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Regional housing supply and demand in Australia

B. Phillips and C. Joseph

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Acronyms

ANU The Australian National University

Contents

Executive summary	. 1
1 Introduction	. 2
2 Methodology	. 7
3 Results	12
4 Policy implications	17
5 Conclusion	18
References	20
Notes	21
Appendix – Top 10 housing shortage and surplus regions	22

Tables and figures

Figure 1.	House price growth, rents and GDP, Australia (index, 1986=100)	3
Figure 2.	Building completions, annualised, ABS 8752.0	. 4
Figure 3.	Simple ratio of persons growth to dwelling growth	. 5
Figure 4.	Accumulated housing surplus, Australia	. 5
Table 1.	Benchmark variables	8
Table 2.	Housing surplus, states	13
Figure 5.	Housing shortage in Australia, SA3 level, August 2017	14
Figure 6.	Housing shortage in Sydney, SA3 level, August 2017	14
Figure 7.	Housing shortage in Melbourne, SA3 level, August 2017	15
Figure 8.	Housing shortage in Brisbane, SA3 level, August 2017	15
Figure 9.	Scatterplot of SA3 region shortage intensity and price growth	16
Table A.1.	Top 10 SA3 Housing Shortage, August 2017	22
Table A.2.	Top 10 SA3 Housing Surplus, August 2017	22

Executive summary

In this paper we develop a comprehensive measure of the gap between housing supply and demand at a regional level in Australia. We take into account a range of complicating factors such as changing demographics, building types and the increase in unoccopied dwellings at the regional level.

Previous research efforts in Australia focus on national estimates of the housing 'gap' or shortage but here we recognise that housing markets tend to be regional and that house price movements and affordability are likely to be as influenced by local demand and supply conditions as by broad national conditions.

Between the years 2001 and 2017, we estimate the Australian housing market experienced an oversupply of 164,000 dwellings. However, there are significant regional differences with some regions experiencing significant undersupply while others have significant housing surpluses.

Nationally, we do find periods of significant undersuppy, particularly between 2007 and 2014 but for other periods beyond 2001 we find oversupply more than compensated.

The majority of Australia's housing surplus is situated in the inner-city areas of its major capitals, with Inner Brisbane, Melbourne and Sydney all oversupplied due to recent strong growth in unit developments. Many regional centres, particularly those in mining-sensitive areas such as North Queensland and Western Australia, also retain housing surpluses.

Many regions in the middle and outer rings of our major capital cities, particularly Sydney, face modest housing shortages.

The modelling suggests that there is some evidence, albeit relatively weak, that a housing shortage is associated with higher house price growth. The analysis exclusively concerns the concept of underlying demand, recognising that this may not be representative of the demand for housing in a traditional economics sense. The paper also acknowledges the limitations of the analysis in terms of both its conceptual basis and the data it relies on.

This paper does not conclude that people's housing needs are being met or that what is being supplied is at an affordable price point for all families.

The lack of a housing shortage may have significant implications for housing policy in Australia and the economy more broadly. If Australia's current record home-building levels are not balanced by a large housing shortage, then there is the risk that these current levels will reduce in the near future. Policy makers will also need to place greater emphasis on other potential drivers of house price growth and housing affordability, such as a range of demand influences.

1 Introduction

Housing affordability is a major concern for many Australians struggling to buy or rent a home. Australia's housing market has experienced strong price growth over the last few decades, with particularly high growth from the early 2000s. In this paper we consider one element that may have contributed to this growth - the level of home building in Australia. It could be argued that new housing supply has not kept pace with population growth and demographic change, and that a housing shortage is an important driver of house price growth (NHSC 2013). In this paper we develop a set of estimates of underlying demand at a regional level across Australia and match this with actual supply - this enables us to consider housing imbalances.

The National Housing Supply Council (NHSC) was established in May 2008 to monitor housing demand, supply and affordability in Australia, and to highlight potential gaps between housing supply and demand. The NHSC considered housing supply from an aggregate perspective. In this paper we examine both the aggregate and the regional dimensions of the problem, doing so from the basis that Australia is comprised of many distinct sub-national housing markets, rather than operating as a single market at a state or national level. While regional markets are unlikely to be completely independent, it is unlikely that, for example, a housing shortage in inner-city Sydney exerts an immediate impact on regional housing markets in other states. To understand the impact on house prices relating to supply it is important to understand regional markets.

In this paper we develop a methodology enabling estimation of the housing shortage in each Statistical Area level 3 unit (SA3, the ASGS standard for subdivision of Australia at regional level), of which there are around 340 nationwide. This implies an average of around 25,000 dwellings in each SA3. We compare this housing shortage estimate to house price growth within each region, thereby improving understanding of the relationship between supply levels and house prices in individual markets.

Figure 1 indicates that house prices effectively decoupled from income growth around the year 2000: over the past 17 years real house prices (HP_Real) outgrew prices by 117 per cent, incomes (as measured by GDP per capita) by 71 per cent, and rents by 95 per cent. A major structural change in the Australian economy that may have contributed to this disparity is the persisting depression of nominal interest rates since the 1980s. The growth rate of home mortgage repayments is significantly less than for house prices alone, due to significantly lower average interest rates, which have increased by only 22 per cent more than GDP.¹ In Figure 1 this is represented by 'HP_Adjusted'.

