

THE IMPACT OF LAND SUPPLY ON HOUSING AFFORDABILITY IN THE PERTH METROPOLITAN REGION

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ABSTRACT

A number of commentators and policy makers believe that a potential solution to housing affordability is available through large scale release of newly subdivided land on the urban periphery. The argument follows that releasing more land increases supply and, through market forces, leads to lower new land and house prices. This will, in turn, lead to improved affordability within the stock of existing houses. Despite this view, there has been very little empirical research investigating how large scale land release on the urban fringe actually affects housing affordability. This question has important implications for both planning policy and affordability within local housing markets, but also within the wider aggregate urban housing market. This paper explores this issue by quantifying land release in a number of Perth (Western Australia) Metropolitan suburbs and comparing the extent of land release with changes in land and house prices. Our analysis indicates only a weak relationship between land supply and rates of house price growth, concluding that the drivers of housing affordability are far more complex than the single issue of land release.

Keywords: land supply, housing affordability, Perth

INTRODUCTION

This paper examines the impact of land supply on housing affordability. The influence of land supply on housing affordability remains a controversial topic. Many authors argue that planning restrictions have caused house price rises and a decline in housing affordability (for example Gyourko et al. 2008, Glaeser and Wards 2009, Pendall et al. 2006). This paper does not address this issue. What it does address is the argument from a number of authors that releasing more land increases supply and automatically leads to lower new land and house prices (Moran 2006 & 2008, Demographia 2007, Beer *et al.* 2007, White and Allmendinger 2003, Nelson *et al.* 2002). This will, in turn, improve affordability within the stock of existing houses. This issue is often discussed within the context of 'land banking' by developers and builders. Evans (2004) argues that in the UK environment, land developers need to land bank in order to ensure land is only released when the market will deliver the required returns. The behaviour of developers has significant implications for the success of any land release policy.

Despite this view, there has been very little empirical research investigating how large scale land release on the urban fringe actually affects housing affordability. This question has important implications for both planning policy and affordability within local housing markets but also within the wider aggregate urban housing market.

Housing affordability encompasses both housing prices as well as housing availability. This paper discusses the Perth planning policy environment that dictates land release. We look at patterns of land supply in the Perth metropolitan area and compare the rate of land supply with movements in house prices. Our methodology seeks to examine the question of whether the broad land release policy in Perth has improved housing affordability, or at least slowed the rate of decline. We achieve this by examining the rate of land supply, house price growth and housing affordability within suburbs of very different market characteristics. The paper is organised as follows. Section 2 extends our discussion of the motivation for this research and reviews some of the important related literature. Section 3 describes population growth and housing supply patterns in the Perth Metropolitan region and section 4 outlines the data used in the study and the methodology. Section 5 presents our results before section 6 concludes.

MOTIVATION AND RELATED LITERATURE

Housing affordability in Australia remains a highly controversial issue that is frequently debated both within the popular press and the academic community. It has also become a key political issue within both State and Federal government. In recent years, the debate concerning housing affordability has been defined in an era of rapidly increasing house prices in Australia's capital cities and some significant research and recommendations in terms of policy responses to declining housing affordability. Much of this discourse focuses on the capacity of the land use planning system to deliver sufficient housing supply. In recent years, there has been a new emphasis on supply as a housing policy concern, not only in Australia but also in many other developed countries (Lawson and Milligan 2008, Bramley 2007).

There exists a significant recent academic literature examining land supply and housing affordability in both Australia and internationally. Within Australia, the Australian Housing and Urban Research Institute (AHURI) has promoted a number of recent projects examining housing affordability issues. In "New directions in planning for affordable housing: Australian and international evidence and implications" (Gurran et al: 2008), the authors examine international approaches in planning for affordable housing. The study reviews the arguments of appropriate policy with respect to planning initiatives and affordable housing. It also compares the range of affordable housing strategies currently contained within metropolitan plans applying to a number of Australian capital cities. Gurran et al. (2008) and Gurran (2008) argue that within Australia and internationally, metropolitan planning is now heavily

focused towards managing the outward growth of cities. Planning is now closely associated with environmental and urban sustainability concerns. They argue that in this new planning environment, it is anticipated that cities will still grow in terms of population and new households; however a key planning objective is the containment of growth in the spatial dimensions of the city. The 'urban consolidation' or 'containment' advocates argue that more intensive development in inner-city areas and limited conversion of rural land on the urban fringe will result in more sustainable cities and promote a more efficient and equitable use of urban infrastructure.

