Growth Perspective on Western Australia

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GROWTH PERSPECTIVE ON WESTERN AUSTRALIA

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1. Introduction

The Government of Western Australia (WA), acting through its Department of Primary Industries and Regional Development (DPIRD), invited the Growth Lab of the Center for International Development at Harvard University to partner with the state to better understand and address constraints to economic diversification through a collaborative applied research project. The project seeks to apply growth diagnostic and economic complexity methodologies to inform policy design in order to accelerate productive transformation, economic diversification, and more inclusive and resilient job creation across Western Australia. As its name implies, this Growth Perspective Report aims to provide a set of perspectives on the process of economic growth in WA that provide insights for policymakers toward improving growth outcomes.

This Growth Perspective Report describes both the economic growth process of Western Australia — with a focus on the past two decades — and identifies several problematic issues with the way that growth has been structured. In particular, this report traces important ways in which policies applied during the boom and subsequent slowdown in growth over the last twenty years have exacerbated a number of self-reinforcing negative externalities of undiversified growth. The report analyzes three key channels through which negative externalities have manifested: labor market imbalances, pro-cyclicality of fiscal policy, and a misalignment of public goods. The report includes sections on each of these channels, which provide perspectives on the ways in which they have hampered the quality of growth and explore the reasons why problematic externalities have become self-reinforcing. In some cases, new issues have emerged in the most recent iteration of WA's boom-slowdown cycle, but many issues have roots in the long-term growth history of WA.

The Growth Lab visited Western Australia and interacted with stakeholders across public, private, and academic institutions to enrich the analytical findings of this report. Together with the Growth Lab's *Economic Complexity Report for Western Australia*, the perspectives in this report pave the way for the accompanying *Research Findings and Policy Recommendations Report*, which provides a framework for internalizing many of the externalities of undiversified growth. Taken together, these reports aim to provide a rigorous basis for actions that WA can take to strengthen its path toward long-term, sustainable, and inclusive economic growth.

Finally, a note on COVID-19 is relevant as the pandemic has introduced an unprecedented economic shock during the later stages of this research. The global crisis has had a rapid and profound economic impact in WA over the past few months – jobs have been lost, businesses across all sectors have closed, and some mining operations have been disrupted. Nonetheless, the fundamental findings of this report remain unchanged. In fact, the economic shocks that have emerged from the public health crisis underscore the importance of understanding WA's economic environment and the way growth has been structured in the past two decades. Meanwhile, the crisis of today highlights the powerful tools that government has at its disposal to respond to both the drivers and the impacts of exogenous shocks, and it may open new opportunities for policy innovations to solve problems that have slowed growth in WA in the past.

2. Executive Summary

Western Australia is a sparsely populated state, which represents just 10% of the population of Australia; however, it accounts for almost 50% of the country's goods exports. This outsized economic weight is partly explained by the state's vast wealth of natural resources and its competitiveness in the mining sector. These factors allowed the state to benefit significantly from the global commodity supercycle experienced between 2002 and 2014. During this period, WA attracted 270 billion dollars in private investment to expand the state's mining capacity, which was the main catalyst for rapid economic growth, broad-based wage growth, and improved standards of living across the state.

However, the existing productive structure of WA, and particularly its labor market, was not fully prepared to effectively absorb this large investment surge. This translated into large wage premia that attracted workers from the rest of WA as well as inter-state migrants, but mostly international migrants. Similarly, it translated into a large fiscal expansion, in an effort to retain public sector employees, meet the needs of a rapidly increasing population, and facilitate the provision of productive infrastructure required by remote mining operations. The combination of these factors allowed for a substantial increase in the state's mining capacity and underpinned substantial consumption and real estate booms, but in the process likely worsened a long-term pattern of crowding out non-mining tradeable economic activities. The phenomenon of WA's large fly-in-fly-out (FIFO) workforce sustained a uniquely large geographical mismatch between the places where wealth was created and mining-related construction was concentrated versus where workers spent their earnings and where demand for non-tradable services boomed. This allowed the benefits of resource wealth to be spread across much of the state, but also created location-specific vulnerabilities in several markets (including labor, housing, and financial markets).

As global demand for key commodities slowed in 2013/14, the flow of investment to expand mining capacity came to a halt. The impact of this sudden stop reverberated throughout the economy and across the state, particularly in the labor market. As demand for labor in construction and other mining-related services collapsed, the state lacked supplementary engines of growth that would have been able to absorb these workers. This translated into a sharp increase in both unemployment and underemployment, and a modest downward real wage adjustment. As total household disposable income stagnated as a result of job losses, discretionary consumption contracted, the prevalence of non-performing loans increased, and the housing market saw an overhang. Workers who were hit the hardest tended to be in non-tradable services, mining, and construction, and in parts of the state far from where mining occurs. Shocks to the housing and real estate markets were geographically concentrated.

The impacts of this negative shock could have been reduced with a larger fiscal stimulus than was used, which would have been consistent with counter-cyclical fiscal policy. Given that the state had front-loaded significant investments during its rapid economic expansion, it did not save

during the good times — in fact it borrowed during them. Meanwhile, state revenue sources were structurally pro-cyclical such that when the commodity boom ended and growth slowed down, revenues fell as well. This pro-cyclicality exacerbated WA's fiscal vulnerability during the slowdown. During the slowdown, the state accelerated debt accumulation with little space built into the fiscal system to provide additional counter-cyclical stimulus to smooth the impact of the investment slowdown. Moreover, increasing deficits and rapidly expanding public sector debt accrual — even if at a low level relative to the size of the economy — motivated a response in favor of added fiscal prudence, which in turn enhanced pro-cyclical effects and socialized the cost of the slowdown.

These recent dynamics highlight several key self-reinforcing elements of the WA economy:

- Labor market imbalances, namely the relative rigidity of the labor supply vis-à-vis volatile labor demand, which leads to a mismatch between permanent increases in labor supply and temporary increases in labor demand. This results in both a high place-specific wage premium that serves barrier to nascent economic activities and in vulnerability to sudden labor market dislocations.

- Pro-cyclicality of revenue sources and public spending, which limits the ability to introduce timely stimulus initiatives to help smooth sudden demand shocks and diminish the ripple effect to the rest of the economy.

- A misalignment of public infrastructure investment with the needs of a diversified economy and implicit subsidization of public service, which leads to additional frictions in the labor market, increases fiscal pressures, and hampers the performance of nascent industries that are necessary for economic diversification and overcoming the boom-bust dynamics.

WA has grown over the long-term without significant economic diversification, and this has made workers and firms more vulnerable to periods of sharp economic downturns when exogenous variables influence either the price of commodities or the flow of new business investment in the mining sector. Moreover, these adverse effects have been exacerbated by self-reinforcing negative externalities from the growth process.

The accompanying *Research Findings and Policy Recommendations Report* focuses on policy tools, and an overarching policy framework, that WA can utilize to alleviate these adverse dynamics. Solving these problems would help WA catalyze faster diversification of the non-mining economy while maintaining the benefits of its natural resource wealth, which in turn would promote better labor market outcomes and more sustainable growth across the state.

3. Economic Growth Trajectory

Since the late nineteenth century, the mining sector has played a major role in shaping WA's economy and its development (Department of the Treasury and Finance, 2004). The discovery of gold in Halls Creek (1885) and Mt. Charlotte (1893) attracted a large amount of investment in mining ventures and triggered the arrival of thousands of immigrants from other colonies and parts of the world. Between 1890 and the early 1900s, the population grew four-fold (ABS, 2004). The Gold Rush also triggered unparalleled levels of public infrastructure expenditure in order to facilitate the expansion of the mining activity (i.e. Fremantle Port) and enable access to key infrastructure in remote regions (i.e. Goldfields Water Pipeline). However, after two decades of unprecedented growth, WA's economy struggled to manage the concurrent end of the gold mining boom and major external shocks (First World War, Spanish Flu Pandemic, Great Depression, etc.). In the absence of equally productive alternative engines of growth, GSP per capita levels observed in 1913 were not attained again until the 1950s (Snooks, 1981). Unlike other regional economies around the world such as those on the west coast of North America that were able to complement mining with other new sources of growth such as the aviation industry, the global film industry, technological innovation, and thriving tourism, WA's economy continued to be built largely on new waves of mining and extractive industries — chiefly iron ore, liquified natural gas (LNG), petroleum, gold, alumina, and nickel — and efficiency improvements in the production of other primary goods, including agriculture and fishing. While this did not prevent WA from growing to achieve a high level of income and living standards, it made workers and firms more vulnerable to negative external shocks.

For the last two decades, mining industry trends have continued to drive WA's economic trajectory. While the world experienced an extended period of high global commodity prices throughout 2002-2014, known as the "global commodity supercycle", WA experienced a surge in investment as mining operations expanded capacity to keep pace with growing global demand. WA's average growth rate of 3.1% per capita per year in real terms over this period (Figure 1) was mainly driven by this investment, which grew on average by 11.1% per year (Figure 2). This investment led to more jobs and rising wages across various sectors of the economy, which supported strong growth in household consumption (4.9% CAGR). During 2002-2012 in particular, 18% of all new jobs in Australia were created in WA — an outsized effect given that WA accounts for approximately 11% of Australia's population — and annual real wage growth was as high as 5% in 2012. Real household disposable income grew by an average of 7% per year over 2002-2012 (OECD). This was above and beyond a statewide increase in the cost of living as prices rose and the Australian Dollar appreciated, which translated into an additional boost to consumption and real estate prices. In some places, these trends were unsustainable. Interviewees in Karratha described the severe shortage of housing during the boom: prices increased rapidly as workers slept in makeshift places due to a shortage places to rent. This led to an expansion of the expensive housing stock, with high construction costs driven by expensive labor and materials.

Figure 1: Compound Annual Growth Rates of Real GSP Per Capita, WA vs. AUS

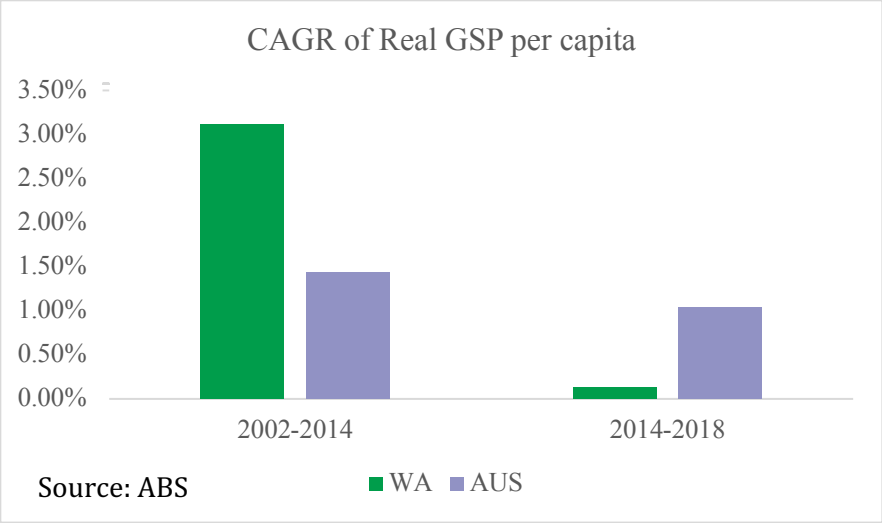
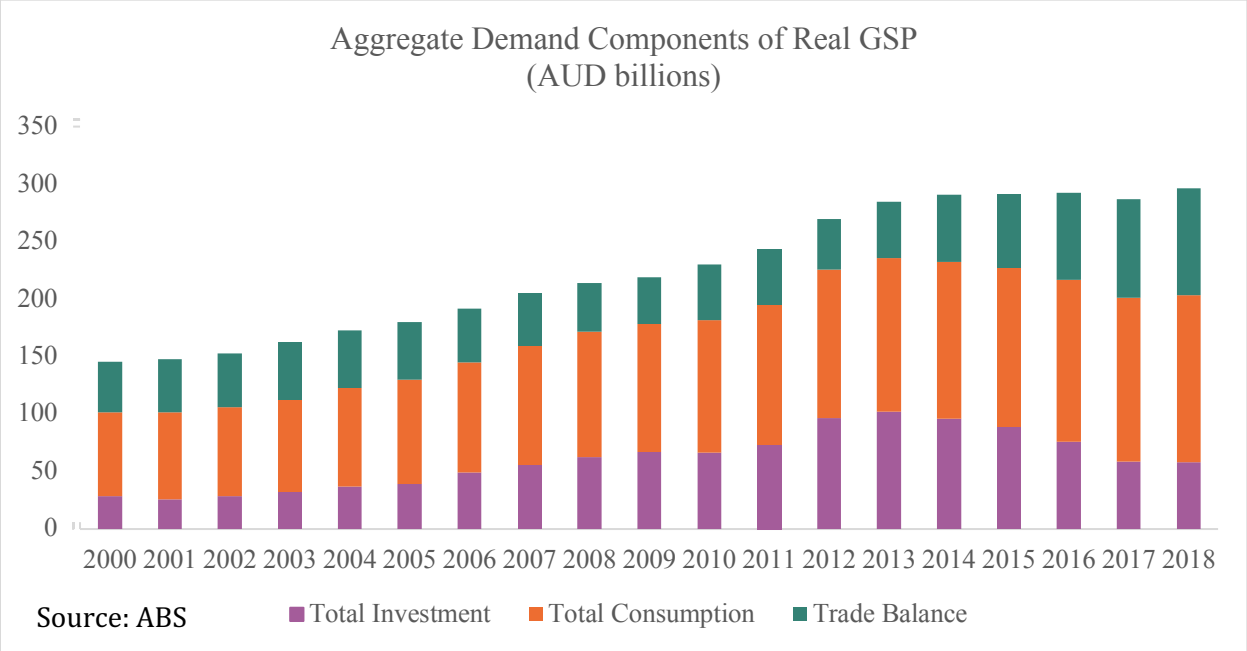


Figure 2: GSP Decomposed by Components of Aggregate Demand



From 2012-2014, investment leveled off, but net exports jumped. As mining output expanded at still high global prices, WA continued to witness economic growth until 2014, when a fall in global commodity prices triggered a fall in WA's economic growth for the next four years, with an absolute fall in real GSP in 2016/17. Mining exports, particularly for iron ore, remained high but at reduced prices. Iron ore alone accounted for more than half of WA's goods exports in 2016, and roughly half of all Australian mining jobs were still in WA in 2019. However, without other sources of growth, a large gap was left in WA's economy.