There is a range of potential drivers of this house price growth, which includes investors receiving benefits from the tax system – such as the combined impact of negative gearing and discounted capital gains tax arrangements – low interest rates, population growth, strong income growth, periods of housing undersupply, foreign investment, and exclusion of the family home from pension assets testing.² This paper focuses on the supply of new housing in Australia and how that compares to housing demand caused by demographic drivers. We also consider, albeit in a relatively simplistic way, the relationship with house prices at Statistical area level 3.

We emphasise that this paper's primary interest is in demand from the perspective of population growth and demographic change at the regional level, and how well new supply of housing meets this demand. This can be a substantially different concept to demand for real estate, as real estate demand can be affected by an increase in transactions for existing properties, with the concomitant increase in the rate of turnover causing market churn. Likewise, it also diverges from the real demand for new housing, which incorporates consumer preferences



Figure 1. House price growth, rents and GDP, Australia (index, 1986=100)

Source: ABS Residential Property Price Indexes, ABS National Accounts, RBA standard variable rate, author calculations

and other economic drivers, such as interest rates or employment.

There has been considerable interest in housing supply as a potential driver of house price growth, and the related issues of housing affordability. The 2004 Productivity Commission report into First Home Ownership suggests that rising house prices indicate 'demand has been outstripping supply' and that much of this increase was related to more accessible finance and strong economic growth. The report also points to 'unrealistic expectations' in a 'supportive tax environment' along with other concerns such as restrictive land supply and developer charges.

For much of the time since this report, similar arguments have been proposed by industry and government while house prices have continued to rise. While a recent change in the housing market has been a marked increase in residential construction rates, the type of construction has also undergone stark transformation. Traditionally, Australians have purchased detached one- or two-storey houses. Figure 2 depicts the increased construction of residential units and townhouses during this decade.

Over the year to June 2017 Australia built nearly 220,000 dwellings. Construction rates of units and other attached housing have more than doubled this decade, with around 103,000 units, townhouses and terrace houses completed in the latest financial year. Most of these completions are high-rise units in Australia's capital cities. Detached house completions have also trended up in recent years, but the growth has been more modest. This paper accounts for differential in the type of stock being built, with detached housing supporting a greater number of persons per dwelling than units and townhouses.

Of particular interest is whether or not the increase in the number of completed dwellings led to a situation of housing oversupply relative to population growth, or whether new construction has soaked up





a previous undersupply, or if we remain in a situation of undersupply.

Figure 3 provides a rudimentary assessment of dwelling supply relative to population growth. Across Australia the average number of persons per household was 2.6 in 2001.³ Through time the ratio of population growth to dwelling growth has varied between 1.38 in 2000 to 3.23 in 2009. Numbers above 2.6 are indicative of supply shortage, and below indicates a surplus. A proportion of building completions are demolitions, and thereby merely replace old stock; roughly estimating this proportion at 20 per cent suggests the benchmark could be closer to 2.1.

Our methodology described in the section below does not rely on such assumptions, but Figure 2 nonetheless remains a useful guide for understanding changes through time in the supply and demand balance in Australia. On this basis, Australia built too few dwellings for most of the period between 2007 and 2014. For all of the period between 1998 and 2006 we built more than was required. The period after 2014 has also been a period of over-building.

Comparing the balance of person growth with dwelling growth and accumulating any surplus or deficit on the basis of the number of persons per household is a simple way to calculate the overall balance through time. Figure 4 suggests a modest surplus of housing supply between 2001 (our starting point for analysis in this paper) and 2017. A surplus of new building of around 200,000 accumulated between 2001 and 2006. From 2006 to 2014 Australian home building was in deficit relative to population growth by around 250,000 dwellings, leaving a shortage of 50,000 dwellings. Since 2014, a moderate surplus of approximately 27,000 dwellings has accrued. Had our starting-point been 1998, the surplus would have been more significant, at around 190,000 dwellings, since strong homebuilding numbers peaked at 160,000 dwellings while population growth was around half current levels. These results are contrary to those developed in the NHSC's latest report, which suggests that most of its estimated accumulated housing shortage between 2001 and 2011 developed between 2001 and 2006. The NHSC researchers were unable to explain this result, acknowledging that relatively low population growth and strong home building between 2001 and 2006 would indicate this result was unlikely, and that the period between 2006 and



Figure 3. Simple ratio of persons growth to dwelling growth

2011 was the more likely time period for a housing shortage.

The simple approach used in our research has the advantage of being easily calculated for each quarter - in this way it can function as a timely, practicable guide to changes in the demand and supply balance for Australian housing. The downside is that such an approach does not take into account a number of important factors that may alter the



main findings and is much more complicated to calculate at a regional level. Such factors could include an ageing population, the trend toward units and townhouses, which tend to have fewer persons per household, and other household compositional changes, such as an increase in single-parent families or lone-person households. This approach also does not account for the known increase in unoccupied dwellings or changes in the non-private dwelling population. The next section attempts to resolve these shortcomings by developing a new methodolody that can account for these factors.