A common view that contrasts with the new emphasis in planning policy is that a general solution to housing affordability is available through large scale release of newly subdivided land on the urban periphery. Indeed, the view that containment makes housing less affordable by artificially restricting the supply of land is quite a widely held view. Moran (Moran: 2008 p54) suggests that "the stellar rise in house prices across Australia was due to land costs those costs were shown to be derived from state governments and local authorities acting to restrict the availability of land for housing". Demographia (2007) (an often quoted international review of house price data) identifies a number of regions as examples of where housing is affordable due to liberal land release policies. In contrast, cities including Sydney, Perth and Melbourne all rate as cities where housing is considered unaffordable due to strong planning restrictions on new land release. Basic supply and demand economics tells us that when demand is increasing but supply does not, or cannot respond, then prices rise. The land use planning system plays a crucial role in delivering new housing supply in metropolitan regions. If the planning system is not working efficiently causing delays in the release of residential development land, this will result in an undersupply of new housing relative to demand.

The interaction of urban containment initiatives and housing affordability remains a dilemma for city planners as promoting affordable housing is also a primary objective of metropolitan strategies in Australia (Searle 2006; Beer et al. 2007). There exists a widely held view that policies designed to contain urban growth by limiting the release of land for new development are inherently inconsistent with overall affordability goals (Beer *et al.* 2007, Moran 2006 & 2008, White and Allmendinger 2003, Nelson *et al.* 2002). Other authors express the view that the issue of housing affordability is more complex in its nature and cannot be explained merely by land supply constraints. For example, Gurran (2008) contends that the anti-containment arguments are flawed. The suggestion that policy promoting liberal land release on the urban fringe will reduce house prices elsewhere assumes that the supply of residential land for the construction of new housing on the urban fringe determines house prices across the whole market. This argument ignores the considerable sub-market literature that has established that there are very different housing sub-markets across metropolitan regions (see Jones, Leishman and Watkins (2005) or Coiacetto (2006) for a comprehensive discussion on the characteristics of housing markets and sub-

markets). It also ignores the scale of new housing supply in relation to the established housing market. This limits the potential impact of new supply on existing house prices.

In an extensive review of the literature, Bramley Leishman and Watkins (2008) argue that overall there is no consensus that sub-markets operate independently within city-regions. Their view is that consumers apply rankings of preference between different types and locations for housing services and that all 'sub-markets' overlap causing substitution effects. In this context and in terms of housing affordability, liberal land release policy might well provide a suitable supply of low cost housing on the urban fringe while having no impact in other localities within the same metropolitan region. Alternatively, containment policies may affect affordability if sufficient alternative development opportunities are not provided or because the amenity affect of consolidation is positive and so enhances house prices (Bramley and Leishman 2005a).

Much of the recent literature concerning planning policy and land supply emanates from the UK in response to *The Barker Review of Housing Supply* (Barker 2004). This report presented recommendations to the UK government for securing future housing needs. In general, the findings of the report were that the UK had experienced a long term upward trend in real house prices over the previous 30 years that impacted adversely on housing affordability. In order to reduce the future rate of increase in house prices, a number of policy initiatives were proposed including increasing the supply of existing houses, and allocating additional land in local development frameworks which could be released by market indicators ("triggers"). In general, the report promotes the greater use of market indicators as the basis for providing sufficient land for future housing requirements and a more flexible and responsive planning system. A market trigger or signal such as declining housing affordability would be an indicator that increasing land supply is required to alleviate worsening housing affordability. Within this context, there has been a major shift in policy interest towards the relationship between land use planning and housing market outcomes, particularly concerning affordability for low and moderate income earners (Bramley and Leishman 2005b). In the United Kingdom and parts of the United States, policy responses have included overall approaches to enhancing the responsiveness of the planning system to housing demand, as well as more specific use of planning mechanisms to protect and create new affordable housing units (for example, see Crook et al 2006).

Meen and Andrew (2008) respond to the housing affordability recommendations within the Barker report and argue that the traditional approach to land release used by planners is based on trend household projections not housing affordability considerations. They contend that the traditional planning approach will typically lead to worsening affordability over time. They develop an alternative economic model "more suitable to the post-Barker era", covering both household formation and tenure

choice. This model is used to analyse a range of policy issues, including raising home-ownership rates and home-ownership sustainability.

