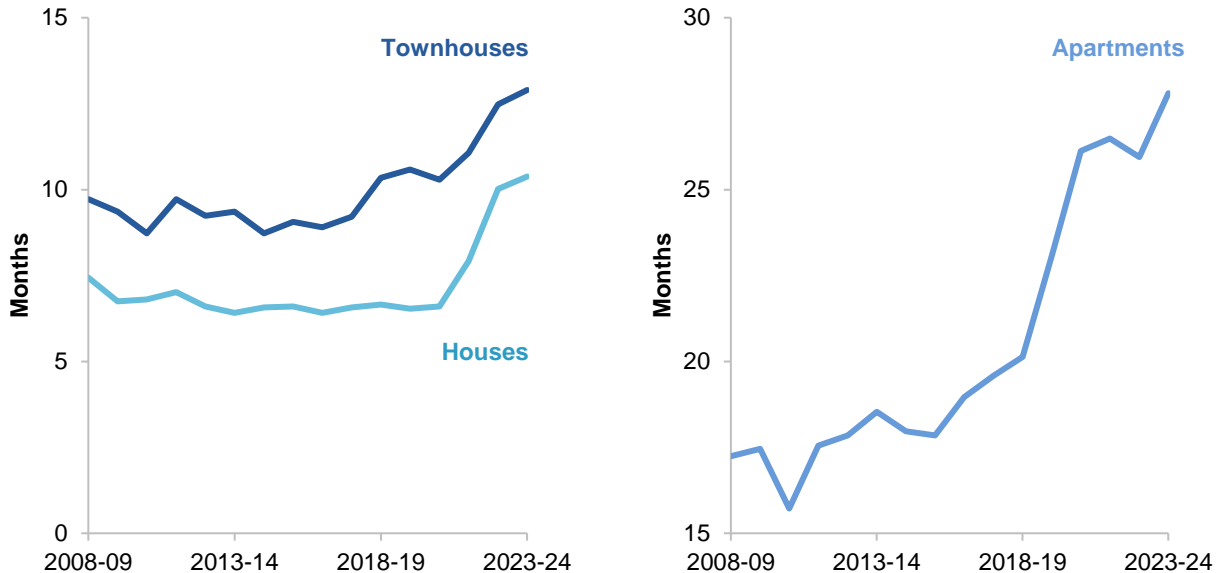
The total number of new dwellings completed each year has roughly doubled since 1955, representing an annualised growth rate of 1.1% per year. This growth has been dominated by higher-density housing, which in 1955 accounted for just 3% of new builds, and now accounts for about a third. In annualised terms, the rate of new detached houses completed grew by about 0.6% per year, compared to 4.8% for higher-density housing (PC estimates, using ABS 2024e).

However, relative to population growth, the number of housing completions have been trending down for decades. There was an uptick in the 2010s driven by a record number of higher-density completions, but that growth has not been sustained (figure 1.1, right).

Housing is taking longer to build

The average time taken to complete new housing has increased significantly in recent years (figure 1.2). In 2023-24, the average time to complete a single detached house was about 10.4 months, up from about 6.4 months a decade earlier. The average time taken to complete new townhouses rose from about 9.4 months to 12.9 months, and for new apartments, from about 18.5 months to 27.8 months (though this only covers apartments in New South Wales, Victoria and Queensland).

Figure 1.2 – Completion times have been rising for all housing types^a
Number of months taken to complete apartments, townhouses and houses



a. The average completion times are for apartments in New South Wales, Victoria and Queensland only.

Source: ABS (2019, 2024e).

1.2 The role of productivity

Housing affordability is a function of the cost of housing and household incomes. Increasing the number of homes will put downward pressure on the cost of housing, improving affordability (Daley et al. 2018, p. 3; Saunders and Tulip 2020, p. 28).

Many factors influence housing supply, including: the availability and cost of land, workers and building materials; financing costs; land use planning and zoning; building regulations; housing-related infrastructure costs; and taxes, levies and charges (PC 2022, pp. 71, 73–74). But construction productivity also matters.

Productivity is the rate at which outputs, such as goods or services, are produced per unit of input, such as labour, capital or materials. Productivity growth occurs when more outputs are produced with the same or fewer inputs, or the same volume of outputs are produced with fewer inputs. Productivity growth can come from a range of sources including improving the skills of the workforce and management practices, technological improvements and innovation, and increased economies of scale and scope⁴ (PC 2024b).

While there is significant research and debate about the need to increase the supply of housing in Australia, the role of productivity growth in increasing supply has received relatively limited attention.

⁴ Economies of scale occur when producing more of a particular good reduces the total average cost of production. Economies of scope occur when producing an increased variety of goods reduces the total average cost of production.

1.3 The role of this report

The focus of this report is unpacking and explaining trends in housing construction productivity. Broad directions for policy to improve productivity are also considered. Although the emphasis is on productivity, it touches on other dimensions of housing supply, although not in great detail. Housing supply issues may be considered in future Productivity Commission work.

The report is structured as follows:

- Chapter 2 provides a comprehensive overview of housing construction productivity over the past 30 years, including analysis of domestic productivity and international comparisons, and considers measurement issues.
- Chapter 3 discusses possible reasons for why housing construction productivity has declined.
- Chapter 4 highlights policy areas that governments should focus on to improve productivity and increase housing supply. As this is self-initiated research, the PC has not made formal recommendations.

Technical appendices provide additional detail about how we estimated productivity (appendix B), how the ABS adjusts productivity estimates to account for changes in quality (appendix C) and international comparisons of productivity (appendix D).

2. Productivity in Australian housing construction

Key points

- ✳ **Measures of productivity in the dwelling construction industry – which includes detached houses, townhouses and apartments – have declined in recent decades. Our estimates suggest that between 1994-95 and 2022-23:**
 - the number of new dwellings built per hour worked has declined 53%
 - dwelling construction gross value added per hour has declined 12%
 - labour productivity in the broader economy has increased 49%.
- ✳ **This deterioration is not explained by changes in the quality of housing as the Australian Bureau of Statistics adjusts for most quality changes. Any residual measurement issues are modest and cannot explain the persistent underperformance of dwelling construction compared to the broader economy.**
- ✳ **Poor construction productivity growth is not just an Australian phenomenon. Indeed, Australian aggregate construction (including residential, commercial and civil) labour productivity growth is at least on par with overseas peers (though there are measurement challenges).**
- ✳ **Construction (including civil, commercial and housing) is not an inherently slow productivity growth sector.**
 - There have been long periods in some countries where labour productivity growth for construction exceeded growth in the broader economy.
 - In Australia, construction productivity typically kept pace with the broader economy until the 1990s.
 - But since the mid-1990s, most advanced economies' construction industry productivity has consistently underperformed the broader economy.

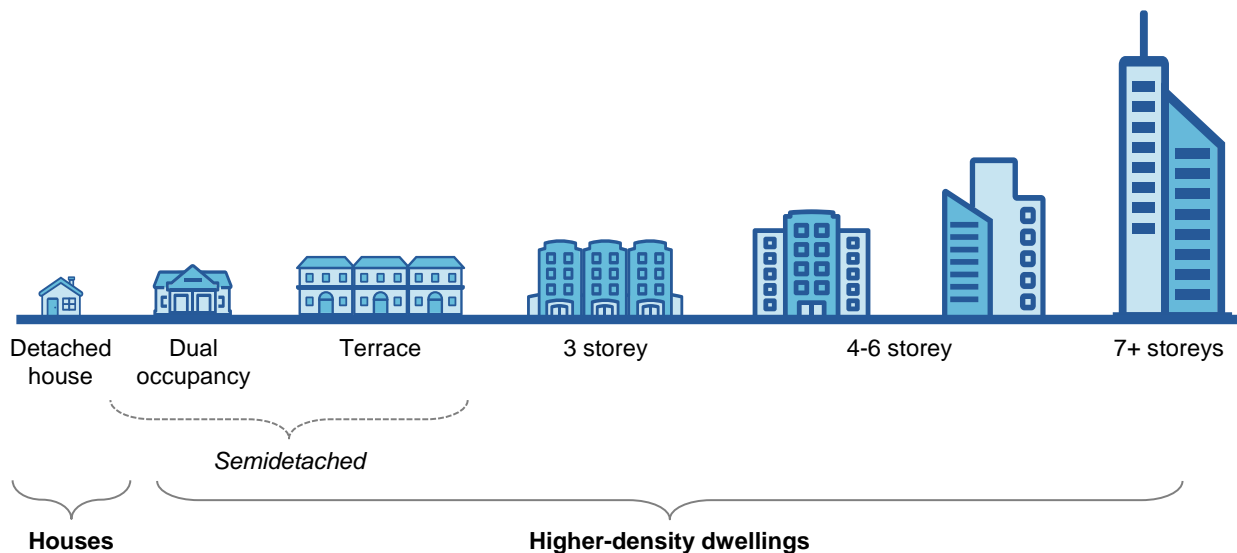
2.1 The nuts and bolts of housing productivity

What is housing?

Housing in Australia can be classified as one of two dwelling types that are primarily used for long-term housing purposes: detached, single-dwelling houses and everything else. In Australian Bureau of Statistics (ABS) releases, everything else is typically referred to as 'other residential buildings', which includes semidetached, row or terrace houses or townhouses, and flats, units or high rise apartment buildings (ABS 2024f). These various dwelling types are illustrated in figure 2.1.

In this report we refer to detached houses as houses, and other residential buildings as higher-density dwellings. In the 2021 Census, about 70% of Australia’s dwelling stock consisted of houses and 30% was higher-density dwellings (13% of the dwelling stock was semidetached) (ABS 2022).⁵

Figure 2.1 – Australian housing types



What is (housing construction) productivity?

Productivity is the ratio of ‘output’ (goods and services such as food, clothes, shelter) to the number of ‘inputs’ (hours of work, machinery, materials) required for production.

There are no ‘official’ estimates of productivity for Australia’s dwelling construction sector.⁶

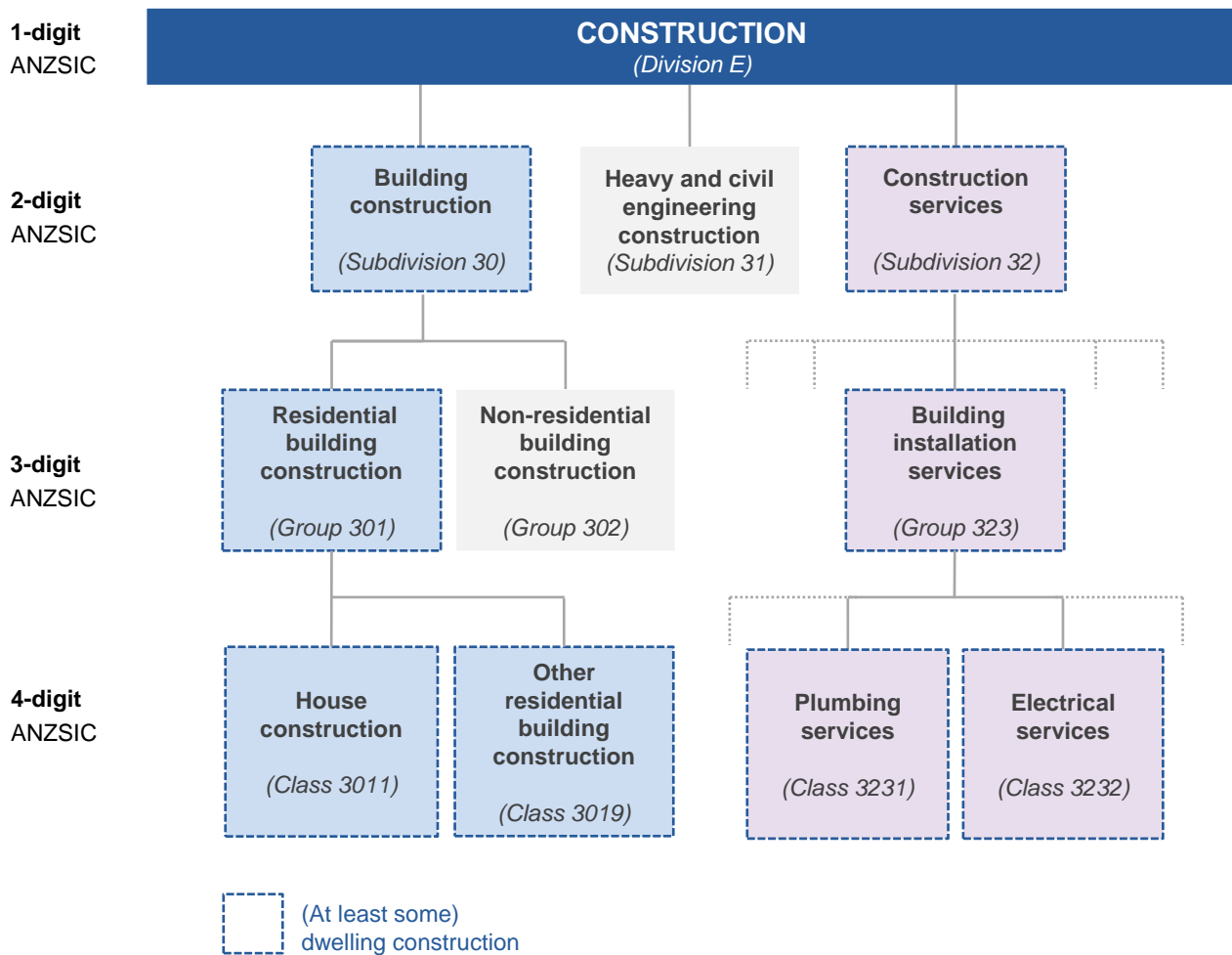
For this report, the PC built up a set of labour productivity proxies. This involves estimating sector outputs and labour inputs from specific parts of the ABS construction sector statistics, which are split across two industries: *residential building construction* (the main builders and developers) and *construction services* (the various tradespeople involved in building the dwelling) (figure 2.2).

Our methodology is outlined in more detail in appendix B.

These productivity proxies capture the broad underlying changes in productivity in the sector, though with less precision than official estimates of industry productivity found in the *national accounts*.

⁵ About 1% of housing stock comprises of other types of buildings, including caravans, houseboats, improvised homes and dwellings attached to shops or offices (ABS 2022).

⁶ The gross value added, labour hours and capital associated with producing dwellings (houses, apartments, townhouses and semidetached) are not classified as a single industry in the national accounts (figure 2.2).

Figure 2.2 – Stitching together the components of the housing construction sector^a

a. This figure is not an exhaustive representation of the construction services subdivision. Other construction services groups include land development and site preparation services, building structure services, building completion services and other construction services. Other building installation services classes include air conditioning and heating services, fire and security alarm installation services and other building installation services.

Source: adapted from ABS (2013a).

Certain aspects of the performance and activities of the dwelling construction industry are not included in our productivity estimates. This includes:

- offsite production of prefabricated buildings and building components – the value added of these activities are captured within the manufacturing industry (ABS 2013d)
- labour hire services – these are instead counted in the administration and support services industry (ABS 2013g)
- infrastructure and utilities – the contribution of accompanying infrastructure and utilities are counted in heavy and civil engineering construction (ABS 2013e)
- time to completion – only the amount of time spent on site, to complete a dwelling, is captured in the productivity statistics – delays stemming from workers being prevented from being onsite, are not captured
- foregone housing due to regulatory restrictions – if a housing development is rendered unviable due to regulatory restrictions, there is no measured effect on productivity. If, however, a development goes ahead

but builders and main developers directly employ more labour to navigate the development process, measured productivity falls.

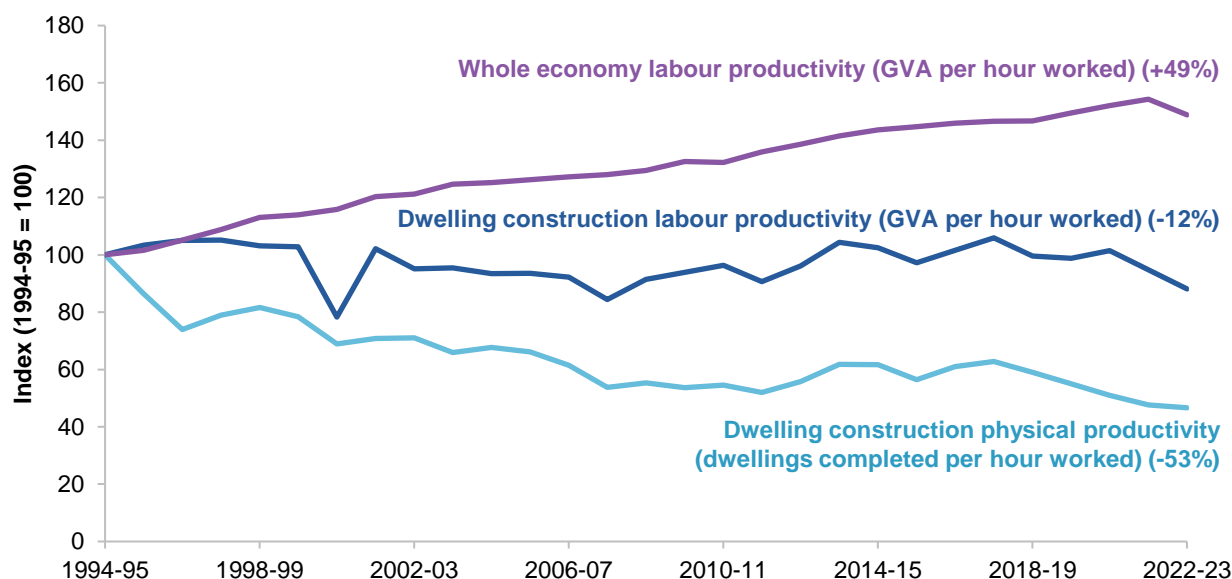
These issues are discussed in more detail in appendix B.

2.2 Dwelling construction productivity is falling

Our measures indicate that dwelling construction productivity has fallen in absolute terms and underperformed relative to the broader economy (figure 2.3).⁷

Figure 2.3 – Dwelling construction productivity is in decline^{a,b,c}

Proxies for dwelling construction productivity between 1994-95 and 2022-23



a. GVA is sourced from the national accounts supply-use tables, while the output measure for dwellings completed is sourced from building activity data. **b.** The deflator is constructed using building activity data. **c.** The hours worked measure for both productivity measures is constructed by apportioning two-digit building construction and construction services hours worked from the labour account using shares of residential building construction and non-residential building construction from the labour force survey (building construction) and shares of construction services purchases in the national accounts supply-use tables (construction services).

Source: PC estimates using ABS (2024c, 2024e, table 37) (output); ABS (2024e, tables 3 and 21) (deflator); ABS (2024c, 2024i, data explorer, 2024j, EQ06) (hours worked).

‘Physical dwelling construction productivity’ – the number of dwellings completed per hour worked by construction workers – has declined by a sizeable 53% since 1994-95. However, this measure does not account for increases in both the size and quality of new housing – both of which have improved. For example, a new house now has a larger floor area than one built in the mid-1990s (an increase from 193m² in 1994-95 to 232m² in 2021-22) (ABS 2013b, 2023a). The range of features and inclusions available to new homeowners has expanded, and consumers can now choose from a larger range of features and finishes than was available in the past. Changes to regulatory settings have also resulted in quality changes – new

⁷ The PC refers to these estimates as ‘proxies’ because they do not rely solely on data published in the national accounts, but instead use a variety of other ABS sources (additional detail in appendix B). Estimates at this level of disaggregation would not be possible relying solely on the data published in the national accounts.

houses are free from known harmful materials such as asbestos and meet a higher standard for energy efficiency (ABCB 2023, p. 2; NSW EPA 2020).

When we control for these aspects of size and quality, labour productivity (gross value added (GVA) per hour worked) has declined by much less – about 12%. However, compared to the broader economy, which experienced labour productivity growth of about 49% over the same period (figure 2.3), dwelling construction productivity has strongly underperformed. To put this in perspective, our average incomes would be about 41% lower than they are now had broader economy labour productivity moved in line with the dwelling construction sector.

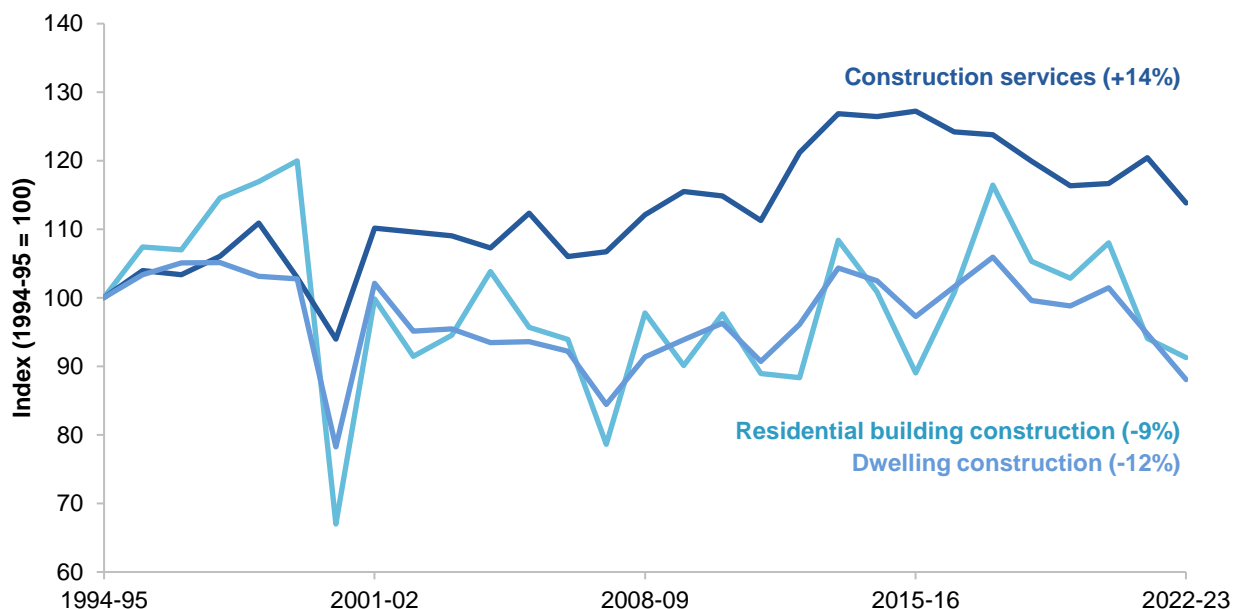
What's driving the aggregate result?

Productivity growth has been faster for construction services than residential building construction

Since 1994-95, productivity for construction services (mainly tradespeople) has grown faster than for residential building construction (mainly developers and main builders), although it has still been sluggish compared to the broader economy (figure 2.4).

Figure 2.4 – Construction services have outpaced residential building construction labour productivity over the past 30 years^{a,b}

Labour productivity index for construction services, residential building construction and dwelling construction between 1994-95 and 2022-23



a. Hours worked and nominal output measures constructed as per figure 2.3. b. Residential building construction output is deflated using building activity data. Construction services output is deflated using data on nominal and chain volume GVA for construction services from the supply-use tables and national accounts.

Source: PC estimates using ABS (2024c) (output); ABS (2024e, tables 3 and 21, 2024c, 2024d, table 5) (deflators); ABS (2024c, 2024i, data explorer, 2024j, EQ06) (hours worked).

Residential building construction captures much of the labour and capital services usage in the pre-development stage (see figure 3.1) when this is performed by the main developer and builder. On the other hand, much (but not all) of the actual onsite construction is captured in construction services. The

labour devoted to project management through the onsite construction process is largely captured by the main builders in residential building construction.

Relatively slower productivity growth for residential building construction over the past 30 years is consistent with the observed increase in pre-building regulatory settings. For example, an increase in planning and zoning regulations will be captured in – and weigh on – residential building construction productivity because it increases the amount of labour spent on the planning process (see chapter 3) that is undertaken in-house by builders and developers.

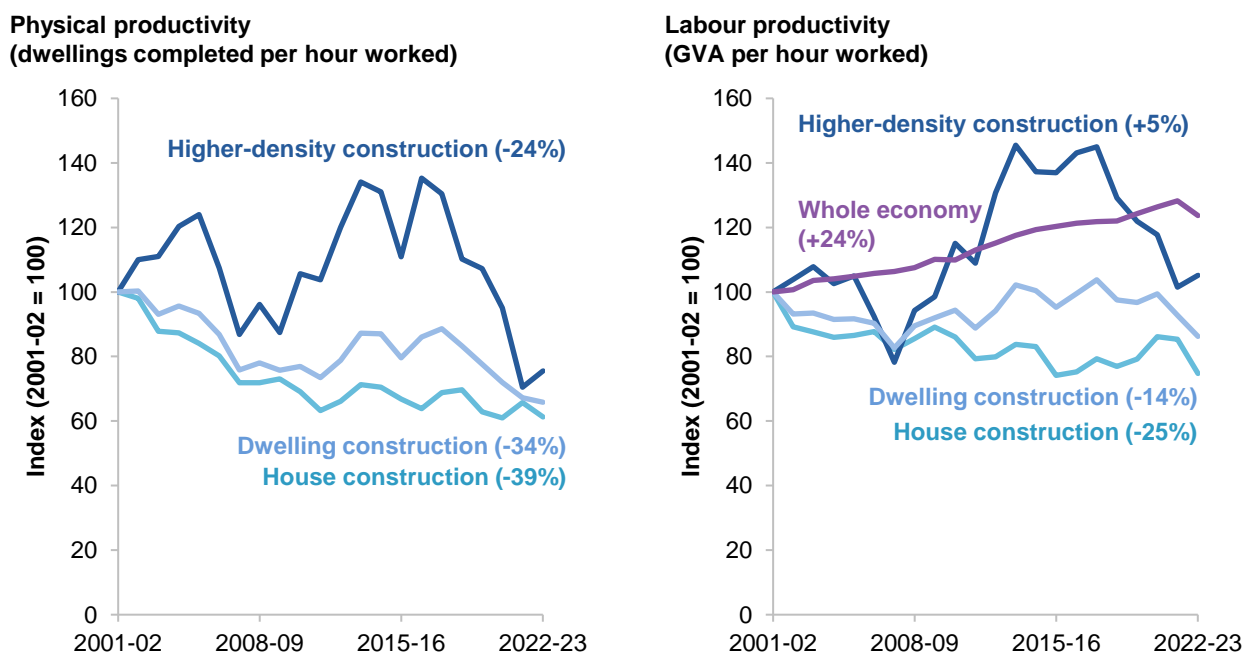
House construction productivity is worse than for apartments

When we decompose our aggregate estimate of dwelling construction by type of dwelling, we see that, in GVA terms, house construction has fallen consistently over the past two decades. On the other hand, higher-density construction has exhibited an overall rising, if volatile, trend – including a period between 2007 and 2014 where productivity growth significantly outpaced the whole economy (figure 2.5).⁸

As houses comprise the majority of housing construction done in Australia, poor house construction productivity weighs on the broader measure of dwelling construction labour productivity (ABS 2024e, table 21).

Figure 2.5 – Trends in labour productivity differ by dwelling type^{a,b,c}

Proxies for house and higher-density construction productivity, 2001-02 to 2022-23



a. Dwelling construction output is split between dwelling types using building activity data. **b.** Deflators are constructed using building activity data. **c.** Dwelling construction hours worked are split by dwelling type using the Business Longitudinal Analysis Data Environment (BLADE) Pay As You Go module.

Source: PC estimates using figure 2.3 (dwelling construction and whole economy data); ABS (2024e, table 21) (output shares); ABS (2024e, tables 3 and 21) (deflators); ABS (2024k) (input shares).

⁸ Caveats regarding the reliability of these estimates are outlined in appendix B.