2 Methodology

The paper relies heavily upon data contained in the 2001 and 2016 Censuses. 2001 is chosen as our base point for analysis. This point in time is partly for convenience (a census being available) and partly as a point just prior to the house price boom in Australia. The simple analysis in the introduction suggests that in the years just prior to 2001 the Australian housing market enjoyed relatively strong housing supply construction and only modest population growth.

This paper attempts to estimate the underlying demand for housing in 2016 based on demographic and building type changes between 2001 and 2016. We compare the estimated underlying demand with actual supply to generate the 'gap' or housing shortage between 2001 and 2016.

The gap estimate is based on changes in the number of persons per household. Where the number of persons per household is higher in 2016 than 2001 we can deduce that underlying demand was greater than what was supplied to the market through this period and there is undersupply. Conversely, where the number of persons per household is lower there is an oversupply of housing in the region.

We don't simply divide the number of persons by the number of households in each region. If a region, for example an inner city region, were to develop through the period such that proportionately more units were built relative to detached housing there would naturally be a lower number of persons per household since units tend to have fewer occupants. Similarly, were a region to attract a higher proportion of couples with children the number of persons per household would naturally tend to increase. To overcome this problem we standardise our results for each combination of housing type - age of head of household, household type and dwelling type⁴.

For each household type combination we calculate their number of persons per household for each

year based on the reweighted unit records in the PolicyMod basefile for both 2001 and 2016⁵.

For each SA3, *i*, we calculated, $N_{16,ij}$ the average number of persons per household for each combination, *j*, of household type. The averages are calculated over the n households in the survey data that belong to each household type combination.

$$N_{16,ij} = \sum_{n} P_{16,ij} / \sum_{n} H_{16,ij}$$
$$N_{01,ij} = \sum_{n} P_{01,ij} / \sum_{n} H_{01,ij}$$

Underlying demand, $D_{16,ij}$ for 2016 is then estimated by multiplying the ratio of persons per household between 2001 and 2016 by the number of households in 2016 for each household type and region.

$$D_{16,ij} = \left(\frac{N_{16,ij}}{N_{01,ij}}\right) * \sum_{n} H_{16,ij}$$

By comparing the actual supply, $S_{16,ij}$ in 2016 with underlying demand we calculate the gap $G_{16,ij}$ for each region and household combination.

$$S_{16,ij} = \sum_{n} H_{16,ij}$$

$$G_{16,ij} = D_{16,ij} - S_{16,ij}$$

 $G_{16,ij}$ is the estimate of housing shortage for each household type combination for a given SA3.

A negative number implies a housing surplus. We aggregate these results to obtain the housing supply shortage or surplus for a given SA3.

$$G_{16,i} = \sum_{j} G_{16,ij}$$

Aggregating each region's gap provides the national estimate of the housing shortage.

$$G_{16} = \sum_{i} G_{16,i}$$

To estimate the number of persons, *P* and households, *H* for each SA3 that enable the calculations above we undertake a reweighting of PolicyMod to benchmarks firstly for 2001 and then for 2016. We estimate the household and person numbers in 2001 using a set of benchmarks for age, dwelling type, and family type distributions. We apply these benchmarks to our PolicyMod model of the Australian Tax and Transfer system. This model is largely based on the ABS Survey of Income and Housing for 2013-14. By reweighting this model to the 2001 Census benchmarks for each SA3, we can be assured of accurately ascertaining not only the number of households, but also the person age profile, dwelling type, and family type. The next step is to reweight PolicyMod according to the same benchmark variables, but this time using the 2016 Census benchmarks for each SA3.

We use a reweighting methodology where we can match a range of different benchmark variables simultaneously. The NHSC research attempted a similar approach, but used only age by sex household headship as a single constraint. With the Gregwt algorithm we can include a vector of constraints – in this instance, age of persons, family type, and dwelling structure, all of which are known to have significantly different household size characteristics. We undertake this analysis at the SA3 level rather than at a state or national level, as was the case with the NHSC research.

Table 1.Benchmark variables

Benchmark Variable	Benchmark Targets
Person age	15–34,35–54,55–74,75+
Dwelling type	Detached, Semi-Detached/ Terrace/Townhouse/Other, Units
Family/Household type	Couple with children, Single parent, Lone person, Couple only, Other

Developing the estimates for the number of households under the 2001 and corresponding 2016 years requires altering the initial weights a_i in PolicyMod to the new weights w_i^{GR} that satisfy the benchmarks for each respective year.

The Gregwt algorithm develops a new set of household-level weights that minimise the squared differences from the original weights subject to a set of constraints (the benchmarks). The mathematical problem that the Gregwt algorithm solves for each SA3 is as follows:

$$\min \left(w_i^{GR}-a_i\right)^2/a_i$$

Subject to:

$$\sum_{n} w_i x_i = X$$
$$\alpha < (w_i^{GR}/a_i) < \beta$$

Where x_i is a row vector of auxiliary variables, and X_i is a corresponding vector of benchmarks. In our case, the auxiliary variables are the age of the head of the household, family type and type of dwelling.