Many of the Australian policy responses to housing affordability are based on measures of housing stress. Housing stress is commonly defined as *“When a household in the bottom 40% of the income distribution spends more than 30% of its gross income on housing costs it is said to be in ‘housing stress’ as it has insufficient income for life’s necessities. Higher income households who choose to allocate more than 30% of their income on housing costs are not in housing stress. They may have a higher housing cost to income ratio but they will still have sufficient income left for life’s necessities”* (Winter 2008).

The problem with this definition is it relates to households that have already accessed housing in the private or social sectors. Housing stress tends to ignore the large number of Australians in housing need. Housing need is defined as *“households who lack their own housing or live in unsuitable housing and who cannot afford to meet their housing needs in the market”* (Communities and Local Government 2007). Current patterns of large scale land release in the Perth Metro area deliver a very similar product; the 400-600m² lot designed to accommodate a three/four bedroom two bathroom house. Targeting an improvement in housing affordability by increasing the supply of such lots fails to produce a much greater diversity of housing directed at those in need.

POPULATION AND SUBURB GROWTH

The data used in this study were taken from the Perth (Western Australia) metropolitan region for the period 1998-2008 and are based at the suburb level. The pattern for urban development during this period was influenced by the Perth residential development strategy. In summary, the predominant pattern of development can be described as a coastal linear band extending north and south limited by the ocean to the west and corresponding with the urban fringe and development of new public transport infrastructure. In addition, new development has also occurred to the east of the city limited by the Darling scarp. There are also a few relatively minor new developments that can be considered outside the Perth metropolitan region but still within the rural urban fringe. There are some other regions east of the city where there are also high volumes of vacant land sales evident. It is important to note that land supply not only influences the amount of new housing available, but the different varieties of new land released also impact upon the type of housing constructed. The planning system determines plot density as well as certain design characteristics, through the “R-Codes”. These in turn determine the type of housing constructed on the land. Maximising the value of the lot has become more and more important for homeowners as land forms an increasingly large proportion of

the overall value of the final built product. Value tends to be maximised through house size in new release areas.

The proliferation of large lots that produce the standard four bedroom two bathroom house restricts diversity in the new housing stock and limits the supply of new housing to those that can afford to purchase a large plot of land and construct a large housing unit. This in turn tends to raise median prices in these areas as the majority of new houses are large and hence in the higher price ranges. This begs the question as to whether land is being released in a manner designed to maximise profits for key stakeholders in the development process rather than based on sound planning principles focused towards housing affordability considerations.

There exist patterns of very low density housing in the newly developing areas north and south of Perth. Higher density developments within redeveloped areas of the city correspond with easy access to new public transport infrastructure. Almost 80% of the dwelling stock in the Metro area is separate or detached housing with only 10% of the stock defined as medium/high density (Social Housing Task Force 2009). This makes housing development in Perth quite unusual and the results described in this paper perhaps applicable only to areas with similar characteristics.

MEASURING RELATIVE LAND SUPPLY

Our research hypothesis is based on the assumption that land supply has a direct impact on house prices within individual suburbs. As suggested by many authors promoting the anti-containment view of land supply, we would expect that suburbs with a significant supply of new residential lots would experience lower rates of house price growth than those areas with a very limited supply of new lots. Our principal research question concerns whether the quantity of land supply directly affects housing affordability through a significant influence on new land and existing house prices. Our methodology examines both the demand and supply sides of the Perth housing market. In examining the demand side of the housing market, we used Real Estate Institute of Western Australia (REIWA) median house price data for a selection of Perth suburbs (46) and recorded house price growth over the last 1 and 5 years (from December 2008). In adopting this approach, we assumed that the rate of house price growth was the most important driver of housing affordability change for house purchasers during the sample period (a period of rapid price growth). We believe this to be a reasonable assumption given the steady decline in housing affordability from 2003-2008 (HIA 2009) on the back of rising household incomes and fairly stable interest rates.

