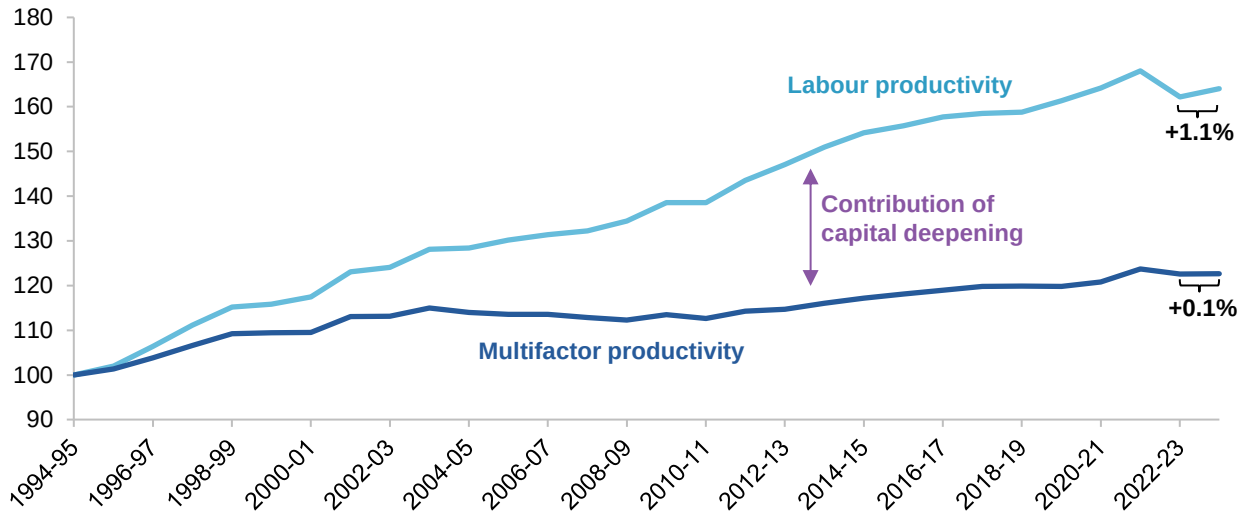
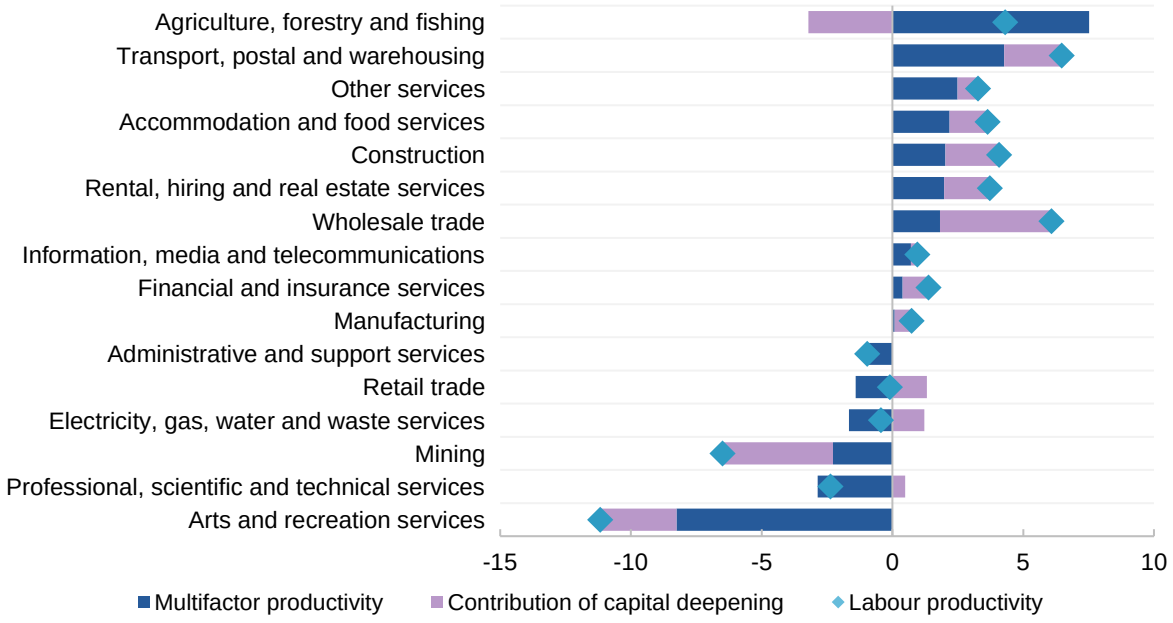
Australian Government
Productivity Commission

Annual productivity bulletin 2025

Market sector productivity (index, 1994-95 = 100)



Productivity growth by industry, 2022-23 to 2023-24 (percentage change)



Source: PC estimates based on ABS (*Estimates of Industry Multifactor Productivity, 2023-24*).

Update from Alex Robson
Deputy Chair, Productivity Commission

Multifactor productivity (MFP) is a measure of how well labour and capital inputs are combined to produce outputs and is a key determinant of growth in GDP and living standards.

Unfortunately, recent MFP growth has been almost non-existent.

Market sector MFP rose by a sluggish 0.1% between 2022-23 and 2023-24, below the 20-year average of 0.3% per year and well below the 1.6% per year between 1994-95 to 2003-04 (an MFP boom decade). Better educated and more experienced workers were the only thing keeping MFP afloat – if these improvements in labour quality are filtered out, MFP declined by 0.2% between 2022-23 and 2023-24.

Market sector labour productivity rose by 1.1% between 2022-23 and 2023-24, a slight recovery after its 3.5% crash between 2021-22 and 2022-23 as the COVID-induced productivity bubble deflated. The rise in labour productivity was due almost entirely to capital deepening (more capital per worker) – MFP contributed very little.

Among the industries, agriculture, forestry and fishing led MFP growth at 7.3% between 2022-23 and 2023-24. Arts and recreation services saw the largest fall in MFP (-8.6%), driven by a large rise in hours worked that failed to lead to a commensurate increase in output. Mining saw its fourth consecutive year of declining MFP, which the ABS attributed to disruptions from poor weather combined with a rise in hours worked to undertake maintenance.

All this said, year-to-year changes in MFP should be interpreted with a great deal of care, since the numbers depend on capital utilisation assumptions that do not necessarily hold over short periods.

Conceptually, and in practice, MFP growth requires two ingredients:

1. New ideas need to be *discovered* – the productivity frontier needs to shift outwards.
2. These new ideas need to be *applied* or *used* – businesses need to eliminate inefficiency and reach the new frontier.

This year's annual productivity bulletin includes a feature article by Lawson Ashburner and Vincent Wong, who find that MFP growth has slowed since the mid-2000s because the rate of growth of the productivity frontier slowed *and* persistent inefficiency crept into the economy in the 2000s. They estimate that MFP in the market sector, excluding mining, would be roughly 7% higher without this inefficiency. The analysis is a great reminder that MFP isn't always all about cutting-edge innovation – applying new ideas and doing more with what we have can also matter a lot.