For this paper we include the additional constraint that weight movements must be no more than a pre-specified maximum β or minimum *a* percentage change. These constraints are often applied in microsimulation modelling to ensure that negative weights are not produced and to ensure that no single weight has too much influence in a household based survey. Such constraints require a non-linear solution, which is obtained through the search algorithm Newton-Raphson in the Gregwt SAS code.⁶ As the PolicyMod weights sum up to the number of households in Australia – roughly nine million for 2016 – the initial weights used in the Gregwt algorithm equals these initial weights multiplied by the population proportion of each SA3 relative to the full population of Australia. These weights, a_i are transformed into the new weights w_i^{GR} that satisfy the constraints of the Census benchmarks. Using the w_i^{GR} that relate to 2001 we can estimate the number of persons per household for each household type combination. Likewise, the w_i^{GR} weights that relate to 2016 can be used to estimate this same ratio but for 2016.

The estimate of the supply balance is based on occupied dwellings for each SA3, as the benchmarks and underlying survey data relate to occupied dwellings. It is debatable whether unoccupied dwellings should be included as adding to supply or not. In the 2016 Census there was a buildup of unoccupied dwellings across Australia. Typical unoccupied dwellings could include second dwellings, holiday homes, buildings under construction, for sale, or other types of vacant properties. For this analysis we calculate housing shortage from the perspectives of both including unoccupied dwellings and not including them. By including them we are assuming they do add to supply, and therefore reduce any housing shortage or increase any potential surplus.

The benchmarks used for age are for all persons, whereas the benchmarks for dwelling structure and family type are based on persons in occupied dwellings. As the number of persons in non-private dwellings is growing at a faster rate than the rest of the population, we would expect that our estimates of underlying demand throughout the period to be greater than is actually the case. Between 2001 and 2016 the non-private dwelling population grew by around 220,000 persons, approximately 70,000 above what could have been expected had the population grown at the same rate as the private dwelling population. Our analysis aggregates these additional numbers of people with demand for private dwellings, when in fact they have already been housed in non-private dwellings. To overcome this issue we adjust our population numbers for each SA3 by the growth of the non-private dwelling population that exceeds the population growth for the total population of each SA3.

We have also included estimates of dwelling supply beyond the Census for a further year to August 2017. Our estimates of new dwelling completions for the year preceding the Census (August 2016) are based on building approvals for the calendar year in 2016. A simple and reliably accurate correlation of building approval dates with a date 12 months subsequent establishes building completions. We develop a simple regression model approach for each region, regressing the number of approvals against population growth since 2002. By comparing the estimated approvals with the actual approvals for 2016, we are able to gauge the degree of over or undersupply in the market anticipated throughout the year to August 2017.

We accept this is a rough approximation, made less certain by the prospect that we may currently be experiencing the end of a boom period for new housing development, and that as a consequence a not-insignificant number of building approvals may remain uncompleted. With that caveat in mind, our model suggests that the number of dwelling completions for the year to August 2017 is around 35,000 higher than population growth would predict, and we have therefore reduced the estimation of housing shortage by an amount, *G'*_{17,i}. The plausibility of this approach is bolstered when we compare its results with existing figures: building completions across Australia were running at 218,000 through the financial year 2016/17, while underlying demand by reference to given population growth was closer to 180,000 to 200,000 per annum.7

Finally, after adjustments for non-private dwellings, the change in unoccupied dwellings and the addition to the gap in 2017 our estimate of the housing shortage for each SA3 becomes:

$$G_{17,i} = G_{16,i} - NPD_{16} - UPD_{16} - G'_{17,i}$$

 NPD_{16} represents the increase in non-private dwellings in excess of population growth for the SA3 during the 2001 to 2016 period. UPD_{16} represents the growth in uncoccupied dwellings beyond what would be expected from population growth for the SA3. $G'_{17,i}$ represents the increase in the shortage based on the expected gap for the single year 2017 which is based on modelling of the gap for just 2017 using regression modelling of population growth and building approvals in 2016. As this method only applies to the years between 2001 and 2017, it assumes the housing market was in balance at the commencing year of 2001 therefore we also assume that the housing market in 2001 was in balance with respect to supply of dwellings relative to demand. Nonetheless, this assumption is not without basis. The year 2001 was a point of relative stability in the housing market, with significantly lower house prices relative to income, relatively weak population growth, and significant dwelling supply in the years immediately prior. That said, using 2001 as a starting point of stability or equilibrium is by assumption only and, as mentioned earlier, is in part due to the convenience of a census year with adequate public data provision enabling sophisticated analysis.