Data limitations hinder analysis of investment patterns

When analysing labour productivity it is common to distinguish between the component driven by 'capital deepening' (the increased use of machinery and equipment for each worker) and 'multifactor productivity' (the combined effect of capital and labour). However, because of data limitations, it is impossible, using publicly available sources, to assess whether investment per worker in dwelling construction is different to the broader economy, and to what degree investment patterns can explain the productivity trends in the housing construction sector. Future research using the Business Longitudinal Analysis Data Environment (BLADE) dataset could potentially be used to fill in these data gaps.

2.3 Measurement error cannot explain persistently low productivity growth

Participants raised unmeasured quality as an issue likely to affect the accuracy of productivity statistics (HIA 2024a, p. 1). The ABS adjusts for quality changes in housing over time by tracking the cost of different housing types and the component parts that make up housing, such as fittings and internal walls. Similar housing types and components are matched over time so that price changes reflect changes in the 'pure cost', rather than changes in the basic attributes of housing types and component parts (such as an additional bedroom or bathroom in a house). The ABS also consults with builders to understand how the quality of homes changes over time, and how this is reflected in housing costs.

The PC considers that this methodology captures most quality changes over time. No method could ever completely capture all quality changes occurring in a market in real time and some compromises have to be made.

If anything, the PC considers that there is a greater chance of quality being overestimated than underestimated, and therefore for dwelling construction productivity to be overstated rather than understated. This is because building regulations may mean some quality changes are required even though consumers value them less than their marginal cost (which is what the ABS uses to judge the value of the quality improvement). The ABS do not incorporate the effect of building defects into their estimates of quality improvement and, to the extent building defects have worsened, this may mean quality is overestimated.

Moreover, even adopting international estimates of measurement error in quality adjustment (which almost certainly overestimates the degree of error in Australia given the ABS's rigorous processes), we find that labour productivity in dwelling construction would still lag the broader economy by between 1.38 and 1.96 percentage points annually. In other words, it is highly unlikely that mismeasured quality improvements can explain the gap in productivity growth between dwelling construction and the whole economy.

Quality adjustment is discussed in more detail in appendix C.

2.4 Lacklustre construction productivity is an international issue

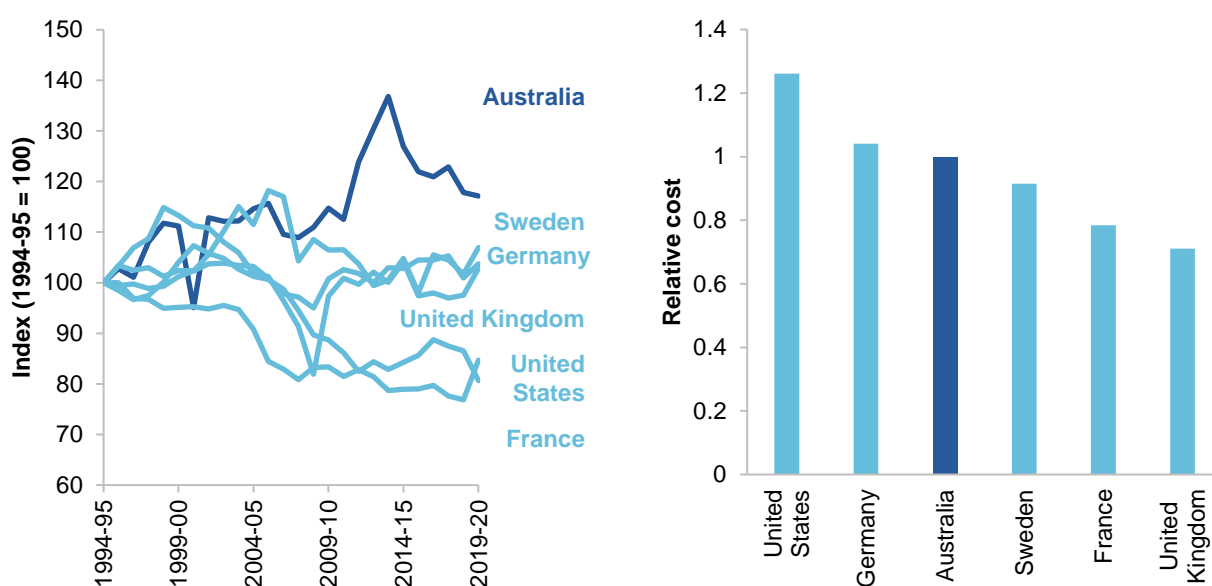
International comparisons of dwelling construction sector productivity performance are not possible because of a lack of publicly available data at the relevant level of disaggregation. However, we can compare for the construction sector as a whole (which includes the residential, commercial and civil subsectors), although the data is also imperfect. The comparison highlights that slow construction productivity growth is not restricted to Australia. It appears to be a global, or at least an advanced economy, phenomenon.

Indeed, based on measured productivity growth, Australia does relatively well. Looking across construction, Australia’s labour productivity has flatlined, whereas the United States, France and the United Kingdom have experienced significant declines in measured productivity over the same period (figure 2.6, left).

Despite stronger relative productivity growth, the cost of overall construction in Australia is slightly above average (figure 2.6, right, additional detail in appendix D). Taking both indicators together, Australia’s performance is likely to be at least moderate.

Figure 2.6 – Australia’s measured productivity is relatively high but costs are slightly above average^{a,b,c}

Labour productivity (1994-95 = 100) and relative construction costs (2020), by country



a. Estimates are for all construction (residential, commercial and civil). b. While attempts have been made to harmonise data across countries, technical differences (such as the treatment of quality improvement) may contribute to differences between series. c. Prices are compared using purchasing power parity exchange rates and thus reflect the opportunity cost of construction; how expensive construction is relative to other local goods and services.

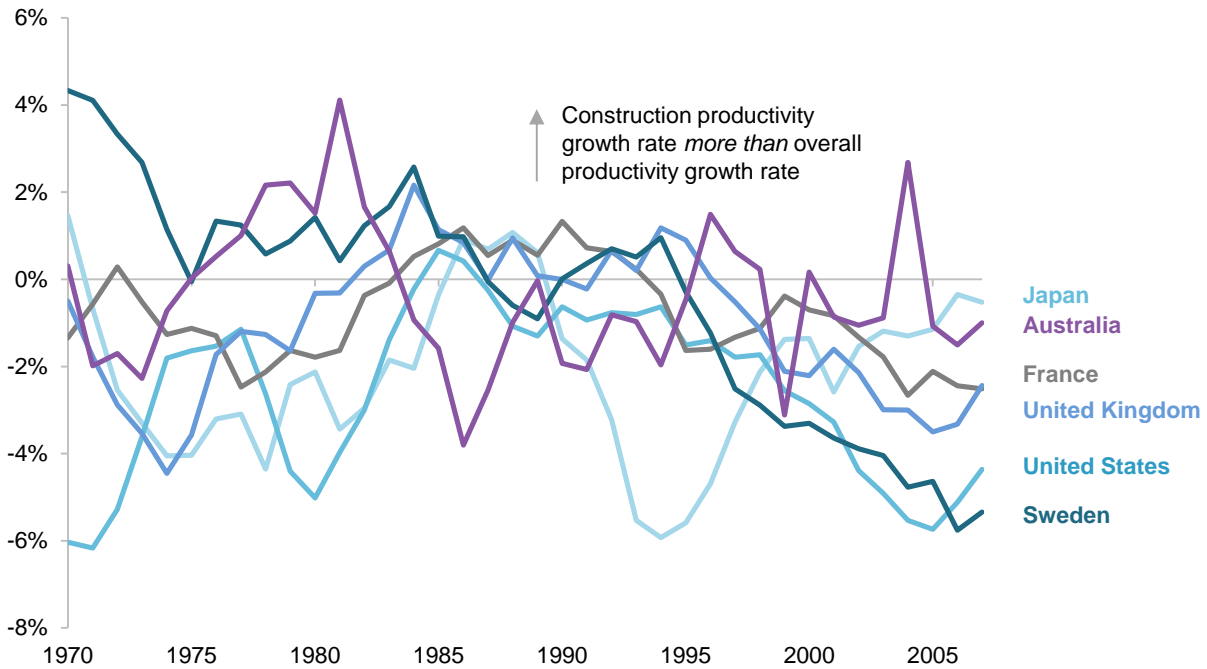
Source: PC estimates using ABS (2023b, table 6); Bontadini et al. (2023); OECD (2024d).

2.5 Construction productivity has not always been sluggish

Long-run international data suggests that relatively low construction productivity growth is a somewhat recent phenomenon (figure 2.7). Indeed, across major economies, there have been extended periods over the past five decades where aggregate construction (housing, commercial and civil combined) productivity grew faster than whole economy productivity – for example, Sweden prior to the 1990s and Australia in the 1970s. Since the mid-1990s, however, construction productivity growth has consistently lagged whole economy productivity growth in these countries. This paints construction less as an industry where productivity growth is inherently slow, but one that has, across the globe, acquired this trait in recent decades.

Figure 2.7 – Construction productivity growth has sometimes outperformed broader productivity growth, but not since the mid-1990s^{a,b}

Difference between construction and whole economy labour productivity growth rates, five-year centred moving average, by country, 1970 to 2007



a. Due to data constraints, productivity is calculated on a per person engaged, not hours worked, basis. **b.** Productivity for Australia (for both the construction industry and whole economy) is calculated as the ratio of chain volume GVA to labour account employment.

Source: PC estimates using Butlin (1985, tables 31 and 35) (1970 to 1974, backcast) and ABS (2024d, table 5) (1975 to 2007) (output (Australia)); RBA (1996, table 4.10c) (1970 to 1994, backcast) and ABS (2024i, data explorer) (1995 to 2007) (employment (Australia)); Timmer et al. (2015) (international).

3. Why is productivity poor?

Key points

- * **The housing development and construction process is complicated, and every step of the way is subject to regulation. The combination of inherent complexity and heavy regulatory burden is constraining productivity.**
- * **Housing construction is complex, often slow, and prone to cascading failures.**
 - Housing developments can take years, and in some cases over a decade to complete. Most of this time is taken up trying to get approvals, as opposed to constructing homes.
 - The process to deliver new housing involves the tangible steps of construction, but also many intangible steps to acquire land, gain necessary approvals, secure financing, and set up access to infrastructure. The process is inherently risky, time-consuming and costly. Delays can lead to 'cascading failures'.
- * **The housing construction process is heavily regulated. Regulations tend to differ in content and scope at every level of government, and they can change frequently.**
 - There are important reasons why housing development and construction is regulated, including to ensure health, safety and minimum quality. But excessive regulation hinders housing construction productivity and increases housing costs.
 - The burden of regulation impacts productivity directly through slowing the process to deliver new housing. It also has indirect effects through limiting firm sizes and appetite for innovation.
- * **The sector is fragmented. There are many small firms and subcontracting is common.**
 - Geographically inconsistent regulations, project-based regulation and project risk management processes tend to reinforce smaller firm sizes.
 - The fragmentation of the industry reduces its capacity to benefit from economies of scale and scope.
- * **Innovation is low among construction firms, and product improvements often come from other parts of the supply chain. Industry culture, the prevalence of small firms, prescriptive standards and regulations, and lack of private returns all appear to contribute to the poor innovation performance.**
- * **Workforce issues are also impacting new supply and may contribute to poor productivity. The sector faces some challenges in attracting and retaining workers, and occupational licencing and migration settings reduce flexibility and the supply of workers.**

3.1 Construction is complex and subject to ‘cascading failures’

The construction process is complex ...

A typical detached house contains about 3,000 parts, an apartment building upwards of 30,000 (Mureithi 2024):

Construction has the unfortunate combination of building mostly unique things each time (even similar projects will be built on different sites, in different weather conditions, and likely with different site crews) and consisting of tasks that are costly to undo (it’s a lot easier to pour concrete than to unpour it), and are highly sequential (and thus time-sensitive). A building, for the most part, can’t be beta-tested to work the bugs out. Combined with the riskiness inherent of building large, heavy things that will be occupied by people (any failure becomes a potential life safety issue) and are heavily regulated, this means that any given process failure has the potential to completely derail your project. (Potter 2021)

There are many steps along the journey from identifying a parcel of land – be it greenfield or brownfield – and converting it into new housing (figure 3.1).⁹ Not only does housing development involve the tangible steps of construction, it also requires many intangible steps to acquire land, plan the project, get development and planning approvals, secure financing, and set up access to infrastructure. Throughout the project, many different professions and trades will be involved at each stage, and they must navigate layers of regulation (section 3.4).

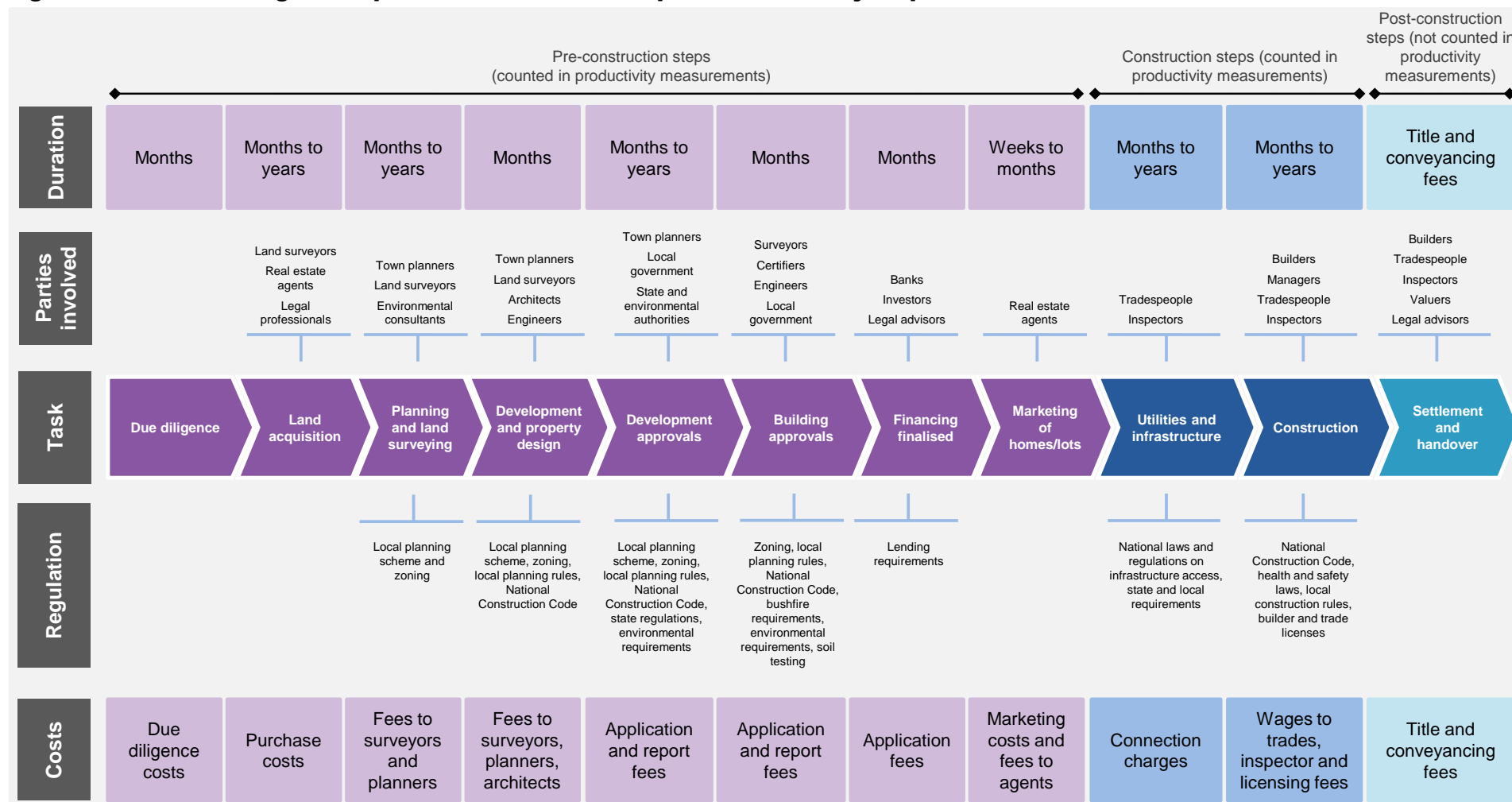
... and can be slow

Stakeholders explained that the end-to-end development process is long and getting longer. Estimates vary widely depending on location, but several stakeholders suggested that a five to seven-year timeframe for a sizable development or apartment complex is not uncommon. For new greenfield developments, we were told five to 10 years is the average time taken for establishing a housing estate, and as long as 20 years is possible.

Of these timeframes, a large fraction is typically taken up by the development approval process prior to construction: actual building accounts for less than half of the total time, if not significantly less. The apartment complex that takes seven to 10 years to complete probably only involved one to two years of actual building.

⁹ Figure 3.1 implies that the steps to develop and construct new housing are mostly sequential. And in practice, each stage must be mostly complete before the next can start. This is particularly the case for construction (you cannot put up a wall without the concrete foundation being poured). However, many of the preliminary steps that go to preparing a site for development can be undertaken concurrently – for example, the process of doing due diligence prior to land acquisition typically involves gathering as much information about the entire development process. And tasks like arranging supporting infrastructure and services on a greenfield site will happen well ahead of the beginning of construction and in conjunction with prior steps, though it generally needs to be complete before construction of housing begins.

Figure 3.1 – The housing development and construction process has many steps^a



a. While much of the housing development and construction process is sequential, some steps can overlap. For example, a developer may begin arranging financing or setting up supporting utilities and infrastructure much earlier in the process for them to be ready in time for construction to commence.

Source: Beachwood Homes (2024); Infrastructure Victoria (2019); Lofty Building Group (2021); O'Brien et al (2000, pp. 75–76); Urban (2014); discussions with project participants.

The risks of ‘cascading failures’

Ultimately, disruptions at any stage of the development process can lead to delays in the time it takes to complete housing projects. These delays can be ‘cascading’ because if one stage is delayed (for example, because an approval is not received on time, or a utility service is not connected, or a skilled tradesperson or a specific material is unavailable), it tends to flow on and cause delays in every subsequent part of the development and building process. These issues become more acute when labour or materials are in short supply – meaning the next available appointment or shipment can be weeks or months away, leading to significant increases in construction completion times (figure 1.2).

Delays in approvals can also slow other associated approvals. In fact, the PC was told of delays of such length that other approvals that had already been obtained – such as environmental approvals – had to be redone.

3.2 The construction sector is fragmented

The construction sector is fragmented – made up of mainly small firms and individual subcontractors. This appears to, at least in part, stem from the way in which the sector is regulated. The large number of small firms potentially reduces capacity to innovate, including because the benefits from economies of scale and scope are forgone, limiting productivity gains in the sector.

The construction industry is one of the least concentrated in Australia

The average construction firm (which includes building construction, heavy and civil engineering construction and construction services) had 2.7 employees¹⁰ as of June 2024, compared to an average of 5.5 employees across all firms (PC estimates using ABS 2024a, 2024i via data explorer). In residential construction, firms were even smaller – 1.5 employees on average in *house construction* and 1.9 in *multi-unit apartment and townhouse construction* (IBISWorld 2024).

The prevalence of small firms appears to reflect the tendency in construction to manage projects via subcontracting arrangements. Many construction projects are not completed by a single large firm, but instead by a lead firm which subcontracts out different parcels of work (WA Department of Finance 2019, p. 3).

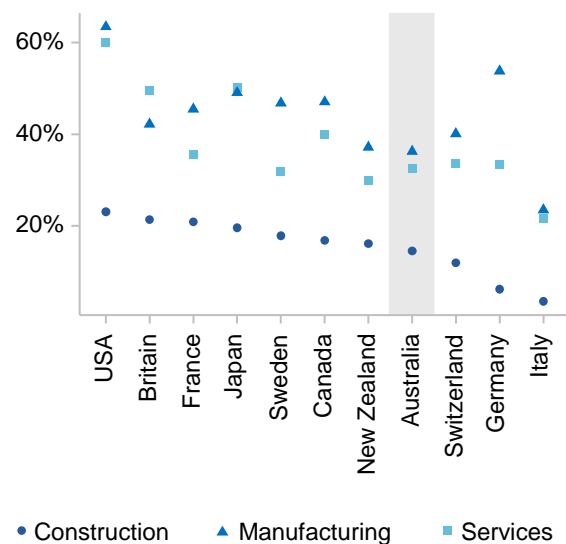
Even among the larger firms, the construction industry remains relatively unconcentrated. Across each construction subdivision (building construction, heavy and civil engineering construction and construction services) the average market share going to the largest four firms was just 12% in 2017, the lowest of any sector (figure 3.2, left). Low market concentration is also a feature of all dwelling construction subindustries¹¹, with the exception of elevator installation and maintenance (IBISWorld 2024).

Australia is not unique in having a fragmented construction market. In other countries, the employment share of large firms is lower in construction than in manufacturing or services (figure 3.2, right).

Concentration is also low for housing developers, with the largest developers in Victoria, New South Wales and Queensland each controlling less than 2.1% of development sites. Concentration is somewhat higher in Western Australia and South Australia, with the largest developers controlling 11.4% and 2.9% of sites (OpenLot 2024).

¹⁰ ‘Employees’ does not include self-employed workers such as sole traders or owner-managers.

¹¹ Concentration was only examined for industries directly involved in dwelling construction (house construction, multi-unit apartment and townhouse construction, construction services subindustries), and not for industries involved in upstream processes such as creating materials used in construction.

Figure 3.2 – The construction industry in Australia and overseas has low concentrationShare of output in Top 4 in Australia by industry, 2017^aLarge firms' share of employment by country and industry, 2014^{b,c}

a. Concentration is averaged across three-digit ANZSIC codes for each industry. b. Large firms are defined as those employing 200+ workers in Australia, 300+ in Canada and Japan, and 250+ in other countries. Data for Switzerland excludes firms with 1–2 employees, data for Britain excludes small unregistered businesses and data for Japan includes overseas employment. c. Data is for 2014 or closest available year.

Source: Andrews et al. (2023); OECD (2017, fig. 2.10).

Why are construction firms small?

There are several features of the market and regulatory environment that may lead construction businesses to stay small, including:

- regulations that differ across geographic areas, even for adjacent local government areas. These differences make it hard to efficiently replicate a development or construction process across the country
- building regulation tends to be project-based rather than firm-based, meaning a builder is required to obtain new regulatory approval and to demonstrate compliance for each new project. In other industries, regulations effectively act as a fixed cost that encourage firms to scale up to spread those costs over a larger revenue base. But in construction, if a builder does scale up, their regulatory costs scale up proportionally, reducing or even negating the benefits of expansion
- project risk management and a regulatory focus on the builder as a coordinating head contractor leads to highly disaggregated specialisation and outsourcing of skilled, semi-skilled and unskilled work.

That said, consolidation does occur, and the PC met with several large developers and builders including vertically integrated firms, and firms operating across multiple jurisdictions. We observed that vertical integration may be more attractive than horizontal integration. Some examples we heard about in our engagements included builders purchasing material businesses, and material suppliers acquiring or starting prefabrication and modular businesses. Interestingly, where vertical integration does occur, those firms still tend to subcontract trades (for example, electricians and plumbers).

Foreign investment appears to be a common path towards consolidation and achieving scale. There is significant foreign investment in the Australian housing construction market, particularly partnerships with Australian firms that have the experience and reputation to support the associated investment risk. More

than one in 10 homes are built by businesses funded by large Japanese conglomerates (HIA 2024c, p. 18). For example, the Japanese firm Sumitomo Forestry recently acquired a majority share in Metricon, Australia's largest home builder (Bleby 2024; HIA 2024b, p. 5).

Why a fragmented structure might contribute to poor productivity

Smaller firm size likely has downstream effects on the ability of construction firms to achieve 'economies of scale' (greater productivity stemming from higher levels of production) and 'economies of scope' (applying the learnings from one line of business to another), which can be important drivers of productivity growth. Smaller firms may also have less capacity to innovate, further impacting on productivity (section 3.3).

A US study of the housing construction industry found that larger firms were more productive on average. For example, they found that compared to firms with fewer than 20 employees, businesses employing between 100 and 499 employees produced almost twice as many housing units per worker, while firms with more than 500 employees were more than four times as productive (D'Amico et al. 2024, p. 34).

None of this is to say that big firms are inherently better than small firms. While large firms are more productive, large firms start small, and small firms likely push larger firms to continue to adapt and innovate (creative destruction and competition at work). But the concern is that housing policy may be creating incentives that keep firms small. For example, the above study found that stricter land use regulation in US cities is associated with smaller firm size.

3.3 Low levels of innovation

The construction industry (civil, commercial and housing combined) has relatively low levels of innovation. Private business expenditure on research and development and the proportion of firms innovating are lower than in most sectors (figure 3.3).

Innovation is also more incremental. Relative to firms in other industries, construction firms are more likely to introduce products that are only 'new to the business' (6th highest of 17 industries) or 'new to the industry within Australia' (4th highest), as opposed to products that are 'new to Australia' or 'new to the world' (ABS 2024g).

Innovation tends to come from other parts of the supply chain

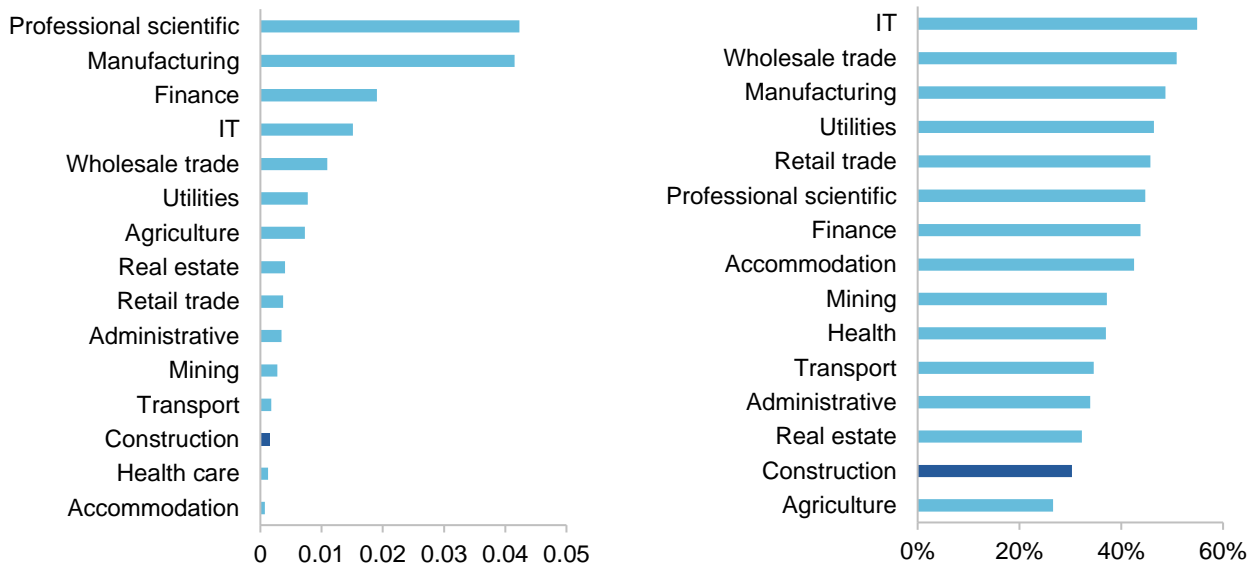
In the two years to 30 June 2023, construction firms were less likely to introduce new or significantly improved goods or services than any other industry outside of primary production (ABS 2024g).