With productivity growth a major target for economic reform, the PC has embarked on a series of inquiries under each of the five pillars of the Australian Government's productivity growth agenda. These are:

1. creating a dynamic and resilient economy
2. building a more skilled and adaptable workforce
3. harnessing data and digital technology
4. delivering quality care more efficiently, and
5. investing in cheaper, cleaner energy and the net zero transformation.

Learning but not always doing: Sources of multifactor productivity growth in Australia

By Lawson Ashburner, Senior Research Economist, and Vincent Wong, Assistant Research Officer

Recent issues of the Productivity Commission's (PC's) *Quarterly productivity bulletin* have highlighted that the productivity bubble has now deflated, meaning that productivity rose during the COVID-19 pandemic but has since collapsed back to its pre-COVID levels.

The productivity in this story is labour productivity – output per hour worked. Growth in labour productivity comes from two sources: more investment (capital deepening), and better ways of combining capital and labour to produce outputs – also known as multifactor productivity (MFP) growth.

MFP growth has been slower over the past two decades. This suggests that our economy has improved at using labour and capital, but the rate of improvement has been slower than it used to be. Why is this happening? Are we not learning new ways of organising labour and capital as rapidly as we once were? Or are we just applying fewer of the skills, knowledge and innovations that we have?

Both are true, according to the PC's new decomposition of changes in MFP, based on a method devised by Diewert and Fox (2018) and previously applied to Australian data by Zeng et al. (2018).

The method decomposes MFP into the MFP frontier and inefficiency.

- The *MFP frontier* is the highest level of MFP achievable with contemporary knowledge and mix of capital and labour inputs. We never actually witness the true frontier, but the decomposition takes a conservative approach and estimates it to be roughly the highest level of MFP previously achieved in each industry. It is assumed that industries never 'forget' the best way to combine labour and capital, and so the frontier can only decline because of changes in the availability of labour and capital. In practice, changes in the availability of labour and capital have quite a small impact on the frontier.[1]
- *Inefficiency* captures how far *actual* MFP is from the MFP frontier.

The decomposition suggests two reasons for the slowdown (figure 1).[2]

First, we seem to be finding fewer new and better ways to organise inputs. Growth in the MFP frontier has slowed since the mid-2000s (the transparent blue line grows more slowly since then).[3]

Second, we are not using our resources as we best know how. Inefficiency crept into the economy in the 2000s and has persisted since (the light blue bars grow over the 2000s and do not subsequently decline). This inefficiency is now substantial – MFP would have been about 7% higher in 2023-24 without it. It is also somewhat cyclical, temporarily rising around the global financial crisis in the late 2000s and the recent COVID-19 crisis, which is probably because more capital sits idle in economic downturns than during better times.

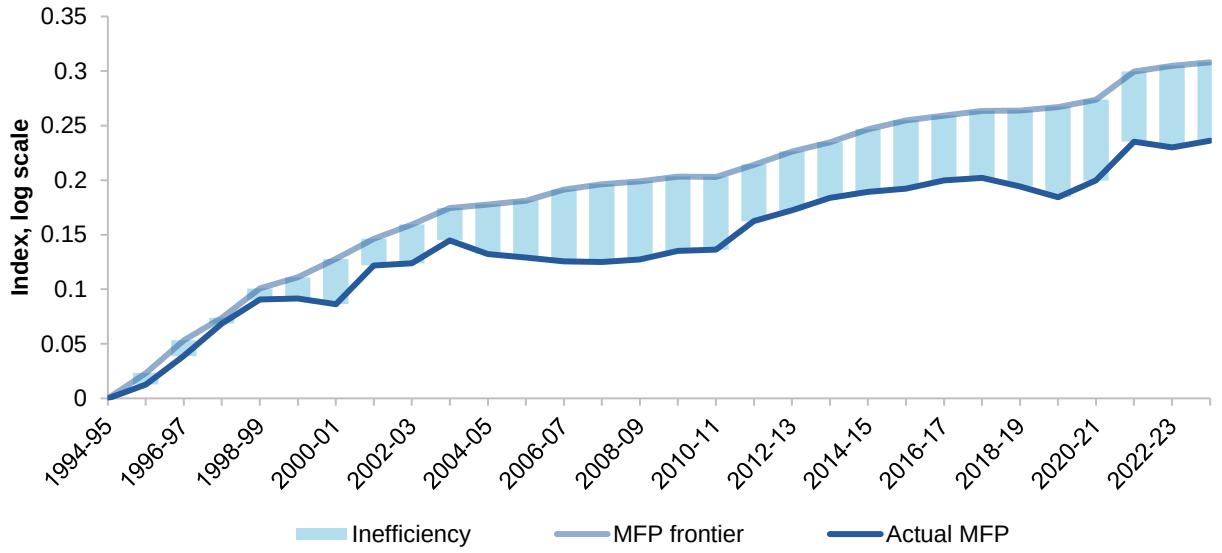
[1] The full decomposition further splits the MFP frontier into a technical frontier term and an input prices term, but these are combined in this article.

[2] The decomposition is performed at the industry level and then aggregated, which leads to slightly different estimates of aggregated MFP than official measures. To illustrate, appendix figure A.1 compares the decomposition-estimated market sector MFP to the official market sector MFP.

[3] Because figure 1 has a log scale, the change from a steeper linear trend to a flatter linear trend in the mid-2000s indicates a slowdown in the rate of exponential growth.

Figure 1 – MFP growth slowed because growth in the frontier slowed and inefficiency crept in

Decomposition of multifactor productivity – market sector excluding mining



Source: PC estimates based on ABS (*Australian System of National Accounts, 2023-24*; *Estimates of Industry Multifactor Productivity, 2023-24*).