Finally, a few caveats around our methodology and the topic covered in this paper. Caution should be taken in drawing conclusions between the housing balance in a given region and house prices. As discussed above, this measure only relates to the concept of underlying demand, not actual economic demand. Observed price growth for a given region or the nation as a whole is a complicated process relating to many factors, most of which are not the focus of this paper. Regardless of the housing balance in a given region, it should also be observed that a housing shortage in a given region does not necessarily cause price increases and, conversely, that a surplus does not guarantee a decline in house prices. The fluctuation of house prices is complex and dynamic: relative to the total stock of dwellings, any particular imbalance may not be significant enough to exert a dramatic impact.

This paper only considers the broad picture within each region of the balance of demand and supply – it does not infer anything about the affordability of that stock. Where a region is found to have a housing surplus, for example, this does not suggest that any of that region's stock is affordable or unaffordable.

Beyond the complexities of understanding asset prices – in this case house prices – there are also several important data caveats to be mindful of that may limit the reliability of this analysis. The census data are not expected to be perfect. The quality of census data does tend to improve through time, with the ABS improving its methods for identifying and recording dwellings. However, buildings such as units and non-private dwellings sometimes present greater obstacles than usual to being recorded, so comparability between censuses is difficult to determine. There are also differences from census to census with regard to response rates. The ABS undertakes additional programs to limit these disparities, such as conducting a post-enumeration survey, but problems remain, particularly at the small statistical area level unit of SA3 regions. This analysis measures persons living in private dwellings, with some adjustment for those in nonprivate dwellings. However, it has not included any attempt to account for the homeless population.

The analysis employs a reweighting methodology using age, family type, and dwelling type as variables that explain the underlying growth. The results may well have been otherwise had alternative variables been selected. Given Australia's ageing population, its trend towards smaller dwellings such as units and townhouses, and towards lone-person dwellings, we do take some account of a reduced number of persons per household in our underlying demand methodology.

However, as pointed out by Kohler and Mere (2015), Australian household sizes have trended downwards since at least 1960, with the average number of persons per dwelling dropping from around 3.6 in that year to 2.6 in 2000. The authors note little change in the ratio since 2000, observing that this trend may have been arrested by higher house prices. Were this paper to factor in a continuation of this trend as part of underlying demand, it is likely that the balance in housing supply would shift towards a shortage of dwellings. While it should be expected that the trend in persons per dwelling would taper off at some point, we acknowledge that underlying demand estimates would be higher than estimated in this paper were such a trend to continue.

It should be noted that the decline in the number of persons per household in earlier decades was partly driven by important social, cultural and legal changes such as no-fault divorce, and lower fertility rates. The impacts of these changes were mostly felt in the decades prior to the 2001 starting point of this research. Marriage, divorce and fertility rates have been relatively stable since 2001.

With these caveats in mind, we believe we have developed a comprehensive measure of the housing balance for Australian regions from the perspective of demographic and dwelling type change. We also point out that an important contribution of this paper is to consider the relativities between regions with regard to housing supply, rather than focus on the aggregate balance of supply and demand.

3 Results

We develop a range of results for each region of Australia. The first estimate is based only on the gap for private occupied dwellings. At this level we find that the Australian housing market is largely in balance, with a surplus of just 8,000 dwellings. This implies that after we account for changes in population structure with regard to age and family type, and account for differences in the types of dwellings these people occupy, we find very little difference in the number of persons per household between 2001 and 2016.

One shortcoming in this shortage estimate using private occupied dwellings only is that the numerator (persons) includes persons living in non-private dwellings, whereas the denominator (dwellings) comprises only private dwellings. Given that there has been an increase in persons living in non-private dwellings, some of the population growth in the above estimate is leakage to the non-private dwellings sector and should shift the balance further towards a surplus. We estimate that the inclusion above of the growth in non-private dwelling residents in the population total overstates underlying demand by 24,000 dwellings and so also understates the surplus of housing estimated.⁸

Nationally we find a further 134,000 'surplus stock' of unoccupied residences. That is, unoccupied dwellings grew by 134,000 more than would be expected by population growth alone between 2001 and 2016. Ignoring the growth in unocuppied dwellings understates housing surpluses or overstates shortages.

That said, the 2016 census only provides limited detail on the nature of this growth. It is also not clear whether this increase accurately represents additional available housing supply, and the extent to which that stock may largely comprise second homes or holiday houses currently unavailable to the market, and unable to be considered as stock that can be balanced against demand. In aggregate, where we assume all unoccupied dwellings are part of the usable supply of housing and we account for the growth in persons living in non-private dwellings, we find that Australia has a cummulative oversupply of 164,000 dwellings as of August 2017 relative to an assumed balanced market in 2001. With regard to underlying shifts in demographic factors and types of dwelling, this suggests that Australia is not presently subject to a housing shortage, and that the recent substantial increase in home building is not a struggle to redress apparent undersupply, but rather is already creating a surplus.

Of course, while this oversupply is evident at the national level, there may well be regions where shortages exist. Given the uncertainty surrounding the nature of unoccupied dwellings, it could be argued that the surplus of dwellings that is available to satisfy underlying demand is somewhere between 32,000 and 164,000 dwellings. Either way, our net additions to the housing stock was greater than required for underlying demand during the period 2001 and 2017.