But despite apparently low levels of innovation, the quality of homes is increasing over time (chapter 2). This is because these improvements largely come about via innovation in other parts of the supply chain, particularly building materials (think of polystyrene bricks, aerated concrete and photovoltaic solar panels, and conversely, phasing out harmful materials like asbestos), prefabrication processes and design (for example, open plan, accessible homes and online, in-home entertainment services). And in the main, the value add of these improvements is not primarily captured in productivity numbers for the *dwelling construction* industry. For example, prefabrication and new and improved building materials will be captured under manufacturing.

Figure 3.3 – Innovation is low in construction^{a,b,c}

Business R&D expenditure per dollar of GVA, 2021-22

Proportion of firms innovating, by industry, 2021-22 to 2022-23



a. R&D expenditure per dollar of GVA is based on ‘intramural’ R&D expenditure. Intramural R&D covers R&D performed by a firm, regardless of the source of funds. As such, intramural R&D omits R&D wholly carried out by a third party. **b.** Innovating firms are firms that introduced any new or significantly improved goods or services or business processes across 2021-22 and 2022-23. Non-employed firms are excluded from this measure. **c.** Several industries are omitted from the above graph due to only one indicator being available (education and training, arts and recreation, and other services) or due to being predominantly public sector (public administration). Using available indicators, other services and arts and recreation had a higher proportion of innovating firms than construction, but education and training had lower R&D per dollar of GVA.

Source: PC estimates using ABS (2023c, table 1, 2024d, table 5) (R&D expenditure), ABS (2024g, table 1) (proportion of firms innovating).

Slow take up of data and digital technology

In addition to the low levels of product innovation, stakeholders indicated that housing construction firms were typically slow in taking up information and communications technology to transform how they work.

This is borne out by survey data, with construction firms relatively unlikely to use data in their decision making (ABS 2017).¹² Indeed, construction firms rank:

- last (out of 17 industries) in the proportion of businesses that use data for ‘design of new goods or services’ and ‘demand forecasting’
- third last in the proportion of firms that use data for ‘supply chain management’ and fifth last for use of data in ‘environment management’.

Stakeholders attribute the slow digital take up to lack of industry expertise but also industry culture (discussed below). For example, stakeholders indicated there would be potential to improve efficiency and reduce the impact of cascading failures through use of online platforms to find available labour or identify available inventory ‘just in time’. However, lack of digital literacy, combined with reliance on informal local

¹² This data is from 2015-16 and the survey was only asked once. But given the alignment with other more frequent and recent ABS surveys and overall consistency with the messages coming out of consultation, there is little reason to think that this picture has fundamentally changed in the years since.

networks of builders, tradespeople and preferred material and equipment suppliers may have stymied adoption of these types of digital innovations.

Slow take up of prefabricated construction

Prefabrication can refer to offsite construction of entire buildings, but can also be components of buildings, such as 2D components like walls and trusses or 3D components like bathroom and kitchen pods (HIA and AMGC 2022, pp. 2–4).

Prefabricated construction – particularly robot assisted automation – has several benefits for the productivity of the construction process, including:

- greater efficiency, as components can be manufactured quicker and tradespeople can work in one location on multiple components and dwelling units at a time
- prefabricated components can be higher quality
- higher reliability and throughput as production can occur throughout the day, unaffected by bad weather
- improved worker safety (HIA and AMGC 2022).

Despite these benefits, the use of prefabrication is currently low in Australia. The best estimates are that less than 5% of total construction – not just residential – is prefabricated (prefabAUS 2023, p. 23).

There are a range of regulatory barriers to greater uptake of prefabricated construction. For example, building regulations were designed with onsite construction in mind, and some planning and zoning rules favour 'traditional' homes. These issues, and possible policy responses, are discussed in chapter 4.

There are also non-regulatory barriers to greater uptake of prefabricated construction, including:

- consumer preferences – Australian consumers' apparent preference for customised housing products, and limited knowledge and understanding of prefabricated construction may lead to a lack of comfort with the product, leading to low levels of demand
- financing – stakeholders noted that some producers of prefabricated products have found obtaining financing for factories difficult and the current method for financing home loans, which usually involves progress payments after inspections at key stages, is inconsistent with prefabricated construction
- industry resistance – some tradespeople and their industry representatives are resistant to prefabricated construction methods being adopted under the perception that it will reduce demand for their services
- transport issues – larger prefabricated components can be difficult to transport due to width and height limitations on the existing road network
- industry readiness – many builders do not have the necessary training and skills to utilise prefabricated construction (HIA and AMGC 2022, pp. 27, 45; PC consultations with stakeholders).

We heard that lack of demand is probably the largest barrier to greater uptake of prefabricated construction. Prefabricated components often need to be manufactured at a large scale to be cost-effective (for example, Bertram et al. 2019, p. 23) and achieving the necessary scale to realise those cost savings (and price reductions) has proved difficult in Australia so far. As a result, stakeholders note that the cost of prefabricated construction can be similar, or more expensive than onsite construction.

Why is innovation in construction so low?

Fragmentation

As noted above, at least part of the construction industry's low propensity for innovation is likely due to its fragmented nature. Stakeholders said that the limited innovation that did occur often came from larger firms and that the small ones rarely innovated. And this is backed up by the data – while only 35% of all

construction firms are 'innovation-active', among those with 20 to 199 employees, this figure jumps up to nearly 80%. Firm size is correlated with both process and product innovation (ABS 2024g).

Industry culture

Some stakeholders characterised construction firms as often unwilling or unable to adopt new approaches. ABS survey data indicates the construction industry was:

- least likely to agree, or strongly agree, with the statements: 'this business takes a proactive approach to market competition' and 'this business is usually the first in the market to innovate'
- third least likely to agree or strongly agree with the statement 'this business normally initiates changes upon which its competitors react' (ABS 2017).

One theory is that inertia in the construction industry is grounded in industry structure and practice. In particular, the industry's 'loose couplings' – whereby a large number of players come together to complete a construction project and then move on – mean that once the project is completed, the knowledge gained is not captured in any systematic way. As Dubois and Gadde (2002) argue:

each project is considered to have a life of its own – without either history or future.

The lack of cross-project knowledge spillovers leads to people favouring a conservative approach – there is little to be gained from innovation on a single project, so it is better to do things the way they have always been done.

Lack of direct benefits to firms from innovation

Another explanation is that firms may not receive the benefits when they do innovate.

ABS data indicate construction firms are less likely than most other industries to report receiving any payoff from innovating, ranking third highest (out of 17 industries) in the proportion of businesses to report 'no benefit' from the innovations they introduce (ABS 2024g).

When they do report a benefit to innovation, construction firms are relatively more likely to report 'improved safety standards' (second highest), 'environmental benefits' (fifth highest) and 'social benefits' (seventh highest) than most other industries. They are less likely to report 'reduction in costs' (second lowest) (ABS 2024g).¹³

The PC did hear from residential housing market participants that produced higher quality products through innovation – for example, a factory using automated robots to manufacture highly precise, low tolerance prefabricated housing components that improve the overall energy efficiency of housing. However, they were not able to achieve a price premium for these products. Exactly why price premiums are hard to extract is unclear. Whether it stems from consumer preferences, such as a lack of willingness to pay for additional quality at the market price, versus market failures: that consumers may have less visibility over build quality.

Regulatory burden

Participants suggested that the high and growing regulatory burden (section 3.4) affects firms' ability to innovate because it forces developers and builders to focus unerringly on achieving compliance within the existing regulatory framework to finalise projects on time and budget. Innovation is simply too risky.

The ABS innovation survey shows that while the regulatory burden is a factor limiting innovation, it is not necessarily the biggest factor (at least when commercial and civil construction are also included). This data shows nearly 42% of construction firms reported facing barriers to innovation. Of those, 19% reported

¹³ These rankings are generally consistent with previous years' survey results.

'government regulations and compliance' and 4% reported 'adherence to standards' as barriers (ABS 2024g).¹⁴ Construction firms were more likely to point to 'lack of skilled persons in any location' (64%) as a barrier than regulatory burden specifically (although skills shortages can also be related to policy settings, especially those relating to occupational licensing, training and migration). It should be noted that this data includes commercial and civil construction firms, so may not be the full story for residential construction firms.

3.4 High regulatory burden

Housing construction is subject to a range of regulations

To develop and construct housing in Australia requires compliance with layers of regulation imposed by every level of government that dictate:

- where housing can be built (for example, planning regulations in each state and territory that affect things like which land is zoned for residential development)
- how housing should be built (for example, the National Construction Code – which regulates minimum standards about how buildings are constructed)
- what housing should look like (for example, local government planning requirements for setbacks and roof pitches).

Other regulations that new housing developments must comply with are indirect, such as environmental regulations, which, for example, necessitate setback requirements and buffer zones that reduce the amount of developable land that housing can be built on.

And the regulatory burden is increasing. The volume of planning regulations in some locales has increased markedly over past decades and can run into the thousands of pages. The National Construction Code and related housing provisions are more than 2,000 pages long. This unambiguously increases the cost of development and construction, and ultimately the cost of housing for Australians.

There is no easily accessible comprehensive list of regulations that a housing developer or a builder must comply with. We spoke with some developers who suggested that difficulty accessing information about the regulatory thicket and how to navigate it is a de facto barrier to entry that might be reducing competition.

In this section we provide a summary of the broad types of regulations that exists in different jurisdictions in Australia, and some specific examples. This is not a comprehensive treatment.

Planning and zoning

State and local governments regulate where housing is permitted through planning and zoning regulations. Some of the commonly used instruments include:

- **state laws and regulations** cover state-wide requirements and may set out frameworks for how rules affecting developments are made and processes for assessing and approving development proposals. For example, in NSW it is the *Environmental Planning and Assessment Act 1979* and supporting regulations. In Victoria, the *Victoria Planning Provisions* are provided under state legislation and provide a framework from which councils form local planning schemes (NSW DPE 2018; Victorian DTP 2024c, p. 5)

¹⁴ This data is expressed as fractions of the firms that reported any barrier to innovation. So, for example, 12.7% of all construction firms cited 'cost of development or introduction/implementation', which as a share of the 41.7% of firms reporting any barrier, is about 30% (ABS 2024g).

- **state and regional plans** are issued by state governments and outline broader targets for future development, such as identifying and supporting growth corridors. For example, *Plan Melbourne* was developed in 2017 to identify planning priorities for Melbourne to 2050, including places of state significance that will 'be the focus for investment and growth' (Victorian DELWP 2017, p. 14)
- **local strategic plans** can be developed by local governments and outline development plans for the area, including priorities for certain parts of the local government area. These plans typically must consider the priorities identified in the relevant state and regional plans (PIA 2012, p. 2)
- **local planning schemes** contain land use controls in local government areas, including zoning, overlays and other controls used to determine the types of activity and development allowed (with or without a permit) or prohibited on a given site (Victorian DTP 2024c, pp. 5–9)
- **development assessment** is the process of assessing an application for consent to carry out a development such as building works and, in some cases, a change in land use (PC 2021, p. 4).

A list of relevant regulatory instruments, strategies and guidelines provided by select state and territory governments are provided in table 3.1. This list is not comprehensive but illustrates the volume.

Table 3.1 – Selected state and territory planning regulatory instruments, strategies and guidelines

New South Wales	Western Australia
<ul style="list-style-type: none"> • <i>Environmental Planning and Assessment Act 1979 (NSW)</i> • <i>Environmental Planning and Assessment (Statement of Expectations) Order 2024</i> • State Significant Rezoning Policy • Development Assessment Best Practice Guide • Your guide to the Development Application Process – Small housing development • Local Environment Plan Making Guideline 	<ul style="list-style-type: none"> • <i>Planning and Development Act 2005 (WA)</i> • <i>Planning and Development (Planning Codes) Regulations 2024 (WA)</i> • <i>Planning and Development (State Planning Policies) Regulations 2024 (WA)</i> • State Planning Strategy 2050 • State Planning Policies and Planning Codes (instruments under <i>Planning and Development Act 2005 (WA)</i>) • Regional and sub-regional strategies
Queensland	Australian Capital Territory
<ul style="list-style-type: none"> • <i>Planning Act 2016 (Qld)</i> • <i>Planning Regulation 2017</i> • <i>Planning and Environment Court Act 2016 (Qld)</i> • <i>Planning and Environment Court Rules 2018</i> • <i>Regional Planning Interests Act 2014 (Qld)</i> • <i>Regional Planning Interests Regulation 2014</i> • State Planning Policy • Regional plans • Minister's Rules and Guidelines • Development Assessment Rules • State Development Assessment Provisions • Local planning schemes • Local Government Infrastructure Plans • Temporary Local Planning Instruments • Planning Scheme Policies • State Planning Policy Mapping • Development Assessment Mapping System 	<ul style="list-style-type: none"> • <i>Planning Act 2023 (ACT)</i> • ACT Planning Strategy • ACT Housing Strategy • District strategies • Territory Plan • ACT Infrastructure Plan • Indicative Land Release Program • Design guides • Technical specifications • Development application (DA) and assessment guidance resources and templates

Northern Territory

- *Planning Act 1999 (NT)*
- *Planning Regulations 2000 (NT)*
- Northern Territory Planning Scheme 2020
- Jabiru Town Plan
- Interim development control orders (which can temporarily override or suspend planning rules)

Victoria

- *Planning and Environment Act 1987 (Vic)*
- Guide to Victoria's Planning System
- Victoria Planning Provisions
- Planning Policy Framework
- Local planning schemes
- Housing Statement

Source: State and territory governments (personal communications); Northern Territory Government (2021).

Building regulations

Building regulation for commercial and residential buildings in Australia is underpinned by the National Construction Code (NCC). The NCC is implemented in each jurisdiction by state and territory governments (local government regulations and guidelines can also overlap with the NCC, this is discussed in chapter 4).

The NCC sets minimum technical standards for the design and construction of new buildings. It contains a range of standards, covering aspects such as housing structure, damp and weatherproofing, fire safety, energy efficiency and accessibility (ABCB 2024b).

The NCC was introduced in 2011 and consolidates the Building Code of Australia (which was originally drafted in 1988) and the Plumbing Code of Australia (which was originally drafted in 1990) into a single document (ABCB 2022a).

The NCC is produced and maintained by the Australian Building Codes Board (ABCB). The ABCB is a joint initiative of the Australian, state and territory governments, established through an intergovernmental agreement (ABCB 2022a).

The NCC sets out two approaches through which regulated parties (for example, builders, manufacturers of building materials, designers and architects) can comply with its requirements: a 'deemed-to-satisfy solution', or a 'performance solution' (and a combination of both approaches is also allowed).

Deemed-to-satisfy solutions set prescriptive requirements that 'tell you how, what and in what locations things must be done'. Performance solutions are an alternative way of meeting NCC requirements that specify required outcomes but allow flexibility in how those outcomes are reached (ABCB 2022d). For example, for indoor air quality:

- a deemed-to-satisfy solution prescribes the type of ventilation measures that would comply with the standard
- the performance-based option is met when it is verified that the building's ventilation system complies with specified air quality requirements.

The NCC is reviewed and amended on a three-yearly cycle, but changes can be made mid-cycle if critical matters arise (for example, things relevant to serious defects or safety) (ABCB 2024a).

Other regulations that affect new housing

Many other regulations can affect housing. For example:

- **environmental regulations** can be set by Australian, state and territory, and local governments. At the Commonwealth level, the *Environmental Protection and Biodiversity Conservation Act 1999* requires developments to gain Commonwealth approval if they impact Australia's international environmental obligations, such as world heritage sites and the marine environment. States and territories also enforce environmental laws and regulations that affect development projects – including pollution control, waste disposal and biodiversity protection. And developers may need approvals where there is a risk that the project

may cause environmental damage (Baker McKenzie 2024). Local governments can also set environmental requirements for development projects, and developers typically have to demonstrate compliance with state environmental laws to receive local government approval (Access Environmental Planning 2024)

- **infrastructure and utilities regulations** specify how and where infrastructure can be installed or connected to existing services (for example, railways, roads, sewerage, water and electricity)
- **bushfire and flood area regulations** set requirements for the design of properties in bushfire or flood risk areas including via the use of setbacks and buffer zones against water courses and bushland
- **cultural protections** can apply in culturally significant sites and affect how the land can be used
- **health and safety laws and occupational licensing requirements** affect sites during the construction stage and when other siteworks are carried out, including connection and construction of infrastructure.

How does the regulatory burden impact productivity?

There are important reasons why housing development and construction is regulated, including to ensure health, safety and minimum quality. And well-designed regulation can improve productivity when it cost-effectively solves market failures. For example, regulation can guarantee a minimum level of quality and funnel consumers to legitimate builders, where information asymmetry would otherwise make informed choice difficult.

But excessive regulation hinders housing construction productivity and increases housing costs, making homes more expensive. Even where it is well justified, the large volume of regulation makes the planning and development process unambiguously longer and more complex, involving more agencies and more decision makers who require distinct pieces of information. As alluded to in the introduction to this section, the sheer volume of regulation and difficulty understanding and navigating it may act as a de facto barrier to competition.

Regulatory requirements can feed into the cascading failures outlined in section 3.1. The greater the number of approvals and the more uncertain the timeframes, the greater the likelihood of those timeframes ‘blowing out’, which can imperil the feasibility of housing projects (box 3.1).

Lack of coordination and consistency between decision-making bodies – including at the local government level – can increase the risk and uncertainty associated with housing development. It can also reduce the capacity of firms to benefit from economies of scale and scope (section 3.2). Differences in planning rules, including rules around external design and building materials, can limit the capacity of builders to standardise designs and processes, and so stymie the flow-on benefits of building expertise and ‘know how’ to deliver those designs efficiently.

The burden can also flow through to innovation and appetite for innovation (section 3.3). In some cases, regulation may directly stymie more innovative approaches, for example adoption of prefabrication (chapter 4). More commonly though, the uncertainty created by regulation – especially if it is frequently changing – can make innovation less attractive. Some developers explained how the constant ‘shifting of the goal posts’ could make any innovative approaches quickly redundant.

And finally, the ‘compliance culture’ created by complex regulation seems to have led to a focus on ‘ticking the boxes’ to ensure compliance rather than delivering better consumer outcomes.

Box 3.1 – Regulatory risk and uncertainty can undermine the feasibility of housing projects

The PC heard that many housing projects fail at early stages (figure 3.1). The reasons are many and varied but speak to the often highly uncertain nature of the development process. For example, often developments are ‘stitched’ together from multiple land sales that could occur over many months or years. The PC heard that it is not uncommon for a single landholder that is an unwilling seller to hold up an entire housing development.

Similarly, connecting developments to trunk infrastructure, such as roads, electricity and water, may require easements to be negotiated with one or many private landholders. High quality maps of publicly owned trunk infrastructure do not always exist, which means private engineers need to be contracted to work with utilities companies to provide those maps, which delays feasibility assessments and increases the costs of development.

Environmental regulations designed to protect biodiversity, which are regulated at both the state and Commonwealth level, add more uncertainty to feasibility assessments, because sites need to be surveyed to identify what species are present and how the development will mitigate any damage (some developers mentioned the need to subcontract ecologists). Because housing development can take many years, environmental regulations tend to change during that time including to become more stringent, for example, because previously unprotected species (and their attendant flora) have become protected. This can effectively result in the entire development process restarting.

3.5 Workforce and employment issues

The skills and characteristics of the construction sector workforce, and how it is used, shape productivity growth. Stakeholders in our consultations and in brief comments raised several workforce-related issues that could be affecting construction productivity and/or housing supply more broadly (box 3.2).

Box 3.2 – Select brief comments about the housing construction workforce

Apprentices need to be paid more. The training system needs a more regional focus, reflecting the housing demands in the area of employment. We need paid mentors on building sites to provide the guidance needed. (brief comment 8, excerpt)

More needs to be done for workers’ rights and conditions, i.e. superannuation, sick pay, holiday pay, inclement weather pay etc. Apprentices being used as cheap labour then discarded. No wonder people get out of the industry at the first opportunity and never return. (brief comment 12)

The emergence of profit-driven skills assessment companies has led to a marked decline in the skill levels of tradesmen. I did a full carpentry apprenticeship and the TAFE training that went along with it. Previous work history can easily be faked, so the assessment businesses

Box 3.2 – Select brief comments about the housing construction workforce

are often qualifying people with little to [no] technical training or little understanding of the underlying principles of construction. (brief comment 16)

Productivity in housing construction has declined badly over the past 20 years. The use of mobile phones has taken away the need to be organised and the project management skills of the industry and contractors is very poor at the moment. Contractors are earning far more money than ever before and so the need to work longer hours has been removed to the point where some contractors can only work four days each week and earn the same money they were achieving before Covid. Communication is very poor and the knowledge of contractors and builders working in the industry is at an all-time low. Much more is needed to boost the education and training of the sector. The skills of building designers and architects in relation to the quality and standard of plans and documentation is very poor and leads to duplication of work, errors and misunderstandings during construction which leads to a loss of productivity. (brief comment 19, excerpt)

In Vic, I had commercial and domestic registrations, but not aligned, so had to renew every 5 yrs for both, but at different times. I am the same person for both. Installation of steel Roofing has to be by a plumber, but in other states can be by a carpenter. Many years ago carpenters could install steel roofing in Vic. Need a licence/ registration scheme that is Australia wide, not state based – i.e. electrician has one licence to work in Albury and Wodonga, as well as all other states. We are one country! (brief comment 25)

Workforce and pipeline issues

The construction industry has experienced shortages in the post-COVID period and current workforce growth is likely insufficient to meet built environment policy objectives (BuildSkills Australia 2024b, p. 8; MBA 2024, pp. 19–20). Some of this pressure is likely cyclical, related to government stimulus for construction during the COVID-19 pandemic. Australian Government policies like *HomeBuilder* significantly increased demand for residential building, pushing up prices (Kruk et al. 2024, pp. 543, 586–587).

The large pipeline of government infrastructure builds in some states may have also increased competition for labour that might otherwise be working in the residential sector (NHSAC 2024, p. 69). That said, stakeholders indicated that direct competition for labour is typically limited to projects like schools and hospitals (but not, for example, transport infrastructure), where labour skillsets are similar to that required for higher-density residential projects.

Some stakeholders noted that restrictive entry pathways and occupation licencing requirements reduce labour supply and flexibility. They considered that certain construction tasks could be undertaken by workers who have completed relatively short training courses (months rather than the traditional four years of training). The counterarguments are that long-form training is required to ensure foundational knowledge and that narrower specialisations might limit flexibility in the long run.

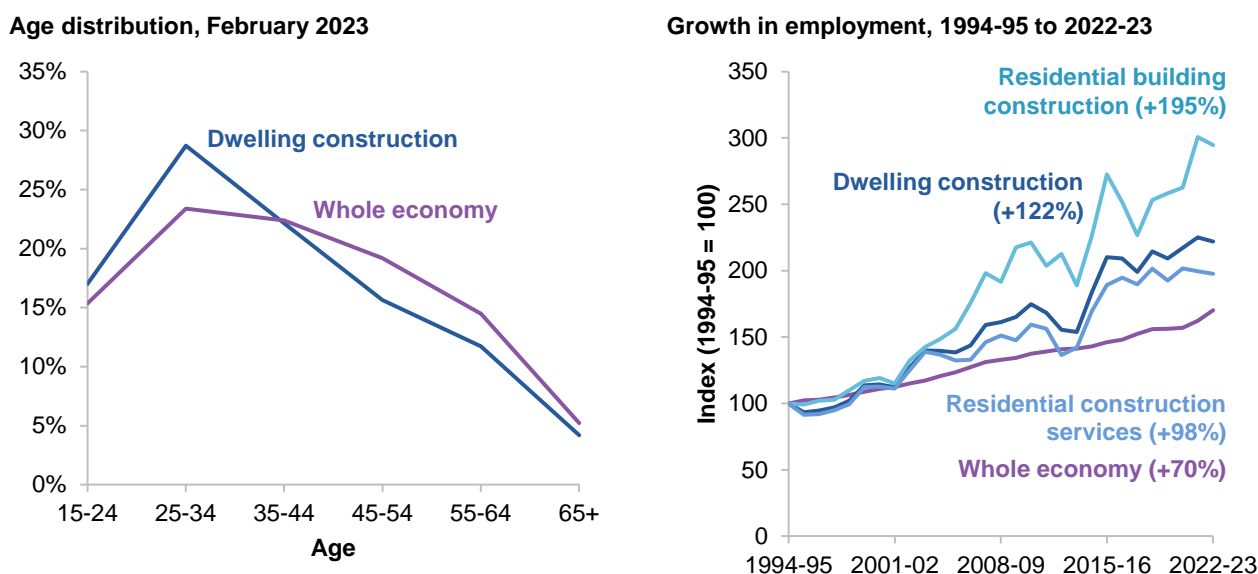
The challenge of attracting and retaining apprentices was also a strong theme in feedback (for example, box 3.2), with participants arguing that low pay and cultural issues discourage people from completing apprenticeships. It appears apprenticeship commencements and completions in construction have stagnated

in recent years, though this follows a significant increase from 2020 to 2022, and steady growth over the longer term (BuildSkills Australia 2024a; PC estimates using NCVER 2024).

More generally, workforce characteristics and cultural issues, including that the workforce is predominantly male and many work long hours, may be a barrier to talent attraction. In response to this, industry and governments have partnered on the Construction Industry Culture Taskforce, which is working on a culture standard that aims to improve workforce diversity, wellbeing and work-life balance (Construction Industry Culture Taskforce 2024). As well, the National Construction Industry Forum was established as a statutory advisory body in 2023 to address issues in the construction industry, including industry culture and gender equity (Australian Government 2023).

Despite these issues, the construction workforce has grown strongly over recent decades compared to the broader economy (figure 3.4, right). And despite frequent mentions of an ageing workforce, the construction workforce is also younger than in the broader economy (figure 3.4, left).

Figure 3.4 – The dwelling construction workforce is young, and growing strongly^{a,b}
Age distribution and growth in employment by selected industries



a. Residential building construction captures workers whose employer works delivering residential projects, and predominantly includes building companies and developers. Residential construction services captures firms of construction tradespeople, such as electricians and carpenters, who work on residential construction projects. **b.** The dwelling construction industry combines residential building construction and construction services (additional detail on the associated methodology is in appendix B).

Source: PC estimates using ABS (2024i, via data explorer, 2024c, 2024j, EQ06, 2024m).

Licensing and migration settings

Stakeholders pointed to ongoing barriers to labour mobility and entry through state-specific licensing regimes. Highlighted challenges included that requirements to obtain and maintain some licenses are too onerous, and the ongoing variation in licensing rules across jurisdictions. Possible ways to reduce these barriers are explored in chapter 4.

Another ongoing challenge for the sector is the capacity to attract skilled migrant workers. Migrants are less likely to work in construction than in most other industries. And very few recent migrants work in the sector (Coates and Wiltshire 2024).

Some of the challenges in drawing on skilled migrants are general challenges with the migration system and the reliance on 'skills lists', some of which, until recently, explicitly excluded construction workers (chapter 4).

But there are also more specific barriers. Currently, overseas qualified tradespeople must have their skills assessed twice: first to qualify for a skilled visa and second to be granted a licence by a state or territory. The Parkison migration review (2023, p. 158) estimated that this process can take up to 18 months and cost more than \$9,000 for some trades.

Opportunities to align Australian, state and territory approvals processes and to support greater mutual recognition of trade qualifications with other countries are explored in chapter 4.

Industrial relations

Some stakeholders pointed to industrial relations and conditions in enterprise bargaining agreements on some worksites as a potential drag on productivity. For example, specific concerns were raised about the flow on impacts on the housing construction sector in Queensland from the Best Practice Industry Conditions (BPIC), which sets out pay and conditions for construction workers on major publicly funded projects (Queensland Government 2024). We note that the BPIC was suspended in November 2024, and that the Queensland Productivity Commission will undertake a review of the construction sector, including industrial relations policies, which may shed more light on this issue (Janetzki 2024).