The drivers of MFP differ by industry

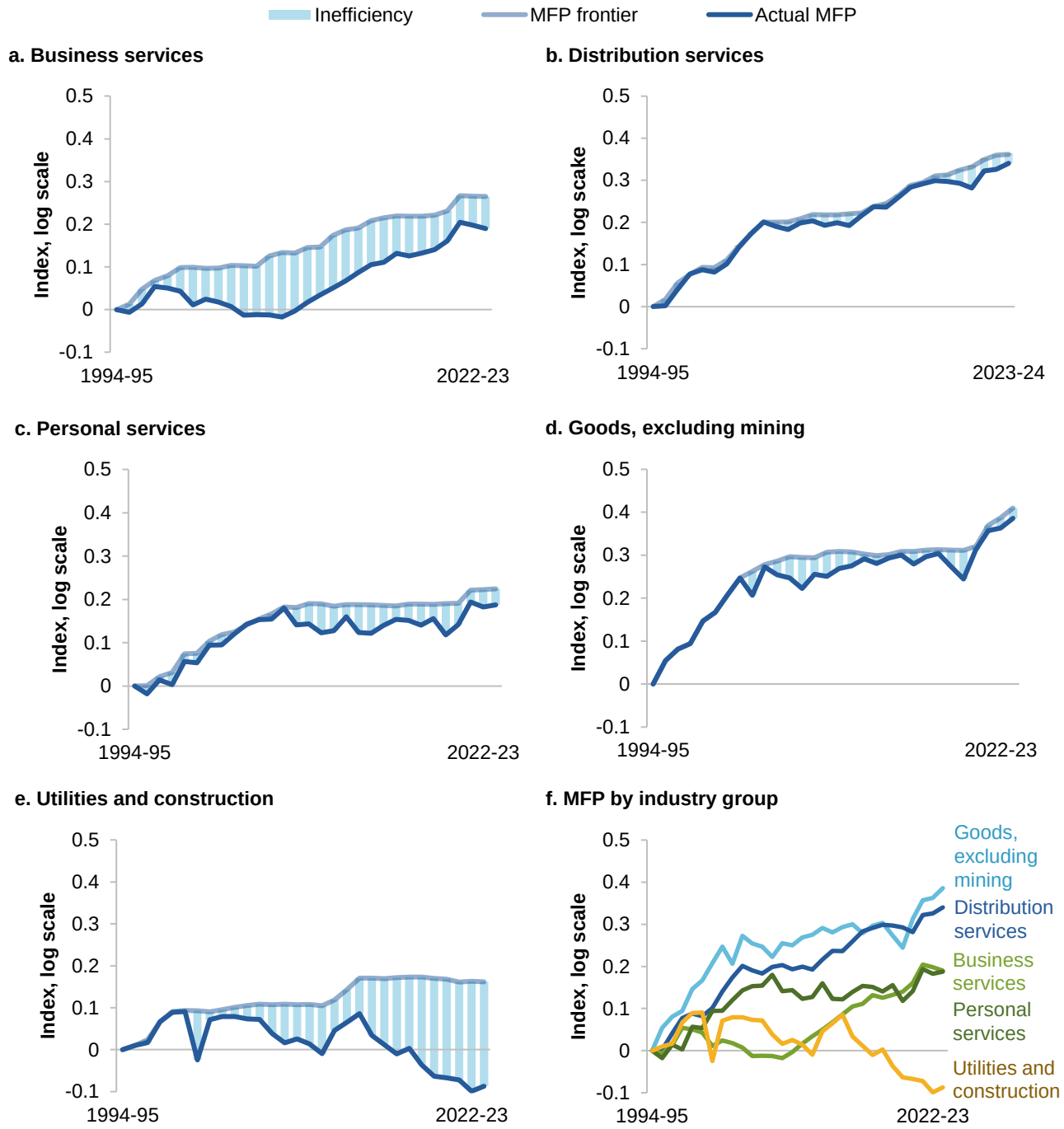
MFP growth has varied greatly between industries, and the decomposition suggests the drivers have varied too.

Business services and distribution services have both seen continual growth in their MFP frontiers, but actual business services MFP was stagnant between the mid-1990s and late 2000s, while actual distribution services MFP grew steadily from the mid-1990s (figure 2, panels a and b). Inefficiency explains the difference – business services became progressively less efficient between the mid-1990s and late 2000s and has only partly recovered since, while distribution services remained efficient throughout.

Personal services and the goods sector (excluding mining) have followed similar trajectories to one another (figure 2, panels c and d). Both saw rapid MFP growth until the late 2000s, driven by growth in their MFP frontiers, and stagnation in the 2010s due to a lack of frontier movement and creeping inefficiency. Both, especially the goods sector, also saw frontier expansion in recent times, boosting MFP.

The utilities and construction sectors stand out as poor performers. Their MFP was stagnant from the mid-1990s to early 2010s, as there was growth in their MFP frontiers and growing inefficiency in roughly equal measure (figure 2, panel e). Since then, MFP has continually fallen as there has been no movement in the frontier and rising inefficiency.

Figure 2 – Multifactor productivity growth, and its drivers, varies by industry group[a,b]



a. 'Business services' comprises 'professional, scientific and technical services', 'financial and insurance services', 'rental, hiring and real estate services' and 'administrative and support services'. 'Distribution services' comprises 'transport, postal and warehousing', 'information, media and telecommunications', 'retail trade' and 'wholesale trade'. 'Personal services' comprises 'accommodation and food services', 'arts and recreation services' and 'other services'. 'Goods' comprises 'manufacturing' and 'agriculture, forestry and fishing'. 'Utilities and construction' comprises 'electricity, gas, water and waste services' and 'construction'. **b.** Appendix figures A.2 to A.5 show the decomposition at the individual industry level.

Source: PC estimates based on ABS (*Australian System of National Accounts, 2023-24*; *Estimates of Industry Multifactor Productivity, 2023-24*).

What might explain these different movements in the MFP frontier and efficiency?

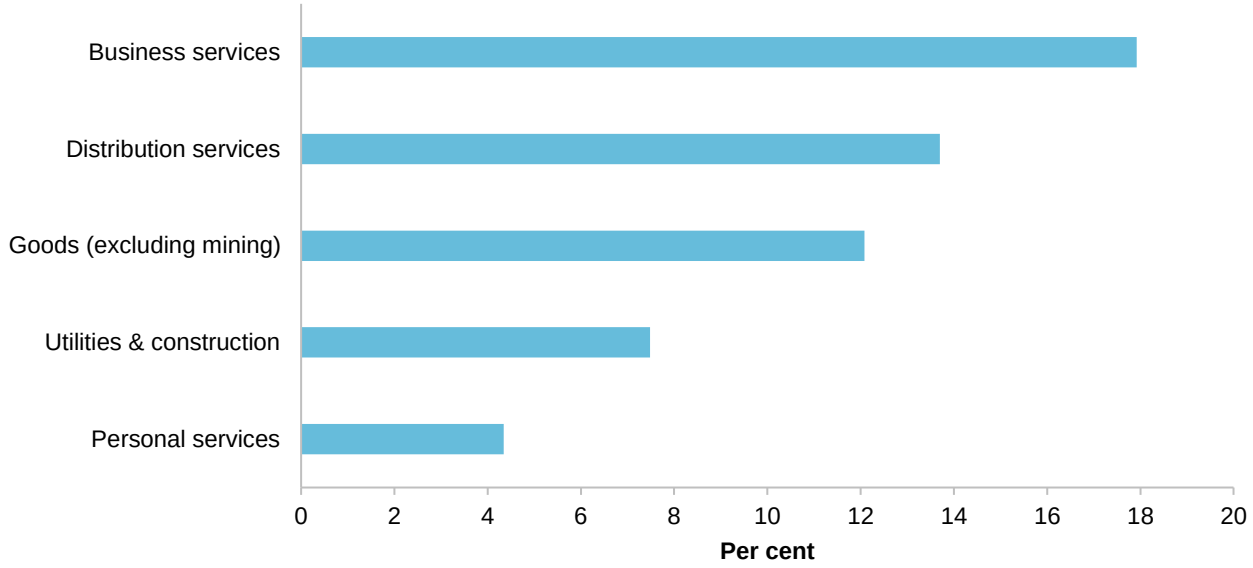
The differences in the growth of the MFP frontier are likely because some industries are better suited to exploiting new technology for MFP growth. For example, the extent to which service industries can utilise work from home, be offshored or delivered remotely is correlated with growth in their MFP (PC 2021), probably because the improvements in information and communications technologies and growing globalisation since the 1990s boosted competition in industries with these inherent features, incentivising innovation and leading to growth in their MFP frontiers. Many business and distribution services industries meet these criteria, such as professional and technical services and information, media and telecommunications services. In contrast, many personal services and utilities and construction industries require face-to-face contact or physical delivery of the service, which can make them more difficult to offshore or deliver remotely.