Table 2 shows our final estimate of supply imbalance and the intensity for each state once we aggregate the shortage for each SA3 within the states. 'Imbalance intensity' calculates the housing surplus or deficit as a share of dwellings for each region. As most states have a 'negative' shortage Table 2 is presented with respect to a 'surplus' of dwellings.

With the exception of a small shortage in Tasmania, all states have a housing surplus relative to 2001. On a dwelling basis, Queensland has the largest surplus at 59,800, but relative to the stock of occupied dwellings the largest surplus is in the Northern Territory, closely followed by the ACT. New South Wales has a very minor surplus, at just 16,200 or 0.6 per cent of occupied stock. Western Australia has a significant surplus at 2.7 per cent of stock.

Table 2. Housing surplus, states

States	Housing Surplus	Imbalance Intensity
New South Wales	16,200	0.6%
Victoria	40,400	1.8%
Queensland	59,800	3.3%
South Australia	13,000	1.9%
Western Australia	25,100	2.7%
Tasmania	-300	-0.2%
Northern Territory	3,500	4.5%
Australian Capital Territory	6,700	4.4%

Source: ANU Centre for Social Research and Methods, ABS

At the regional (SA3) level we find considerable variation across the country. Figure 5 provides the overall mapping of the housing shortage. Most of the country is in a position of surplus, with specific mining areas in Western Australia and the Bowen Basin in Queensland displaying significant excess housing. Shortages are especially prominent around the most populous areas of the southeast coast of Australia and Tasmania.

Figures 6, 7, and 8 depict the major capital cities in detail. Figure 6 focuses on Sydney. It is often claimed that Sydney has failed to build enough dwellings to satisfy its strong population growth in recent years. While building levels have fluctuated in the city since 2001, we find that there are both regions with a shortage and regions with a surplus of dwellings.

Due to numerous recent unit developments in the inner part of Sydney, we do find a significant surplus of stock in the Inner Sydney SA3 region. Inner Sydney has an overall surplus of 5,900 dwellings, the largest of the 328 calculated SA3 regions in this research. This equates to around 5.2 per cent of the total stock of dwellings in this region that is surplus to underlying requirements since 2001. Most of the inner-north and inner-south of Sydney is also in a surplus position. Housing shortages in Sydney are to be found in the mid-west and far-west of Sydney in regions such as Fairfield, Strathfield, Bringelly, and Hurstville. Each of these four SA3 regions rank in the top 10 housing shortage regions of Australia⁹. Figure 7 clearly shows that much of Melbourne is in a surplus position. The inner-city SA3 has a surplus of around 4,000 dwellings, which in relative terms to the stock of dwellings is about the same as Inner Sydney. Much of the middle and outer-ring areas of Melbourne are also in a position of surplus. To the north of Melbourne the SA3 of Whittlesea – Wallan is also in the top 10 in Australia in terms of the size of surplus, at around 2,600 dwellings or 3.4 per cent of stock. Melbourne's regions of Mornington Peninsular and Casey – South are two regions in Melbourne that occupy the top 10 housing shortage list in Australia, each with housing shortages over 1,000 dwellings.

Figure 8 depicts a significant housing surplus in Inner Brisbane with an overall surplus of 4,500 dwellings or 12.7 per cent of total stock. This is the most significant surplus of housing in the country with respect to stock size for major cities and towns. Inner Brisbane has had significant unit development in recent years, and this analysis suggests that development is beyond requirements by a significant extent.

It should also be noted that several other significant regions in Queensland are subject to generous surpluses. Townsville, Cairns and Gladstone, Surfers Paradise, and the Bowen Basin all have substantial surpluses relative to their stock levels. With the exception of Surfers Paradise, most of these regions are towns that are linked to mining activity. All are in the top 10 list of housing surplus regions in Australia, with the exception of Bowen Basin at eleventh place.

Other notable areas of surplus include a number of Western Australian regions such as Kimberly, Stirling, Joondalup, and Pilbara. The Kimberly ranks in the top 10 list of housing surpluses. This is in all likelihood due to minng in these regions – mining centres are heavily influenced by factors affecting non-private dwellings and unoccupied dwellings due to their sometime transience and sporadic populations, which comprise a large proportions of the nation's fly-in-fly-out workforce; for this reason caution should be taken in interpreting data from these regions.





Figure 6. Housing shortage in Sydney, SA3 level, August 2017





Figure 7. Housing shortage in Melbourne, SA3 level, August 2017

Figure 8. Housing shortage in Brisbane, SA3 level, August 2017



Figure 9. Scatterplot of SA3 region shortage intensity and price growth



The expectation would be that regions with shortages would have experienced stronger price growth and, conversely, regions with surpluses less price growth. Figure 9 indicates this correlation to be statistically significant, although it is relatively weak. The figure compares house price growth with supply intensity.¹⁰ Supply intensity is constituted by the particular SA3 region's housing shortage divided by its stock of dwellings. A positive number indicates a shortage, and the larger that number the more intense the shortage in that region. For example, a shortage of 0.1 would indicated that the shortage for a given SA3 was 10 per cent of the total stock of dwellings in that SA3, while -0.1 indicates a surplus of 10 per cent of the current dwelling stock.