The PC has not investigated this issue further in this review. However, to the extent that there are barriers to productivity from certain work practices in enterprise bargaining agreements, this should only directly affect a relatively small proportion of the residential construction sector, since usually only multistorey apartment complexes are unionised building sites (approximately one quarter of full-time equivalent employment in the residential building construction industry is in higher-density housing (PC estimates using ABS 2024k) and of those only some work on multistorey developments).¹⁵

Growth in the professional or 'white collar' workforce

Some participants also claimed the growing prevalence of white-collar workers in construction, relative to blue collar 'on-the-tools' workers (labourers and trades), has increased project costs and reduced productivity. PC analysis suggests this has likely had only a modest effect on construction productivity (box 3.3).

¹⁵ We do not have a disaggregated breakdown for higher-density residential employment into those working on multistorey developments. With respect to output, approximately 49% of higher-density completions since 2001 were apartments in buildings with four or more storeys.

Box 3.3 – Increased hiring of professionals cannot explain much of the decline in productivity in housing construction

White collar work has increased as a share of the (aggregate) construction workforce over time. There are more than four times as many professionals working in construction in 2023-24 than there were in 1994-95. The number of technicians and trade workers doubled over the same period (PC estimates using ABS 2024j).

Some stakeholders claimed that this rise in white collar workers could explain declining productivity in the housing construction industry. But the PC estimates that even if white-collar employment had not increased, productivity growth would have still fallen by a similar amount.

To investigate how much the increase in white collar workers has affected residential building construction, the PC calculated the growth in gross value added (GVA) per employee for a counterfactual that keeps constant the number of white-collar professionals employed (at 2011-12 levels and 2015 levels for the datasets used below). This counterfactual implicitly assumes the additional professionals that entered the workforce added zero value. The resulting gap (between the counterfactual and the actual outcome) can be thought of as the maximum impact that professional employment could be having on productivity.

The analysis was done for two different datasets – *Jobs in Australia* (based on the *Linked Employee Employer Dataset (LEED)* and *Participation, Job Search and Mobility* (a module in the *Labour Force Survey*) – as there is no single published ABS dataset that has employment at the level of *residential building construction* and major occupation group for the entirety of 1994-95 to 2023-24.

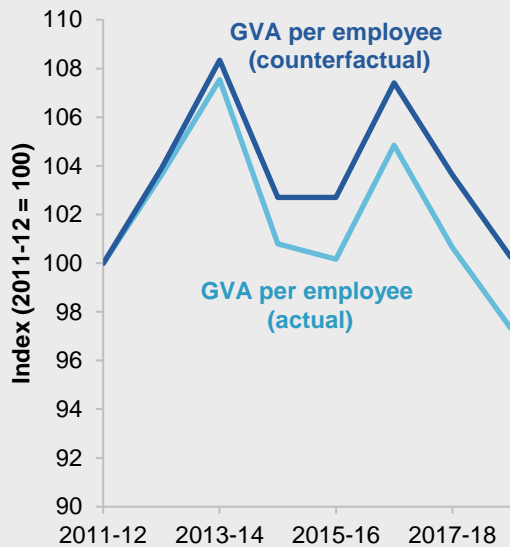
The Jobs in Australia dataset shows that excluding professionals from the labour inputs results in GVA per employee increasing about three percentage points more than when they are included. By contrast, using the Participation, Job Search and Mobility dataset shows minimal effect of excluding professionals (figure below).

Overall, this analysis suggests (at most) a modest detrimental effect of hiring additional professionals on residential building construction productivity. That said, this analysis does not directly measure the entirety of the compliance cost of regulation. Many of these costs would be borne within the existing workforces of firms and by owner managers for smaller builders and developers or by hiring specialist firms in other industries, rather than through additional hires in residential building construction.

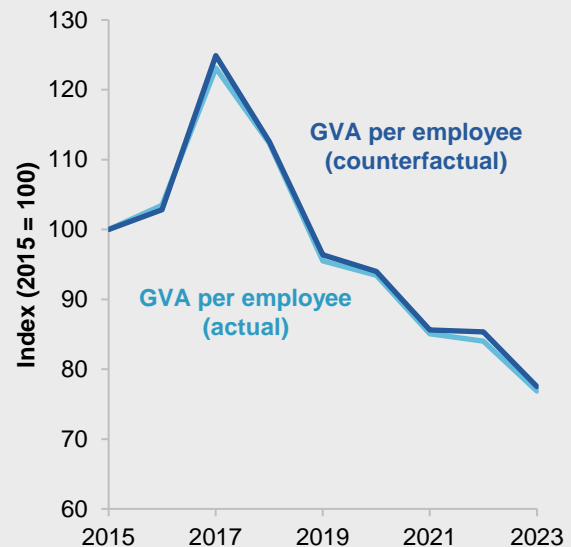
Box 3.3 – Increased hiring of professionals cannot explain much of the decline in productivity in housing construction

Removing professionals from the residential building construction productivity calculations has a modest effect on overall trends^{a,b,c}

Jobs in Australia (LEED)



PJSM (Labour force survey)



a. Left-hand side uses the Jobs in Australia ABS publication to calculate the number of employees while the right-hand side uses the Participation, Job Search and Mobility (PJSM) ABS publication. b. Estimates of residential building construction output derived using same methods as figure 2.3. c. PJSM data from 2015, for example, is used for the 2014-15 financial year. The PJSM employment data has high standard errors, but it was used as there are few alternative sources of employment data at the level of residential building construction.

Source: PC estimates using ABS (2024c, Data Explorer, 2024d, table 5, 2024j, EQ6, 2024i, table 6, 2024h, 2024m).

4. How to improve housing construction productivity

Key points

- * **To improve housing productivity and supply, governments at every level need to (in some cases, continue to) reduce regulatory burden, streamline and speed up approval processes, support innovation and improve workforce flexibility.**
- * **Governments need to make the planning and approvals process for housing quicker, and easier to navigate.**
 - There is scope to improve the end-to-end process through improving coordination across approvals bodies and introducing mechanisms to deal with extended delays, and ensuring that regulators, particularly local governments, are adequately resourced.
- * **The National Construction Code (NCC) has been a positive development and remains sound in principle. However, some aspects of the code and the way it is implemented, including its interaction with state and local government regulations, impose unnecessarily high costs on building construction.**
 - A review of the regulatory arrangements for building construction is needed. It should cover the NCC's objectives, governance arrangements and state and territory implementation. It should also cover any additional regulations imposed by states, local government rules that relate to the construction of dwellings and how they interact with the NCC.
- * **Governments should proactively tackle barriers to innovation in the construction sector.**
 - This could include trialling extension services to encourage the uptake of new technologies, examining funding for construction research and development, and greater use of rating schemes to support a price premium for quality.
 - Governments should address unnecessary regulatory impediments to the uptake of prefabricated and modular construction.
- * **Improving labour market flexibility would help address skills shortages and boost housing supply and productivity over time. Governments could support greater flexibility through continuing to reform occupational licencing regimes, reducing impediments to migration and improving support for apprentices.**

4.1 Improve the regulatory system that governs housing

There are good reasons why housing development and construction is regulated. But the current level of housing regulation is burdensome, and its complexity is adding unnecessarily to the cost of housing and weighing on productivity (chapter 3).

Policymakers must strike a balance between, on the one hand, providing minimum levels of quality, amenity (both to future occupants of the house and the local community) and environmental protection, and on the other, providing affordable housing for a growing population.

Currently, Australian governments have not got this balance right. Regulations have undoubtedly improved the safety and amenity of housing, but this has come at too high a cost to consumers and has slowed the supply of new housing.

Turning this around will require regulatory reform across all levels of government, with a genuine focus on prioritising housing supply and affordability.

Improve coordination of the planning and approvals process

Governments are in the process of easing the restrictions on urban infill ...

Planning and zoning rules have long been criticised for restricting the supply of new housing, particularly in areas close to jobs and amenities (Daley et al. 2018; OECD 2010, p. 53). Growing evidence suggests these rules also have a flow-on effect to the productivity of housing construction (D'Amico et al. 2024; Maltman 2024).

Governments have recognised the importance of policy reform to deliver on their ambitious housing supply targets. Recently, under the National Housing Accord, state and territory governments agreed to work with local governments to deliver planning and land use reforms (Australian Government 2022). In 2023, National Cabinet agreed to implement the National Planning Reform Blueprint, which comprises 10 measures and 17 supporting actions to improve planning systems (The Treasury 2024c).

These reforms are focussed on boosting housing supply, including by increasing density in well located areas such as transport hubs. To this end, the NSW and Victorian governments have designated areas that will be subject to different planning controls to increase housing supply (NSW Government 2024d; VPA 2024).

... but other planning barriers to construction remain

Given the substantial policy work already underway to amend planning rules that otherwise limit densification, this subject is not a focus of this report. But the way planning rules are implemented matters too.

Participants described the process as too slow, overly complex, lacking coordination and that there are too many 'information gaps'. This has occurred as more government agencies have become involved in the planning process, including those whose remit is not specifically housing related (for example, environmental regulations – which have increased significantly over the past 20 years, and we heard are particularly time consuming to comply with and subject to high levels of uncertainty). The degree of difficulty of navigating this process can be exacerbated where there is limited coordination between the relevant agencies.

Generally, the regulatory burden falls on industry to work out what approvals are needed, and how best to sequence obtaining them. There needs to be a focus on process reform that speeds up the delivery of new housing and reduces regulatory burden on builders and developers.

Long timeframes for planning and zoning approvals can slow development

Participants expressed frustration about substantial increases in the time involved in receiving development approval for some projects. We heard that average approval times have increased over recent decades. The NSW Productivity and Equality Commission has also highlighted that average timeframes have risen across NSW in recent years, reaching over 150 days on average in some areas (NSW PEC 2024, p. 48).

State and territory governments have attempted to provide accountability for approval timeframes, and most jurisdictions have statutory timeframes in place to publicly report on these targets (table 4.1). For example, NSW publishes council league tables that contain monthly data on development approval (DA) lodgement and assessment timeframes by the type of development being considered (NSW Government 2024a).

However, the information reported about timeframes and targets varies widely by jurisdiction, and the usefulness of the metrics is not always clear. For example, Victoria reports on the proportion of decisions that meet its 60-day target for decisions, but this reporting includes everything from simple renovations to new multistorey developments with hundreds of dwellings. This means the metrics can be skewed by the sizeable proportion of simple, straightforward decisions.

Table 4.1 – Reporting of approvals timeframes for state and territory planning authorities

	Statutory timeframes for planning	Achievement against KPIs
New South Wales	Set out in the <i>Environmental Planning and Assessment (Statement of Expectations) Order 2024</i> . Council should lodge DAs as soon as practical and within an average of 14 days of submission for 2024-25. In 2024-25, councils should determine DAs by whichever is the lesser of council's previous financial year average or within an average of 115 days of lodgement.	For 6 months to 31 December 2024: 58% of councils with average lodgement days within expectation. 75% of DAs meeting the lodgement days expectation. 52% of councils with average assessment days within expectation. 63% of DAs meeting assessment expectation.
Victoria	<i>The Planning and Environment Act 1987</i> requires planning decisions to be made within a 60-day statutory timeframe.	66% of all applications were processed within the statutory timeframes in 2023-24 (84 days median).
Queensland	The Queensland Government publishes indicators for the performance of the State Assessment and Referral Agency (SARA). These include (where SARA is the assessment manager): <ul style="list-style-type: none"> Percentage of applications responded to without an information request Median time taken to issue an information request Median time taken to issue a decision notice (after information requests and public notification completed) Percentage of decisions appealed Otherwise, individual local governments are responsible for publishing documents and making publicly available registers relevant to planning decisions made by local governments.	85% target (84% actual 2021-22) 8 business days (target and actual) 22 business days (target); 25 (actual) <2% (target); 1% (actual)

	Statutory timeframes for planning	Achievement against KPIs
Western Australia	<ul style="list-style-type: none"> • Determination of applications within statutory timeframe. • Processing of local planning scheme amendments within the 42/60/90-day (as applicable) statutory timeframes. • Determination of development applications (under region schemes) within the 60/90-day (as applicable) statutory timeframe. 	<p>85% target (90.6% 2023-24 actual)</p> <p>85% target (91.6% 2023-24 actual)</p> <p>85% target (79.4% 2023-24 actual)</p>
Australian Capital Territory	<p>Statutory timeframes are set for key planning decisions. Statutory timeframes range from 30 to 60 working days under the new <i>Planning Act 2023</i>.</p>	<p>Statistics on current timeframes compared to statutory timeframes are regularly reported.</p> <p>Data is reported monthly, with 49–100% of applications submitted under the new Planning Act meeting deadlines (Feb–Dec 2024).</p>
Northern Territory	<p>The Department of Infrastructure, Planning and Logistics aims for an average development application processing time of 55 days or less.</p> <p>NT Planning Scheme 2020 also provides general objectives for housing.</p>	<p>The average processing time for development applications was 55 days or less in all years since 2016-17, except in 2023-24.</p>

Source: ACT Government (2024, 2025a, 2025b); NSW Government (2024c, p. 5, 2024b); NT DIPL (2019, 2020, 2022, 2024); QLD DSDILGP (2022, pp. 1–14; 2023, pp. 1–3); Victorian DTP (2024a, 2024b); WA DPLH (2024, p. 25); WAPC (2024, p. 17).

Other approvals are also increasingly slow ...

The NSW Productivity and Equality Commission (2024, p. 49) found that what they dubbed the ‘post-Development Approval’ period – the period prior to construction beginning where developers need to meet a set of additional conditions before they can obtain a construction certificate – is increasingly adding substantial costs and delays.

Conditions may require engagement with state government laws or local government guidelines or require the development of construction management plans – this may require the engagement of specialist consultants to liaise with regulators and prepare necessary reports. Examples of specific conditions include getting written approvals from relevant utility and service providers, paying infrastructure contributions, and preparing various plans for managing the construction site (for example, a waste management plan).

One developer reported to the NSW Productivity and Equality Commission (2024, p. 49) that they went through a DA process with 230 conditions that needed to be addressed before they could receive a construction certificate, noting ‘this process can add another six months’.

... potentially because of constrained resources

We heard that the timeframes for other government processes have increased – potentially due to a lack of resourcing, and particularly at the local level – such as the titling of land and strata, which can take 6 to 12 weeks to occur in some cases. These delays can be especially frustrating for developers as they are often the last regulatory hurdle prior to handing over the keys to a buyer and coincide with when a project is likely to be carrying maximum debt.

Stakeholders suggested insufficient resourcing of decisions makers at the local government level is a key source of delay in assessing development and other approvals. Specifically, the increased regulatory load

delegated to councils by state governments has not been accompanied by increased resources to implement the regulations. The PC previously identified the squeezing of local government resources in a review of local government in 2012.¹⁶

The local governments and planners the PC met with agreed that inadequate resourcing was a key challenge for local planning authorities. The Australian Local Government Association has previously highlighted rate capping, restrictions on developer charges, and reliance on federal funding for essential infrastructure as some of the resource challenges facing local councils (ALGA 2024).

What should be done?

Streamlining the operation of the entire planning system (chapter 3, figure 3.1) is needed to improve productivity. The PC (2021) previously identified as priority reform areas the use of fast, streamlined assessment tracks to reduce the time taken to assess development approvals. This would promote faster appeals and review processes, and improve post-approvals processes.

Many states have recently introduced new planning coordinating bodies or ‘concierge’ services to coordinate their planning approvals (table 4.2). This is a welcome development. These types of bodies are designed to address some of the coordination and timeframe issues that the PC has identified in this review.

Table 4.2 – State Government planning coordination bodies

	Coordination body	Key features of coordination body
New South Wales	Planning concierge (2020)	<ul style="list-style-type: none"> Not a decision maker, but a single point of contact for industry that can assist to resolve complex issues, undertake case management to progress projects, and champion change and efficiency.
New South Wales	New Housing Delivery Authority – new state-led approval pathway (announced November 2024)	<ul style="list-style-type: none"> Available to new housing developments above an estimated cost of \$60 million in Greater Sydney or \$30 million in regional NSW.
Victoria	Minister for Planning as decision maker – Development Facilitation Program (as amended 2023)	<ul style="list-style-type: none"> Available for residential developments that provide at least 10% affordable housing and are worth at least \$50 million in Melbourne or \$15 million in regional areas. Reduced decision timeframes to 4 months.
Victoria	Case management by Department of Transport and Planning – Development Facilitation Program (as amended 2023)	<ul style="list-style-type: none"> Is not a decision maker, but works with local state government referral agencies to clear applications that have been in the system for more than 6 months.
Victoria	Concierge service (announced 2024)	<ul style="list-style-type: none"> Is not a decision maker, but will work with industry and local governments to unlock land and address issues preventing greenfield development on high yield zoned land.
Queensland	State Assessment and Referral Agency (2013)	<ul style="list-style-type: none"> Only involved when a development triggers a ‘state interest’ (e.g. transport corridors, state level heritage, SEQ Koala habitat).

¹⁶ Also see PC (2017, supporting paper 16) for a survey of issues faced by local government.

	Coordination body	Key features of coordination body
Queensland	State Facilitated Development – where approver is Director General of the Department of State Development, Infrastructure and Planning (2024)	<ul style="list-style-type: none"> • For residential developments that are a ‘priority of the state’, including infill and affordable housing. • Must include 15% affordable housing in the development with a diverse mix of dwelling types or sizes. • Process limits the standard appeal rights.
Western Australia	State Referral Coordination Unit (2024)	<ul style="list-style-type: none"> • Pathway open to proposals above \$20 million in metro and \$5 million in regions (or by decision of Premier).
Australian Capital Territory	Gateway Team (continuing initiative)	<ul style="list-style-type: none"> • First point of contact for all planning and DA matters, including pre-application meetings and completeness checks. • Without local governments, the ACT Government (through the Environment, Planning and Sustainable Development Directorate) is effectively a ‘one-stop shop’.
Northern Territory	Development Assessment Forum (2022)	<ul style="list-style-type: none"> • Not a decision maker, but allows a development proponent to have a single meeting with representatives of decision makers to get early feedback prior to submitting an application for development approval.

Source: State and territory governments (personal communications).

To be effective, coordination bodies need to have a broad remit to make and coordinate decisions necessary for construction to commence and not be limited to planning approvals alone. On this, the NSW Productivity and Equality Commission has argued in favour of a more ‘end-to-end’ approach given the rising costs and complexity of obtaining a construction certificate after nominally receiving planning approval. In particular, they recommend the NSW government adopt a concierge and clearinghouse mechanism to ensure whole-of-government coordination and accountability across the entire development process, including powers to escalate and intervene when delays occur after a prescribed period of time (NSW PEC 2024, pp. 51–52).

Some states have already established more comprehensive mechanisms. For example, the Queensland State Assessment and Referral Agency provides a type of end-to-end service for developments that trigger a ‘state interest’ threshold (QLD DSDILGP 2024). While the mechanism is not entirely comprehensive (we heard that developers themselves are having to act at times as a coordinator across government agencies, local councils and public service providers) it provides a starting point for other states to look to when implementing such reforms.

More generally, the success of states in streamlining their approvals process will depend on the regulatory and service delivery agencies, especially local councils, being sufficiently resourced to deliver the necessary assessments. State governments should consider whether funding for local councils is sufficient to deliver on their objectives. The PC (2012b, p. 135) has previously suggested that any delegation from state governments to local governments needs to be preceded by ‘an assessment of local government capacities as part of the regulatory impact analysis’.

Finally, state governments should ensure that they have the right accountability regimes. All states should report their performance against statutory timeframes for planning approvals. These should be meaningful targets. The PC suggests that, where jurisdictions do not differentiate already, different types of development approvals could usefully have different performance targets to reflect their complexity (for example, single dwellings as opposed to entire housing estates).



Reform direction 4.1 – Coordinating housing development and construction approvals

Australian governments have made progress in improving coordination between decision makers in the planning approval process. But further efforts are needed to eliminate bottlenecks in the system and provide certainty to the residential building industry. Governments should consider:

- establishing coordination bodies to speed up the entire housing development and construction process (not just the planning process) and intervene in cases of long delays
- ensuring delivery agencies and regulators, particularly local governments, are adequately resourced to achieve the target timeframes
- setting performance targets for planning approval decisions that reflect the complexity of the planning decisions and extend performance reporting to capture the post development approval period.

Review building regulations

The National Construction Code (NCC) is sound in principle and has several important strengths:

- It sets minimum standards for buildings that aim to ensure they provide adequate health and safety (Australian, state and territory governments 2000).
- It is a national code, that, when implemented consistently across all jurisdictions, encourages scale, efficiency and transferability.
- Having performance-based and deemed-to-satisfy solutions provides flexibility about how best to meet the requirements of the NCC. Performance-based solutions encourage innovation and efficiency (in theory), while deemed-to-satisfy solutions can reduce uncertainty and costs.
- Regulatory changes to the NCC are expected to be subject to regulatory impact statements (Australian, state and territory governments 2000).

Previous reviews have noted these strengths (box 4.1).

Box 4.1 – Past inquiries noted the benefits of a countrywide construction code

Shergold and Weir (2018, p. 9) noted the economic benefits that can come from a performance-based approach and reported that the strongly held industry view is the 'benefits of the NCC have outweighed any negative impacts'.

A 2012 review of building regulations found that major reforms, including the implementation of a single national code, the introduction of a performance-based code, and the integration of plumbing and construction into a single code had resulted in significant benefits (The CIE 2012).

The PC (2004, 2012a) has previously found that a national performance-based code had likely enhanced productivity and delivered greater certainty to, and efficiency in, the building industry, and that the integration of plumbing and construction into a single code would likely reduce construction costs.

But participants the PC spoke to raised a number of shortcomings to do with the implementation of the NCC.

Many said the cycle of reviews and updates to the NCC is too short. Code updates are currently scheduled every three years. While industry participants recognised the need for evolution of the code, they argued that the expectation of significant changes every few years deters innovation, as shifting regulatory goal posts risked rendering new products or processes almost immediately non-compliant.

Other issues with building regulations and their implementation raised by stakeholders included:

- **Performance-based solutions are high cost.** The performance-based solutions option is more commonly used on higher density developments than on detached housing. We have heard that the regulatory procedure to get a construction process or material certified under the performance standards is too prone to idiosyncratic differences in opinion between certifiers and across jurisdictions. The cost of preparing a performance-based design brief was also raised as a barrier.
- **Updates are adopted where they are found to impose net costs.** In some cases, updates to the NCC have been implemented by ministers even where a cost benefit analysis found the policy was likely to impose a net cost on society (box 4.2).
- **Implementation is inconsistent.** Implementation of the NCC varies across state and territory governments. For example, the 2022 NCC has been varied by many state governments (box 4.3). In addition, some local governments impose rules that affect how homes are built, including rules around external design and building materials, which overlap with the NCC. This adds complexity for construction firms who want to, or do, operate across multiple jurisdictions (box 4.3).
- **Insufficient adjustment time.** Industry mentioned that the 2022 changes to the NCC were implemented too quickly, including because some jurisdictions fast-tracked the changes. For example, a participant claimed new energy efficiency requirements led to shortages in products, such as double-glazed windows.
- **Ineffective compliance and enforcement.** Participants suggested that compliance with the NCC is not guaranteed, and that work may be of low quality.
- **Lack of effective communication about changes.** Some builders, particularly smaller builders, may not have sufficient levels of understanding or awareness of the latest NCC rules and changes.

While noting some of the concerns of industry, it is also the case that industry representatives currently hold seven positions on the Australian Building Codes Board and, through these positions, are in a position to propose reforms and be heavily engaged in the content and timing of changes to the NCC.

Box 4.2 – Changes to the NCC are sometimes adopted even if they impose net costs on society

The Australia Building Code Board's objectives specify that changes to the NCC should have a rigorously tested rationale (Australian, state and territory governments 2020). Changes should be of net benefit to society and should not be implemented if superior alternatives are available. While a number of changes to the NCC have passed a regulatory impact assessment (RIA), frequently it has been the case that either the accompanying RIA does not recommend the change or the cost benefit analysis within the RIA shows a net cost to society.

The table below details a sample of changes that either appear to have failed a cost benefit analysis or were not robustly shown to be the most efficient solution to a policy problem.

Box 4.2 – Changes to the NCC are sometimes adopted even if they impose net costs on society

NCC change	Regulatory impact assessment (RIA)	Issues
Energy efficiency requirements (2022)	RIA recommended NCC changes despite a net cost to society (BCR: 0.8). These changes were justified based on uncertain and unquantifiable benefits.	While some benefits of greenhouse gas emissions reductions were quantified, others were not. While meeting greenhouse gas emission targets is an important goal, it was not rigorously shown that energy efficiency requirements were a least cost way to meet these targets.
Liveable housing changes (2021)	The RIA found that accessibility changes would be of net cost to society (BCR: 0.39) but left policy makers to weigh up these costs against the social justice benefits of greater accessibility.	The RIA found that non-regulatory options such as direct subsidies for the provision of accessible housing were preferable and likely to be of net benefit to society. Despite preferable alternatives, NCC changes were adopted.
Mandatory sprinklers for class 2 and 3 residential buildings under 25m and at least four floors (2018)	The RIA found that mandatory uptake of sprinklers would have a net present cost of \$74.5M, although using sprinklers as an option for compliance would have a net benefit.	Mandatory sprinkler requirements were adopted, despite failing to pass a regulatory impact assessment.
Interconnected fire alarms in new houses (2013)	RIA found that changes would be of net cost to society (BCR: 0.13).	Fire alarm interconnection changes were adopted, despite failing to pass a regulatory impact assessment.

a. BCR: benefit cost ratio, a BCR under one implies a net cost to society. BCR's presented here are for the 'base case' and thus do not include some benefits and costs that are difficult to quantify.

Source: energy efficiency: ACIS Allen (2022), ABCB (2022c), liveable housing: The CIE (2021), ABCB (2022b), mandatory sprinklers: ABCB (2018), ABCB (2019), interconnect alarms: ABCB (2013), OIA (2015).

Box 4.3 – State government implementation of the National Construction Code varies, and local governments can ‘override’ it

The National Construction Code is designed to support consistency, but state and territory governments can vary the application of the NCC, which many did for the 2022 performance requirements.

Areas where jurisdictions varied performance requirements in NCC (volume two)^a

	NSW	VIC	QLD	WA	SA	TAS	ACT	NT
H1 Structure	✓	✓	✓	✓	✓			
H2 Damp and weatherproofing	✓	✓			✓			✓
H3 Fire safety	✓				✓			
H4 Health and amenity					✓	✓	✓	✓
H5 Safe movement and access					✓			
H6 Energy Efficiency	✓	✓				✓	✓	✓
H7 Ancillary	✓		✓		✓	✓	✓	✓
H8 Liveable housing	✓							
H9 Water use				✓	✓			
H10 Disability access					✓			

a. Jurisdictions are classified based on if they have **any** variations to a section, which may include temporary variations (as of the adoption of NCC 2022) where a jurisdiction delayed the implementation of certain provisions. Source: ABCB (2024c); ACT Government (2023).

Local governments may ‘override’ the National Construction Code

Local government regulations can also overlap with the remit of the NCC, leading to builders having to alter specifications and designs between local government areas, undermining the intent of the NCC (Senate Economics References Committee 2015, pp. 114–115). Complying with local regulations creates additional costs and delays and has been identified as an area for action by the Building Ministers’ Forum (Building Ministers’ Forum 2015).

Local government regulations may be framed as recommendations. For example, the City of Glen Eira’s Quality Design Guidelines ‘do not seek to vary any policy, standard or guideline implemented by the Victorian Government’ (Glen Eira City Council 2018, p. 5). Nonetheless, builders require permits. This means satisfying local governments by complying with regulations, regardless of how they are framed.