The sharp slowdown in investment that began in 2014 drove lower per capita growth and accelerated labor market dislocations. Sixteen of the eighteen major industrial sectors displayed a lower growth rate in 2013-2018 than they did in the previous five-year period. This was particularly acute in mining, which contracted on average 5.9% (Curtin, 2019). In parallel, wage growth stagnated, seasonally-adjusted unemployment rose above 5% and reached above 6% in 2018, and labor underutilization simultaneously rose to over 15% — levels that WA had not experienced in decades and from which it has not yet fully recovered from even today (Figure 3). Moreover, as their income fell or stagnated, households exercised restraint and discretionary consumption per capita contracted. Similarly, real estate prices fell statewide (including by 8% in Perth), leading to a rate of mortgage delinquencies of nearly 2.5% in 2019 — far above the national average of approximately 1% — and the approval of new dwellings fell by more than 50% between 2013 and 2019. Anecdotal evidence from regional WA described a soft housing market that suffered because the collapse of prices left many residential properties worth less than the cost to construct them. Some regions and occupations were especially hard hit by the changing labor market and subsequent recession. The recession was deepest in Perth, the Southwest, and Kimberley, which all had lower real per capita incomes in 2018 than they did in 2014 (Figure 4). Meanwhile, even as real per capita growth remained high in the Pilbara and Gascoyne, regional employment levels shrank.

Figure 3: Unemployment and Underutilization Rates in WA and Australia Overall

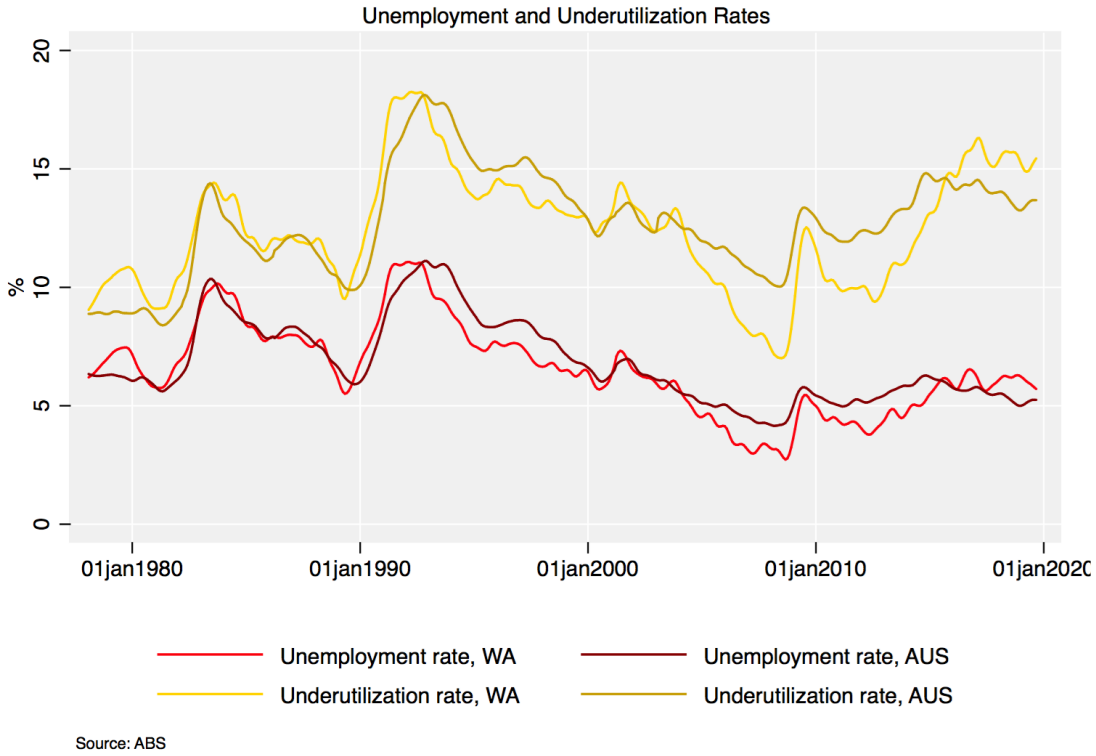
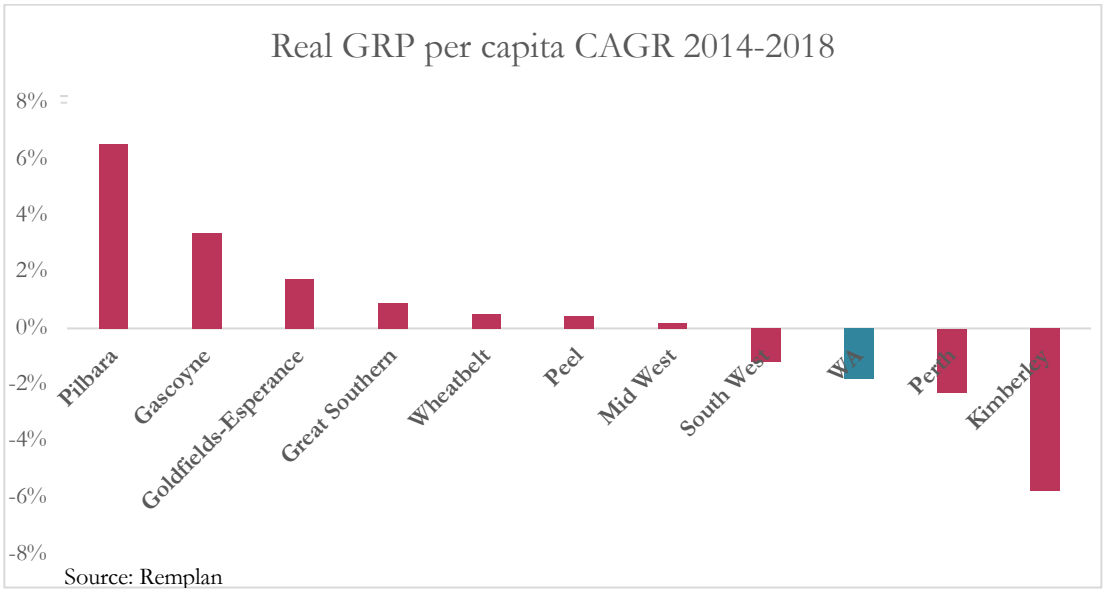


Figure 4: Real Per Capita Growth Rates by Region, 2014-2018



Economic diversification could have helped buffer the recession and the job losses experienced by WA workers, absorbing excess capacity, repurposing existing skills and laying the groundwork for a post-boom recovery. However, just as it has been the case in the past, economic diversification failed to take root in WA over the course of the commodity supercycle. A handful of companies shared examples of developing more sophisticated capabilities over time by buying unique machinery, learning new ways of using old infrastructure, and innovating within the current value chain. However, this was mostly concentrated in process improvements to output in the mining sector, and was less evident during the slowdown.

As discussed in the Growth Lab's Economic Complexity Report for Western Australia, WA began and ended the 2008-2016 period with a low number of exported products in which it expressed a revealed comparative advantage.[1] It added only three new products to its export basket in this time frame, which in 2016 collectively accounted for approximately 1% of the value of its goods exports. In contrast, Victoria added 76 new products to its export basket over the same period. Similarly, when considering gross value added (GVA) composition, the WA economy is now more concentrated — both in absolute and relative terms — than it has been in the past 25 years (Curtin, 2019). On the whole, WA persistently exhibits low economic complexity and low complexity outlook, and thus requires a strategic approach to overcome diversification challenges.

[1] Growth Lab, Center for International Development at Harvard University. "Economic Complexity Report for Western Australia," March 2020.

Even though WA's recent growth trajectory has significantly outperformed the rest of Australia in terms of GSP per capita growth, its trend has been more volatile. Thus, its trajectory has potentially been suboptimal in three complementary ways. First, it built up economic pressures that led to sharp corrective forces in the form of job losses, underutilization, wage stagnation, and other abrupt market adjustments at the end of the commodity supercycle. Second, its recovery performance hinges on a factor — high levels of new investment in the mining sector and related industries — that is heavily influenced by exogenous variables. Third, it failed to create the economic robustness that could have shielded against those forces. In combination, these trends resulted in an economic recession that had serious consequences across a variety of WA locations and industries. Importantly, this was to some degree an avoidable outcome. Natural resource economies are notoriously volatile and difficult to manage, but there are policy mechanisms that have been developed in other national and regional circumstances to manage this volatility by focusing on "internalizing externalities" of mining-driven growth. The next sections will discuss key externalities that persist in WA.

4. Labor Market Imbalances

The costs of WA's undiversified growth are ultimately felt by workers, who are at a heightened risk of experiencing job loss and wage stagnation when exogenous factors dampen either new investment in the mining sector or global demand for relevant commodities. The patterns of the recent slowdown not only exemplify this, but also signal how two externalities — high wage levels as a barrier to the development of new industries and a systemic spread of labor market vulnerabilities — that emanate from the growth trajectory in one sector play a larger role in the rest of the economy. The first externality refers to the way other tradeable industries and potential diversification opportunities in WA face barriers to global competitiveness as a result of the high-wage equilibrium driven by the heightened labor demand in mining and construction during the boom. The second externality refers to the fact that when mining investment suddenly contracts, non-tradeable industries that had expanded to meet the rapid increase in demand also contract, resulting in job losses and wage stagnation that are actually more severe in industries far removed from mining and construction and in parts of the state far from where mining occurs.

Recent patterns of employment and wage growth

To better understand these externalities, it is useful to examine the economic forces that drove labor market imbalances during the most recent boom and slowdown phases. A simple but illuminating approach is to analyze the pattern of employment growth and contraction in terms of labor supply and demand, since bottlenecks to healthy equilibria in the labor market may point towards relevant constraints. During the boom years of the commodity supercycle, labor demand grew at a very fast pace that translated to a rapid acceleration in wage growth starting in 2006. By 2007, WA became the Australian state with the highest relative wages, a fact that remains to this day. The wage premium paid in WA versus the rest of Australia has been attributed to many causes, but empirically speaking, it reflects a pattern in which labor demand growth was not fully met by labor supply growth during the boom years.

The existing labor supply responded to new job opportunities during the boom period, evidenced by rising employment and labor force participation rates, and unemployment rates that fell to record low levels for the last three decades. Employment in the mining sector grew at a compound annual growth rate of 16.8% between 2003 and 2012, while employment in other sectors related to the mining expansion (i.e. utilities and construction) grew rapidly as well (10% and 5% CAGR, respectively). The mining expansion and its associated operations also demanded a variety of professional services (legal, engineering, accounting, etc.) which supported a CAGR of 8% for professional, scientific and technical activities. As jobs grew and wages rose, higher disposable income in the state led to increased demand for non-tradable services (including retail, restaurants, hospitality, and real estate), and hence demand for workers in these industries rose as well.