It would be expected that regions with a shortage of housing (supply intensity > 0) would exhibit higher price growth than regions with a surplus. Indeed, we do find this to be the case; however, the relationship, while significant, is not particularly strong. Undoubtedly there are many other factors at play that also drive house price growth at the regional level. Figure 9 does indicate that, all other things being equal, regions with a shortage of 1 per cent of stock greater than another region will have experienced price growth of about 2.9 percentage point points greater over the 16 year period since 2001. To put this in perspective, our sample of 328 SA3 regions in the simple regression model below predicts that house price growth of the 90th percentile of shortage will have experienced around 20 per cent stronger house price growth since 2001, about 1.1 per cent per annum, relative to the 10th percentile of shortage region.

4 Policy implications

House prices in Australia are a matter of considerable interest politically, for the public at large, and for policy makers. Ideally, house prices would be lower and housing would be more affordable than at present. Delivering policy that would lead to lower house prices is challenging in view of the current extent of home-ownership – about two in three households already own a home, so lowering prices reduces their wealth and may have collateral effects on the economy, such as decreased consumer spending.

With this in mind, if a goal of policy makers in the area of housing is to lower prices, or at least to lower the rate of growth of house prices in the future, then government does require policy levers that will assist in that goal.

In considering appropriate policy levers it is important to attempt to understand what drives house prices. A common explanation is that housing supply in Australia has not kept pace with population growth and demographic change. Put simply, we are not building enough houses. The theory for this view is that if planning systems enabled a greater supply of housing, then supply could be increased and pressure would be lifted from house prices. This paper shows that Australia has built enough houses from the perspective of population growth and demographic change. In some areas where population growth is known to be robust, such as inner-city suburbs, we have shown that our building levels are presently beyond requirements.

This analysis demonstrates that increasing supply may have some beneficial impacts on reducing house price growth; however, the supply levels between 2001 and 2017 were sufficient, or indeed larger than necessary to cover demand requirements. The reasonable inference from this is that increasing supply may have some benefits, but is unlikely in isolation to create affordable housing in Australia. This inference is all the more likely given the time taken to complete new dwellings and that inevitably in the short to medium term new supply is only likely to be a small share of the total dwelling stock.

This finding that Australia has completed enough homes for our given population growth also has implications for monetary policy and the economy more broadly. It could be argued that if house prices are supported by a lack of supply, then there is less risk of house price falls in the future. It could also be argued that loose monetary policy can be justified from the perspective of high house prices so long as the housing market is supported by a shortage of housing. If, as this report suggests, housing in Australia is not in short supply, then we need to find alternative explanations for house price growth – such explanations would direct policy in applying levers capable of affecting housing affordability.

With the mining boom no longer exerting the positive economic impact Australians have experienced in the last decade, it has been hoped that a large housing shortage will lead to a long boom in housing construction. If our finding is correct that the Australian housing market is not in shortage, then it would seem more likely that the current construction boom and the associated economic boost may only be temporary and not a long-term solution for plugging the current economic gap. It may also be the case that in the absense of a housing shortage that the current record levels of home building construction may not be sustainable.

5 Conclusion

In this paper we develop a comprehensive measure of the gap between housing supply and demand at a regional level. The measure relates to the concept of 'underlying demand' and not 'real demand' for housing – nonetheless, we believe it is a useful guide for understanding the position of regional housing markets with regard to supply covering underlying demographic and dwelling type changes since 2001.

Between the financial years 2001 and 2017, the Australian housing market experienced an oversupply of 164,000 dwellings with varying distributions across regions. This represents a surplus of just under two per cent of the total stock of dwellings. If we regard the increase in unoccupied dwellings since 2001 as artificially supplementing the stock of available housing, and omit it, then that surplus reduces to 32,000 and effectively suggests the housing market is largely in balance. Across Australia, however, there are significant regional differences in the balance of housing supply and demand.

Australia's most oversupplied state-level areas are the two territories – the Northern Territory and the Australian Capital Territory. Queensland also has a significant oversupply, while New South Wales has a relatively small oversupply and Tasmania has a very mild shortage.

The majority of Australia's housing surplus is situated in the inner-city areas of its major capitals, with Inner Brisbane, Melbourne and Sydney all oversupplied due to recent strong growth in unit developments. Many regional centres, particularly those in mining-sensitive areas such as North Queensland and Western Australia, also retain housing surpluses.

Many regions in the middle and outer rings of our major capital cities, particuarly Sydney, face modest housing shortages.

The modelling suggests that there is some evidence, albeit relatively weak, that a housing shortage is associated with higher house price growth. This simple correlation analysis is only preliminary and requires further research before firm conclusions can be drawn.