Some examples of local government rules that appear to effectively vary the NCC are:

- The City of Canada Bay (NSW) requires an articulated front façade and has specifications for roof pitch and form, external materials and where windows can be placed (City of Canada Bay 2022).
- The City of Glen Eira (VIC) includes specifications for ‘preferred’ built forms, facades, textures and accessibility features (Glen Eira City Council 2018).

Box 4.3 – State government implementation of the National Construction Code varies, and local governments can ‘override’ it

- The City of Cockburn’s (WA) requirements include minimum sizes for different room types and recommendations for external material finishes. Certain requirements vary also within the city, although these are generally aesthetic (City of Cockburn 2024).

What should be done?

Governments should undertake an independent review of building regulations at the federal, state and territory, and local government levels. This would include reviewing the aims and objectives of the NCC, its effectiveness, and its governance arrangements and membership. State and territory government implementation of the NCC, including approvals, certification and enforcement, and local government rules that relate directly to the construction of dwellings, such as those related to the design of houses, would also be in scope.

The NCC has not been comprehensively reviewed since it was introduced in 2011. There are reviews of NCC content when it goes through its regular updates, and there have been reviews of aspects of building regulations, including state-level reviews (for example, Expert Panel on Building Reform 2024).

In 2018, Shergold and Weir (2018) reviewed compliance and enforcement systems across jurisdictions and made 24 recommendations to strengthen the implementation of the NCC. While the progress jurisdictions have made in implementing these recommendations is unclear, a stocktake completed in 2023 found that more progress was needed (ACIF 2023). The independent review should consider the effectiveness of governments’ changes in response to the 2018 review.

In addition to the issues raised above, the review should also consider:

- Whether the scope of the NCC – the achievement of nationally consistent, minimum necessary standards of relevant health, safety, amenity and sustainability – is too broad (the PC understands that as of 1 July 2025, resilience against extreme weather events will be a specific objective of the ABCB (DISR 2024a)).
- Only implementing changes to the NCC where it is clear the changes pass a benefit–cost analysis and cannot be achieved through non-regulatory measures.
- Whether the NCC objectives include a provision that potential changes to the code be weighed against increased housing costs and lower housing supply.
- Increasing the time between regular updates to the NCC or moving away from regular updates entirely.
- Ways to achieve greater consistency in implementation across states and territories (for example, consideration of model legislation for construction and building regulation).
- The interaction between the NCC and other types of regulations at the state, territory and local government levels that also act as de facto building regulations (for example, local government regulations that come over the top of energy efficiency requirements in the NCC).
- Reducing impediments to innovation and whether changes to the performance-based solutions are needed to encourage innovation.
- How to improve awareness and understanding of the NCC among builders, including use of outreach (for example, roadshows – extension services are discussed below).



Reform direction 4.2 – Effectiveness of building regulations

Governments should commission an independent review of building regulation. This review should cover the National Construction Code's effectiveness against its aims and objectives, its governance arrangements and membership. The review should also address the implementation of the NCC at the state and territory government level, including approvals, certification, compliance and enforcement, and local government rules that relate directly to the construction of dwellings, such as those related to the design of houses.

Until the independent review is completed there could be merit in pausing regularly scheduled updates to the NCC.

4.2 Promote innovation

Innovation and the adoption of new technologies is a key driver of productivity growth. Innovation leads to higher quality products or being able to produce more output with the available inputs. Chapter 3 highlighted some of the barriers to increasing innovation in the housing construction sector. This section provides some policy directions to help overcome these barriers.

Improve information to generate a premium for quality

Rather than setting higher minimum standards via the NCC, a less costly approach could be to create a price premium for housing quality by expanding the use of rating schemes. There are several ratings schemes at present including the iCIRT star ratings for building professionals in New South Wales (Equifax 2025) and the compulsory disclosure of the ratings of the ACT's existing homes' energy efficiency when they are sold or leased (*Civil Law (Sale of Residential Property) Act 2003 (ACT)*, s. 22).

The emphasis of each scheme is different: iCIRT focuses on the quality of the builders, so is mainly relevant for renovations and new builds; while the ACT scheme applies to the existing stock of buildings. However, both can reasonably be expected to have the effect of providing information to underpin a price premium for higher quality builds and hence reduce information asymmetries between buyers and sellers.¹⁷



Reform direction 4.3 – Improving building quality

State and territory governments should continue implementing ratings systems that effectively improve information available to consumers about new (and existing) building quality. Better information could help create a price premium for higher quality builders and building.

¹⁷ An independent review of the ACT scheme (Common Capital 2023, p. 3) has assessed it as being effective and that these types of disclosure schemes do meet demand from the public for information about energy efficiency and that there is a price premium attached to this information (for example, buildings with higher energy efficiency attract a price premium and that the type of improvements these schemes encourage do lead to 'emissions reduction, energy cost savings and improved health outcomes').

Promote innovation diffusion through extension services

Extension services involve the government promoting new innovations and technologies, including those discovered through public funding (for example, this might include a government ‘extension’ officer visiting individual farmers to discuss novel farming techniques or technologies). These have been successfully implemented in the agricultural industry, with studies generally finding a high rate of return (Alston et al. 2000; Sheng et al. 2011). The PC (2023c, p. 49) has previously recommended trialling expanded extension services ‘tailored by sector depending on what services are relevant for most small businesses in that sector’. The PC considers that housing construction should be a part of any such trial.

The scope of extension services could be narrower for construction than for agriculture, with the focus being on innovations and technologies that cost-effectively implement changes to the NCC. These services could be facilitated by AusIndustry, which already helps firms navigate the various channels of government support and has a network of local business contacts (Australian Government 2025).

Such a service could lower the cost of implementing new NCC or planning provisions and potentially mitigate some of the issues noted above with the building and planning regulatory systems.



Reform direction 4.4 – Extension services for housing construction

The Australian Government should trial providing extension services – potentially piloted through the Australian Government’s AusIndustry program – modelled after those provided to agriculture, to the housing construction industry to promote the diffusion of innovation.

Consider the adequacy and effectiveness of funding for construction innovation

The Australian Government has recently announced a *Strategic Examination of Research and Development* (DISR 2024c). In the context of relatively low private sector spending on research and development (R&D) in construction (chapter 3), this review could usefully consider whether the level of government funding for R&D allocated to housing construction is adequate given the social importance of housing, the recent decline in housing affordability, the low scale of most firms (which limits the ability to capture the returns on private R&D), and the poor productivity record of the housing construction industry.

Further, the PC notes that there are two construction-related Cooperative Research Centres (CRCs): Building 4.0 (with whom the PC consulted) and SmartCrete (Australian Government 2024). If it recommends additional government funding for construction R&D, the strategic examination should consider whether construction CRCs could usefully focus additional funding on developing innovations that lower construction costs to tackle the productivity challenge facing the industry.



Reform direction 4.5 – R&D funding for housing construction

The *Strategic Examination of Research and Development* should consider the adequacy of research and development funding for housing construction to improve the productivity performance of the housing construction industry.

Address impediments to the use of prefabricated and modular construction

Prefabrication and modular construction in housing is unlikely to be a silver bullet for housing construction productivity. Some barriers to increased adoption will take time to address, and some related to consumer preferences and industry culture (chapter 3) are likely to be particularly slow to shift.

There are also regulatory barriers to its uptake. For example, the NCC was designed for onsite construction. While there is not anything in the NCC that explicitly precludes prefabrication in housing construction, the implementation of the Code can create impediments to its adoption (HIA and AMGC 2022).

The absence of explicit approval in the NCC creates uncertainty about the acceptability of prefabricated construction. Rules vary by jurisdiction and some stakeholders noted that regulators' acceptance of prefabricated construction varied by jurisdiction. Further, the building approval process is less clear, and some certifiers can be conservative in their views and may be less comfortable certifying prefabricated construction. This ambiguity discourages investment in prefabricated construction (HIA and AMGC 2022).

In addition, the sequential nature of certifying onsite construction, such as checking the structure, fire, thermal, acoustic and weatherproofing, is difficult with complex prefabricated units such as pods that are installed onsite as complete units (HIA and AMGC 2022, pp. 35–37).

Local government rules can also be an impediment to prefabricated construction. Like the NCC, planning regulations have been designed with 'traditional homes' in mind, and prefabricated construction is often considered as being limited to manufactured homes and caravan parks. Rules related to design and aesthetics can also pose barriers (HIA and AMGC 2022, pp. 31–33).

Governments should tackle unnecessary regulatory impediments to the uptake of prefabricated construction. Changes that could be pursued include:

- moving to a regulatory framework where the production process of prefabricated components is itself certified, eliminating the need to separately certify each separate component
- explicitly recognising prefabricated and modular construction as an accepted construction practice and adopting standardised terms in building regulations
- adding deemed-to-satisfy pathways to the NCC for prefabricated and modular construction
- developing a product registration and/or manufacturer certification scheme.

Some of these options are being considered and progressed as part of existing policy processes (box 4.4). In addition, some governments are constructing social and affordable housing using prefabricated methods. For example, the New South Wales Government is working with industry to design prefabricated social housing, and in Queensland, QBuild's Modern Methods of Construction program is aiming to build 600 modular homes by December 2025 (NSW LHC 2024; Queensland DHPW 2024).

Box 4.4 – Governments are progressing with changes to regulatory regimes to support pre-fabrication

Governments have a range of policy processes underway to improve regulatory regimes to support prefabrication.

- In March 2024, the Australian, state and territory government building ministers asked the Australian Building Codes Board, which is responsible for the NCC, to ‘work with industry and local governments to clarify existing regulatory pathways [for prefabricated and modular housing] through a new guidance paper and undertake a comprehensive review of regulation improvements to reduce red tape’ (DISR 2024b).
- The Australian Building Codes Board has produced a prefabricated, modular and offsite construction handbook to improve understanding on achieving compliance with the NCC (ABCB 2024d).
- In late 2024, the Australian Building Codes Board also undertook consultation on a proposed risk-based building product registration scheme. The discussion paper noted the proposed scheme could ‘help increase the use of offsite manufacturing by reducing regulatory uncertainty for product suppliers, builders and approval authorities’ (ABCB 2024e, p. 25).
- In November 2024, it was announced that the Australian Government would fund a voluntary certification scheme to help facilitate the approval of prefabricated housing under the NCC and that banks, superannuation funds and other institutional investors would work with industry to address barriers to financing prefabricated housing at scale (Chalmers and Husic 2024)
- In November 2024, the Australian, state and territory governments signed an intergovernmental agreement to deliver a 10-year national competition policy reform program. It was announced that regulation and certification processes related to modern methods of construction would be part of the reforms (Chalmers and Saffioti 2024).
- In August 2024, the New South Wales Government released a position paper proposing a new regulatory framework for prefabricated and manufactured buildings (Building Commission NSW 2024).



Reform direction 4.6 – Modern methods of construction

Governments should continue to reduce unnecessary regulatory impediments to greater uptake of modern methods of construction in housing construction, including prefabricated and modular construction.

4.3 Improve workforce flexibility and supply

Chapter 3 highlighted several workforce-related issues affecting housing supply and construction productivity, including skills shortages, occupational licensing, industrial relations and the growth in the white-collar workforce.

Recent PC reviews have touched on the skills and training system, occupational licensing, and the skilled migration system. If implemented, the recommendations in those reviews would benefit the housing construction workforce, potentially increasing the supply of workers and improving productivity.

Improve occupational licensing and mutual recognition

In the 2023 productivity review, the PC found that licensing arrangements in the construction sector had become more stringent across most jurisdictions in recent years, and:

The lack of empirical evidence supporting licensing design has led to a ramping up of licensing stringency that has increased barriers to entry and is likely leading to considerable inefficiencies in the provision of skills and reduced productivity in the sector. (PC 2023a, p. 76)

The PC recommended that Australian governments 'conduct regular, independent review of occupational licensing systems in their jurisdictions, aiming to improve efficiency without compromising safety outcomes, considering efficient scope of practice as well as the optimal mix of licensing and other forms of safety regulation' (recommendation 7.11) (PC 2023a, p. 87).

Australian governments have made some progress in reducing the compliance burden associated with occupational licensing requirements. For example, several states have moved to introduce digital trades licences and credentials to improve the ease of applications and renewals (NSW DCS 2025; VBA 2025).

Australian Governments also introduced automatic mutual recognition – whereby states recognise licences granted in the others – in 2021, with the aim of improving interstate mobility (PC 2023a, p. 85). States and territories have continued to refine their approach to automatic mutual recognition as the scheme matures.¹⁸

However, many exemptions and conditions still exist. For example, Western Australia does not currently allow automatic mutual recognition for electricians and Victoria does not currently recognise some occupations, such as building surveyors and plumbers (Victorian DTF 2024; Western Australian Government 2024). Queensland is not currently participating in the scheme (DEWR 2024a).

In 2024, as part of its modelling of proposed National Competition Policy reforms, the PC modelled the potential economic impact of removing unnecessary licensing and registration requirements and streamlining remaining requirements to ensure they are justified by consumer safety risks. The PC found that if reforms were implemented in a manner such that the intended outcomes are realised to their fullest extent, they had the potential to boost GDP by between \$5.2 billion and \$10.3 billion (0.19% - 0.39%). This was due to an increase in productivity for industries with likely high incidences of occupational licensing requirements, such as construction (PC 2024a, pp. 23–24, 128).

Address barriers to migration

The PC's 2023 productivity review also found that migration settings were inhibiting productivity, including:

- restricting employer-sponsored temporary migration to occupation skills lists makes the migration system less responsive to labour market needs
- the process to recognise the skills, experience and occupational licences of prospective migrants creates barriers for qualified workers to enter Australia, and often duplicates occupational license requirements (PC 2023a, pp. 27, 35, 52).

The PC recommended that wage thresholds rather than occupation lists be used for employer-sponsored migration (recommendation 7.2), that further international mutual recognition of overseas occupational licenses should be pursued (recommendation 7.7) and that skilled migration requirements should be better aligned with occupational license recognition requirements, including by removing duplication of assessment where possible (recommendation 7.8) (PC 2023a, pp. 41, 54, 57).

¹⁸ For example, laws before the NSW Parliament would expand automatic mutual recognition to interstate real estate agents, conveyancers and property agents, as well as to car dealers and repairers, and tow truck drivers (Automatic Mutual Recognition Legislation Amendment Bill 2024 (NSW)).

In December 2024, the government introduced a new Skills in Demand visa (replacing the Temporary Skills Shortage visa). The new visa supports entry based on a ‘modernised’ occupation list, which includes additional construction-related occupations, based on labour market analysis and stakeholder consultations by Jobs and Skills Australia. The visa also includes a Specialist Skills stream, which allows applicants without occupations on the list to enter, providing they earn at least \$135,000. Notably technicians and trades workers and labourers are excluded from accessing the Specialist Skills stream (DHA 2024),¹⁹ curtailing the potential benefits of the changes for construction productivity and housing supply.

Improve training pathways

There may be opportunities to streamline training pathways that make it easier for new workers to enter certain trades. The PC understands that BuildSkills Australia, which is responsible for developing training products for the construction sector (DEWR 2024b), is currently liaising with industry participants on this issue. This is part of a broader piece of work they are undertaking around future skills and training needs in the sector.

Previous PC work has backed short form microcredentials as providing an opportunity for workers to quickly obtain specific new skills, including to address acute skills shortages (PC 2023b). The PC is currently undertaking an inquiry into building a more skilled and adaptable workforce. This may include considering options for formally recognising prior learning and shorter term non-formal training, such as microcredentials.

Support apprentices

In its review of the National Agreement for Skills and Workforce Development, the PC found there are supply and demand barriers affecting apprenticeship commencements and completions. It recommended apprenticeship candidates be screened to better match apprentices and employers and identify support needs (recommendation 11.1), and that the coordination and delivery of apprenticeship support services should be improved (recommendation 11.3). In addition, the review also recommended that apprenticeship pathways to trade occupations should be made more flexible (recommendation 11.4), and incentives for employers should be redirected to other measures such as apprenticeship support services (recommendation 11.5) (PC 2020, pp. 50–52). The *Strategic Review of the Australian Apprenticeships Incentive System* also made recommendations to better support apprentices and improve apprenticeship commencements and completions (DEWR 2024c).²⁰



Reform direction 4.7 – Improving workforce flexibility

Governments should adopt previous PC recommendations in *5-year Productivity Inquiry: Advancing Prosperity* and *National Agreement for Skills and Workforce Development Review* to improve occupational licensing, address barriers to migration and improve support for apprentices.

¹⁹ Other excluded occupations include machinery operators and drivers.

²⁰ Following the release of the report the Australian Government announced incentive payments for apprentices working in housing construction, an extension to the Australian Apprentice Training Support and Priority Hiring Incentive payment, an increase in the Living Away from Home Allowance, and an increase in the Disability Australian Apprentice Wage Support payment (Albanese et al. 2024).

Appendices

A. Public consultations

This appendix outlines the consultation process undertaken and lists the organisations and individuals (table A.1) who participated in our preparation of the research paper. The PC also held three roundtables (table A.2) and received 28 brief comments. The PC would like to thank everyone who participated in our work on this paper.

Table A.1 – Consultations

Participants

Australian Bureau of Statistics

Australian Building Code Board (ABCB)

Australian Local Government Association (ALGA)

BGC

Bob Seiffert

Building 4.0 CRC

Building Commission NSW (Department of Customer Service NSW)

Building Products Industry Council

Build Skills Australia

BuiltGrid

Centre for International Economics

Construction, Forestry and Maritime Employees Union

Department of Industry, Science and Resources

Department of Infrastructure, Transport, Regional Development, Communications and the Arts

Department of Social Services (DSS)

e61

Gabrielle Trainor AO

Geocon

Grattan Institute

Hickory

Housing Australia

Housing Industry Association

Infrastructure Australia

Infrastructure NSW

Participants

Master Builders Association (MBA)

Master Builders QLD

McCloy Group

Modscape

National Australia Bank

National Housing Supply and Affordability Council

NEX Building Group

NSW Building Commission

NSW Productivity and Equality Commission

NSW Treasury

Planning Institute of Australia

Property Council of Australia

Queensland Treasury

Reserve Bank of Australia (RBA)

Ron Wakefield and Ehsan Gharie, RMIT School of Property, Construction and Project Management

Timbertruss

The Treasury

Urban Development Institute of Australia (UDIA)

Victorian Building Monitor

Wilhelm Harnisch

Table A.2 – Roundtables

Participants

18 September – Urban Development Institute of Australia

Col Dutton

Stockland Western Australia

Oscar Stanley

ABN Group

Paul Addison

Billbergia

Kieran Pryke

GFM Investment Management

Charlie Daoud

Traders in Purple

Anna Cox

Urban Development Institute of Australia Queensland

Andrew Minho

Urban Development Institute of Australia National

24 October – Housing Industry Association (HIA)

John Bowen

Bowens Timber

Anthony Tannous

NEX Building Group

Rob Bird

ABN Victoria

Participants

Nick Cook	Stoddart Group
Tim Reardon	Housing Industry Association (HIA)
Maurice Tapang	Housing Industry Association (HIA)

25 November – Australian Local Government Association

Amy Crawford	Australian Local Government Association
Rachel Feeney	Australian Local Government Association
Simon Booth	Australian Local Government Association
Mary Watson	Local Government Association of the Northern Territory
James Holyman	Local Government Association of South Australia
Kat Panjari	Municipal Association of Victoria
James McLean	Municipal Association of Victoria
Emlyn Breese	Municipal Association of Victoria
Crystal Baker	Local Government Association of Queensland
Matthew Leman	Local Government Association of Queensland
Nicole Matthews	Western Australian Local Government Association
Chris Hossen	Western Australian Local Government Association
Michael Edrich	Local Government Association of Tasmania
Jane Partridge	Local Government Association of New South Wales

B. Measuring dwelling construction productivity

The Productivity Commission has produced novel proxy estimates for labour productivity in the dwelling construction industry, as well as disaggregated estimates for houses and higher-density dwellings.²¹ The PC refers to these measures as ‘proxies’ because they are not official statistics – estimating productivity using the same methodology and data as what is published in the *national accounts* is not possible. That said, these proxies capture underlying productivity trends over the longer term for the dwelling construction industry.

This appendix summarises how construction activity is classified under the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006 code (section B.1),²² and outlines how the labour productivity proxies were calculated (sections B.2 and B.3). Section B.4 considers the reasonableness of the assumptions required to calculate the proxies.

B.1 How is dwelling construction activity classified?

ANZSIC codes have a hierarchical structure, where each firm’s industry can be identified at the one-digit level (the highest level of aggregation) through to the four-digit level (the lowest level of aggregation). For example, a volume home building firm’s ANZSIC codes would be construction_(E) (one-digit), building construction₍₃₀₎ (two-digit), residential building construction₍₃₀₁₎ (three-digit) and house construction₍₃₀₁₁₎ (four-digit) (ABS 2013h, 2013i).²³

Official productivity statistics exist at the one- and two-digit level only. While these official statistics highlight that labour productivity growth is slow across the construction industry, it is impossible to determine from the available data whether poor productivity growth in dwelling construction is contributing to this trend (figure B.1).

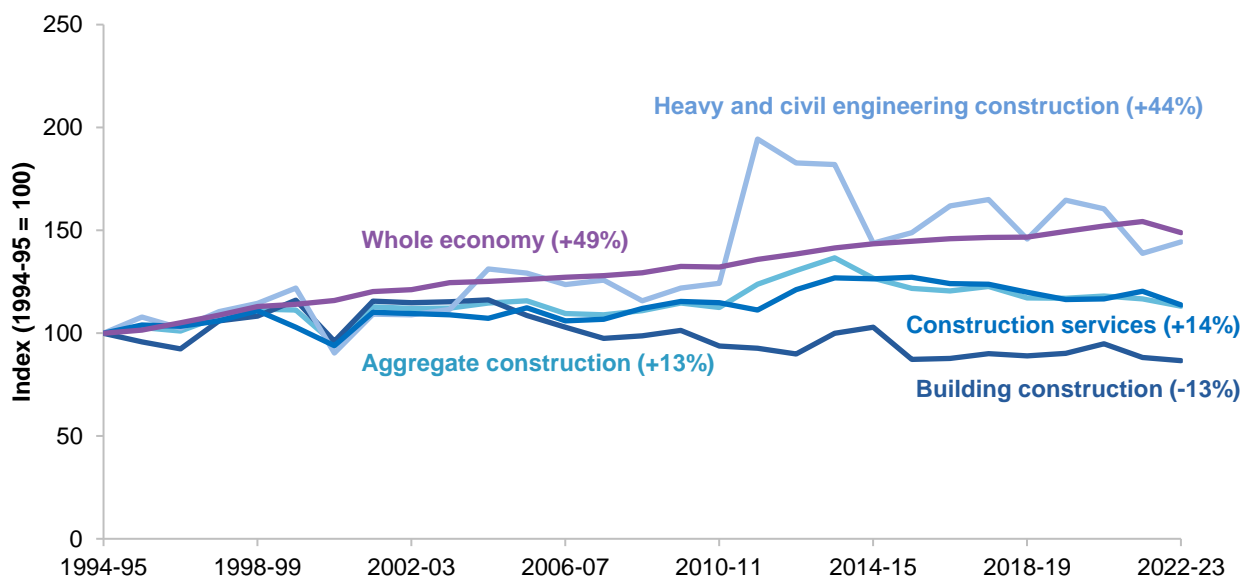
²¹ Higher-density dwellings are those other than houses which are primarily used for long-term housing, including semidetached, row or terrace houses or townhouses, and flats, units or apartments (figure 2.1). This type of housing is referred to as ‘other residential’ buildings in ABS publications (2024f).

²² ANZSIC is the standard classification used for Australian and New Zealand industry statistics (ABS 2013a).

²³ Throughout this appendix, industry names are subscripted with their corresponding ANZSIC code. For example, the house construction industry, which has the ANZSIC code 3011, appears as house construction₍₃₀₁₁₎.

Figure B.1 – Labour productivity growth is slow across the construction industry^a

Index of labour productivity by industry subdivision, 1994-95 to 2022-23



a. Constructed as the ratio of gross value added by industry subdivision in the national accounts to hours worked by industry subdivision in the labour account.

Source: PC estimates using ABS (2024d, table 5) (real output); ABS (2024i via data explorer) (hours worked).

Identifying the dwelling construction industry

Estimating labour productivity specifically for housing construction requires additional work to identify the outputs and inputs in aggregate data that relate to housing construction. There are two main challenges associated with this.

First, no single ANZSIC code wholly represents the housing construction process (figure B.2). Builders and developers coordinating construction are classified in the industry group residential building construction⁽³⁰¹⁾, while the firms that do much of the construction (tradespeople such as concreters, carpenters and plasterers) are counted in the industry subdivision construction services⁽³²⁾ (ABS 2013i).²⁴

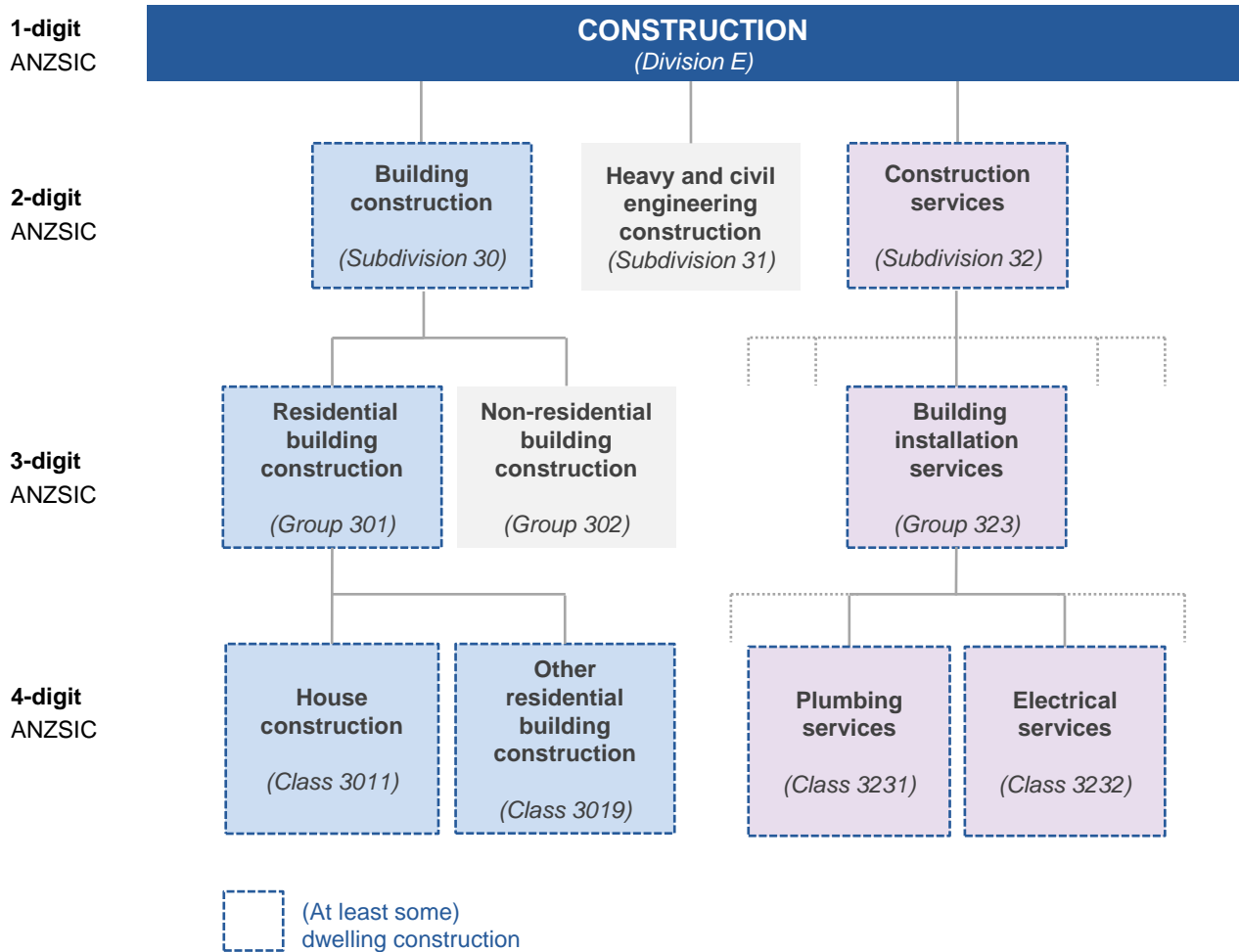
Second, ANZSIC codes for construction services⁽³²⁾ firms are not differentiated based on the type of construction work (residential, non-residential or civil) undertaken by firms. This means that official statistics do not distinguish between, for example, two plumbing firms that primarily work on commercial buildings and new housing estates, respectively (ABS 2013f).