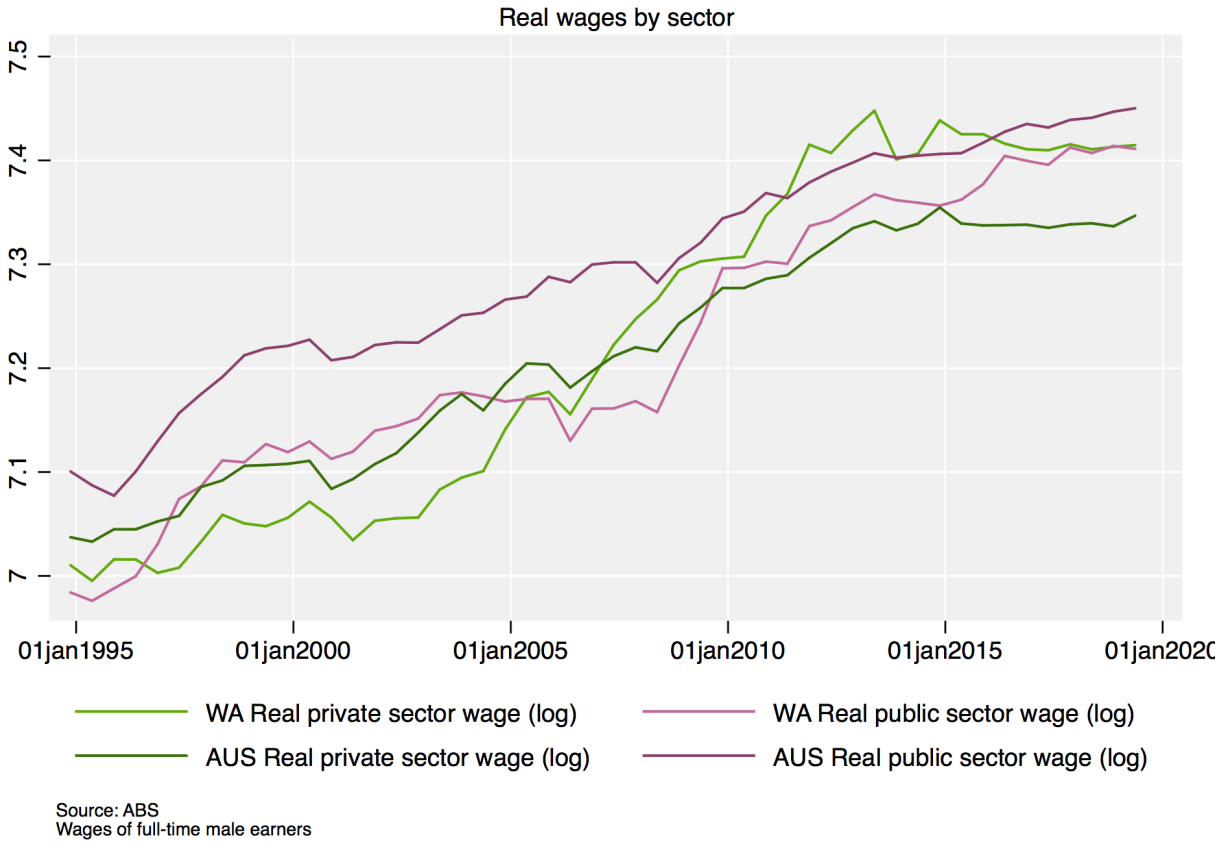
Employment grew substantially across the board. The pace of this employment growth is perhaps best captured by comparing rates of growth with the rest of Australia. WA's employment growth in utilities was 60% faster than that of the rest of the country, while mining, construction, professional services, and real estate all grew by around 30% more than the rest of the country. Overall employment growth for each of WA's regions was faster than the Australian average as well. As non-mining regions supplied workers to mining sites through the FIFO model, and as those workers spent their disposable incomes far from where they physically worked, the drivers of employment growth across regions varied.[2]

Despite this expansion in employment, sustained wage growth and rising occupation- and industry-specific wage premia show that the expansion in labor supply was not fast enough to keep pace with demand. Importantly, structural features of WA also contributed to the wage pressures, especially remoteness, lack of connectivity between regions and cost of living pressure. The mining sector paid a wage premium of 27% in WA versus other Australian states as early as 2006, which grew to 33% in 2011. Similarly, construction in WA paid a growing premium versus other states of 13% in 2006, and then 39% in 2011. These wage premia extended to a variety of occupations related to mining operations. For example: laborers received a wage premium of 13%, technicians a premium 21%, and machinery operators a premium of 18%.[3]

Sectors unrelated to mining likewise saw large wage gains, as average real private sector wages grew broadly and public sector wage hikes were instituted in order to attract and retain employees as well as to compensate for the rising cost of living in WA (Figure 5). Regionally, these premia manifested themselves differently depending on the remoteness of the region and its population base, but it is fair to say that the wage pressures spread across the state. For example, based on qualitative evidence, wages to work in the mines were almost 60% higher than employment in heavy manufacturing in other regions. Real wage growth as of 2012 was fastest in Perth, followed by Peel (especially among sales workers, technicians and managers), and the Pilbara (especially among technicians and trades workers and laborers).

[2] For example, machinery operators and laborers each grew rapidly in the Pilbara; machinery operators and technicians grew rapidly in Peel; and professionals and managers grew rapidly in Perth.
[3] Results from an interval regression using 2011 Census data on wage brackets controlling for age group, industry, gender and educational attainment.

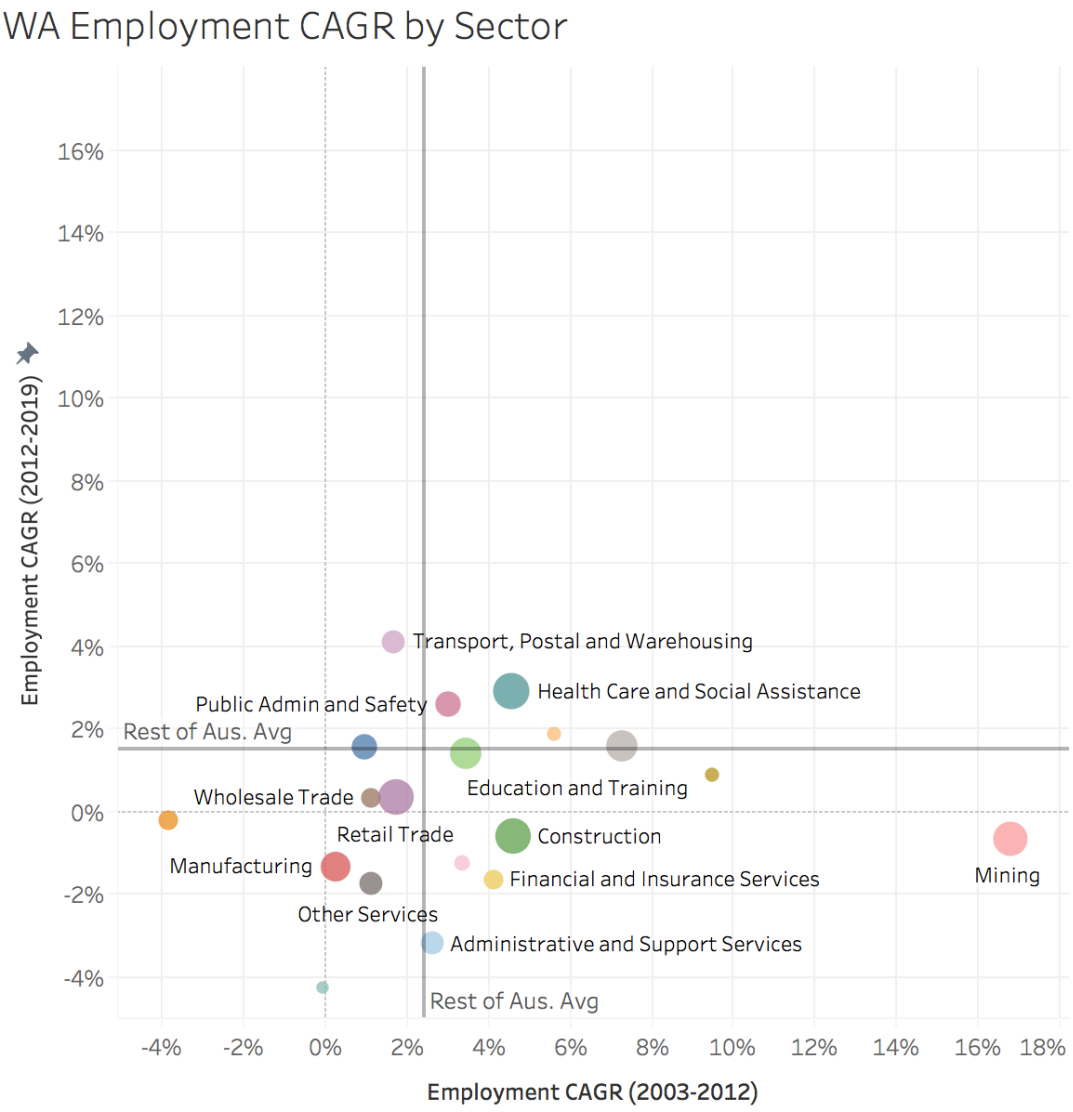
Figure 5: Public and Private Sector Real Wage Growth, WA vs. Australia



Weaknesses in the labor market started as early as 2012/13, notably preceding the slowdown in GSP, but coinciding with the contraction in new business investment. Wages stagnated but were not the main source of labor market adjustment. Because wages are sticky, employers responded by cutting down either jobs or hours or both. Unemployment rose above 5% and reached 7.4% in 2018. Underutilization, which captures the involuntary reduction in work and work hours, shot up from below 10% to above 15%. Employment in mining contracted by 0.7% between 2012-2019 (CAGR); however, contractions were felt across WA's entire labor market. Nearly all sectors experienced lower job growth than the national average over this period, and many sectors experienced outright job losses (Figure 6). The construction sector's workforce shrank by 0.7% CAGR, and rental and real estate activities shrank by 1.3% CAGR. Finance and insurance downsized its workforce by 1.6% CAGR, while administrative and support services lost jobs by 3.2% CAGR, and the small information media and telecommunications sector by 4.2% CAGR. Even beyond absolute job losses, there was a significant rise in part-time employment as opposed to full-time employment across sectors, and this was especially prominent for finance and insurance and accommodation services. No region in WA escaped this downturn in labor market outcomes. Moreover, the skill match of the workforce was also a pressure point; businesses in regional WA described the difficulty in attracting and retaining skilled workers in sectors like

manufacturing and tourism. Employment shrank in Perth, the Pilbara, the Mid West, Goldfields-Esperance, and Kimberley. Additionally, between 2012-2016, real wages contracted across regions, most notably in Goldfields-Esperance, the Mid West, Perth, and the South West, while it was less severe in the Wheatbelt.

Figure 6: WA's Employment Growth Rates During the Boom and Bust versus Australia



Source: ABS, Detailed Quarterly Labor Force

These dynamics were agnostic of the educational attainment and skills composition of the WA workforce. When compared to the rest of Australia, the educational attainment of workers in WA is not significantly different. On its own, education does not explain the observed wage premium between WA and the rest of the country. However, the observed wage premium is relatively smaller for occupations associated with higher levels of educational attainment. This might signal

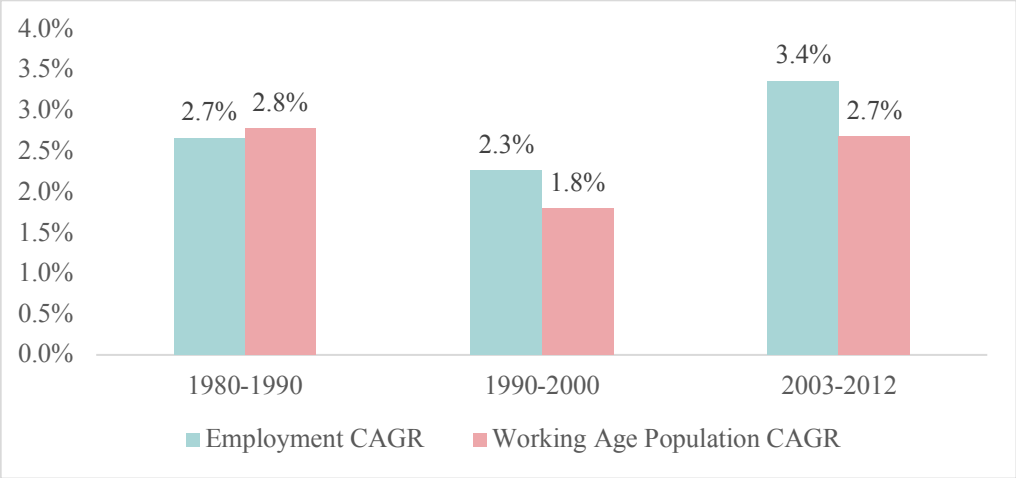
that, in the context of a mining boom, WA is better suited to meet a surge in labor demand for occupations associated with higher levels of educational attainment than it is to meet the surge in labor demand for those with lower levels. Moreover, the relative availability of a well-educated workforce will likely play a role in the feasibility of potential diversification opportunities. *Ex-ante*, given the high premia for occupations with lower levels of educational attainment, it is possible that diversification opportunities more intensive dependent on a highly-education workforce are more feasible.

Nonetheless, the unfortunate scale of job losses occurred even as the state's wage levels remained the highest in Australia. While the growth in wages was obviously beneficial to workers in these industries and occupations, it caused two interrelated problems. First, the growth in wages during the boom actively worked against the potential for more diversification into other tradeable industries, as any such industry would have to pay high WA labor costs while remaining competitive with global markets. Visits to abandoned factories in the regions illustrate how labor-intensive manufacturing (e.g. wool products, food products) could not compete with lower-cost Asian producers. Second, as the commodity supercycle reached its end and mining expansion subsided, many of the jobs gained were then lost as firms could not retain workers at such high wage levels when state final demand contracted; this was particularly true for non-tradeable industries that either served mining operations or benefitted from the multiplier effect of investments and wage growth. This raises the question of why this rapid wage growth occurred in the first place. In other words, why did labor supply not expand at the same pace as labor demand? Although some degree of wage growth was desirable and inevitable, the extreme pace of growth worsened the short-term negative outcome of widespread job losses at the end of the commodity supercycle and further hampered diversification efforts.