Education is another plausible driver of the differences in MFP frontier growth. Since the mid-1990s, the quality of the labour force (based on education and experience) in business and distribution services grew by more than in other industries (figure 3). More educated and experienced workers can, in theory, produce more per hour worked, even with the same amount of capital per worker.

The inter-industry differences in efficiency are harder to explain. Inefficiency can occur because new technology makes old capital obsolete, but firms do not dispose of the capital and so it goes underutilised (Fox 2018). More stringent regulation is another possible driver, as regulation can prevent firms adopting new technologies and using resources efficiently. Indeed, even well-designed regulation might reduce MFP in pursuit of other social, environmental or economic goals that are not captured by output. Measurement error may also be a contributor. Both regulation and measurement error reduced measured MFP in the utilities industry in the 2000s (Topp and Kulys 2012).

Figure 3 – The MFP frontier grew faster in industries in which workers upskilled

Growth in the Australian Bureau of Statistics' labour quality index, 1994-95 to 2023-24



Source: PC estimates based on ABS (*Estimates of Industry Multifactor Productivity, 2023-24*).

Australia's MFP could be higher

The decomposition is not perfect. Most notably, it attributes the reductions to mining MFP to inefficiency, which is debatable and why we excluded the mining industry from the whole-of-market-sector measure in figure 1 (box 1).

But even with these imperfections, the decomposition encourages us to broaden how we think about MFP. Discussions about boosting MFP growth often focus on boosting the rate of technological innovation – in other words, they focus on the MFP frontier. The frontier is important, but the decomposition shows that efficiency matters too. The PC's 2023 Productivity Inquiry examined this in the volume *Innovation for the 98%*, and highlighted that only about 2% of Australian firms innovate in ways that are new to the world (PC 2023). Its central theme was that much productivity growth will come from the wider adoption of established, even dated, technologies and practices by the other 98% of firms.

The PC is revisiting this theme in the five inquiries it is currently undertaking under each pillar of the Australian Government's productivity growth agenda.

Box 1 – Beware 'missing' inputs, compositional changes, and simultaneous changes in the MFP frontier and inefficiency

There are three instances in which the decomposition cannot fully account for the drivers of changes in MFP – changes in 'missing' inputs, changes in the composition of industry output and simultaneous changes in the MFP frontier and inefficiency.

Changes in 'missing' inputs

In some industries, capital, labour and intermediate products are not the only inputs into production. Interpreting the decomposition requires some care where key inputs are unaccounted for, or 'missing'.

The mining industry is the most prominent example. The decomposition indicates that the mining MFP frontier has not moved this century and that inefficiencies have reduced mining MFP since 2000-01 (appendix figure A.2, panel b).

In reality, the long-term decline in mining MFP is likely because easier-to-mine resources have been depleted but rising prices for Australian minerals have made it profitable to pursue harder-to-mine resources (Topp et al. 2008; Zheng and Bloch 2014). As this explanation predicts, increases in mining output prices tend to be associated with reductions in mining MFP, with a lag of several years to facilitate construction of infrastructure projects (appendix figure A.6). Similarly, falls in prices are associated with increases in mining MFP. It is possible that labour and capital are being used efficiently but extract less because the land now being mined is less fertile. This appears as inefficiency because MFP statistics do not consider the quality of the natural resources as an input to the mining industry (they are 'missing' inputs).

The agriculture, forestry and fishing industry faces a similar issue – the weather is not captured as an input, so measured MFP can decline sharply in bad weather, such as in 2003 and 2019 (appendix figure A.2, panel a; ABS 2023).[a] The decomposition attributes this to inefficiency, but that is debatable – perhaps labour and capital were used efficiently but bad weather intervened.

Box 1 – Beware 'missing' inputs, compositional changes, and simultaneous changes in the MFP frontier and inefficiency

Changes in the composition of industry output

The decomposition can mislead when an industry's MFP changes because the composition of its output changes. For example, suppose an industry consisted of one highly productive subindustry and one unproductive subindustry. If the unproductive subindustry were to grow relative to the productive subindustry, the industry's overall MFP would decline. The decomposition would attribute this to inefficiency, but it is actually due to a change in the composition of the industry's output. Alternatively, if the compositional shift were to occur in the opposite direction (the productive subindustry was to grow relative to the unproductive subindustry), the decomposition would erroneously attribute the resultant growth in the industry's overall MFP to an increase in its MFP frontier.

There is no way to get a complete picture of these issues because there is no data on MFP at the sub-industry level. Nevertheless, the limited data on changes in the composition of industry output (appendix figure A.7 and A.8) suggests that:

- the growth in the business services MFP frontier may be overstated, because the business services industries in which the MFP frontier grew (finance and insurance services; professional, scientific and technical services) witnessed concurrent shifts in output composition
- the inefficiency in distribution services during the COVID19 pandemic may be overstated, because this can be traced to measured inefficiency in the transport, postal and warehousing industry (appendix figure A.4, panel a) which coincided with a sharp change in the composition of output due to the temporary shuttering of air travel.

Simultaneous changes in the MFP frontier and inefficiency

The decomposition is not able to disentangle simultaneous changes in MFP and inefficiency. For example, suppose that an industry was operating efficiently in one year, and in the next year an improved management technique was discovered (an increase in the MFP frontier), but only a small share of firms adopted it (an increase in inefficiency). This would appear as MFP and the MFP frontier growing by the same amount (less than the true increase in the MFP frontier) and no inefficiency.

a. While not part of the National Accounts, the Australian Bureau of Agricultural and Resource Economics and Sciences produces 'climate-adjusted' measures of farm MFP that do this (ABARES 2024).

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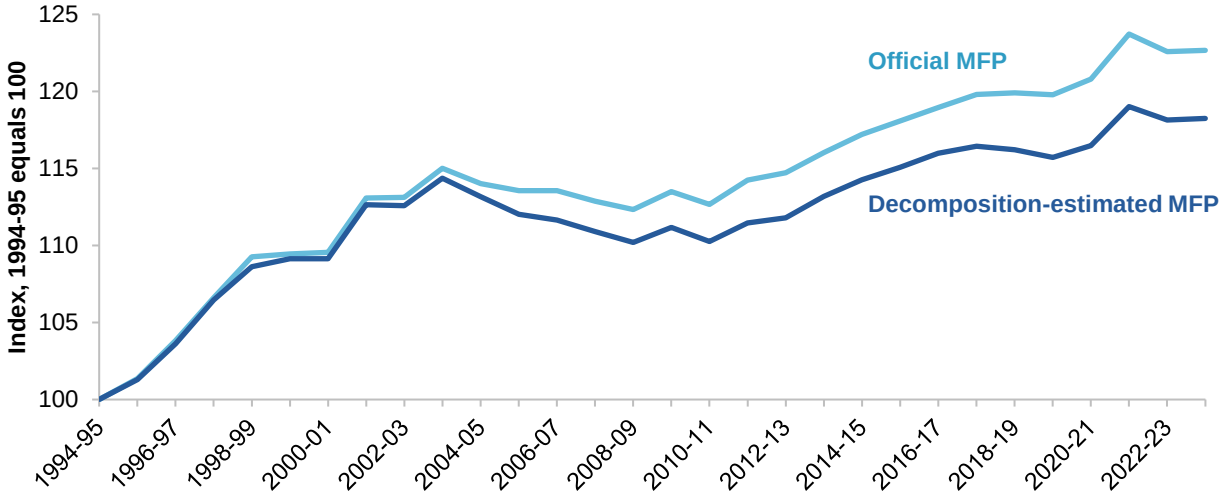
A. Additional data

This appendix presents additional data to support the 2025 annual productivity bulletin feature article *Learning but not always doing: Sources of multifactor productivity growth in Australia*.