Policy makers are keen to use the argument that large scale land release will have a direct effect on house prices, but is it really that simple? If it were, we would expect those areas with large scale land release to see median house prices grow at a much

lower rate than suburbs with a restricted land supply. To test this simple hypothesis, we calculate a relative measure of land supply by suburb. The Western Australian Planning Commission publishes quarterly data on the number of final lot approvals. These are lots which have been through the appropriate planning approvals and are ready for sale. This is the best measure of new land reaching the market available in Western Australia. To calculate relative land supply, it was necessary to devise a measure which would allow the comparison of the quantity of land release between suburbs. The existing private sector dwelling stock was used to provide the base measure. Comparing the number of final lot approvals with the quantity of existing stock permitted a direct comparison of the extent of new land supply between suburbs. The final land supply measure is calculated by dividing the number of new lots over a given period of time by the dwelling stock. The percentage figure then becomes the supply measure. This method is illustrated in Table 1 for the Perth Metro area. Over a 5 year period, there was an increase in final lot approvals of 11% when compared to the housing stock from 2006. Although a very simple measure, the principal aim was to allow consistent land supply comparisons between suburbs of different characteristics.

Table 1: Land supply in Perth metro area

Perth Metro Area	
Number Final Lot Approvals: 2001/02-2005/06	58,968
Housing Stock 2006 (Total Private Dwellings ABS Census)	528,532
Supply Measure	11%
Annualised Median House Price Growth: Dec 2003- Dec 2008	14.3%
Median House Price Growth: Dec 2007- Dec 2008	-5.4%

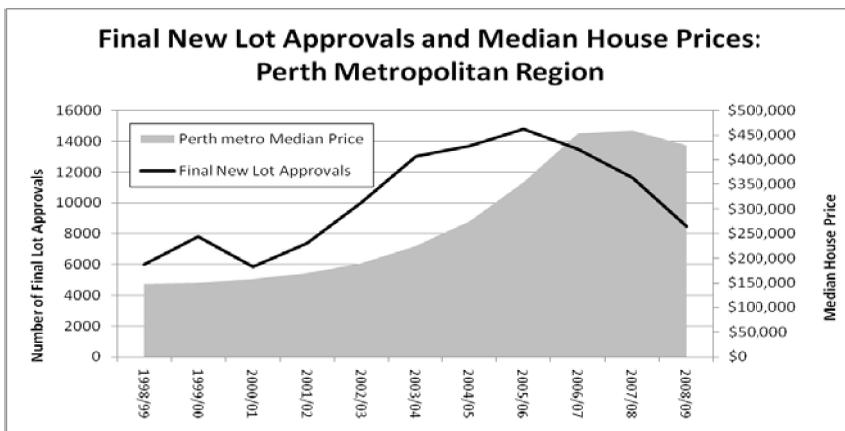
There are, of course, limitations to this measure. First it assumes a stock measure at the end of the land supply period rather than the beginning. The census year 2006 was adopted primarily to allow the comparison of newly developed suburbs that had little or no stock at the beginning of the study period. Land supply is quantified for the 5 year period 2001/02 – 2005/06. This period was selected to allow time for the new lots to be marketed, sold and built out. We assume that the vast majority of these lots were actually sold. This is a fair assumption given the very strong demand for land in the Perth Metropolitan area over the study period. Comparisons with house prices for 2007/08 would allow time for the majority of these new lots to add to the existing housing stock through development, although only a proportion would actually be traded on the market for existing houses.

Returning to Table 1, the average supply measure of the Perth metropolitan region is approximately 11%, meaning that that for the average Perth suburb, the supply of newly approved, individual lots is approximately 11% of the total stock of existing homes. The annualised five-year growth rate in median house prices was 14.3%. This develops a benchmark against which to test other suburbs with different

characteristics. If a supply measure of 11% results in 5 year growth of 14.3%, and most recent 1 year growth of -5.4%, then we can compare the results of other suburbs to examine whether the quantity of supply has had any impact on house price growth rates.

Figure 1 describes the relationship between final new lot approvals and median house prices in the Perth metro region. The graph suggests little relationship between the two variables. Rising prices in the early part of the decade stimulated new lot development but the number of new lots declined rapidly in 2005/06 prior to the peak of the house price boom. This may indicate that some developers anticipated the recent downturn in the market or illustrates a shortage of developable land (most likely a combination). The graph is based on the whole of the Perth Metro area but does indicate the relationship between new land supply and median prices is complex and many demand side factors dominate price formation.

Figure 1: The relationship between final lot approvals and median housing prices in the Perth metro region



Source: WAPC State Lot Activity, Quartile Publication (1999-2009)
REIWA (2008) Market Update, December Quarter 2008.