Factors that influenced the limited labor supply response

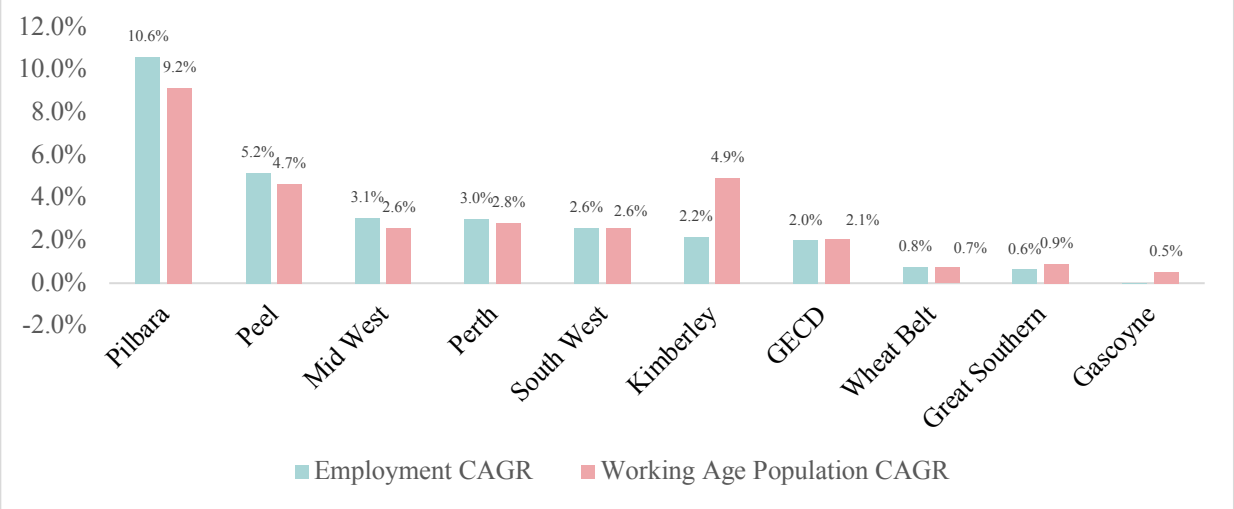
A close look at the evidence shows that the labor supply response was smaller than needed because existing channels had three problems: (i) a small population base, (ii) rigidities that limited a larger migration response, and (iii) geographical distance and a lack of connectivity. WA was not well positioned to respond to the historical expansion in labor demand because of structural misalignments. From a historical perspective, the expansion of labor demand during the commodity supercycle was dramatic, and while population growth increased significantly through immigration, it could not match the growth in labor demand (Figure 7). The under-supply of labor was more dramatic in some regions than in others, especially in the Pilbara, followed by Peel, the Mid West and Perth (Figure 8). Interviews in different regions highlight the varying degrees to which regions were insulated from this dynamic: while the collapse in wage and population in the Mid West was severe, the Great Southern experienced less drastic swings.

Figure 7: Employment and Working Age Population Growth in WA by Period



Source: ABS, Labor Force

Figure 8: Employment and Working Age Population Growth in WA's Regions (2006-2011)



Source: ABS Census 2011, 2006. LGA level data based on place of usual residence.

WA entered the boom period with a somewhat small population. Queensland serves as a key point of comparison here. The mining investment boom in Queensland proceeded along a very similar timeline to that in WA, and the magnitudes of the total investment received were reasonably comparable in absolute terms. In per capita terms, however, WA received much higher mining investment than Queensland, or any other Australian state for that matter (55% more in aggregate terms and 3.3 times more in per capita terms).[4] Queensland's comparatively deeper labor market left it better positioned to absorb this shock, and the subsequent volatility of its economic growth was noticeably lower than that of WA's. Since WA had a small starting population in comparison

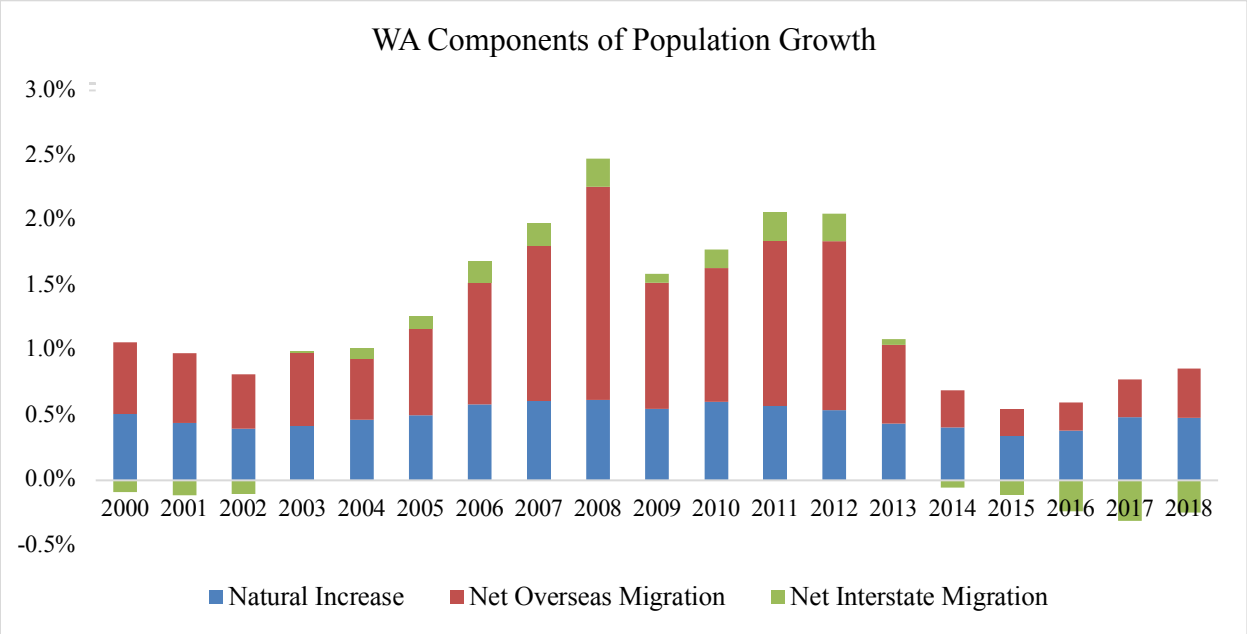
[4] Peak-to-peak comparison

to the size of new demand, it required workers to migrate in to fill these jobs. International immigration accounted for roughly 60% of WA's net population increase between 2003-2012, while net inter-state migration supplied a much smaller share of labor (Figure 9).

Since the state was the epicenter of the resources boom in the country, immigration was essential in meeting the heightened labor demand. WA received more than its fair share of international migration during the boom: it received roughly 20% of all permanent and temporary visas, while accounting for approximately 11% of Australia's population.[5] However, the immigration system – mostly managed at the level of the Commonwealth – was not designed to sufficiently meet the high surge in the demand for labor. International immigration was responsive to the growth in the economy, as annual international immigration to WA increased annually almost uninterruptedly until 2012;[6] however, national-level policy introduced caps and frictions on the labor supply channel (Figure 10). For example, relevant visa types can be granted only for certain occupations, determined at the level of the Commonwealth, with minor input from states. Moreover, there are certain requirements for English-language proficiency and a minimum wage level for temporary skilled visas. This is all compounded by quotas for the annual total number of visas at a national-level. The result is that national policy determines the potential for immigration to adequately respond to surges in labor demand at a state level; however, players within the state, either at an industry-level or employer-level, could take proactive steps in attracting overseas workers. Firms cited these challenges, and in addition mentioned the added risk for small and medium firms in taking on these high (direct and indirect) costs. One interviewed firm sent recruiters to the Philippines to recruit employees in-person to screen for the specific skills-requirements they needed.

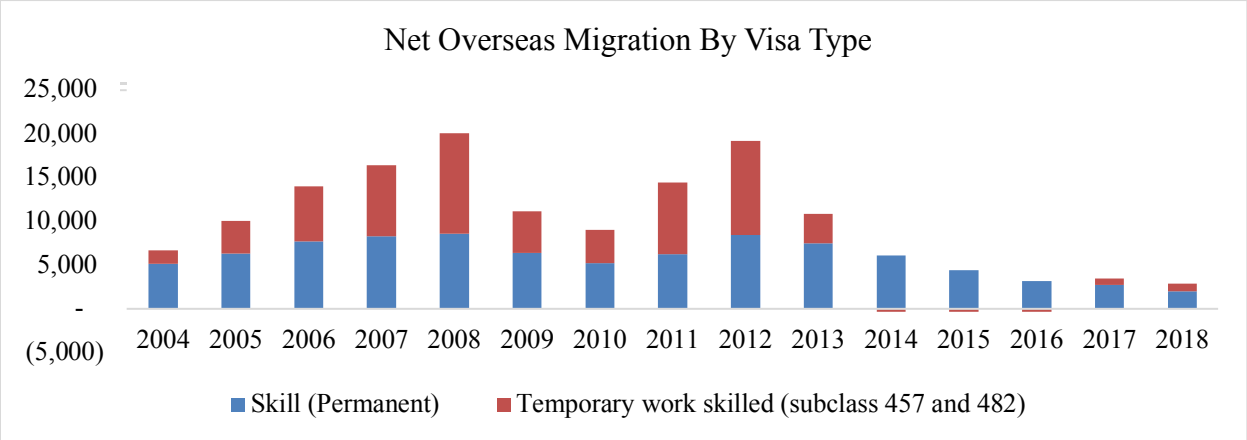
[5] Data source: ABS, Overseas Migration Data
[6] With the exception of 2008

Figure 9: WA's Population Growth Decomposed by Year



Source: ABS, Australian Demographic Statistics

Figure 10: Supply of Permanent and Temporary Skilled Work Visas to WA by Year



Source: ABS, Australian Demographic Statistics

Meanwhile, inter-state migration to WA, though positive, was comparatively small. Given that domestic migration is substantially less expensive than international immigration — both financially for migrants and politically for policymakers — it is surprising that it only accounted for 8% of WA's population growth during the boom. While inter-state migration is by definition a zero-sum-game between states, WA could have potentially absorbed more inter-state migrants than it received. During the commodity supercycle, WA received only 10% of all Australian inter-state migrants, while Queensland received 27% of them.

While international immigration policy at the national level likely limited WA's ability to attract sufficient from abroad, inter-state migration policy was passively pursued. There was a lack of concerted effort to coordinate a State-level initiative to attract Australians from the rest of the country to meet the rising labor demand in WA.

Low inter-state migration to WA may have had much to do with the third factor that likely constrained the labor supply response — that WA's dense population base in the southwestern part of the state is geographically concentrated far away from the areas with the mining investment, particularly the Pilbara. This distance amplified the disconnect between mining labor demand and the labor supply, enhance demand for FIFO workers, and further drove up wages. This distance factor likely reduces the preference of inter-state migrants to permanently move to WA. It is telling that inter-state FIFO workers made up 41% of all inter-state workers in WA. Economic reasons and pragmatism appear to have been important motivating factors for the mining and resource sectors to establish and then expand their FIFO operations. Many mines in Australia have a fairly limited life and infrastructure costs are high; the combination of these factors advises against the establishment of any substantial residential communities for these operations (Gillies et al, 1991). Meanwhile, workers in the sector may choose to commute for both economic and social reasons: accessing a well-paid job while at the same time retaining family and friendship ties in their home communities. The prevalence of FIFO workers is a relevant channel of externalities, as these workers distribute both the socio-economic costs and benefits of the supercycles across numerous communities, regions, and states (McKenzie, 2011).

In terms of wages, the remoteness of non-city Australian Local Government Areas (LGAs) relative to population centers was associated with higher mining wages in 2011 and 2016, even after controlling for the total mining employment in each LGA. A basic multivariate regression also indicates that the fraction of workers earning more than $100,000 is nearly twice as high in the most remote versus the least remote LGAs. Similar effects have also been exhibited in the literature.[7]

Queensland serves as an intuitive counterfactual here, too. Not only does it have a larger population than WA, but its population is more widely distributed throughout the state and on the whole its population is more proximate to mines. That is why drive-in-drive-out (DIDO) mining work is considerably more prevalent in Queensland than WA, compared to FIFO. This geographic proximity allows mining demand in Queensland to be met more flexibly, reducing wage pressure for the broader state economy.

This relatively small response in the labor supply in comparison to the expansion of labor demand leaves the WA economy with the challenge of very high wages today. As few sustainable drivers

[7] Paredes, Soto and Fleming (2017) find that extra commuting time increases wages for FIFO workers in Chile.

of growth have emerged to absorb the shock of falling commodity prices, WA has suffered high underemployment and job losses, and downward adjustment of wages to readjust. At present, if WA was to experience another surge in labor demand set off by global commodity prices, the same patterns would likely reoccur. Reflections from both businesses and government institutions predict a similar cycle to repeat itself in the next mining-related investment boom in WA. In fact, it is possible that if demand coincided with a more restrictive national stance on immigration, the supply channels would be more even limited than they were in the past. Therefore, the negative externalities associated with the commodity supercycle would be even more damaging.