A.1 Differences between decomposition-estimated productivity and official productivity

The decomposition used in the feature article generates estimates of aggregate multifactor productivity (MFP) that differ slightly from the official Australian Bureau of Statistics estimates. Figure A.1 compares these estimates for the market sector.

Figure A.4 – Market sector multifactor productivity – official estimate verses decomposition estimate



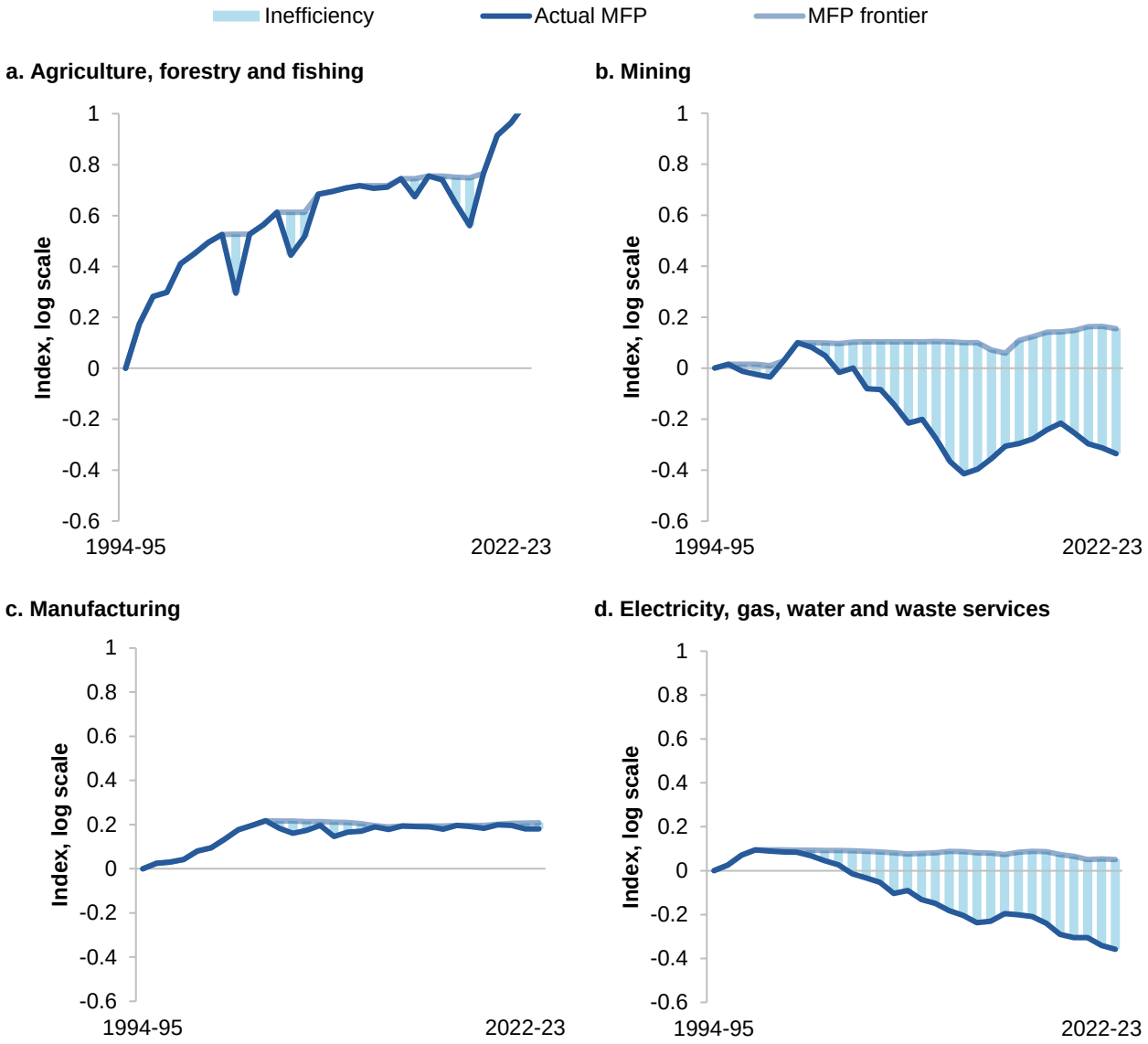
Source: PC estimates based on ABS (*Australian System of National Accounts, 2023-24*; *Estimates of Industry Multifactor Productivity, 2023-24*).

A.2 Industry-level decompositions

The decomposition is applied at the industry level and then aggregated to the industry group and market sector levels as shown in the feature article. Figures A.2 to A.5 show the industry-level decompositions.