The PC's approach addresses these challenges by extracting the outputs and inputs from two industry subdivisions (building construction⁽³⁰⁾ and construction services⁽³²⁾) that contain activities associated with

²⁴ Strictly speaking, some amount of construction services work is not undertaken by construction services⁽³²⁾ firms. For example, some developers and main builders are vertically integrated and hire their own tradespeople.

housing construction. The outputs and inputs are then merged to estimate proxies of labour productivity for a combined dwelling construction industry (figure B.3).²⁵

Figure B.2 – The housing construction process is split across multiple ANZSIC codes^a

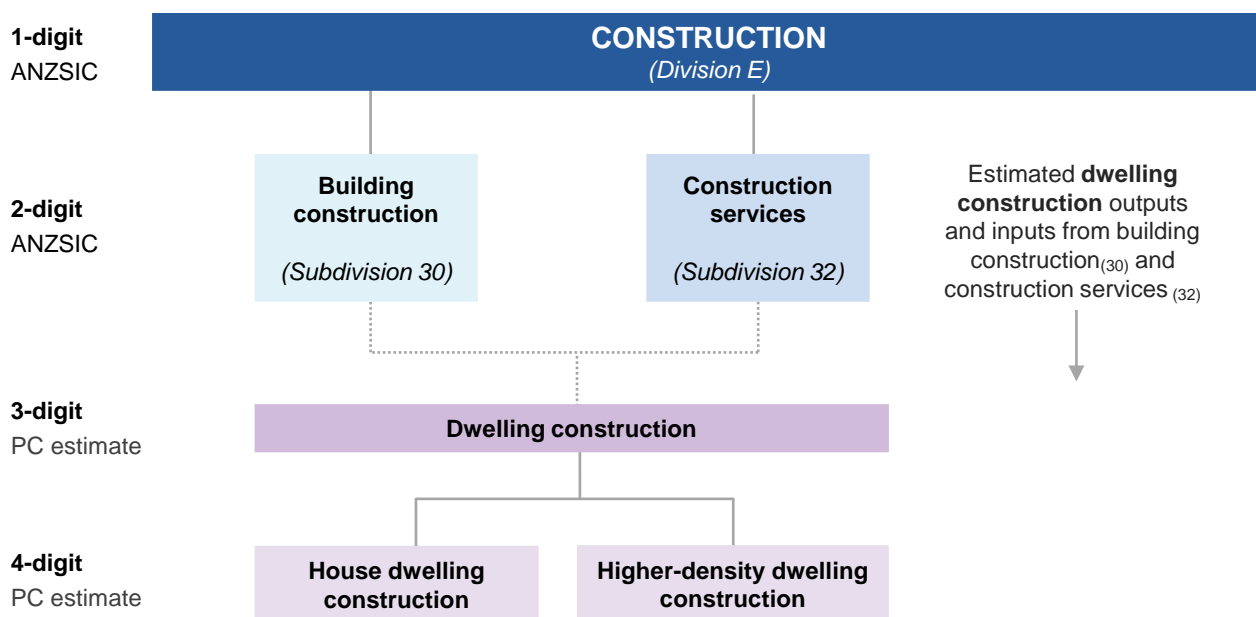


a. This figure is not an exhaustive representation of the construction services₍₃₂₎ subdivision. Other construction services₍₃₂₎ groups include land development and site preparation services, building structure services, building completion services and other construction services. Other building installation services classes include air conditioning and heating services, fire and security alarm installation services and other building installation services.

Source: adapted from ABS (2013i).

²⁵ There is another category of output in the national accounts relating to housing: ownership of dwellings, which consists of the actual and imputed rents that landlords and owner-occupiers respectively receive from housing (ABS 2024b). However, as ownership of dwellings relates to the services derived from the stock of existing homes – rather than the value of new dwellings generated during the construction process – it is not included in the estimate of dwelling construction output.

Figure B.3 – Proxy estimates of dwelling construction labour productivity can be derived using inputs and outputs from multiple industry subdivisions



Source: adapted from ABS (2013i).

How different stages of the development process are accounted for in the national accounts

Figure 3.1 outlines the various stages of the development process, from acquisition of the land to final sale. Each of the stages is captured in the national accounts.

Land acquisition

The labour and value added of developers and their staff in acquiring land (and the research they do ahead of acquisition) would be accounted for in the residential building construction₍₃₀₁₎ industry and so would affect our estimates of dwelling construction productivity.

Planning and land surveying

As with land acquisition, the labour and value added of developers and their staff in undertaking planning and land surveying would be accounted for in residential building construction₍₃₀₁₎ and would affect our estimates of dwelling construction productivity. That said, the labour and value added of architectural and design service firms contracted by the developers would not be classified as construction_(E) – they would instead be classified as professional, scientific and technical services_(M) firms. So, these services would not be accounted for in our estimates of dwelling construction productivity. Professional land surveyors contracted by developers would also be counted in the professional, scientific and technical services_(M) industry.

Development, property design and building approvals

The labour and value added of developers and their staff in obtaining various regulatory approvals would be accounted for in the residential building construction₍₃₀₁₎ industry and so would be accounted for in our estimates of dwelling construction productivity. But labour used by government agencies on these approvals, or time spent by parties contracted from outside the construction_(E) industry (such as lawyers hired by developers) would not be accounted for in our productivity estimates.

Financing and marketing of new properties

The labour and value added of developers in seeking finance and engaging in marketing would be accounted for in the residential building construction₍₃₀₁₎ industry and so would be accounted for in our estimates of dwelling construction productivity. However, the labour used by financial firms lending money and marketing firms engaged by developers would not be accounted for in our productivity estimates.

Commencement of construction, completion and handover

The labour and value added of the construction process by various tradespeople would be primarily accounted for in the construction services₍₃₂₎ industry. However, materials used in the construction process are generally not classified as construction_(E) but instead accounted for in manufacturing_(C). Additionally, the labour used by certifiers in the certification process would not be captured in the productivity estimates.

Some housing construction activity is not completely captured by our proxy estimates of labour productivity

Before we outline our methodology, it is worth noting that some aspects of housing activity are not captured (or captured only to a limited extent) by our proxy estimates of dwelling construction productivity.

- Offsite production of prefabricated buildings or building components – The value added and hours worked of these activities are captured within the manufacturing_(C) industry rather than in construction_(E). This will complicate the measurement of construction industry productivity if the use of modular construction and prefabrication rises. However, onsite assembly or installation of prefabricated components that were manufactured offsite – which is more common in the construction industry than prefabricating entire dwellings – is included in the proxy estimates (ABS 2013d).
- Labour hire services – The value added and hours worked from labour hire services are not included in the productivity proxies.²⁶ This is instead counted in the administration and support services_(N) industry (ABS 2013g).
- Infrastructure and utilities – The value added and hours worked relating to accompanying infrastructure and utilities are counted in the heavy and civil engineering construction₍₃₁₎ industry. That said, the installation of some connections to outside infrastructure, such as domestic drains, are included within the dwelling construction industry (ABS 2013e, 2013f).
- Materials – The processing and manufacturing of materials used on construction sites, like ready-mixed concrete, is captured in other industries such as manufacturing_(C) (ABS 2013c).
- Time to completion (including delays) – The amount of time required to complete a dwelling is not directly captured in the productivity proxies. Rather, the amount of labour time actually spent on construction is counted. For example, say there are two identical houses under construction, and each project requires six months of onsite construction time to complete. The first house is completed over 12 months due to a six-month delay when no work is completed, while the second house is completed in only six months. In the national accounts, the amount of labour used in construction is the same for both houses, so measured productivity is the same.
- Lost dwellings due to regulatory restrictions – If a housing development is made less viable due to regulatory restrictions, this would have an ambiguous effect on measured dwelling construction productivity. Productivity is the ratio of outputs to inputs, so if the development does not go ahead at all, there is no measured effect on productivity – no output has been produced, but no hours have been worked. However, if the development goes ahead but is made more labour intensive by regulatory restrictions (for example, because additional workers are directly employed by builders and developers to

²⁶ However, firms that provide specialised activities on their own account or supply all their labour to another firm are classified based on the activity they perform. For example, a sole trader electrician supplying labour to a main builder would be counted in construction services₍₃₂₎.

navigate the development process) the housing development will require more labour hours to produce, lowering measured productivity.

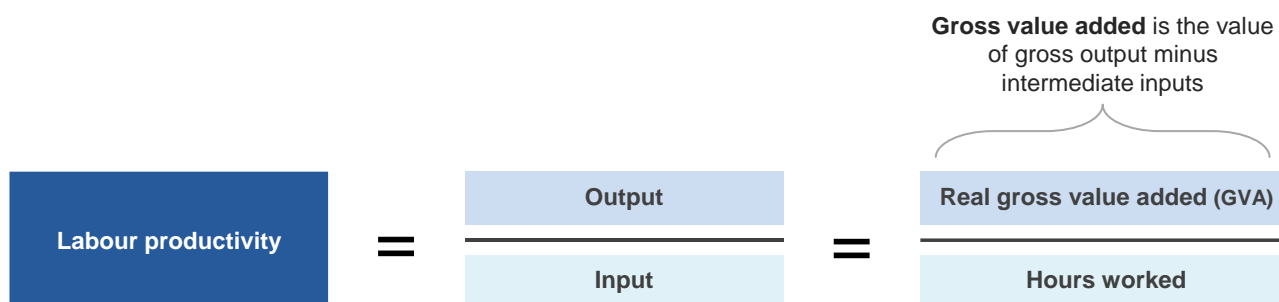
- Amenity to existing residents of a neighbourhood – New construction can negatively affect the amenity of a neighbourhood, both temporarily while construction is occurring and on an ongoing basis after completion (for example, due to increased traffic, shadows and noise). New construction can also improve the amenity of a neighbourhood (for example, where the construction of new housing also involves the construction of new public amenities or space for new retail businesses). These costs and benefits are not captured in the productivity proxies.

B.2 Estimating proxies for dwelling construction labour productivity

Labour productivity is estimated as the ratio of real gross value added (GVA) – gross output minus intermediate inputs – and hours worked (figure B.4). As components of the housing construction process are split across ANZSIC industries, proxies for dwelling construction labour productivity are estimated by combining inputs and outputs from different industries. This includes four steps.

1. Combining nominal GVA for residential building construction₍₃₀₁₎ and a housing construction portion of construction services₍₃₂₎ nominal GVA to estimate **nominal GVA for dwelling construction**.
2. Deflating this combined nominal GVA to estimate **real GVA for dwelling construction**.
3. Combining housing construction portions of building construction₍₃₀₎ and construction services₍₃₂₎ hours worked to estimate **hours worked for dwelling construction**.
4. Constructing the ratio of combined real GVA to combined hours worked to estimate proxies for **dwelling construction labour productivity**.

Figure B.4 – Productivity is a ratio of real GVA and hours worked



Step one: estimate nominal GVA

First, nominal GVA for dwelling construction is estimated by combining residential building construction₍₃₀₁₎ nominal GVA and an estimated housing construction portion of construction services₍₃₂₎ nominal GVA.²⁷

For residential building construction₍₃₀₁₎, nominal GVA is available in the supply-use tables in the national accounts.²⁸ For construction services₍₃₂₎, the estimated housing construction share of nominal GVA is based on the amount of construction services purchased by the residential building construction₍₃₀₁₎ industry in the

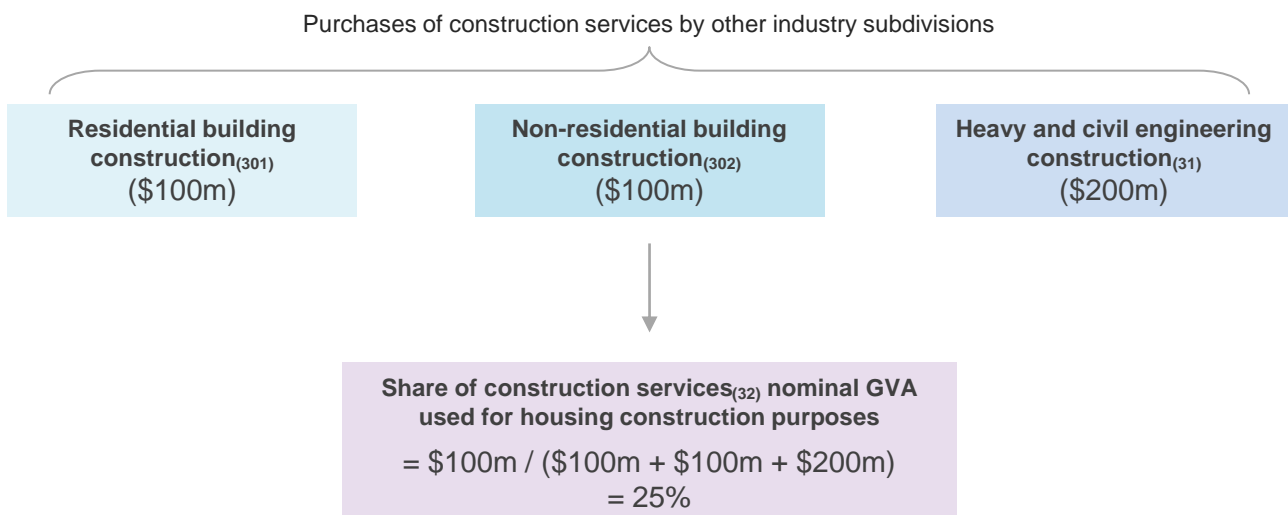
²⁷ Throughout this appendix, 'original' series are used and annualised by financial year.

²⁸ 'Total primary inputs' in the supply-use tables is equivalent to nominal GVA.

supply-use tables (relative to the amount of construction services purchased by the non-residential building construction₍₃₀₂₎ and heavy and civil engineering construction₍₃₁₎ industries).

For example, if purchases of construction services are \$100 million by residential building construction₍₃₀₁₎, \$100 million by non-residential building construction₍₃₀₂₎ and \$200 million by heavy and civil engineering construction₍₃₁₎, then the assumed share of construction services used for housing construction is $\$100 \text{ million} / (\$100 \text{ million} + \$100 \text{ million} + \$200 \text{ million}) = \$100 \text{ million} / \$400 \text{ million} = 25\%$ (figure B.5). If construction services₍₃₂₎ nominal GVA is \$1 billion, then the estimated share of this that can be attributed to housing construction (and therefore incorporated in dwelling construction nominal GVA) is $25\% \times \$1 \text{ billion} = \250 million .

Figure B.5 – Purchases of construction services are used to approximate the portion of construction services nominal GVA incorporated in dwelling construction nominal GVA



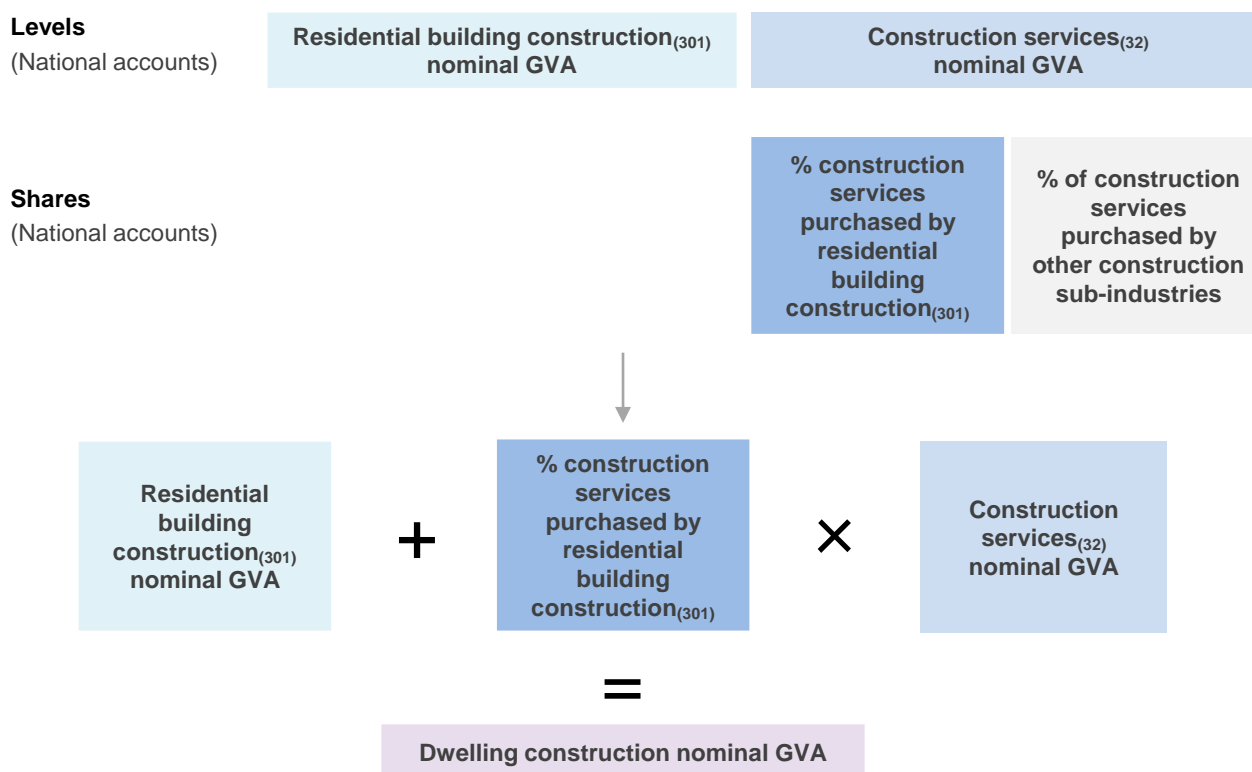
This approach is complicated by the fact that some portion of construction services₍₃₂₎ nominal GVA is both purchased and used by the industry subdivision – like one bricklaying firm subcontracting to another – and that some portion of construction services₍₃₂₎ nominal GVA is purchased by other industries – for example, a hospital engaging a plumbing firm. It is impossible to identify how much of this nominal GVA is used for housing construction, rather than non-residential or heavy and civil engineering purposes.

Consequently, it is assumed that the share of construction services used for housing construction purposes by the construction services₍₃₂₎ subdivision and other industries is the same as the share of construction services purchased by the residential building construction₍₃₀₁₎ industry (relative to construction services purchased by the non-residential building construction₍₃₀₂₎ and heavy and civil engineering construction₍₃₁₎ industries) (for example, 25% as above).²⁹

The nominal GVA of residential building construction₍₃₀₁₎ is added to the estimated housing construction portion of construction services₍₃₂₎ nominal GVA to estimate dwelling construction nominal GVA (figure B.6).

²⁹ This approach ignores certain complicating aspects of the supply-use tables. For example, not all 'construction services' as a product are produced by the construction services₍₃₂₎ industry. Indeed, about 18% of construction services products are produced by other industries (PC estimates using ABS (2024c)). Similarly, construction services₍₃₂₎ (as an industry) use inputs from the residential building construction₍₃₀₁₎ and heavy and civil engineering construction₍₃₁₎ industries.

Figure B.6 – Residential building construction nominal GVA is combined with an estimated housing construction portion of construction services nominal GVA



Step two: deflate nominal GVA to estimate real GVA

The step one estimate of dwelling construction nominal GVA is then deflated using an implicit price deflator. This deflator is constructed using *building activity survey* data: the ratio of the current price value of residential building work done and the chain volume value of residential building work done.³⁰

Because building activity survey data is based on gross output, this amounts to using a gross output deflator in place of a GVA deflator. The gross output deflator used accounts for changes in the prices of outputs, but not explicitly for changes in the prices of inputs. There is no way to construct a GVA deflator, and the reasonableness of using a gross output deflator in its place is tested in section B.4.

Step three: estimate hours worked

Next, the number of hours worked in dwelling construction is calculated by combining the estimated housing construction portions of hours worked in the building construction₍₃₀₎ and construction services₍₃₂₎ industry subdivisions. At the two-digit level, for both building construction₍₃₀₎ and construction services₍₃₂₎, hours worked are available in the *labour account* (the labour input data for the national accounts).

As the labour account data is not disaggregated to the three-digit level, the *labour force survey* is used to apportion building construction₍₃₀₎ hours worked between residential and non-residential building

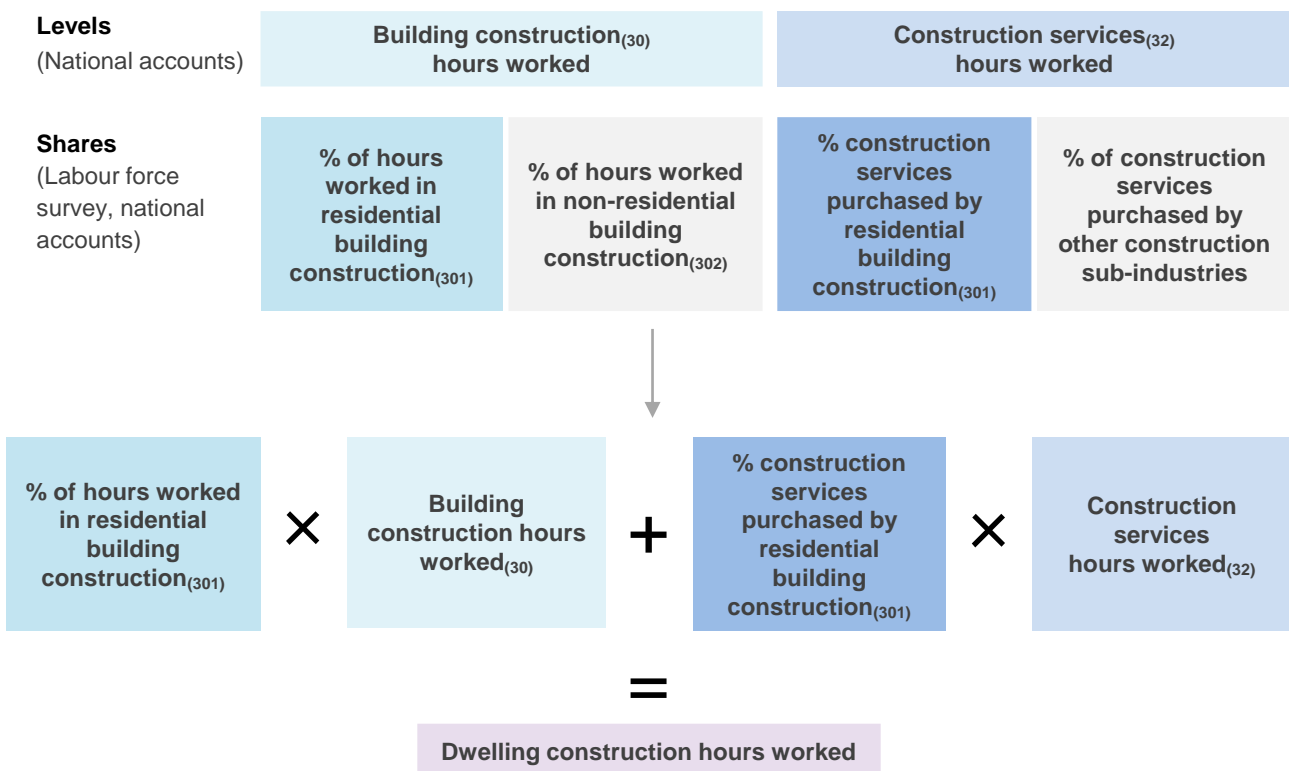
³⁰ A complication with using building activity survey data for price deflators is that the definitions of building and non-building construction can differ from the way ANZSIC (and therefore the PC) classifies these activities. For instance, certain site preparation services would be counted in ANZSIC as construction services₍₃₂₎ (and so form part of our estimates for dwelling construction productivity). However, in building activity survey data, the same activities would be counted as 'engineering construction' rather than 'building construction' and are therefore excluded from the deflators.

construction. The share of hours worked attributed to dwelling construction is set equal to the share of hours worked in the residential₍₃₀₁₎ (relative to non-residential₍₃₀₂₎) building construction industry.

For construction services₍₃₂₎, the share of hours attributed to dwelling construction is set as the share of construction services purchased by the residential building construction₍₃₀₁₎ industry – the same portion that is applied to nominal GVA in step one. Applying this share to both inputs and outputs from the construction services₍₃₂₎ industry is equivalent to assuming that labour productivity in construction services₍₃₂₎ is approximately the same regardless of whether workers are providing services to residential building₍₃₀₁₎, non-residential building₍₃₀₂₎ or heavy and civil engineering construction₍₃₁₎ projects.

The two measures of hours worked are then combined to get an estimate of hours worked for dwelling construction (figure B.7).

Figure B.7 – Hours worked for dwelling construction combines portions of hours worked in building construction and construction services



Step four: estimate proxies of labour productivity

The proxy for dwelling construction labour productivity is the ratio of combined real GVA (step two) to combined labour hours (step three). A productivity proxy has also been calculated using a physical output measure: the number of dwellings completed per hour worked.³¹

Since 1994-95, dwelling construction labour productivity has fallen by 12% based on the GVA measure, and by 53% based on the number of dwellings completed measure (figure B.8).

³¹ The two productivity proxies provide different results because the quality of dwellings (which is only captured in the GVA measure) has improved over time. The physical productivity measure also does not include renovations and repair activity, but the GVA measure does incorporate these.

Figure B.8 – Dwelling construction labour productivity growth is slow^{a,b,c}
Index of proxies for labour and physical productivity, 1994-95 to 2022-23



a. GVA is sourced from the national accounts supply-use tables, while the output measure for dwellings completed is sourced from building activity survey data. b. The deflator is constructed using building activity survey data. c. The hours worked measure for both productivity measures is constructed by apportioning two-digit building construction₍₃₀₎ and construction services₍₃₂₎ hours worked from the labour account using shares of residential building construction₍₃₀₁₎ and non-residential building construction₍₃₀₂₎ from the labour force survey (building construction₍₃₀₎) and shares of construction services purchases in the national accounts supply-use tables (construction services₍₃₂₎).

Source: PC estimates using ABS (2024c, 2024e, table 37) (nominal output); ABS (2024e, tables 3 and 21) (deflator); ABS (2024c, 2024i via data explorer, 2024j, EQ06) (hours worked).

B.3 Estimating labour productivity proxies for house and higher-density dwelling construction

The dwelling construction industry can be decomposed by dwelling type to estimate proxies of labour productivity for house dwelling construction and higher-density dwelling construction. Dwelling construction outputs and inputs are split between house and higher-density construction, then productivity is calculated as the ratio of real GVA to hours worked for each dwelling type.