Thus, in order to minimize the labor externalities associated with commodity cycles, it would be beneficial to adopt labor market policies that would enhance both the baseline labor supply and the effectiveness of its response. Relevant policies that would advance this goal are discussed further in the *Research Findings and Policy Recommendations Report*.

5. Pro-Cyclical Fiscal Policy

Fiscal policy in resource-rich economies follows the same broad principles as in other economies — to promote macroeconomic stability, sustainable and inclusive growth, and fiscal sustainability. The quintessential challenge for resource-based economies is how to manage the impact of volatile and uncertain resource revenues on macroeconomic and financial stability. Fiscal volatility often reflects resource revenue volatility and frequent exogenous shocks in the context of a highly concentrated export basket. When fiscal policy is unable to manage this volatility, it can have its own negative externalities on short-term job losses and pressures against long-term diversification. Forward-thinking economic planning requires counter-cyclical fiscal policy, such that the state saves resources in boom periods and spends more during slowdowns. This is particularly relevant for the mining-rich context of WA because of the importance of resource revenues. WA, however, has seen the opposite trend during the course of the boom-slowdown cycle: its state finances have, on the whole, been structurally pro-cyclical.

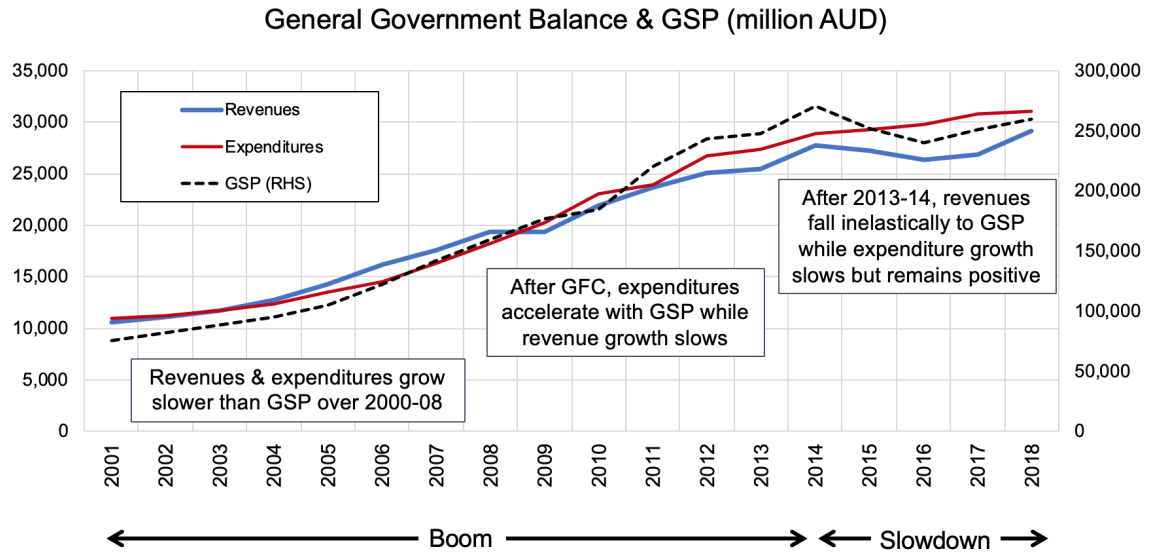
Recent evolution of the fiscal balance

Western Australia witnessed a rapid economic expansion during the mining boom, where GSP per capita increased by almost 45% in real terms over the period 2002-2014. The state economy grew faster than Australia as a whole over this period, at an annualized rate of 3.1% per capita in real terms. This unusually long and widespread boom in commodity demand — particularly for iron ore — manifested in higher mining export profits for a prolonged period of time, and a large surge in construction and investment to expand mining capacity. While GSP (and GSP per capita) is a useful measure to compare changes in overall output, it also comes with important caveats. The dominance of the mining sector works through the primary channels of investment and exports to contribute to GSP. Therefore, the profits from the boom accrue to multinational private companies and the majority of the taxing rights to this sector reside with the Commonwealth. An alternative metric to reflect the welfare of the population is real household income. Compared to domestic and international peer states, WA's real disposable household income grew the most between 2001-2011, by over 40% (OECD).

The commodity boom naturally led to a rapid expansion in state revenues. Over the first half of the boom period, from 2002-2008, government revenues grew at almost 10% per year on average, slower than GSP growth over the period of 11.8% per year on average, but a very rapid increase nonetheless. Expenditures, meanwhile, likewise grew, but did so at a slower pace than revenues (8.4% per year on average). This resulted in a modest fiscal surplus in the first half of the boom period (Figure 11). However, the 2008-2014 period saw substantially reduced revenue growth driven by stagnating non-resource revenues (6% average annual growth), while expenditures continued to grow steadily (8% average annual growth). By 2014, state expenditure was more than two-and-a-half times higher than what it was in 2002. Much of this expenditure growth was necessary to provide public services to a growing population and public goods to support

productive investments, including in remote regions of the state. Part of this also funded an expanding public wage bill and entitlement programs. Much of the State's expenditure is pre-determined by Federal mandate, inevitably decreasing the ability of WA to rapidly influence largescale spending on key infrastructure priority projects. Nonetheless, the nature of such spending increases left the state's finances more vulnerable to fiscal shocks, such as the downturn in resource revenues due to a negative commodity price shock. Spending had become sticky, and future prudence with expenditures proved, understandably, challenging. Overall, after saving a little during the first half of the commodity boom, WA incurred substantial fiscal deficits during the second half. While during the boom the state had to spend more to cater to the growing population, and faced some federal disincentives against inter-temporal savings, the state would have benefited from having access to a stabilization mechanism given the sheer scale of revenue increases over the boom period.

Figure 11: Nominal GSP, Revenues, and Expenditures during the Boom and Slowdown[8]



Source: ABS

State revenues fell at the end of the boom, exactly when WA needed to boost fiscal spending to combat the slowdown. Royalties from mining output had grown elastically during the good years — by an average of 21% per year between 2002-2014 — but also fell elastically during the slowdown — by an average of 5% per year between 2014-2018 (Figure 12). By 2014, royalties constituted 22% of overall revenues, the highest of any Australian state, so Western Australia was destined to face a revenue shock immediately when commodity prices fell, particularly so for iron ore. Tax revenue also fell in 2016-2017 due to lower transfer duty revenue (from commercial

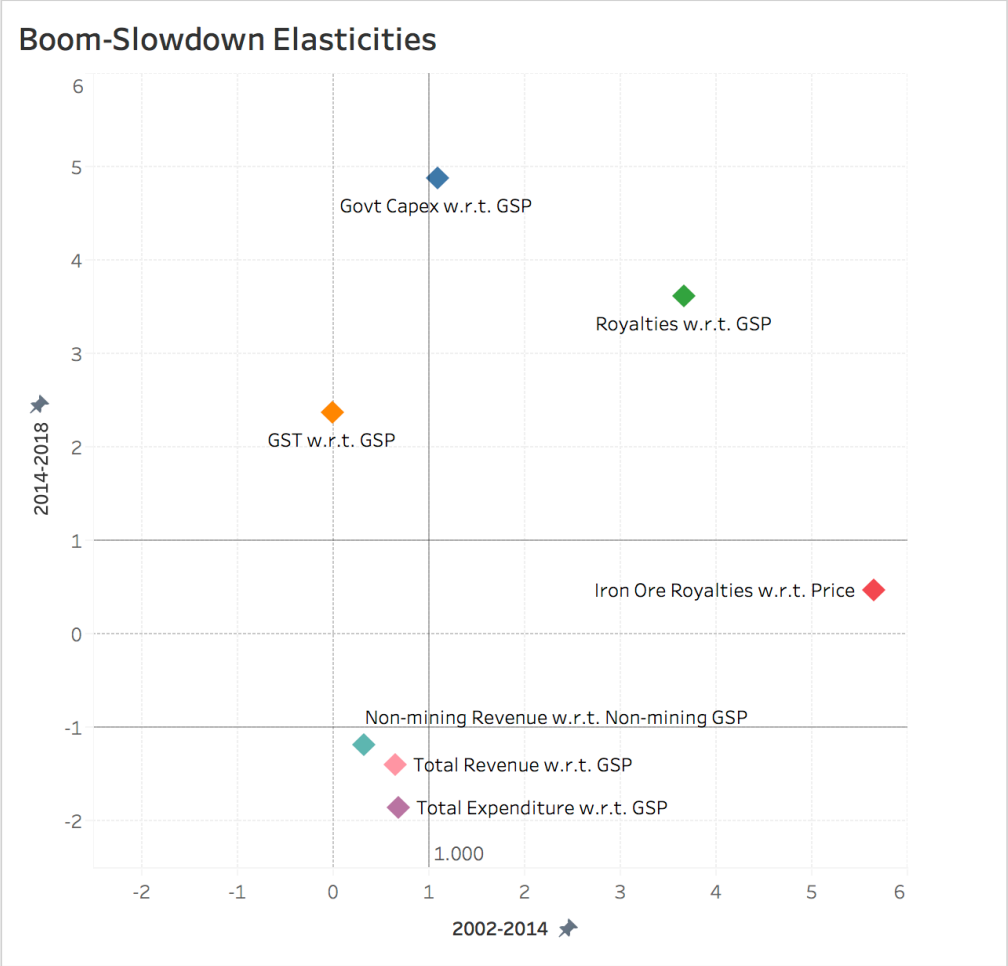
[8] Overall Fiscal Balance is calculated as net operating balance less general government gross fixed capital formation.

property transactions, as well as a soft residential property market), and lower land tax (as a result of lower land values).

Additionally, federal GST transfers to the state, though small as a share of revenues, were also a pro-cyclical contributor to state finances during the slowdown as a result of the time lag in the adjustment of the "relativity" component of the transfer formula. The horizontal fiscal equalization process presented challenges to the state's budget management due to the lagged nature of the formula to determine the payout. At the onset of the boom, GST transfers represented a significant share of total revenues, almost 24%. As the state's windfall royalties accrued, GST transfers were adjusted over time and by the downturn, the share that WA received relative to its population was the lowest in Australia. As illustrated in Figure 12, as GSP fell during the slowdown, GST transfers fell more than proportionally. This motivated an overhaul in GST distribution and a reform to the equalization principles. The implementation of a minimum floor in the amount of transfer will bring to keel some of the pro-cyclicality in GST for WA. Now, the will receive top-up payments to make up for some of its lost revenues, but during the slowdown, the structure was not in the state's favor. In sum, the recent reforms offer greater opportunities to pursue stabilization funds.

While expenditure continued to grow during the slowdown, it grew at a diminished pace of 1.7% (CAGR), which meant that fiscal stimulus to support depressed demand was muted at best. Government expenditure on non-financial assets fell elastically with GSP, and operating costs also grew at a much slower rate than during the boom (Figure 12). Grants from the Commonwealth – both specific purpose payments and general-purpose grants – also fell, limiting the fiscal space to bolster the struggling economy. The non-tradable economy suffered from a sharp reduction in aggregate demand that could have been better mitigated by counter-cyclical fiscal policy. Additional detail on the challenges that WA has faced in terms of its non-resource fiscal sustainability are provided in Box A.

Figure 12: Select Elasticities of Relevance to Fiscal Balances[9]



Source: ABS and DMIRS

Box A: Non-resource fiscal sustainability

Fiscal policy in resource-rich economies is crucial in allocating revenue from resource exports into the domestic economy. Exogeneous commodity shocks have a significant impact on fiscal sustainability due to the heavy dependence of state revenues on the mining sector. Therefore, the non-resource balance (NRB) and non-resource gross state product (NRGSP) are particularly important indicators to take into consideration to smooth fiscal volatility and for short-, medium-, and long-term macroeconomic management. The NRB is the estimated difference between non-resource revenues and non-resource expenditures.

[9] Elasticities are calculated as a ratio of percentage changes. For example, Royalties w.r.t. GSP represents the percentage change in royalty revenues relative to the percentage change in GSP between 2002-2014 on the horizontal axis, and the percentage change in royalty revenues relative to the percentage change in GSP between 2014-2018 on the vertical axis.

In Western Australia, as in other resource intensive economies, fiscal planning and overall output is closely tied to the performance of the mining sector. At the onset of the commodity boom, royalties comprised 6% of total revenues, and the state relied mostly on grants and subsidies, and tax revenues. With the boom in iron ore extraction, the state's revenue composition shifted, and royalties came to constitute 22% of total revenues (Figure A1). Royalties from mining activities are largely concentrated in iron ore, and, to a lesser extent, LNG, which is primarily routed through North West Shelf grants from the Commonwealth (Figure A2). WA's royalty legislation is almost 40 years old, and the fiscal volatility associated with resource booms is a decades-long phenomenon.