Figure A.5 – Decomposition of multifactor productivity

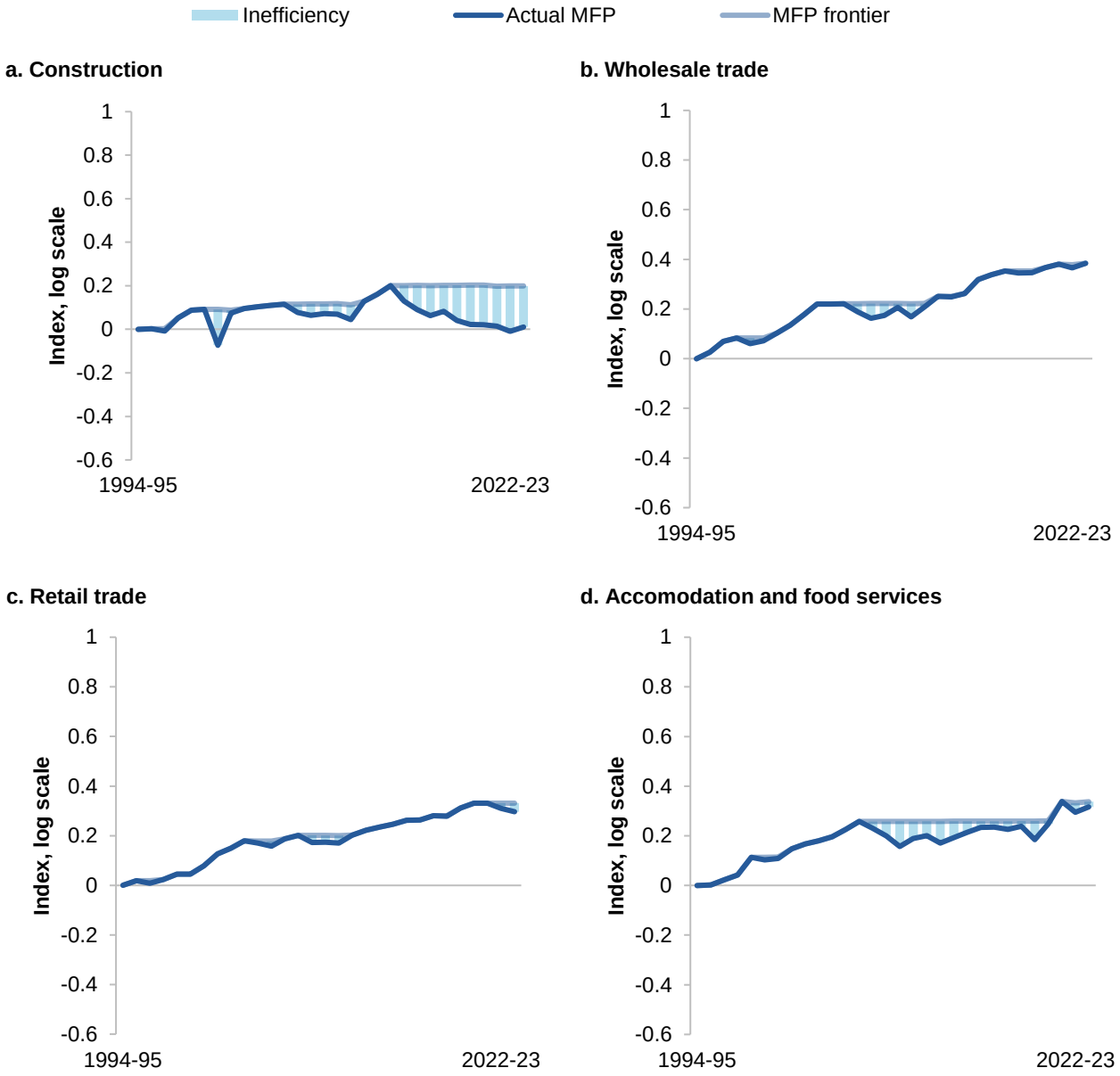
Industries A to D



Source: PC estimates based on ABS (*Australian System of National Accounts, 2023-24*; *Estimates of Industry Multifactor Productivity, 2023-24*).

Figure A.6 – Decomposition of multifactor productivity

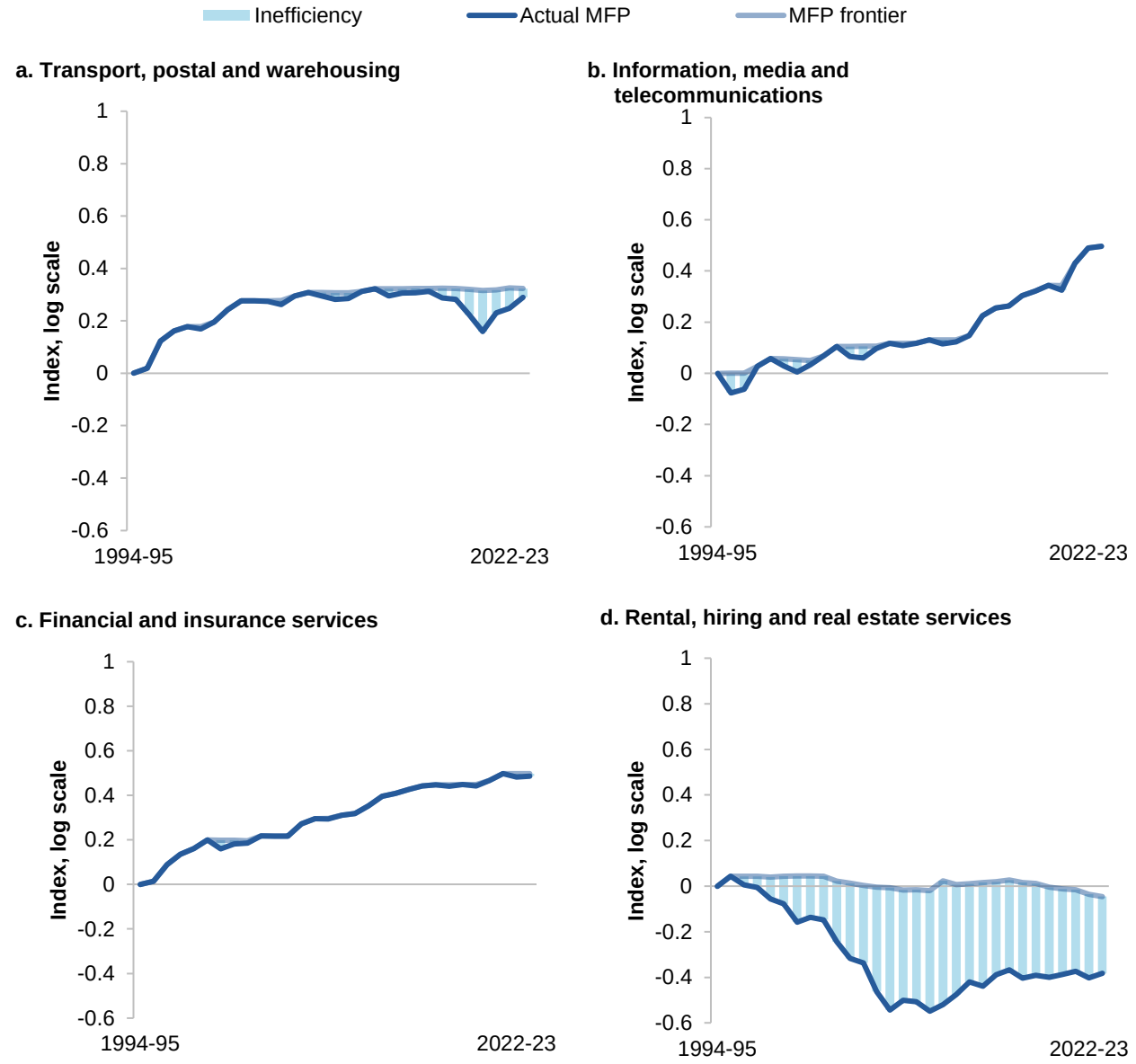
Industries E to H



Source: PC estimates based on ABS (*Australian System of National Accounts, 2023-24*; *Estimates of Industry Multifactor Productivity, 2023-24*).