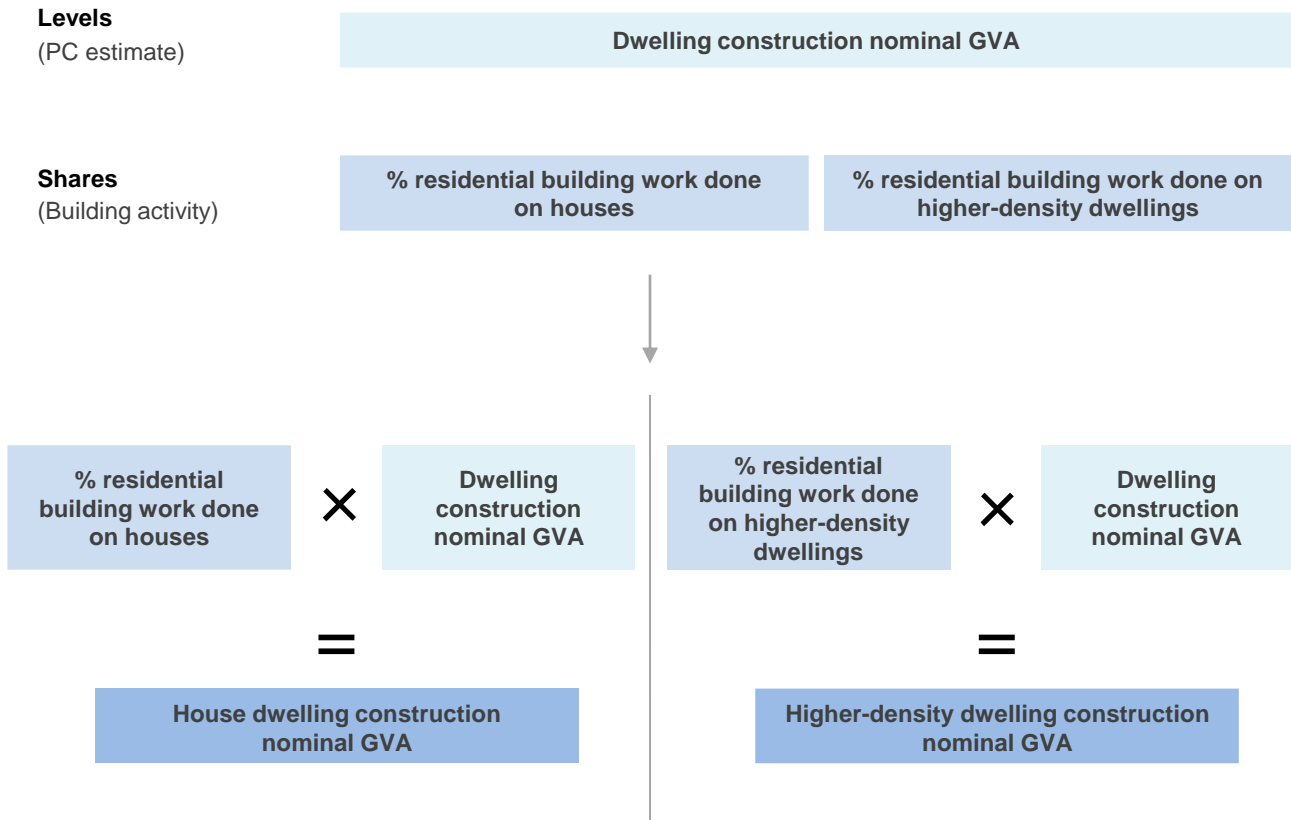
Step one: estimate nominal GVA

First, the previously calculated dwelling construction nominal GVA (section B.2, step one) is divided between house and higher-density construction (figure B.9). This is done based on the share of construction work that is completed for each dwelling type, using building activity survey data.³²

Importantly, dwelling construction nominal GVA, not real GVA, is apportioned between house and higher-density construction. This is so that separate deflators can be applied for each dwelling type.

³² Building activity survey data only disaggregates building work and the number of dwellings completed by dwelling type for new dwellings, so the shares do not account for alterations and additions.

Figure B.9 – Dwelling construction nominal GVA is split by dwelling type using shares of residential building work done



Step two: deflate nominal GVA to estimate real GVA

Separate implicit price deflators are then constructed and applied to the estimates of nominal GVA for house and higher-density dwelling construction. Using individual deflators allows for price changes to vary between dwelling types over time. However, as with the dwelling construction estimates, we use a gross output deflator on an estimate of GVA, rather than a GVA deflator.

The deflators are constructed using building activity survey data: the ratio of the current price value of 'dwelling type' (house or higher-density) building work done and the chain volume value of 'dwelling type' work done.

Step three: estimate hours worked

Dwelling construction hours worked (section B.2, step three) are split by dwelling type (figure B.10). This is done using shares of full-time equivalent (FTE) employment in house and higher-density construction, extracted from the Business Longitudinal Analysis Data Environment (BLADE) pay as you go (PAYG) module. Further detail on the estimation of these shares is in box B.1.

Box B.1 – Business microdata is used to divide dwelling construction hours worked

Dwelling construction hours worked (section B.2, step three) are split between house and higher-density construction using Business Longitudinal Analysis Data Environment (BLADE) data.

Box B.1 – Business microdata is used to divide dwelling construction hours worked

BLADE is a financial census of almost all Australian businesses from 2001-02 onwards. BLADE has a frame based on the ABS business register that provides demographic data, including each firm's four-digit ANZSIC code. BLADE also has a pay as you go (PAYG) module that contains information from the PAYG statements used to withhold income tax from employees (McMillan and Burns 2021, pp. 1, 3). The PAYG module includes a full-time equivalent employees (FTE) variable that the ABS imputes using variables in the module (Hansell et al. 2015).

Linking the BLADE frame and PAYG module allows for the calculation of the shares of FTE employment – a proxy for hours worked – between two four-digit ANZSIC industries: house construction₍₃₀₁₁₎ and other residential (higher-density) building construction₍₃₀₁₉₎. The calculated shares for each year are then applied to the estimates of hours worked in dwelling construction (figure B.10).

This approach is complicated, however, by the fact that some businesses – such as sole traders without employees – are not required to submit PAYG payment summaries. For these firms, FTE data is missing. There is no consensus on how to address the issue of missing variables in incomplete datasets, with some researchers choosing to drop observations with missing data, while others have attempted to impute missing values (Suresh et al. 2020, pp. 2–3).

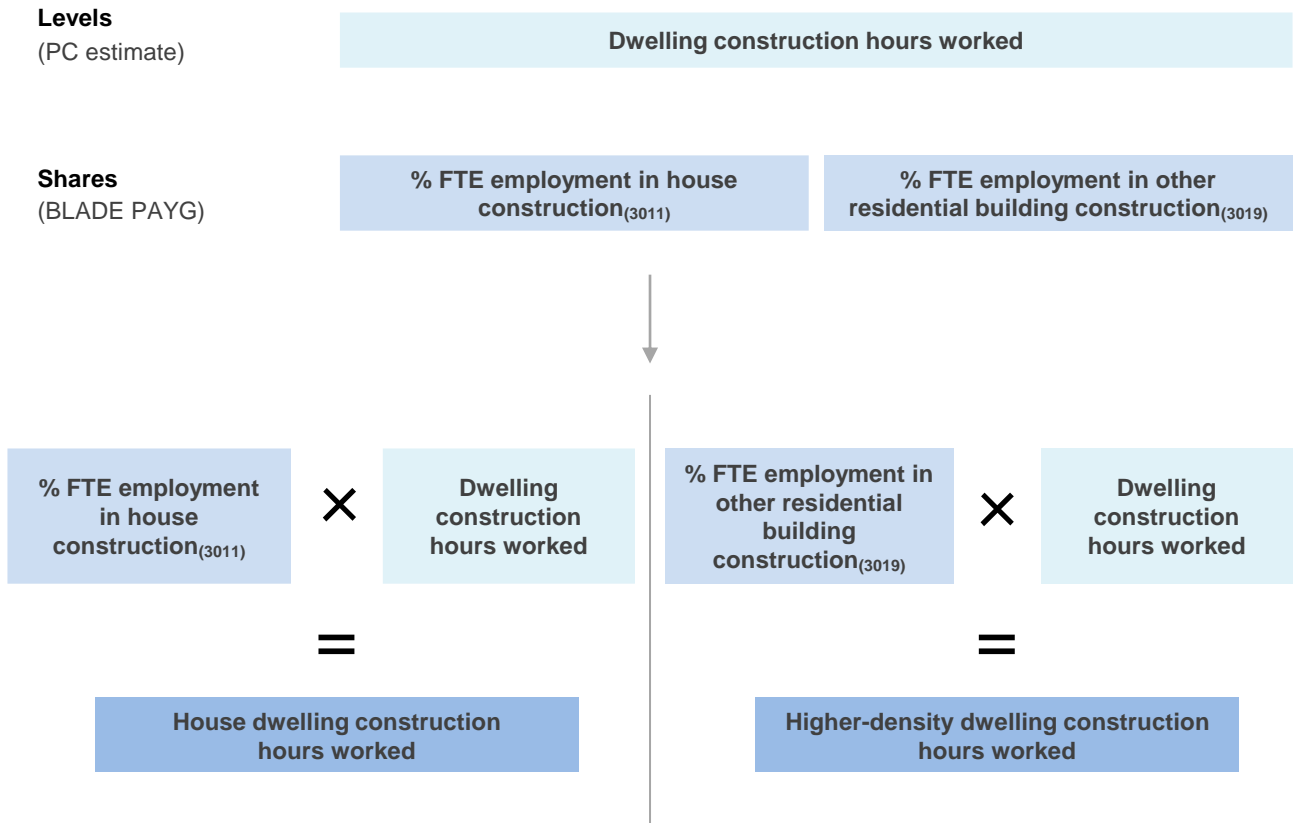
The PC has calculated shares of FTE employment using three methods that span dropping observations and imputing missing values.

- Dropping all observations with missing FTE data (method one).
- Adding one to the reported FTE of sole traders, partnerships and private companies with FTE data (to reflect that business owners contribute to hours worked in each industry), imputing an FTE equal to one for sole traders, partnerships and private companies with missing FTE data, then dropping the remaining observations with missing FTE data (method two).
- Adding one to the reported FTE of sole traders, partnerships and private companies with FTE data and imputing an FTE equal to one for all observations with missing FTE data (method three).

Method three is our preferred approach (figure B.11), but trends in labour productivity are similar between methods. Estimates using methods one and two are available in the report's published chart data.

Additionally, as construction services₍₃₂₎ firms cannot be disaggregated by the type of construction activity they undertake (figure B.2), this approach assumes that employees of construction services₍₃₂₎ firms split their hours between house and higher-density construction in the same way as the residential building construction₍₃₀₁₎ workers from which the shares are derived.

Figure B.10 – Dwelling construction hours worked are split between dwelling types using shares of employment

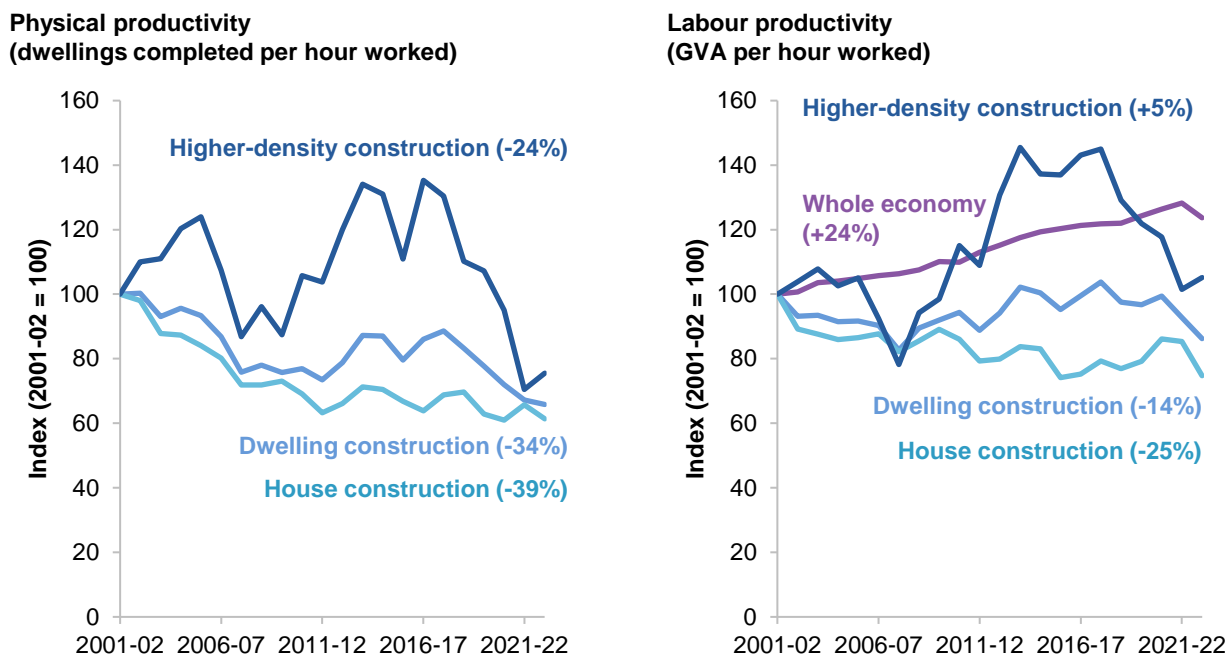


Step four: estimate proxies of labour productivity

As with dwelling construction (section B.2, step four), labour productivity is calculated as the ratio of real GVA and hours worked. Productivity is also calculated using the number of dwellings completed per hour as an alternative output measure.

Separating the estimates for houses and higher-density dwellings reveals divergent trends in labour productivity by dwelling type. The proxy estimate of labour productivity in house dwelling construction has fallen consistently over the past two decades, whereas higher-density dwelling construction exhibits a more cyclical trend, with productivity peaking in the mid-2010s (figure B.11).

Figure B.11 – Labour productivity trends differ by dwelling type^{a,b,c}
Index of proxies for labour and physical productivity, 2001-02 to 2022-23



a. Dwelling construction output is split between dwelling types using building activity survey data. b. Deflators are also constructed using building activity survey data. c. Dwelling construction hours worked are split by dwelling type using BLADE’s PAYG module.

Source: PC estimates using figure B.8 (underlying dwelling construction data); ABS (2024e, table 21) (output shares); ABS (2024e, tables 3 and 21) (deflator); BLADE (2024k) (input shares).

B.4 Testing the assumptions underlying our productivity estimates

Producing the above estimates of labour productivity requires several assumptions. While the validity of some of these assumptions cannot be assessed empirically, where possible they are tested below.

Estimating gross output deflators in place of GVA deflators

As outlined in section B.2, estimates of nominal GVA would ideally be deflated using a GVA deflator. Because there are no GVA deflators available for dwelling construction, house dwelling construction and higher-density dwelling construction, gross output deflators have been used. This assumes that the gross output deflators track the GVA deflators over time.

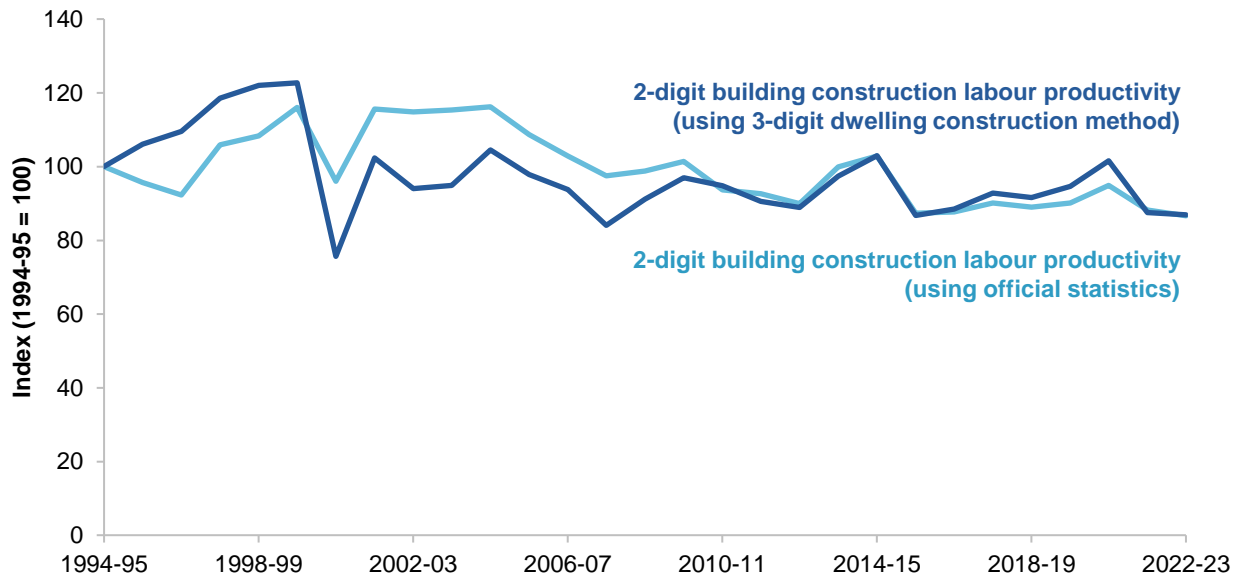
Overall, we would expect this assumption to be reasonable over the longer term, as GVA deflators are just gross output deflators that have also been adjusted for the price of intermediate inputs. That is, in the long run, the price of outputs and intermediate inputs would be expected to be highly correlated, as output prices are a function of intermediate input prices to some degree.

One way to test this assumption is using data at a higher level of industry aggregation – building construction₍₃₀₎ – where both GVA and gross output deflators are available. Figure B.12 displays building construction₍₃₀₎ labour productivity calculated using two different methods. First, using official statistics: the ratio of real GVA (nominal GVA deflated using a GVA deflator) and hours worked. Second – analogous to

our approach – using nominal GVA deflated using a gross output deflator³³ divided by hours worked. Trends in labour productivity are similar for each of the methods, particularly over the past decade. The results begin more divergent and then gradually converge over time – the price of outputs and intermediate inputs would be expected to be correlated over the longer term.

Figure B.12 – Building construction labour productivity is similar when calculated using gross output and GVA deflators

Index of proxies for labour productivity, 1994-95 to 2022-23



Source: PC estimates using ABS (2024d, table 5, 2024i via data explorer) (official statistics); ABS (2024c) (output), ABS (2024e, tables 1 and 12) (deflator), ABS (2024i via data explorer) (hours worked) (dwelling construction method).

Estimating the share of construction services used for dwelling construction

As highlighted in figure B.2, the share of construction services₍₃₂₎ output and input used for housing construction purposes cannot be identified in official data. In the above dwelling construction productivity estimates, the share of construction services₍₃₂₎ nominal GVA and hours worked attributed to housing construction is approximated using the share of construction services purchased by the residential building construction₍₃₀₁₎ industry (relative to the non-residential₍₃₀₂₎ and heavy and civil engineering construction₍₃₁₎ industries). This is equivalent to assuming that labour productivity in construction services₍₃₂₎ is approximately the same when workers undertake housing construction work, relative to other types of construction projects.

It is important to note that this assumption is made less strict by the fact that we are interested in productivity *growth*: if the estimated share of construction services used for housing construction purposes is incorrect, but the estimation error is time invariant, the impact of this imprecision will be differenced out over time.

³³ As building construction₍₃₀₎ labour productivity is being estimated, in this case the gross output deflator is constructed from the value of all building work done, not just residential building work.

The analysis includes some assumptions and limitations that cannot be tested

The labour force survey may not accurately classify all construction workers

The PC used the labour force survey to apportion the labour account measure of building construction₍₃₀₎ hours worked between residential and non-residential construction because it is a publicly available longitudinal data source that contains sufficiently disaggregated information on hours worked. However, the labour force survey is a household survey. A known issue with the survey – which relies on self-reporting, as opposed to assigning workers to industries based on their employer’s ANZSIC code in an administrative dataset – is that some labour hire workers may mischaracterise themselves as working in construction, when they are directly employed by labour supply service₍₇₂₁₂₎ firms that provide labour to the construction industry (ABS, personal communication, 27 November 2024). Significant misreporting would cause the share of hours worked in residential building construction₍₃₀₁₎ to be under(over)estimated, which would cause the estimate of hours worked in dwelling construction to be under(over)estimated, which in turn would cause dwelling construction labour productivity to be over(under)estimated.

While it is difficult to quantify the extent of industry misclassification in the above estimates of labour productivity, the rate of misclassification may differ between the survey data (such as the labour force survey) and administrative data (such as BLADE’s PAYG module) utilised in calculations. Hathorne and Breunig (2022) find that some occupational patterns differ markedly between survey and administrative data – this finding may also be applicable to industries.

Data from BLADE’s PAYG module may not fully capture the shares of hours worked in house and higher-density construction

When calculating house dwelling construction and higher-density dwelling construction labour productivity, it is assumed that the shares of FTE employment calculated for house construction and higher-density construction using BLADE’s PAYG module are an accurate reflection of the shares of hours worked in each of those industries. This assumption may not hold if a firm’s ANZSIC classification, which is based on their primary activity, is not their only activity (for example, they primarily work in the non-residential construction₍₃₀₂₎ industry and are classified accordingly but also do work in the house construction₍₃₀₁₁₎ industry). Hours worked in house construction₍₃₀₁₁₎ and other residential (higher-density) building construction₍₃₀₁₉₎ firms that are unrelated to house and higher-density construction cannot be deducted from the calculated shares of FTE employment. Correspondingly, hours worked in house and higher-density construction by firms outside the house construction₍₃₀₁₁₎ and other residential (higher-density) building construction₍₃₀₁₉₎ ANZSIC codes cannot be added to the calculated shares of FTE employment.

Furthermore, the hours worked in dwelling construction by construction services₍₃₂₎ workers are apportioned between dwelling types using the split in hours worked in house construction₍₃₀₁₁₎ and other residential (higher-density) building construction₍₃₀₁₉₎, which are sub-industries of the residential building construction₍₃₀₁₎ industry. But the split in hours within the residential building construction₍₃₀₁₎ industry predominately represents hours worked by developers and main builders, while the split in hours worked in construction services₍₃₂₎ is based on how firms of tradespeople allocate their time between house and higher-density construction. So, the hours split within residential building construction₍₃₀₁₎ may not be representative of the hours split within construction services₍₃₂₎. We have not tested this assumption.

There is uncertainty attached to the labour productivity proxies

National accounts data is not published with relative standard errors (RSEs). While the surveys underlying national accounts data include RSEs, 'it [is not] possible to systematically calculate the impact that RSEs have on the various national accounting aggregates, because of the transformations of survey data, and the aggregations made in order to compile the national accounts' (ABS 2021a). As the calculated proxies of labour productivity for dwelling construction, house dwelling construction and higher-density dwelling construction are derived from national accounts data, they are also published without RSEs.

By disaggregating published national accounts data, the degree of uncertainty attached to our estimates of labour productivity cannot be defined. However, the proxies for dwelling construction labour productivity – which identify declining productivity in the industry – are broadly consistent with published productivity statistics at higher levels of industry aggregation (for example, slow productivity growth in the aggregate construction industry (figure B.1)).

Additionally, our estimates for dwelling construction labour productivity may be subject to non-sampling error, which arises from inaccuracies during data collection. As identified above, one potential source of inaccuracy is firms and workers misidentifying their industry.

C. ABS quality adjustments in residential construction

This appendix examines the need to adjust price deflators for quality changes (section C.1), as well as the Australia Bureau of Statistics' (ABS) approach to quality adjustment (section C.2).

Much of this appendix is drawn from consultations with the ABS. Where information is publicly available it is cited. In all other cases, the reader should assume that information was drawn from these consultations.

C.1 Quality adjustment occurs through price index adjustment

When measuring output (and hence productivity) in a single time period, prices are typically used to weight different products. Prices allow for the comparison of different goods and services in the economy by conveying information about the value of each product. So, while counting total dwelling completions per year can be informative, the value of completed work is a more comprehensive output measure as it conveys information about quality.

When prices change over time, we need to identify what is driving that change to accurately measure the value of the output. Unadjusted output measures – that is, that ignore price changes – will overstate output (and productivity) growth. For instance, if the average price of a house increased by 10%, it does not necessarily follow that this is indicative of a 10% increase in output. It could be, for example, that construction costs have increased by 10%, in which case output would be unchanged. As a result, economic statistics are adjusted to account for price changes.

But some price changes do represent changes in output. If prices increase due to quality improvements, then failing to account for these changes will lead to underestimates of productivity and output (box C.1).

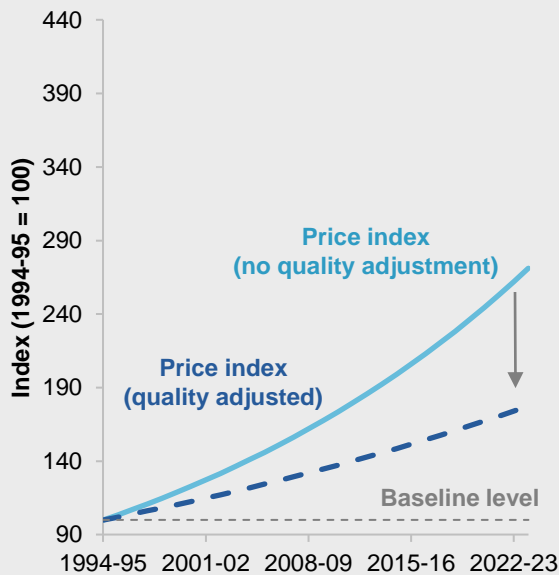
Box C.1 – How quality changes affect estimates of output growth

Quality improvements are incorporated into output estimates by adjusting product prices down, such that they reflect the greater value of higher-quality goods and services. Measured output (and hence productivity) then increases: for the same inputs, more value is being delivered. For instance, increases in energy efficiency and house sizes over the last 30 years explain some, but not all, of the increase in house prices. This is illustrated in the hypothetical example below.

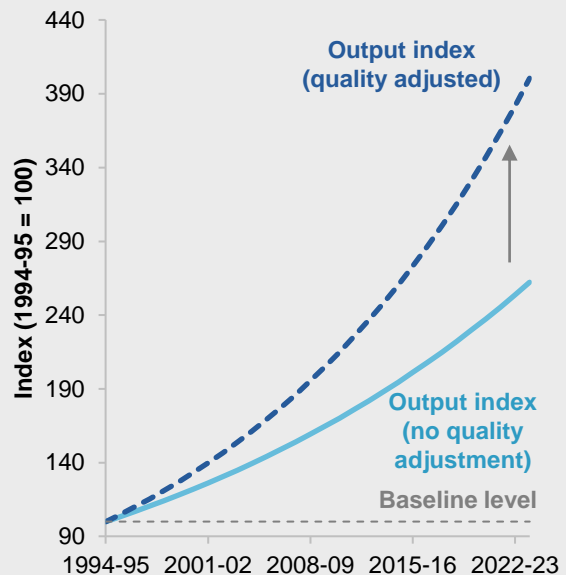
Box C.1 – How quality changes affect estimates of output growth

Quality adjustment decreased the measured price and increased measured output

The impact of quality adjustment on price



The impact of quality adjustment on output



C.2 The ABS approach to quality adjustment of dwelling construction

How does the ABS adjust housing construction costs for quality changes?

To produce our productivity estimates, we used implicit price deflators from the *Building Activity Survey* to deflate estimates of dwelling construction, house construction and higher-density construction output. To construct the series underlying the building activity survey deflators that our analysis relies on, the ABS combines price data for detached houses from the consumer price index (CPI)³⁴ with price data for higher-density housing (‘other residential’) from the producer price index (PPI). To build these indexes, the ABS tracks the prices of two main housing types:

- CPI – new project houses for owner occupiers.
- PPI – what this report calls ‘higher-density’ housing (apartments, flats and anything else other than detached houses, chapter 2).