RESULTS

Our results commence with Table 2. Here we focus on the relationship between house price growth and the supply measure. In the first part of the table, we analyse the top 10 Perth suburbs rated by price growth against the supply measure. If the hypothesis of large scale land supply increasing housing affordability was true, we would expect to see suburbs with the highest house price growth characterised by very low levels of land supply. Supply is restricted and the market driven by demand pressures. It is

evident that eight of the top ten suburbs in terms of 5 year price growth are indeed characterised by low supply levels using the Perth Metro figure as the benchmark. However, this result is not entirely consistent. Note that two of the top 10 suburbs in terms of 5 year price growth have average or well above average measures of supply – High Wycombe at 15% and Seville Grove 26%. For 1 year growth, all but one suburb has a very tight supply of new lots, largely because they are well established suburbs. However, the relatively new suburb of Darch, approximately 25km north of Perth CBD, saw the second greatest land supply of any of the 46 suburbs, 132.6%, and achieved price growth of 5.3%, well above the Perth average. There are a number of explanations for this. First, the supply of new lots has added much larger, higher priced dwelling types to the existing stock which, when traded in the last 12 months, increased the median price. Second, the infrastructure set in place during the development of the suburb has been capitalised into existing prices. With the exception of Darch, there exists a general pattern that the established suburbs with the tight land supply markets experienced the highest price growth.

Table 2: Land supply in high price growth suburbs

Top 10 Price Growth	5 Yr Growth (%)¹	Supply Measure (%)	Top 10 Price Growth	1 Yr Growth (%)	Supply (%)
Claremont	20.3	3.9	Applecross	7.8	7.0
Cottesloe	19.1	4.0	Cottesloe	7.1	4.0
Armadale	18.9	1.1	City Beach	5.4	0.3
City Beach	18.3	0.3	Bayswater	5.3	6.0
Peppermint Grove	18.2	0.9	Darch	5.3	132.6
High Wycombe	18.1	15.2	Mount Lawley	4.8	2.1
Seville Grove	17.6	25.6	Kalamunda	3.9	2.3
Applecross	17.4	7.0	Victoria Park	3.7	3.3
Gosnells	17.3	5.6	Peppermint Grove	3.4	0.9
Perth Metro Region	14.3	11.1	Perth Metro Region	-5.4	11.1

¹ Growth data are taken from the Real Estate Institute of Western Australia's Quarterly Market Update. (REIWA 2008)

When this analysis is extended to the bottom 10 suburbs, the results are inconsistent. Table 3 examines the level of land supply in the suburbs displaying the lowest price growth over the 2 time periods. Baldvis achieved the lowest 5 year growth rate of all the suburbs analysed at 10.1%. The level of land supply influencing that land price growth was 97.3%, so the significant increase in supply contributed to the relatively low growth. Contrast that result with the outcome for Leederville which also achieved low growth but had almost no new land supply over the analysis period (11.2% growth and 1.8% supply). Two contrasting supply outcomes but two similar growth

rates. For 5 year growth, four of the ten suburbs have levels of land supply below the average for the Perth Metro area, but all four achieved below average price growth. For 1 year growth which saw a downturn in many markets, price growth cannot be broadly attributed to an oversupply of land as only 3 of the suburbs received a supply of new land above the average for the Perth Metro region. This suggests there is no clear relationship between land supply and price growth away from the well established, prestige suburbs and there are many other complex factors at play.

Table 3: Land supply in low price growth suburbs

Bottom 10 Price Growth	5 Yr Growth (%)	Supply Measure (%)	Bottom 10 Price Growth	1 Yr Growth (%)	Supply Measure (%)
Baldivis	10.1	97.3	Byford	-18	30.9
Leederville	11.2	1.8	The Vines	-15.4	23.7
Scarborough	11.8	3.3	Scarborough	-15.1	3.3
Secret Harbour	12.3	101.8	South Perth	-14.8	1.6
Port Kennedy	12.5	41.9	Shelley	-14.5	7.3
Darlington	12.7	2.7	Darlington	-14.2	2.7
Cannington	12.7	8.3	Leederville	-13.9	1.8
Madeley	12.7	99.0	Mundaring	-12.6	1.1
Canning Vale	13.2	47.6	Rockingham	-10.2	12.1
Perth Metro Region	14.3	11.1	Perth Metro Region	-5.4	11.1

Table 4 arranges the data according to the supply measure. These results show that areas with a very limited supply of new land have outperformed, in terms of annualised 5 year price growth, the Perth Metro average with only Leederville achieving a growth rate below the average. The situation is more complex for 1 year growth where market volatility erases any pattern. The median price shows how the majority of these tight supply suburbs are in the upper price bracket with only two close to or below the Perth average.