Figure A.7 – Decomposition of multifactor productivity

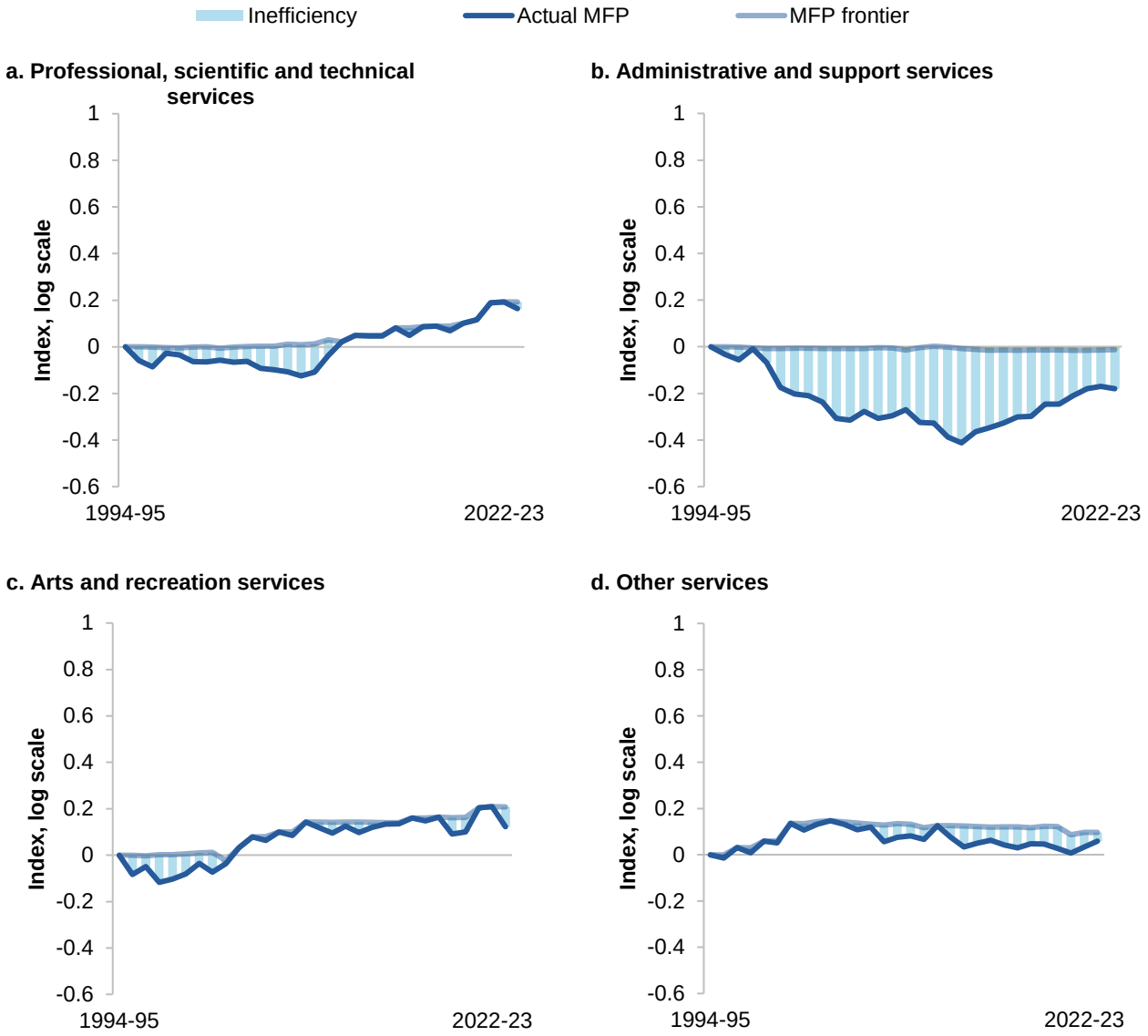
Industries I to L



Source: PC estimates based on ABS (*Australian System of National Accounts, 2023-24*; *Estimates of Industry Multifactor Productivity, 2023-24*).

Figure A.8 – Decomposition of multifactor productivity

Industries M to N, R and S

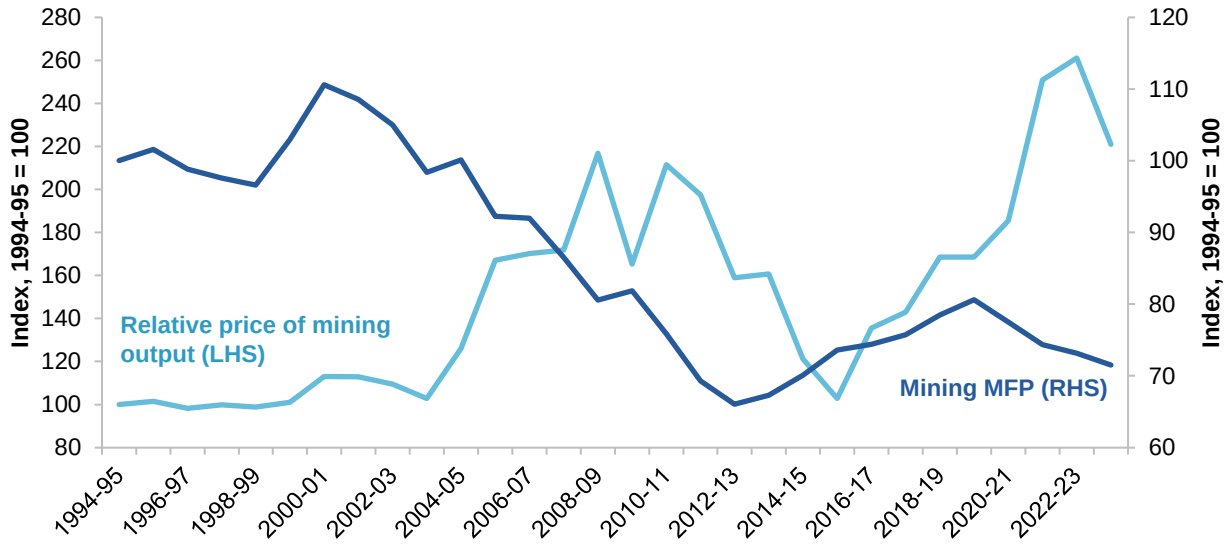


Source: PC estimates based on ABS (*Australian System of National Accounts, 2023-24*; *Estimates of Industry Multifactor Productivity, 2023-24*).

A.3 Mining prices and productivity

As noted in the feature article, increases in the relative price of mining output were associated with reductions in mining MFP (with a lag of several years to facilitate construction of infrastructure projects), and decreases in the relative price of mining output were associated with increases in mining MFP (figure A.6).

Figure A.9 – Mining MFP and relative price of mining output[a]



a. The relative price of mining output is the ratio of the implicit mining gross value added price deflator to the implicit GDP deflator.