³⁴ Strictly speaking, the *building activity survey* deflators for detached housing derive from the PPI series for detached housing. But this in turn is derived from the CPI series for detached housing, with some to adjustment to ensure it excludes subsidies, grants and rebates (which are included in the CPI). We consider only the underlying CPI series for detached housing.

The ABS may also apply other transformations to the underlying CPI and PPI data, depending on the purpose. This can include taking lags or moving averages of particular series. However, these are not examined here as these transformations do not affect whether or not quality changes are incorporated into the statistics over the longer term.

Price measurement of project housing in the CPI

The CPI for residential dwellings captures price changes for new project houses purchased by owner-occupiers in each capital city (ABS 2021c).^{35,36} This choice reflects that the CPI tracks the purchases of consumers and not investors or producers. In addition to these price changes, the ABS monitors a range of specifications in new dwellings, based on information provided by builders. These specifications are then used to match the characteristics of new houses built in different years to quality adjust the price measure for new housing (box C.2).

Box C.2 – A stylised example of ABS quality adjustment

Suppose that a builder has reported the prices of similar project houses in two time periods. In the second period, the builder reports that the house includes a solar system worth \$7,000 in the standard inclusions. The houses are otherwise identical.

The ABS will adjust for this quality change in the home, taking into account the nominal price changes reported by the builder. For example, say the new price of the project home has changed from \$550,000 to \$557,000, reflecting the additional value of the new solar system. Because the quality of the two homes is not objectively comparable and has changed by a value of exactly \$7,000, the new price will be quality-adjusted such that it does not change (and remains at \$550,000).

If the price of the project home increases by more than the quality change, then this implies that a price increase has been observed even after the adjustment. For example, the same solar system is included in the second period but the price of the project home is reported to change from \$550,000 to \$568,000 (a 3.3% increase). In this case, the quality-adjusted price also increases, but only from \$550,000 to \$561,000 (a 2% increase). This smaller figure of 2% represents an actual change in price for otherwise identical project homes (table below).

Stylised example of the effect of quality adjustment on price

Cost of new project home before and after quality adjustment

	Price (\$)	Change since 2022-23 (\$)	% change
Old price	550,000	-	-
New raw price	568,000	18,000	3.3
New ABS quality-adjusted price	561,000	18,000 – 7,000 = 11,000	2

Source: ABS (pers. comm., 9 September 2024).

³⁵ The CPI housing group also contains changes in the price of rent for tenants in private- and government-owned properties, as well as major renovations. These housing costs do not necessarily relate to new builds and so are not considered here.

³⁶ Project home prices do not include land, only the value of new construction work.

The specifications capture a range of dwelling characteristics, based on floor plans from individual homes and accounting for standard inclusions at a detailed level for each section of a new build. Examples of standard inclusions for new project homes include brick and tile selections, ceiling height, kitchen appliances and bathroom fixtures. This allows for additional detail to be captured as part of the quality adjustment for project homes, substantially reducing the risk of unmeasured quality changes.

Price measurement of higher-density housing in the PPI

For higher-density housing (called 'other residential' in the PPI), rather than measure the price of each particular apartment or townhouse, the ABS focuses on the cost of components common to all dwellings of a particular type. The ABS then models each townhouse, apartment and so forth as the combination of varying amounts of these different features and tracks their prices over time.

The components typically used are the critical elements of most residential buildings, such as structural elements, finishes (walls, floors and ceilings) and service components, as well as project costs and margins. For example, the ABS might model the price of apartment complex A as consisting of, among other things, more walls and staircases than apartment complex B, reflecting the greater height of the former. This approach accounts for the heterogenous nature of apartment complexes (and other non-detached dwellings), and exploits the fact that they typically use common features (walls, staircases etc) in differing quantities. The types of projects tracked are updated every three to five years and include a representative range of buildings across regions.

The components the ABS prices over time are based on the most common specification for that component. For example, the cost of kitchen fittings that the ABS uses in their model would be based on the cost and quality of the most common kitchen appearing in complexes of the same type. Apartments with features above or below the typical cost and quality that the ABS tracks would suffer from price mismeasurement.³⁷

In summary

The ABS methodology captures most quality changes over time. The PC considers that to the extent that there is some inevitable residual quality mismeasurement, the chances may be greater that quality is *overestimated* rather than underestimated, and therefore for dwelling construction productivity to be overstated.

There are two areas where the ABS approach could lead to an overestimation of productivity.

- Marginal cost and consumer willingness – the ABS methodology assumes that the marginal cost of new features in project homes (or a changes to components in an apartment buildings) roughly tracks consumers' willingness to pay for these features. In an undistorted market, cost and consumer willingness to pay would align, but government regulations can cause divergence in this alignment. For instance, to further use the example set up in box C.2, the building codes may require a feature costing \$7,000, but buyers may only value it at \$4,000. This misalignment would result in the ABS underestimating the price of constructing new dwellings (the ABS would estimate price growth at 2% when it is actually 2.5%), and therefore overestimating productivity.³⁸ (The opposite case, where consumers value a regulation more than the marginal cost seems unlikely – if it were the case, the consumer would presumably purchase more until the marginal cost rises to the marginal benefit.)

³⁷ The degree of mismeasurement would be relatively constant over time so long as the ABS updates their model frequently enough and the overall distribution of apartment quality does not change. That is, the price level might be mismeasured, but it is unclear if this has significant implications for measuring the growth rate of prices.

³⁸ With reference to the table in box C.2, the calculation for the new 'true quality adjusted price change' compared to the old is $\$18,000 - \$4,000 = \$14,000$. The change is $2.5\% = \left[\frac{\$550,000 + \$14,000}{\$550,000} - 1 \right]$.

- Defects in new apartment buildings – the ABS does not adjust for changes in the rate of building defects when estimating PPI changes for higher-density on the basis that these issues do not emerge until years later. This would indeed be difficult to adjust for, if building defects have become more common it would likely mean that price growth of buildings has been underestimated and productivity overestimated. There have been several instances of significant defects in new buildings over the past decade (Molloy 2024; NSW Legislative Council 2020; Thompson 2024).

Productivity may also be underestimated in some areas, but this is less significant for comparisons with the rest of the economy. Better workplace health and safety (there has been a 43% fall in the rate of serious claims per million hours worked between 2000-01 and 2018-19) (SWA 2020, table 21) and the energy efficiency of new dwellings (with the minimum energy rating increasing from 6 to 7 stars in the 2022 revision of the National Construction Code) (ABCB 2022c) create benefits that accrue beyond home buyers and construction firms. These ‘externalities’ are not captured by statistical agencies. But we have no reason to consider that their exclusion affects the construction industry more than it does for other industries, such as those with known significant externalities like public health and education.

Overall, the ABS approach to quality estimation likely captures the majority of changes and if there are some aspects that are missed, it seems there is more scope for overestimation than underestimation.

Residual measurement error is not sufficient to explain the dwelling construction industry’s poor productivity performance

Despite the quality adjustments made by the ABS, it is possible that there are some quality improvements that are not captured. To assess the potential effect of this on our productivity estimates, we calculate a counterfactual based on estimates of mismeasurement from the literature.

Some international studies suggest a possible overestimation of dwelling construction price growth of 0.44 to 0.80 percentage points each year due to quality mismeasurement (Borg and Song 2014; Garcia and Molloy 2023; Harrison 2007). This estimate is almost certainly too high for Australia given the ABS’s methodology for measuring quality changes within construction is, given our own survey of the literature, much more detailed compared to overseas statistical agency peers (appendixes C and D). Nonetheless, we take these figures as an upper bound.

We also need to adjust for possible unmeasured quality changes in the broader economy. Reviews of the US CPI find annual inflation in the US is likely overestimated by 0.37 to 0.60 percentage points due to quality improvements and the introduction of new products (Boskin Commission 1996; Gordon 2006; Lebow and Rudd 2003; Moulton 2018). Because Australian estimates do not exist, we assume a similar degree of overestimation for Australia.

After incorporating these assumptions into our own estimates, we find that labour productivity in dwelling construction would still lag the broader economy by between 1.38 and 1.96 percentage points annually – still a sizeable gap. It is highly unlikely that mismeasured quality improvements can explain the gap in productivity growth between dwelling construction and the whole economy.

Table C.1 – Estimates of the potential productivity gap needing to be explained by quality mismeasurement in construction between 1994-95 and 2022-23^{a,b}

Annual labour productivity growth in construction and the whole economy before and after adjustment is made for unmeasured quality, as well as the gap between the two

	Before quality adjustment (percentage points)	Quality adjustment (percentage points)	After quality adjustment (percentage points)
Dwelling construction	-0.44	0.44 to 0.80	0.00 to 0.36
Whole economy	1.38	0.37 to 0.60	1.76 to 1.99
Gap	-1.80		-1.38 to -1.96

a. Labour productivity in dwelling construction and the whole economy before quality adjustment have been rounded in this table, they are closer to 0.4398346 and 1.3845879 respectively. **b.** Calculating gaps and adding adjustments are done on the basis of: $z = \frac{(1+x)}{(1+y)} - 1$ rather than $z = x - y$. For example, the gap between annual construction industry productivity growth and that of the whole economy (before quality adjustment) is $\frac{(1-0.0044)}{(1+0.0138)} - 1 = -0.018$. Likewise, the calculation of the effect of quality adjustment is done on the basis of $z = (1+x)(1+y)$ rather than $z = x + y$.

Source: ABS (2024d, table 5, 2024j, EQ6, 2024i, table 6, 2024c, Data Explorer); Borg and Song (2014); Boskin Commission (1996); Garcia and Molloy (2023); Gordon (2006); Harris (2007); Lebow and Rudd (2003); Moulton (2018).

D. International comparisons

D.1 Slow construction productivity is an international phenomenon

The measured slowdown in aggregate construction labour productivity (residential, commercial and civil) in Australia over the past 25 years is consistent across a number of countries (figure D.1, top). Indeed, an international comparison shows construction productivity since the mid-1990s has almost always lagged productivity in the broader economy (figure D.1, bottom).

In relative terms, Australia is one of the stronger performers on these measures. For the period between 1995 and 2020, construction productivity growth in Australia was higher than in the United States, France, Sweden, the United Kingdom and Germany (using EU KLEMS³⁹ and ABS data, figure D.1, left).⁴⁰ Australia also experienced a relatively small gap between construction and economy-wide productivity (figure D.1, bottom).

D.2 Estimates of construction productivity are not fully comparable

The estimates presented in figure D.1 are not fully comparable, as methods used to estimate quality changes in construction vary widely between countries. In particular, while Australia makes detailed adjustments for quality (appendix C), surveyed quality adjustment procedures in the United States, United Kingdom, Canada and Sweden appear less comprehensive. This section reviews some of the literature on the approaches adopted. Not fully adjusting for quality means that productivity measures for other countries are, on average, underestimated.

Additionally, aggregate construction productivity may not reflect residential building construction productivity. Differences between countries in aggregate construction productivity may instead reflect differences in the composition of the construction sector (Vogl and Abdel-Wahab 2015).

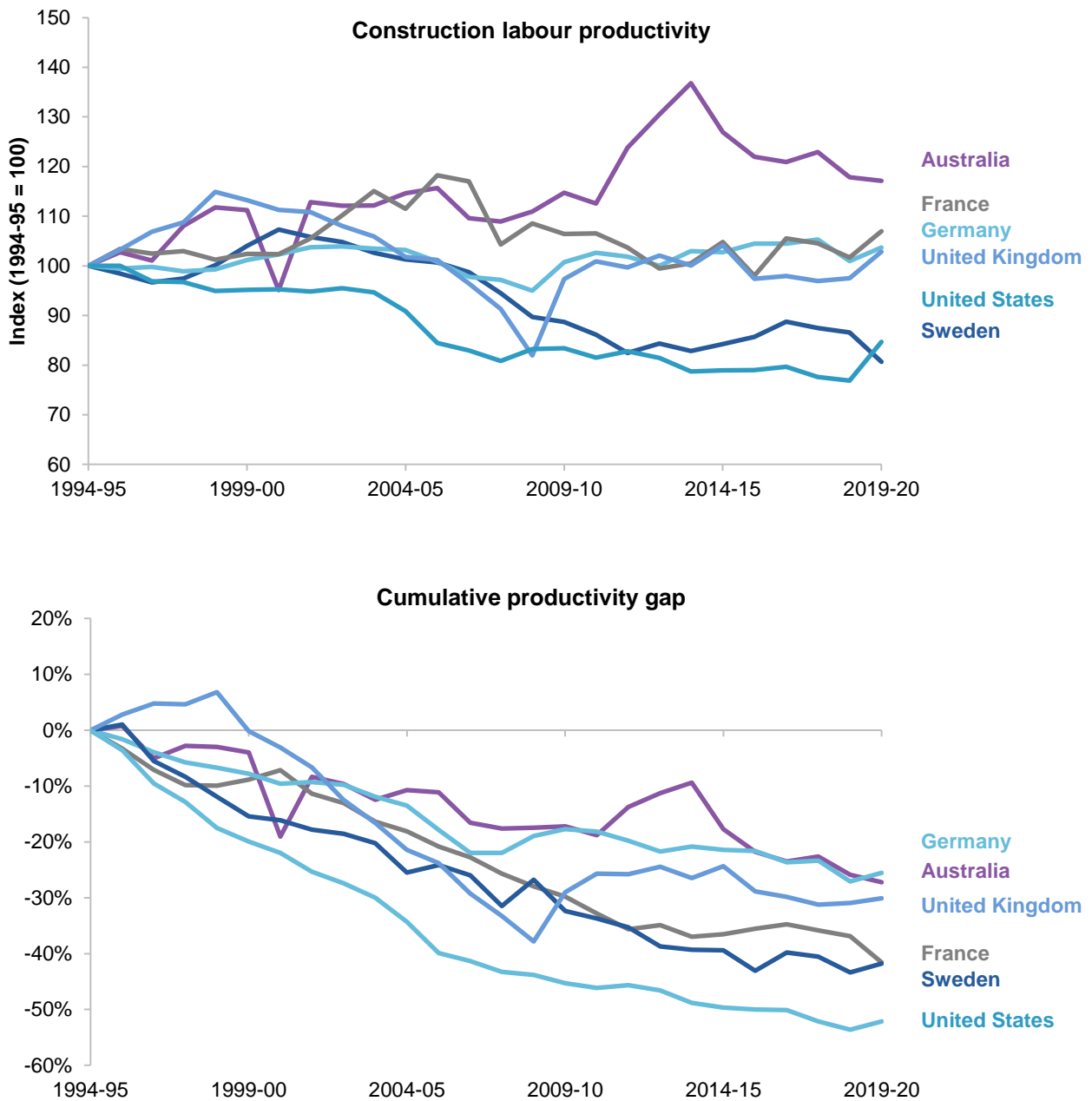
Quality adjustments in the United States

A wide range of productivity estimates are produced in the US. Productivity measures are done at the industry-level by dividing the outputs by inputs (for example, dollar value produced by hours worked), and at the activity-level (for example, the time taken for 'concrete finishing' or 'wood framing of beams and girders').

³⁹ EU KLEMS is a database providing productivity data across 27 European countries, the United Kingdom, United States and Japan (Bontadini et al. 2023).

⁴⁰ See also Abdel-Wahab and Vogl (2011), who found slow construction labour productivity growth in Germany, France, the United Kingdom, the United States and Japan between 1990 and 2005.

Figure D.1 – Low measured construction productivity is an international trend^{a,b,c,d}
Construction labour productivity and the cumulative construction labour productivity gap for select advanced economies



a. Labour productivity is calculated based on hours worked. **b.** The cumulative productivity gap is the cumulative difference between construction sector productivity growth and market sector productivity growth. Australian data, unlike data for other countries, excludes the real estate sector from the market sector, which results in the cumulative productivity being slightly smaller (this does not substantially impact results). **c.** Estimates are for all construction (residential, commercial and civil), not just residential building construction. **d.** While attempts have been made to harmonise data across countries, technical differences are likely to contribute to differences between series. For example, different countries use different procedures to account for quality changes and non-Australian data is reported by calendar year but has been converted to prior financial year (for example, 2020 = 2019-20).

Source: ABS (2023b, table 6) for Australia, Bontadini et al. (2023) for other countries.

Trends in activity- and industry-level productivity estimates are inconsistent. Activity-level estimates typically find that productivity has risen (Goodrum et al. 2002), whereas industry-level estimates show productivity

growth falling (Rathnayake and Middleton 2023). The contradiction between activity- and industry-level productivity has two key causes.

1. Industry level estimates suffer from inadequate quality adjustment.
2. Activity level estimates are not comprehensive.

Industry-level estimates

Industry-level estimates in the United States underestimate productivity due to inadequate quality adjustments. As discussed by Goodrum et al. (2002), US construction productivity measures use unreliable output deflators (output deflators control for price changes in output measures). Specifically, the measures use both input cost-based deflators and proxy deflators, both of which can have serious issues.

- Input cost deflators are based solely on the price of inputs (labour and materials). As such using input cost deflators (to substitute for output costs) assumes a constant relationship between input and output costs, which will only hold if productivity is unchanged. If productivity is rising, for example, fewer inputs are required and hence input cost deflators will underestimate output.
- US proxy deflators are often unrepresentative. For example, the 'single-family houses under construction' price index is used to deflate non-residential and military construction. The price levels for single-family home construction will not be representative of the price levels for the construction of, for example, military bases or shopping malls (Goodrum et al. 2002). Even for single-family houses, the index has faced criticism for capturing only a narrow set of features, and therefore underestimating quality improvement (Dyer et al. 2012).

Activity-level estimates

Activity-level estimates are also a weak proxy for overall construction productivity (Rathnayake and Middleton 2023). Activity-level estimates exclude all project overheads and all non-value adding activities, such as time waiting on site. For example, if a plumber spends half their time commuting between sites, gathering materials and checking their work, then measures of how fast the plumber can lay pipes will not be representative of productivity.

Towards improved productivity estimates in the United States

To overcome these issues with industry- and activity-level estimates, Sveikauskas et al. (2018) used improved price indices to measure construction productivity across four construction subsectors (representing 11% of construction hours worked). They found very high productivity growth for industrial construction, strong growth for multifamily residential, slower growth for single-family homes and negative growth for highways, streets and bridges. However, these estimates rely on gross output productivity (rather than gross value added) and, in our view, use the inaccurate single-family homes under construction deflator.

Goolsbee and Syverson (2023) used physical dwelling completions to avoid issues with deflators, finding negative (or at best laggard) productivity growth. But of course, this approach ignores the myriad changes that have improved the quality of modern housing (appendix C).

Limitations in quality adjustments for other countries

Other comparison countries also use different quality adjustment methods.

- **United Kingdom.** Work based on national statistics found that construction labour productivity grew slowly and construction total factor productivity decreased between 1970 and 2014 (ONS 2021). Over this period, the United Kingdom used output deflators based on bill of quantities sourced from construction

tenders. This method may have been more accurate than methods used in other countries, but may not have been based on a representative sample of building work (Yu and Ive 2008).

- **Canada.** Construction productivity growth in Canada was negative across much of the 1980s and 1990s (Sharpe 2001) and mostly slower than business sector growth between 1961 and 2006 (Harrison 2007). However, 60% of Canadian construction value added was deflated using input cost-based deflators (particularly for engineering and repair construction). Using the output-based non-residential deflator for these activities would explain half of the productivity growth difference between construction and the business sector in general, although this is an imprecise estimate (Harrison 2007, pp. 60–61).
- **Sweden.** Construction productivity growth in Sweden between 1995 and 2020 was low (figure D.1). Construction output in Sweden is deflated using the Construction Cost Index. This index measures the price change for individual production factors and therefore does not account for changes in building technology over time (Pettersson 2016). Therefore, it is likely that productivity growth has been underestimated.

D.3 Australia’s performance is moderate to strong on alternative indicators

Using alternative indicators of construction sector performance, Australia is at least ‘middle of the pack’.

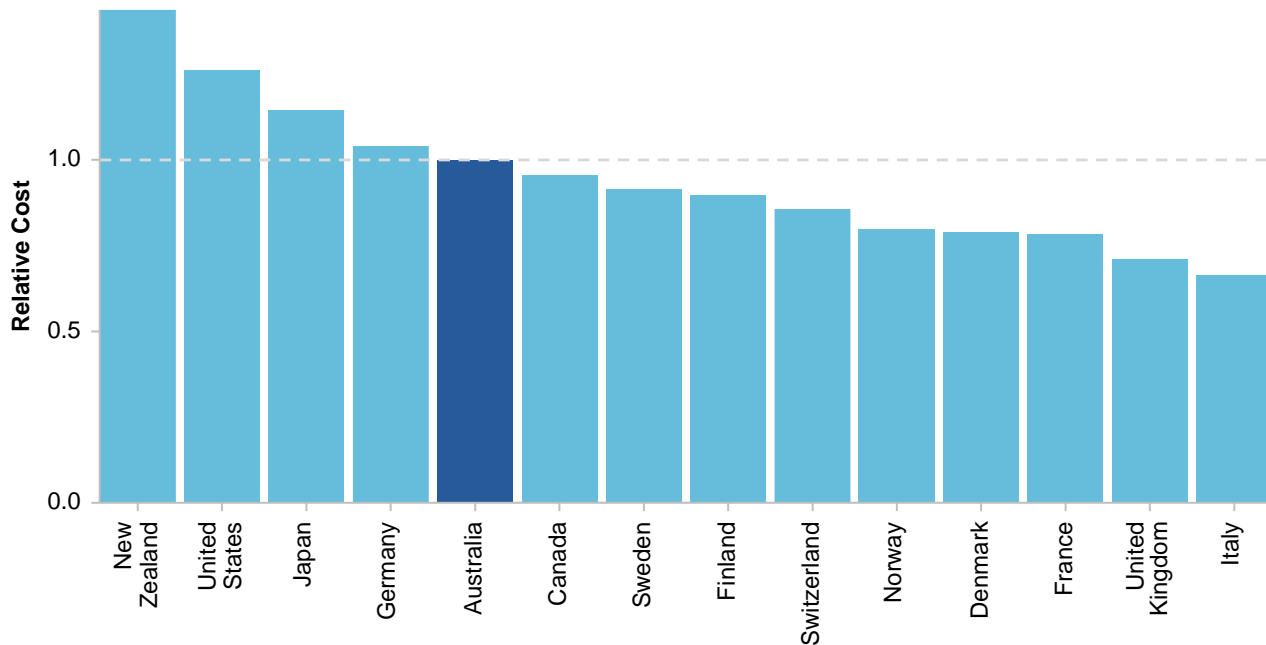
Cost of construction

In 2020 and prior to the rapid rise in construction prices triggered by COVID-19 and other global events, Australian construction (residential, commercial and civil) prices were slightly above average, but not especially high, compared to a set of other advanced economies (figure D.2).

Under certain conditions, construction prices may provide a proxy for relative productivity across countries. Specifically, if one country is more productive than another at constructing dwellings, holding input costs and markups constant across countries, we would expect the cost of construction in that country to be lower (figure D.3). However, price comparisons for construction are rather imprecise because buildings are built to different standards in different countries (Eurostat and OECD 2023, p. 169).

Figure D.2 – Relative to other advanced economies, the cost of construction was slightly above average in Australia^{a,b}

Relative construction prices for advanced economies, 2020

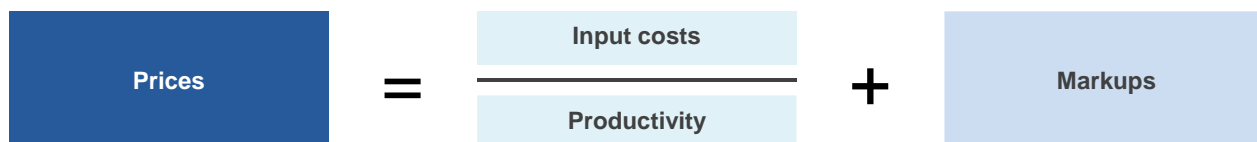


a. Prices are converted to PPP exchange rates and therefore reflect the opportunity cost of construction. That is, prices reflect how many other goods one unit of construction costs (relative to Australia). **b.** Results are sensitive to the choice of comparator countries as less advanced economies often have cheaper prices due to cheaper inputs. Australian construction is expensive relative to all OECD countries.

Source: OECD (2024b).

Figure D.3 – Prices are linked to productivity^a

Price determination



a. The total cost that firms face is the input cost multiplied by the amount of inputs required (which is determined by productivity). Firms then add a markup which results in the cost consumers face.

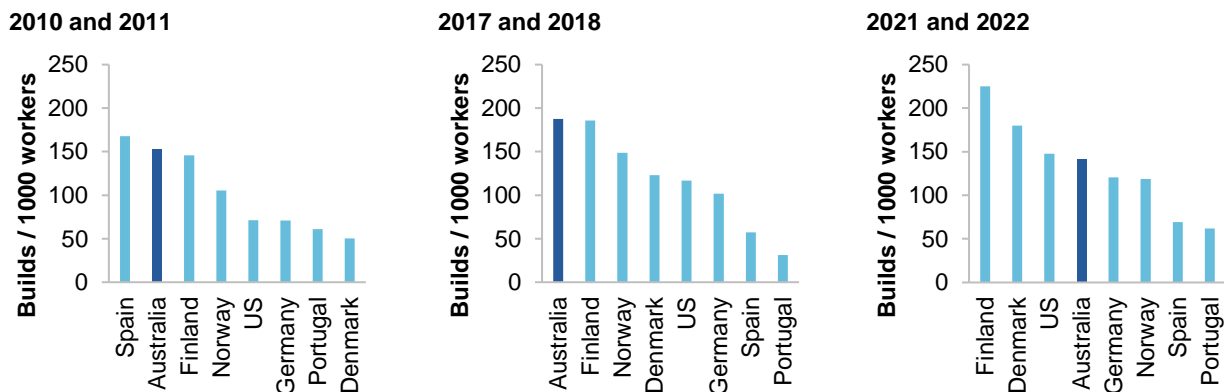
Dwelling completions

The number of dwellings completed is another indicator of construction performance. Dwelling completions capture the increase in housing stock over a period, but do not account for quality differences. Due to data limitations we are only able to compare completions to the overall construction workforce (residential, commercial and civil).

Australia's completions per construction worker compared to other countries were high in 2011 and 2018, but middling in 2022 (figure D.4). Australia's completions per construction worker rose from 2011 to 2018, amid record higher-density dwelling completions, however there was a slight fall in 2022 compared to 2011 levels.

Figure D.4 – Prior to COVID-19, Australian completions per construction worker were high^{a,b}

Dwelling completions per construction worker, 2010 and 2011, 2017 and 2018, 2021 and 2022



a. Workers represents workers across all of construction (residential, commercial and civil), not just residential new builds. **b.** The Affordable Housing Database contains results for different countries in different years. This figure presents only a subset of the countries with data in 2010 or 2011, 2017 or 2018 and 2021 or 2022 (with only one year selected for each country in each period). However, Australia’s relative performance is similar in the full sample.

Source: PC estimates based on OECD (2024a) and OECD (2024c).

Completions per aggregate construction worker are generally not a good proxy for cross-country productivity comparisons due to differences in the shares of residential, commercial and civil construction in each country. Further, not all workers in residential construction work on new builds, and the proportion that do will vary by country. For example, Australia has high population growth, which means the number of employees working on new builds can be expected to be relatively high, independent of productivity.

D.4 Construction productivity is an international issue

Considering the available evidence, Australian performance is likely to be at least moderate. Compared to peer nations’ measured productivity growth was relatively high, although it is likely that productivity was underestimated in some nations due to inadequate quality adjustment. Alternative indicators also suggest moderate to strong Australian performance. Construction prices were only slightly above average and dwelling completions per (aggregate) construction worker ranged from moderate to high.

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