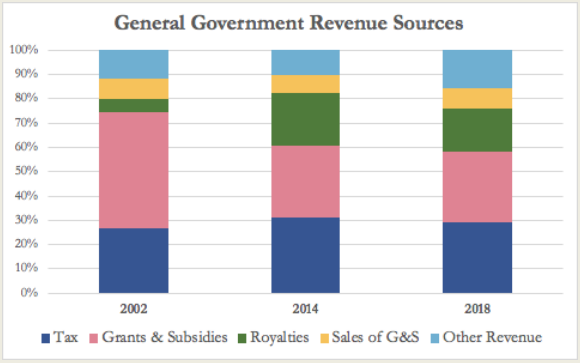
Government expenditures evolved pro-cyclically with the boom in resource revenues. Towards the end of the boom years (2008-2014), public investment and recurrent spending grew faster than revenues. The overall fiscal balance went into a deficit, which continued to worsen through later years of the boom and into the growth slowdown. Fiscal policy should consider the volatility and uncertainty of resource revenues, so as to smooth public finances. This volatility is a key risk affecting public finances in resource-rich economies, and is unfortunately often overlooked in favor of short-term horizons of annual budgets. This exacerbates fiscal vulnerabilities to future downturns due to pro-cyclical expenditure patterns.

This is largely because the NRB becomes exposed to shocks over time. Without generating the potential for future non-resource revenue sources, WA was left overly vulnerable to the commodity price shock in 2014. The concentration of resource revenues in iron ore further deepens the correlation between iron ore prices and the fiscal balance. This unsurprisingly holds true for GSP growth as well (Figure A3) — high growth years are correlated with increases in the price of iron ore, while the growth slowdown corresponds with a fall in the price.

This is further illustrated when comparing the overall fiscal balance with the NRB (Figure A4). After 2008, while the government incurred a modest fiscal deficit (as a share of GSP), the NRB (as a share of NRGSP) was much higher: as a share of the non-mining sector, the non-resource fiscal balance deteriorated quickly. The elasticity of non-mining revenues with respect to the non-mining GSP underscores this differential trend during the boom and slowdown years (Figure 12). During the boom, non-mining revenues grew inelastically relative to the non-mining economy. At the same time, small changes in the price of iron ore were correlated with disproportionately larger changes in iron ore royalties. By the time of the slowdown, these royalties had become inelastic to changes in the price, and the state was able to rely on continuing resource revenue.

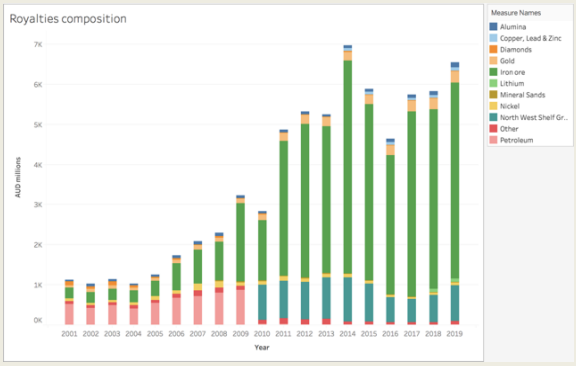
Looking ahead, this evidence strengthens the need for counter-cyclical fiscal planning and focusing on shoring up non-resource sources of revenues to ensure sustainable finances.

Figure A1: Government Revenue Sources



Source: ABS

Figure A2: Mining Royalties Composition



Source: DMIRS

Figure A3: Iron Ore Prices and Real GSP p.c.

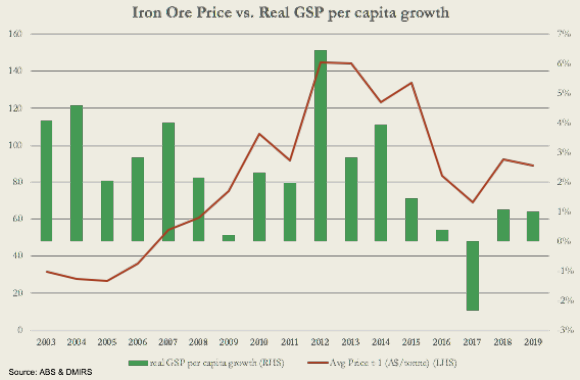
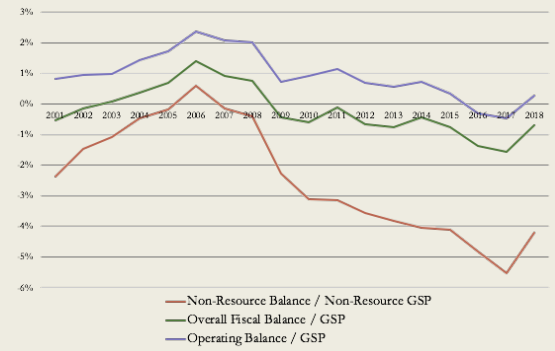


Figure A4: Govt Fiscal Balance Measures



Source: ABS

Factors that influenced the pro-cyclicality of fiscal policy

The fiscal response was less counter-cyclical than needed due to three factors: (i) a lack of inter-temporal smoothing mechanisms, (ii) resource earmarking, and (iii) concerns about mounting debt.

First, given that the state had incurred substantial expenditures and investments to provide public services to a growing population and public goods to support productive investments, it had not been able to save during the good times. This is a relatively common outcome for regional and national governments that lack an enforcement mechanism to save a share of revenues during boom periods in anticipation of a slowdown. It is common for regions with resource wealth to set up stabilization funds for this purpose, but WA lacked one. It is also common for states to set up intergenerational savings mechanisms including sovereign wealth funds. In this case, WA does have one, but it remains very small. During the slowdown, the Western Australia Future Fund (WAFF) was set up in 2016 for a term of 20 years, but it was too little too late. It was seeded with a nominal starting investment, and since 2016 receives only 1% of royalty inflows as top-up payments. This is far less annual capitalization than required to reach a relevant scale (and far less as a share of mining revenues than most other sovereign wealth or stabilization funds, at a state or national level).

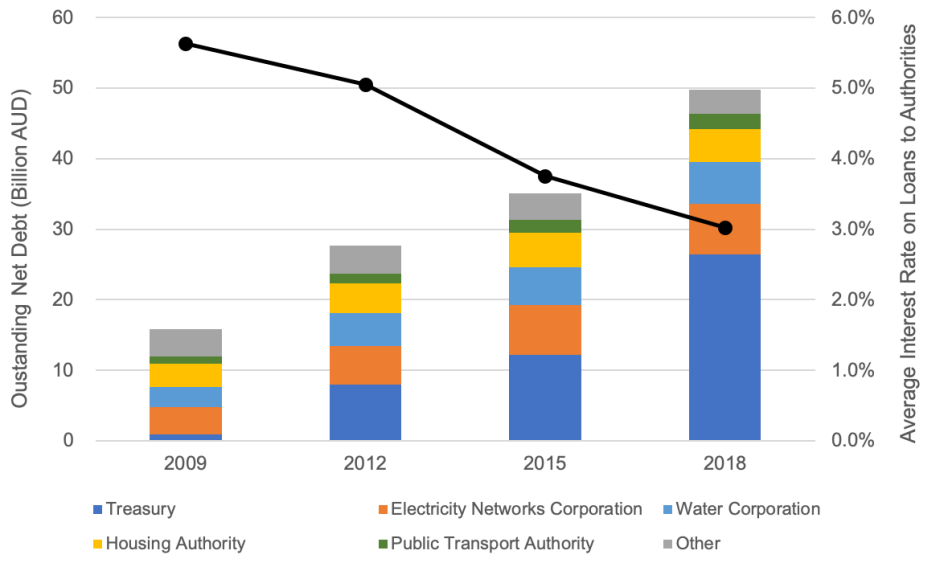
Second, during the peak boom years, along with an absence of fiscal policies to save, resource earmarking was introduced as a significant policy in 2008/09 through the flagship Royalties for Regions (RfR) fund, which was introduced as a vehicle to channel the financial gains from the mining sector directly back to the regions. With an earmark of 25% of royalties being channeled into it, this promising program inherited the volatility of the mining sector. During the boom years, RfR received more funding than could be effectively spent. The vast majority of the program focused on infrastructure projects in the regions, ranging from projects in tourism, to agriculture, to Aboriginal community initiatives. Discussions with Regional Development Corporations revealed mixed outcomes: some stated that it creates a zero-sum environment that fostered competition amongst the region, who all vie for access to much-needed funds, while others claimed that it was only through RfR that they could build the infrastructure they needed to catch up to other parts of the state.

Meanwhile, the seed investment for WAFF was allocated from RfR funds, illustrating the structural mismatch of the optimal allocation of resource revenues between productive spending goals and precautionary savings. The funds are administered by Treasury, and the legislation surrounding it is not specific with respect to how they may be spent. Interviews with relevant stakeholders described the interest being used to pay down the public sector debt, fund healthcare research, and support regional infrastructure. Policymakers in resource-rich countries are constantly faced with the decision of using fiscal resources for investing in projects that have future revenue-generating potential versus investing in financial assets or other savings tools. In WA, in retrospect, the public sector could have diverted more of its efforts to saving through resource stabilization funds. Discussions with academics and public officials point out the broader macroeconomic narrative in Australia during the commodity supercycle that played a role in the spending versus savings dynamics. At the State and National level, macroeconomic forecasting was done in anticipation of an ever-continuing commodity boom, and hence treating the boom as structural rather than cyclical. When the slowdown inevitably came, there was a lack of sufficient fiscal space.

Lastly, while the state could have not only saved more during the boom years, the state could have also borrowed more during the slowdown. Since WA's borrowing costs remained very low even while state final demand dropped by 13% in real terms and job losses were extensive, it is clear that WA would've likely benefited from a larger fiscal stimulus. By the time growth began to rebound in 2017/18, interest payments on total public sector debt represented only 3.6% of revenues and rates on new debt issued by the Western Australia Treasury Corporation remained low (Figure 13). Debt accumulation during this period was noteworthy for its concentration in borrowing by the treasury and the limited growth of debt for state infrastructure, which was a reversal from the past dynamics of borrowing. This likely contributed to the low cost of new borrowing. Therefore, the state may have had ample space to borrow and spend more to cushion

the slowdown and return to growth more quickly. However, during the slowdown, concern about mounting state debt prevented this course of action.

Figure 13: Debt Breakdown and Average Interest Rate on Stock of Debt for Select Years



An agenda to "internalize the externalities" of WA's traditional growth process will require a change in fiscal policy to introduce a shift from a pro-cyclical to a counter-cyclical fiscal approach. Suggested policies that would advance this goal are discussed in the *Research Findings and Policy Recommendations Report*.

6. Infrastructure Policy Misalignment

Public infrastructure plays a significant role both enabling economic activities (for example, through ports, roads, pipelines) and advancing the quality of life of the local population (for example, through schools, telecommunications, mass transport). Hence, misalignments in public infrastructure can translate into barriers for economic diversification, constrain permanent labor supply, and increase pro-cyclical fiscal pressures.

Even without considering the recent dynamics of the commodity supercycle, WA faces several distinct structural challenges in the provision of public goods, including but not limited to: (i) the lack of connectivity to national networks (including electricity, road, rail and air travel); (ii) the very large mismatch between the location of highly productive economic activities (i.e. mining and agriculture) and the places where most of the labor force lives; (iii) natural scarcity of some key resources (especially water); and (iv) other features of its geography and population distribution (i.e. vast swaths of territory with dispersed pockets of population).

Hence, expanding infrastructure access and developing infrastructure in remote areas of the state often entails large up-front investments and sustaining high fixed costs that are often socialized across the state. This means that the state faces difficult choices in how and when to invest in infrastructure, particularly when facing rapid demand surges in remote areas, such as those associated with the recent commodity boom. For instance, when thinking of investments in areas such as education, housing and health, the state faces difficult tradeoffs. Under-investing results in poor living conditions and perpetuates the reliance on FIFO and other labor market imbalances described above, while over-investing may lead to expensive stranded assets when demand subsides. Similarly, WA also faces complex tradeoffs when considering investments in other productive assets such as electricity, railways, and air strips. Some economic activities, such as mining, can and do provide an unusually large share of its own infrastructure, which theoretically could ease the burden on the public sector. However, given that these are not often connected to broader infrastructure networks, they increase regulatory difficulties in maintaining overall network coherence and introduce pricing challenges for public services. In the face of such challenges, significant public investments may still be required. In WA, a large share of economic infrastructure is developed by individual resource companies with limited overarching planning or coordination. This results in areas where multiple rail lines, electricity grids, air strips, etc. run parallel to each other, each servicing the respective company. This is highly inefficient and adds strain on the provision of these goods for non-commercial purposes.

What has resulted is an equilibrium where key infrastructure systems face significant weaknesses in coverage and high market prices. These weaknesses, in turn, may hamper the performance of industries unable to self-provide public goods, further increasing the cost of living, and increasing fiscal pressures. These effects serve to reinforce the growth, labor and fiscal dynamics outlined in previous sections, as they may hinder the diversification of the economy, constrain labor supply,

and enhance pro-cyclical spending patterns. Whereas the reinforcement of externalities regarding labor market imbalances and fiscal policy can be clearly seen in the boom-slowdown cycle of the last two decades, understanding how and why these externalities associated with public infrastructure misalignment persist requires a somewhat longer view. Hence, unlike previous sections in which we describe recent patterns and the factors underpinning the externalities, here we profile factors that lead to a shortfall in the provision of certain public goods — electricity and water — and then offer analytical observations of how these findings may interact with diversification efforts.