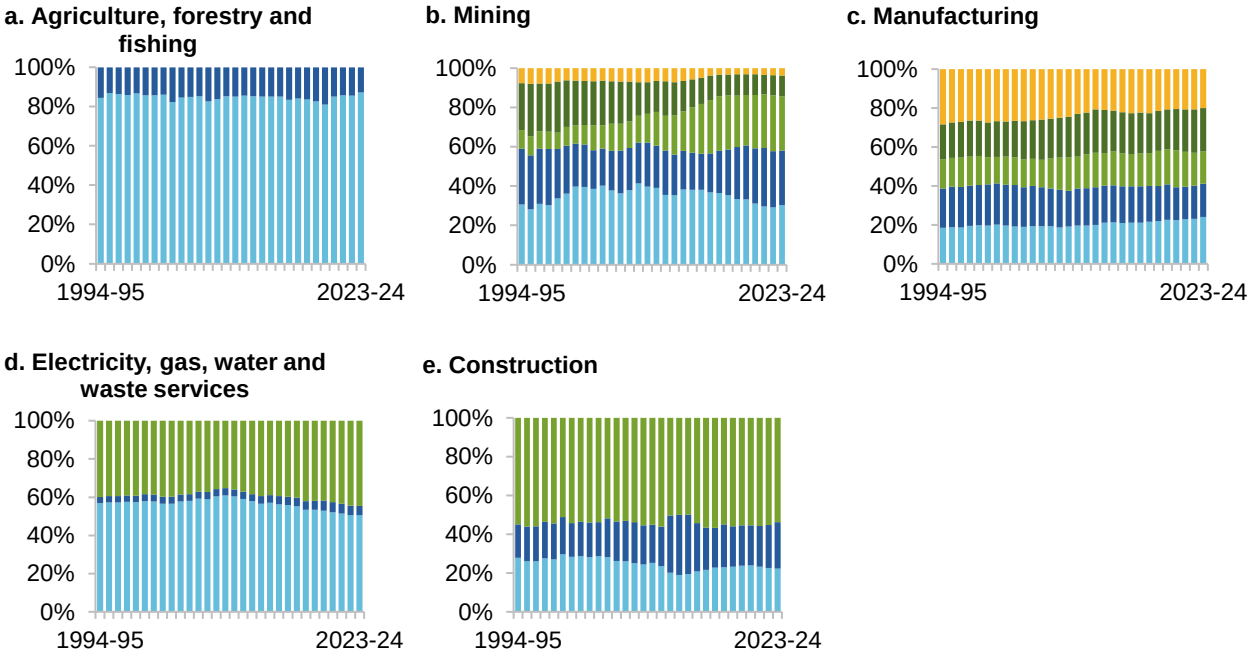
Source: PC estimates based on ABS (*Australian System of National Accounts, 2023-24*; *Estimates of Industry Multifactor Productivity, 2023-24*).

A.4 Composition of industry output

As noted in the feature article, changes in the composition of an industry's output pose challenges for the decomposition. Figures A.7 and A.8 show the sub-industry shares of output by industry. No data were available for the 'wholesale trade', 'retail trade', 'accommodation and food services', 'administrative and support services', 'arts and recreation' or 'other services' industries.

Figure A.10 – Sub-industry shares of industry output[a,b]

Industries A to E

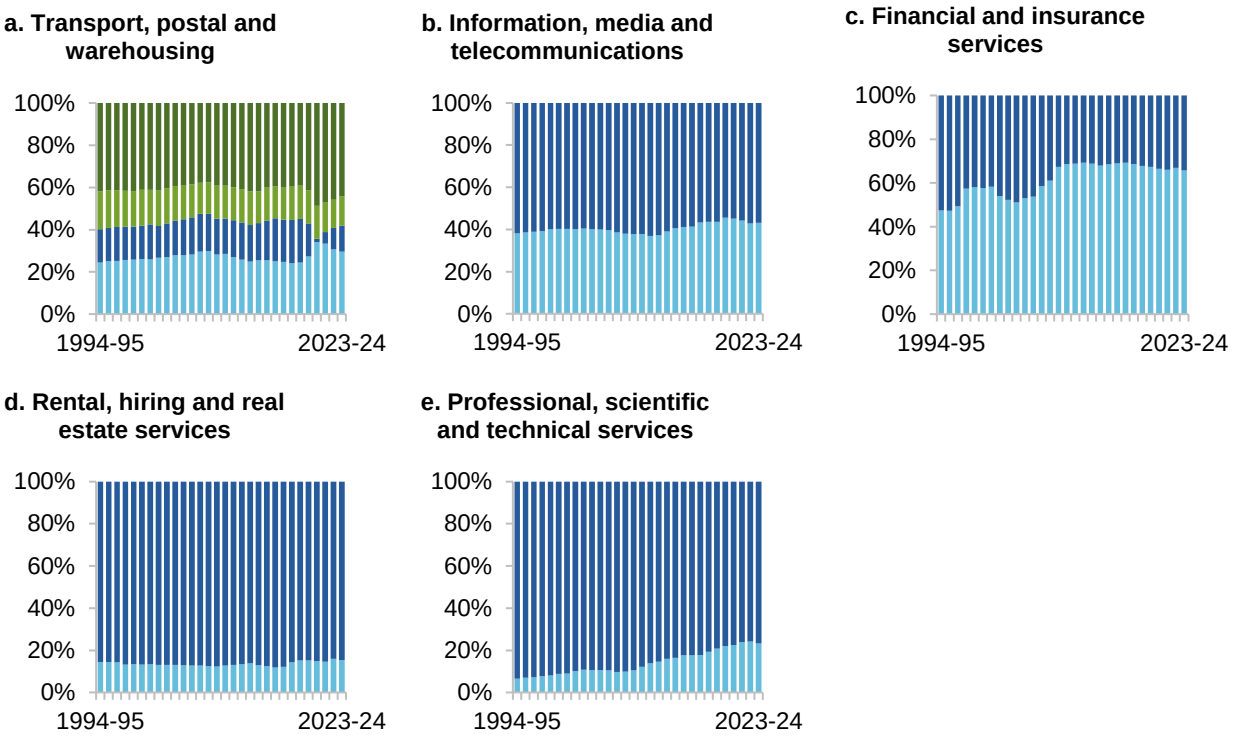


a. Based on real gross value added. **b.** From top to bottom of each chart, the sub-industries are as follows: Agriculture, forestry and fishing: 'Forestry and fishing, 'Agriculture'; Mining: 'Exploration and support services', 'Other mining', 'Iron ore mining', 'Oil and gas extraction', 'Coal mining; Manufacturing: 'Other manufacturing', 'Machinery and equipment', 'Metal products', 'Petroleum, coal, chemical and rubber products', 'Food, beverage and tobacco products'; Electricity, gas, water and waste services: 'Water supply and waste services', 'Gas', 'Electricity'; Construction: 'Construction services', 'Heavy and civil engineering', 'Building construction'.

Source: PC estimates based on ABS (*Australian System of National Accounts, 2023-24*).

Figure A.11 – Sub-industry shares of industry output[a,b]

Industries I to M



a. Based on real gross value added. **b.** From top to bottom of each chart, the sub-industries are as follows: Transport, postal and warehousing: 'Transport, postal and storage services', 'Rail, pipe and other transport', 'Air and space transport', 'Road'; Information, media and telecommunications services: 'Other information and media services', 'Telecommunications services'; Finance and insurance services: 'Other financial and insurance services', 'Finance'; Rental, hiring and real estate services: 'Property operators and real estate services', 'Rental and hiring services'; 'Professional, scientific and technical services': Other professional, scientific and technical services', 'Computer system design and related services'.

Source: PC estimates based on ABS (*Australian System of National Accounts, 2023-24*).