This research represents Australia's first published regional analysis of housing demand and supply. The aggregate numbers align reasonably closely with a very simple comparison of population growth and dwelling completions, but reveal a richer story with the inclusion of regional information around changing demographic profiles, building contruction types, and other important factors such as the growth rates of non-private and unoccupied dwellings.

The analysis exclusively concerns the concept of underlying demand, recognising that this may not be representative of the demand for housing in a traditional economics sense. The paper also acknowledges the limitations of the analysis in terms of both its conceptual basis and the data it relies on. It should also be emphasised that this analysis does not conclude that people's housing needs are being met or that what is being supplied is at an affordable price point for all families.

The analysis does suggest that while building rates have ebbed and flowed, at times well above and well below the rates suggested by demographic change, national dwelling supply has largely kept pace with, and potentially exceeded, that required. Our innercity areas and some mining areas appear to have a surplus of stock levels, while other areas, particularly middle and outer areas of our major capital cities, have been undersupplied. The relationship between the housing supply level relative to underlying demand is a complex one; despite the difficulties this creates in accurately mapping the causative links in this relationship, this research indicates that increasing the supply of housing can temper price increases, at least to a limited extent. The lack of a housing shortage may have significant implications for housing policy in Australia and the economy more broadly. If Australia's current record home-building levels are not balanced by a large housing shortage, then there is the risk that these current levels will reduce in the near future. Lower future home building lowers direct (and indirect) economic activity, and other things equal, detract from Australia's medium-term economic outcomes.

Finally, the incipient steps this research has taken demonstrates the necessecity of directing greater policy and research attention to the factors driving Australia's house prices. If supply is at best a partial explanation, then a comprehensive understanding of the factors that drive house prices, including a better understanding of housing demand and how to temper that demand will be a prerequisite to improve affordability.

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Notes

- This is calculated using the standard variable rate from RBA statistics https://www.rba.gov.au/statistics/ tables/#interest-rates. We have used the average rate over a rolling 10 year period rather than a point-in-time estimate, taking the view that longer-term interest rates are more important than short-term fluctuations. Whether this is actually the case is worthy of further research.
- 2. The exclusion of the family home from asset testing for pensions is not a new policy and was policy well before house prices in Australia accelerated in the late 1990s. Other taxation arrangements like negative gearing also pre-date the acceleration. These factors likely remain positive influences on housing demand.
- 3. ABS Census 2001. This ratio remains largely unchanged in the 2016 Census.
- 4. The same definitions are used as in Table 1 with the exception that the age variable relates to the age of the head of the household rather than person age of all persons as used for the benchmarking exercise.
- PolicyMod is the ANU model of the Australian tax and transfer system. The reweighting here is applied to the 2015-16 basefile which is largely based on an updated version of the ABS Survey of Income and Housing 2013-14.
- Gregwt.sas was created by the ABS (Bell, P 2000). Gregwt stands for Generalised Regression Weighting.

- 7. Completions of 218,000 is from ABS *Building Activity* and underlying demand is based on an assumed household formation rate of 150,000 per annum from 390,000 increase in population and demolition numbers assumed to be between 30,000 and 50,000. There are no official numbers on demolitions for Australia. The rates calculated by the NHSC diverged significantly throughout its reports, with considerable variation between states, ranging from 1.5 per cent for Queensland to 21 per cent for the NT. In earlier reports NHSC estimates were much higher, ranging between 1.5 per cent for Queensland up to around 50 per cent for the NT. Industry estimates are usually between 15 and 30 per cent of newly constructed dwellings.
- In 2001 there were around 599,000 persons residing in private dwellings. By 2016 there were 823,000 persons. This represents growth of about 70,000 persons beyond population growth for Australia, or around 24,000 on a household basis.
- 9. For the top 10 surplus and shortage SA3 regions see the Appendix.
- 10. The house price measure used is based on SA3 median prices using Corelogic prices. The overall median price is taken as the geometric mean of the median growth of units and the median growth of detached dwellings for each SA3. No account is taken for quality change.

Appendix – Top 10 housing shortage and surplus regions

Table A.1.Top 10 SA3 Housing Shortage, August2017			
Rank	SA3 Region	Shortage	
1	Adelaide City*	5,023	
2	Wyong	2,574	
3	Fairfield	1,808	
4	Shoalhaven	1,700	
5	Hurstville	1,612	
6	Strathfield – Burwood – Ashfield	1,596	
7	Bringelly – Green Valley	1,466	
8	Mornington Peninsula	1,193	
9	Casey – South	1,180	
10	Darwin City	1,075	

*Unusual drop in non-private dwelling persons main contributor to this SA3 result. Caution should be taken as result may be driven by volatility in hotel accomodation.

Table A.2.Top 10 SA3 Housing Surplus, August2017

Rank	SA3 Region	Shortage
1	Sydney Inner City	-5,878
2	Brisbane Inner	-4,537
3	Townsville	-4,259
4	Melbourne City	-3,994
5	Cairns – South	-3,516
6	Gladstone - Biloela	-3,384
7	Kimberley	-3,230
8	Stirling	-2,988
9	Surfers Paradise	-2,878
10	Whittlesea – Wallan	-2,637

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