Electricity

Western Australia has two separate large electricity grids — one in the southwest serving the bulk of the state's population and another in the north for population centers there — and each of these are disconnected from the major electricity grids serving the rest of the country. The state equalizes the prices charged to end users across the two grids through implicit cross-subsidization between the systems. High and increasing electricity prices have been a problem across Australia over the last two decades, and Western Australia is no exception. As shown in Figure 14, end user prices are among the highest in the country.

There are at least five factors that can explain why WA has higher electricity costs than the rest of the country. First, WA has an electricity market that is much smaller than the integrated network that serves the eastern half of Australia, meaning that "cost sharing" to build and maintain the infrastructure must be done across a narrower base. Second, distribution costs are high and have continued to increase, because of the challenges of serving remote and thinly populated regions. Third, the state displays a relatively under-diversified electricity generation mix that is heavily concentrated in natural gas (see right side graph of Figure 15), which exposed the rest of the economy to rapidly increasing electricity costs during the commodity supercycle at the very same time that the state's LNG industry was benefiting from higher global prices. In recent years, this has reportedly been tempered by WA's domestic gas policy that helped regulate wholesale gas prices and keep them lower in WA than in the eastern states. Implemented through contractual agreements between developers of LNG export projects and the State government, this policy framework has stabilized the domestic supply and price of gas by requiring producers to reserve 15% of LNG production from each export project for the domestic market. However, numerous stakeholders reported that LNG producers have not met this requirement.

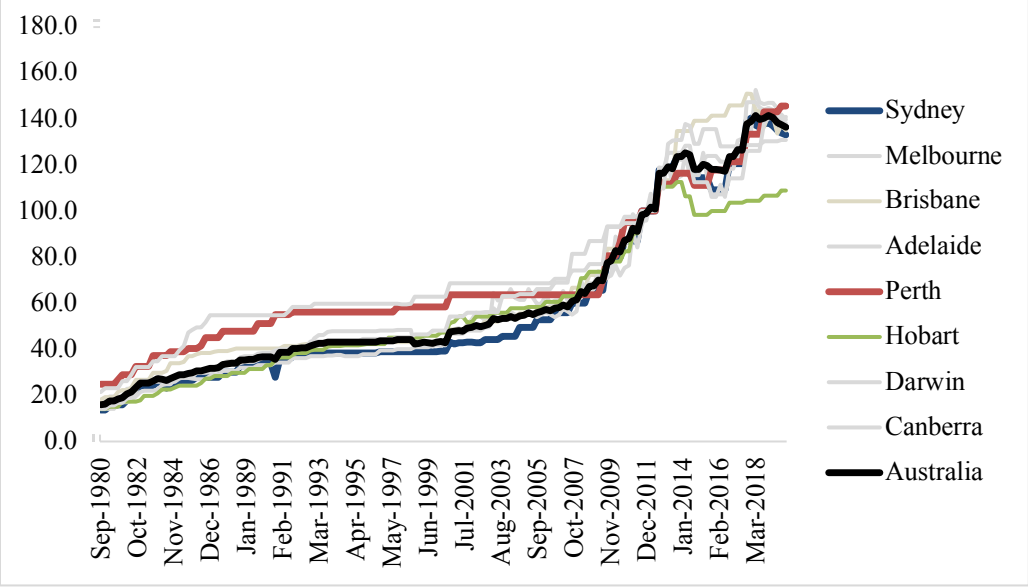
Fourth, WA has seen an increasing prevalence of decentralized energy generation. Part of this relates to the fact that many stakeholders in highly productive industries (i.e. mining) generate their own energy, and part of this relates to enormous growth in decentralized renewable energy. The latter dynamic has been a welcome global phenomenon that has been especially positively received in places like WA where electricity from the existing grid is so expensive. However, this

decentralization places substantial added stress on the grid and utilities, which still must provide baseload and back-up power and provide transmission; meanwhile, the system loses revenues as households and businesses generate more of their own power.

Lastly, WA's economy is much more intensive in its overall energy intensity (left side graph of Figure 15) than its electricity intensity (right side graph of Figure 15). The implication of this is that significant parts of the economy have had limited reliance on affordable electricity and higher reliance on raw fuel inputs. Thus, it is natural that forward-looking system-wide planning that could have kept final prices low in the past may have been less of a priority than in other parts of the world. This dynamic is an example of how the existing economic base of the state may entrench infrastructure systems that undermine diversification, increase fiscal pressures, and adversely impact quality of life.

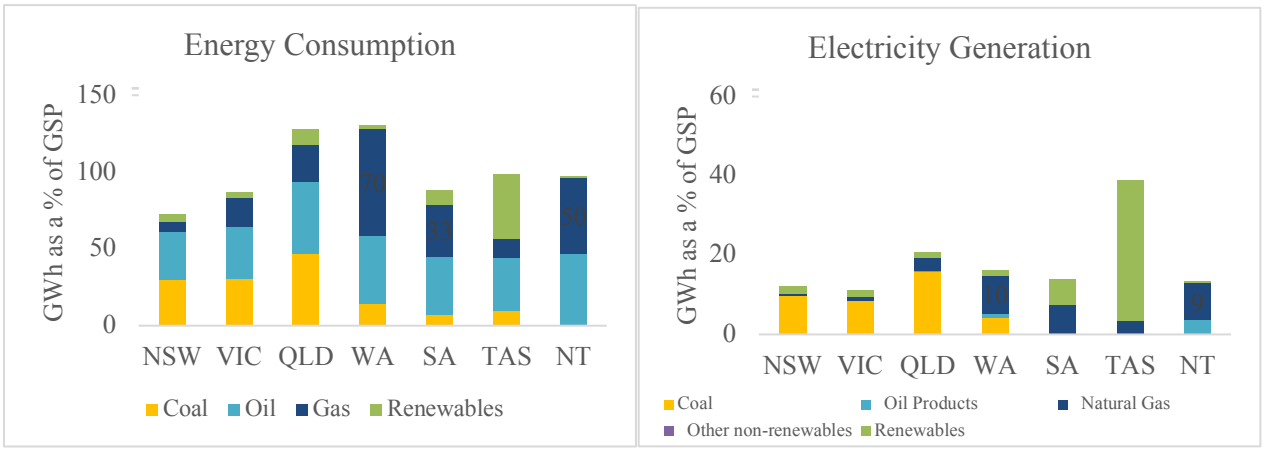
It is clear that WA is now making significant strides toward adapting the electricity system through its Energy Transformation Plan and that the state has widespread opportunities to increase centralized renewable energy sources and storage at much lower overall costs. However, the state is starting this process with an initial hurdle of very high prices inherited in the system, and it may still face the dynamic of sudden increases in demand associated with future mining expansions in remote regions.

Figure 14: Electricity Price Index for Major Cities in Australia



Source: ABS industry price indexes

Figure 15: Energy Consumption and Electricity Generation Sources by State (2017-2018)



Source: Australian Energy Statistics (AES) data

Water

Constraints to water access in WA are driven by a different dynamic, but with similar results as electricity. Water has long been a naturally scarce resource in WA, and its availability has largely determined historical population settlement patterns. In recent decades, water has only become scarcer. This is driven by two main causes: (i) using more water annually than the natural water cycle replenishes; and (ii) less overall rainfall. In essence, parts of Western Australia are running out of natural water supply. These issues are particularly evident in the populated southwest.

Perth is unique in comparison to other major Australian cities in the intensity of this challenge, as it now relies almost exclusively on pumping groundwater and desalination to meet its water needs (Figure 16). Desalination technologies allow for seawater to ultimately provide water supply when natural water supply runs out. However, desalination is far from a costless solution, especially in the context of high electricity costs. This is reflected in the fact that water and sewerage prices for Perth are the highest of all major cities in Australia (Figure 17). Businesses across the state cite water-related prices being a constraint to production. Several noted the lack of enabling infrastructure to connect to an integrated network. Moreover, as water tables continue to fall in many parts of the state that are far from the coastline, water access will include the infrastructure costs to move desalinated water inland.

Scarce water and high market prices represent a reality that will remain in Western Australia long into the future. As with electricity, this result is partly due to geographical factors, but is also due to the way that the existing economic structure of the state may impact forward-looking system wide planning.

Figure 16: Water Sources for Major Cities in Australia

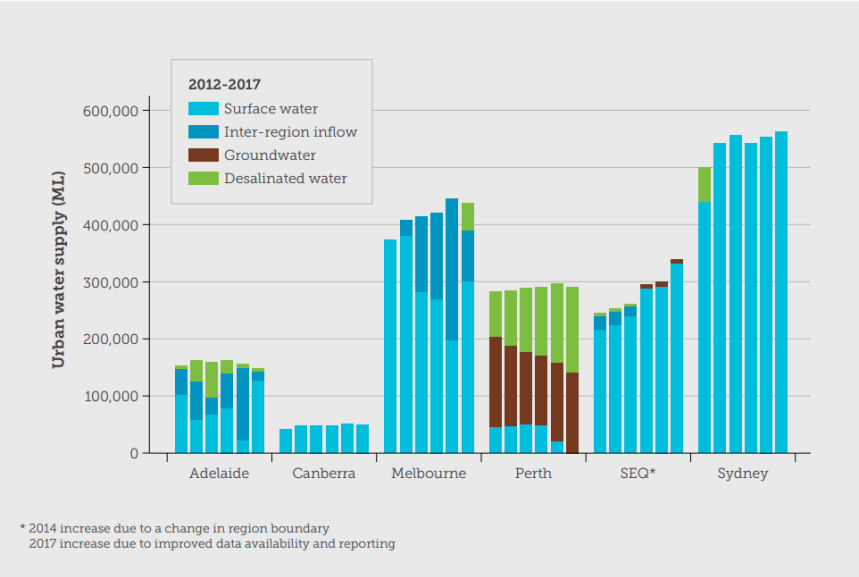
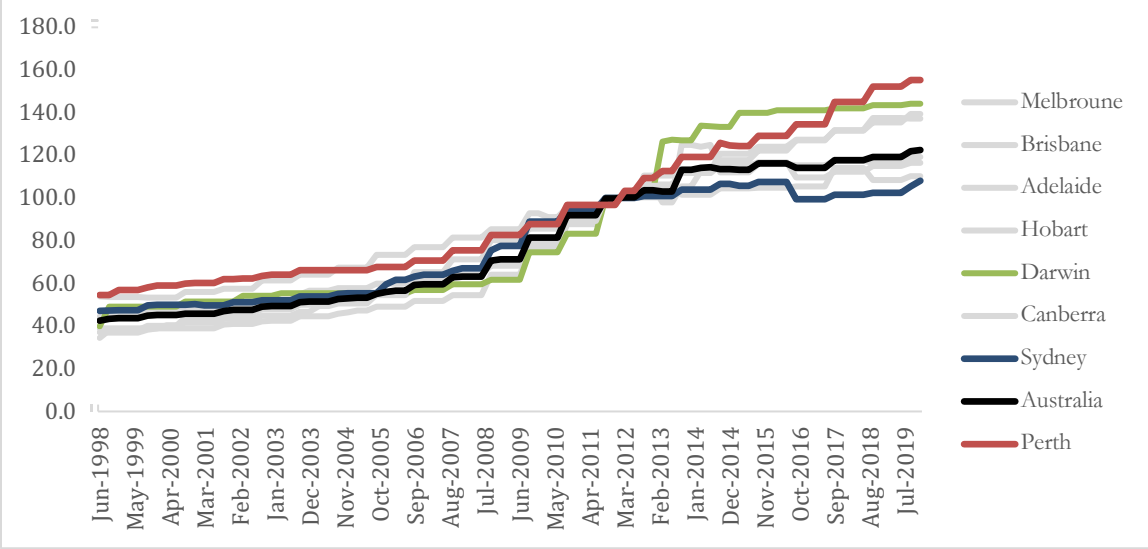


Figure 17: Water and Sewerage Price Index for Major Cities in Australia



Source: ABS industry price indexes

WA's pricing of water — already high — is likely unsustainable. In economic policy, the concept of "scarcity rents" applies to non-renewable resources. When the policy aim is for the resource to be used efficiently by society in consideration of future generations, scarcity rents are charged to users. These rents can be levied in various forms, including through tradable quotas. However, in WA, scarcity rents are not passed on to end users. While this makes water close to free for users that source their own water, water is far from free for society overall. The costs of inefficient water use are ultimately paid for in the costs of desalination, the need for deeper wells, more pumping to

reach groundwater over time, and water transport costs. With a paucity of long-term infrastructure to desalinate and distribute water, these transport costs include the need to move water by truck when localities run out of local supply.

Mining and agriculture source their own groundwater and have never paid a unit price for using that water. Around 40% of all water use in the state is currently attributed to mining, while close to 20% of water use is agricultural. These industries' access to this scarce resource does not fully internalize its true cost and thus has increased the cost of water for others over time, which once again undermines diversification, increase fiscal pressures, and adversely impacts the quality of life. Additionally, by having to devote more public resources than what is economically efficient to safeguard water access, it also means that the state has less degrees of freedom to invest in other public goods that may serve to enhance quality of life across the state or enable the development of other economic activities.

Common Themes

Electricity and water are just two cases of misalignment in public infrastructure in WA with the needs of a diversified economy. But there are myriad of examples of significant inefficiencies in WA's public infrastructure systems. For example, road and rail systems have limited connectivity across sparsely populated regions. The same is true for internet access, with the added limitation that where networks do reach more remote areas, costs are very high. Similarly, air travel is very expensive across the state. Finally, the reach of public services including education and healthcare can only extend so far before services become very thin and quality becomes an issue.

While each of these areas of public goods provision exhibits different dynamics, there are commonalities in the overall misalignment of infrastructure policies. First, structural features of the state make provision complex. Second, forward-looking system-wide planning has been informed by the needs of existing drivers of growth and not necessarily by the needs of prospective drivers of growth. Third, the societal costs of direct and indirect access to public infrastructure are not adequately internalized in the cost structure. Fourth, the high costs of providing infrastructure to remote areas have been socialized through pricing policies and subsidies. What has resulted is an equilibrium where key infrastructure systems face significant weaknesses in coverage and prices that further increase the cost of living, negatively affects the performance of industries unable to safeguard self-provision, and increases fiscal pressures.

Thinking strategically about the challenges existing public infrastructure may pose for diversification efforts is particularly important for WA. Given that labor costs are so high in the state, WA would benefit from all the cost advantages it can get through infrastructure costs to become a competitive location for business activities that would otherwise locate in other parts of the country or other parts of the world. As the cases of electricity and water show, WA starts at a

large disadvantage in cost and coverage for several types of public infrastructure tied to its past drivers of growth. If WA is to diversify its drivers of growth for the future and avoid the pitfalls of the past, strategic public infrastructure development will be critical. An initial discussion of this can be found in Box B below. This discussion is expanded in the *Research Findings and Policy Recommendations Report*.

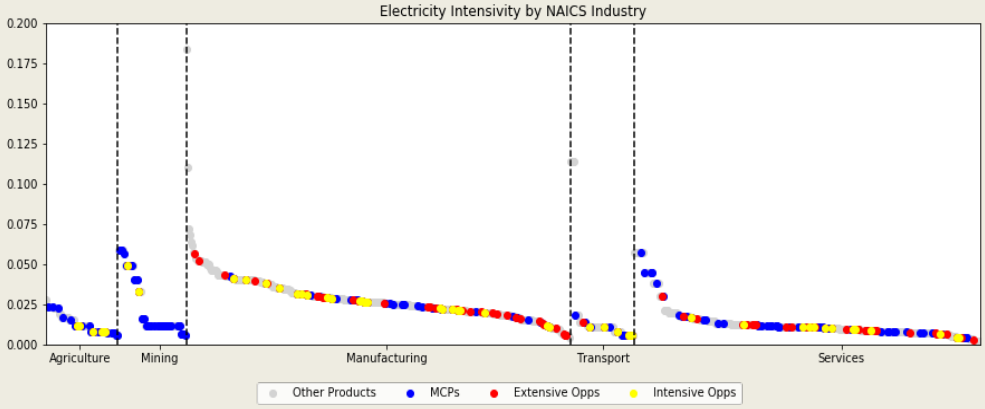
Box B: Public Infrastructure as an Input for Diversification Strategies

While it is clear that infrastructure provision in WA has gaps that may undermine the competitiveness of non-mining and non-agriculture activities, it is not necessarily the case that addressing all of these issues across the state is a necessary precondition for diversification. Business activities that are very intensive in electricity will certainly find WA to be a very expensive place to do business until the state can sustainably lower the price of electricity. Water-intensive industries will be limited to locations where they can be sure that they will have adequate supply. Similarly, industries that require good physical connectivity to other economic hubs will also have limited options for where they can locate. However, not all economic activities are intensive on all public infrastructure.

Building on the Growth Lab's Economic Complexity Report for Western Australia, we can begin to quantify how common these constraints are likely to be among promising diversification opportunities. Figure B1 shows the electricity intensity of all industries, with industries in which WA already has shown a revealed comparative advantage (i.e. MCPs) colored blue and promising diversification opportunities colored yellow and red, depending on whether they would be new industries (extensive opportunities in yellow) or expansions of existing industries (intensive opportunities in red). Figure B2 shows the same graph based on water intensity of production. When yellow dots fall below blue and red dots, it means that prospective industries are less intensive in the use of the factor than industries that have already been developed in the state. Hence, the factor is less likely to be an active constraint to diversification and vice versa.

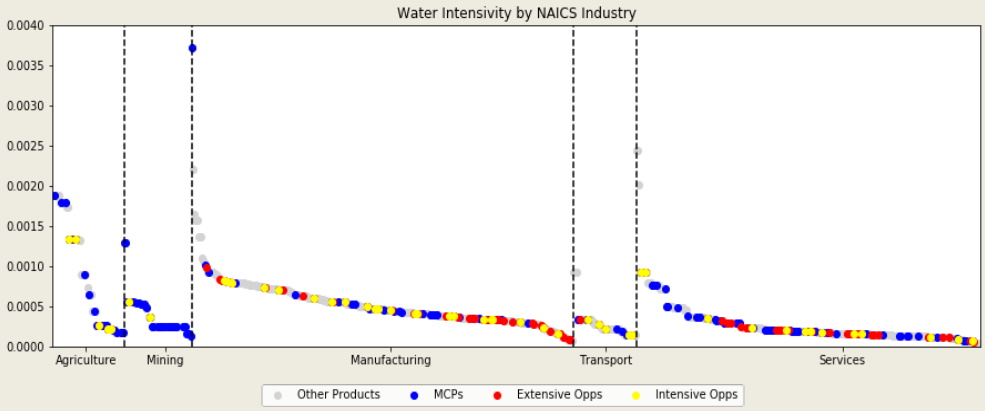
For both electricity and water, potential new industries in manufacturing tend to be significantly more intensive than the current ones, which are located at the low-intensity end of the spectrum. This might mean that promising manufacturing industries find themselves constrained in reality. For example, rolled steel manufacturing is an identified opportunity on the intensive margin that is intensive in electricity use. Our own qualitative interviews revealed an interest in producing steel products in the Pilbara, mirroring demand from mining companies, but a planned galvanizing plant would face prohibitively high electricity costs if it purchased electricity from the grid. Hence, if the project is going to go ahead, it will need to provide its own renewable generation capacity.

Figure B1: Electricity Intensity of Current Industries and Key Diversification Opportunities



Source: BEA Input Output tables

Figure B2: Water Intensity of Current Industries and Key Diversification Opportunities



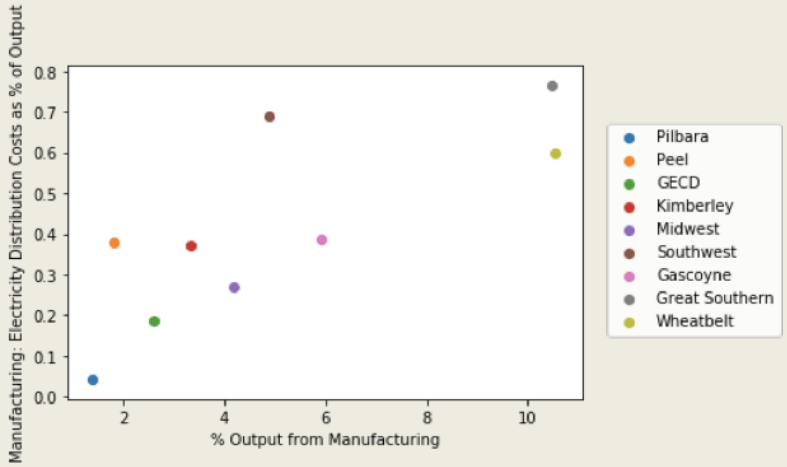
Source: BEA Input Output tables

Meanwhile, the majority of prospective industries in non-manufacturing sectors tend to be as intensive in the use of these factors as existing industries, which signals that these factors may not pose a critical constraint to their development. However, they might be facing other sector specific constraints and thus require additional analysis and active engagement with sectoral stakeholders.

Even this preliminary analysis can be helpful in enhancing diversification strategies. For one, it can serve to prioritize efforts around industries that are less-intensive in the use of scarce public goods. Additionally, it can guide productive dialogue with private stakeholders towards addressing constraints to productivity (i.e. access to cheaper renewable energy in the Pilbara) rather than just fiscal benefits. It also provides a framework to advance diversification initiatives in parallel to medium- and long-term reforms of public infrastructure provision. Lastly, given that different regions have different levels of public infrastructure quality, it can help to fine-tune the roles different regions may play in a state-wide diversification strategy.

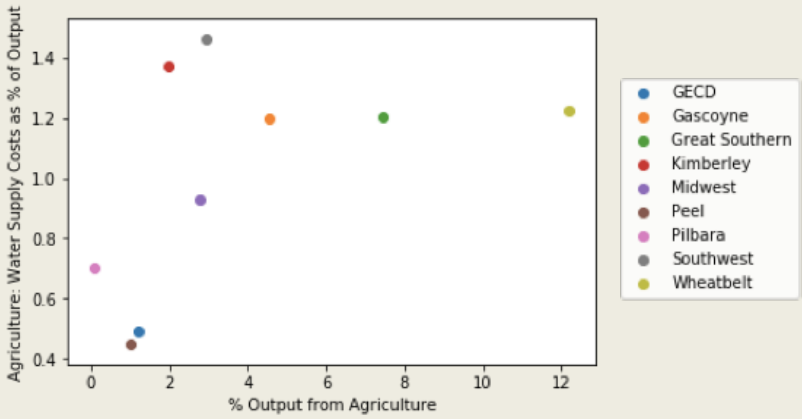
For instance, there is compelling circumstantial evidence that regions with infrastructure constraints may specialize away from those constraints in response. In particular, regions with lower shares of output from agriculture tend to engage in sub-industries within agriculture that are less water-intensive, and vice versa. Similarly, regions with lower shares of output from manufacturing tend to engage in sub-industries within manufacturing less electricity-intensive manufacturing and vice versa (Figures B3 and B4). This type of information is useful in teasing out locations in the state that may be best suited to support the development of prospective industries intensive in the use of a given public infrastructure.

Figure B3: Electricity Intensiveness of Manufacturing Output by Region



Source: Remplan

Figure B4: Water Intensiveness of Agriculture Output by Region



Source: Remplan

7. Conclusions

This Growth Perspective Report has explored the trajectory of the economy of Western Australia, identified several limitations to the quality of growth, and characterized a set of self-reinforcing externalities of the growth process that exacerbate adverse effects. The report does not aim to provide an exhaustive description of the WA economy, but rather outline the central dynamics that shape the boom-bust dynamics of WA's growth process, with the goal of informing a policy framework to resolve key problems. The information is intended to be used in combination with other quantitative analyses and context-specific knowledge of state and local institutions.

Western Australia benefited significantly from the global commodity supercycle experienced between 2002 and 2014. During this period, WA attracted hundreds of billions of dollars in new mining investments, which served as the main driver for rapid economic growth. However, as global demand for key commodities slowed in 2013/14, the flow of investment to expand mining capacity came to a halt. The impact of this sudden stop reverberated throughout the economy. As demand for labor fell statewide through direct and indirect channels, the state lacked supplementary engines of growth that would have been able to absorb these workers. This translated into a sharp increase in both unemployment and underemployment. These labor market dislocations could have been partially mitigated with a larger counter-cyclical stimulus. However, given the pro-cyclical patterns of the state's finances, these impacts were likely exacerbated.

Even though WA's recent growth trajectory over the whole of the last two decades significantly outperformed other states of Australia and peer state and regional economies worldwide, the growth process has significant weaknesses. WA's economy remains vulnerable to exogenous shocks that lead to sudden job losses in the context of an under-diversified economy and the long-term threat of stagnation given its concentration in mining and extractive activities. This Growth Perspective analyzed three self-reinforcing channels that contributed to worsening these vulnerabilities: labor market imbalances, pro-cyclicality of fiscal policy, and a misalignment of public goods. These channels led to externalities that continue to lock WA into boom-bust cycles and undermine diversification that is necessary to reduce these vulnerabilities. Additionally, the report identified the main elements that underpin each of these self-reinforcing channels.

Addressing these challenges is necessary for WA to achieve better growth now and into the future. This analysis underpins the accompanying *Research Findings and Policy Recommendations Report*, which introduces a policy framework to reduce or reverse these self-reinforcing channels and internalize externalities. Ultimately, WA needs not only to leverage policy tools that have been effective elsewhere in the world — and elsewhere in Australia — but also innovation in public institutions to meet the state's unique challenges. This must occur alongside innovation across the private sector to better utilize the state's embedded knowhow. All of these aspects are necessary for WA to develop supplementary engines of growth that can expand concurrently with mining during commodity booms and absorb excess labor capacity during global downturns in commodity demand, which are inevitable.

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