Table 4: Land supply and house price growth

Top 10: Tightest Supply	1 Yr Growth (%)	5 Yr Growth (%)	Supply Measure (%)	Median House Price Dec 2008
City Beach	5.4	18.3	0.3	\$1,900,000
Peppermint Grove	3.4	18.2	0.9	\$3,525,000
Lesmurdie	-6.8	14.3	0.9	\$512,500
Mundaring	-12.6	14.4	1.1	\$450,000
Armadale	-5.1	18.9	1.1	\$280,000
Subiaco	-9.9	16.4	1.5	\$1,165,000
South Perth	-14.8	14.7	1.6	\$1,031,500
Leederville	-13.9	11.2	1.8	\$680,000
Mount Lawley	4.8	15.9	2.1	\$920,000
Kalamunda	3.9	17.1	2.3	\$556,000
Perth Metro Region	-5.4	14.3	11.1	\$440,000
Top 10: Greatest Supply	1 Yr Growth (%)	5 Yr Growth (%)	Supply Measure (%)	Median House Price Dec 2008
Tapping	-1.3	16.3	152.8	\$478,750
Darch	5.3	14.7	132.6	\$565,000
Butler	-4.4	13.4	122.6	\$430,000
Secret Harbour	-3.1	12.3	101.8	\$465,000
Madeley	-2.4	12.7	99.0	\$550,000
Baldivis	-6.4	10.1	97.3	\$421,000
Ellenbrook	-4.8	15.5	69.8	\$395,000
Success	-1.6	15.4	69.6	\$470,000
Canning Vale	-1.3	13.2	47.6	\$490,000
Port Kennedy	-6.4	12.5	41.9	\$365,500
Perth Metro Region	-5.4	14.3	11.1	\$440,000

The areas of greatest supply have performed pretty well when compared to the Perth average. The median prices indicate that these are all typical Perth suburbs, in terms of price characteristics, with four achieving 5 year growth over 14.3%. Even the median prices of Tapping and Darch, the two suburbs with the highest supply measures in the study, have grown in excess of the Perth median.

In testing our hypothesis that higher levels of supply of vacant land will lead to improving housing affordability (lower house prices), our analysis confirms a weak negative relationship between the level of supply and the rate of house price growth

over the last 5 years (correlation coefficient -0.277, sig 0.062). This figure describes the direct relationship between land supply and the rate of house price growth in individual suburbs. Of course, many other factors will weaken the relationship between land supply and house price growth such as the rate at which lots are built out and enter the housing market. Market conditions will alter the rate at which these lots are purchased and developed and then subsequently make their way into the existing housing market.

Parametric statistical tests were applied to establish whether there were any statistically significant differences between the average price growth rates in those suburbs with a strong supply of new land and those with a weak supply. Strong supply was defined as a supply measure above the Perth Median. There were 15 such suburbs. The 15 suburbs with the lowest supply measure were defined as the weak growth suburbs. Total price growth over the period 2003-2008 was calculated for each suburb. It was hypothesised that the average level of price growth in those suburbs that received a strong supply of new lots during the period 2001/02-2005/06 would have a lower price growth rate than those suburbs with a weak supply of new land if supply was the main determinant of price growth.

Both the one-way Analysis of Variance (ANOVA) test¹ and the paired t-test² produced results unable to reject the null hypothesis of no difference in mean growth rates for the two samples confirming that mean price growth was in fact very similar between the two samples. Therefore the level of land supply had no statistically significant impact on rates of price growth across the two groups. Lagged supply effects were also tested with none of the lagged scenarios producing results any different than the original (contemporaneous) scenario. There are limitations to this statistical analysis due to the small sample and future research will produce a more robust analysis by expanding the number of suburbs analysed.

We extended our analysis by examining land supply against vacant land prices. The analysis used the growth in median land prices to compare land price movements. Here we examined our hypothesis more directly by assuming that a greater supply of vacant land would reduce prices of vacant land in those suburbs with the higher supply. In this analysis data availability limited our results to 30 suburbs. The results shown in Table 5 below are more inconsistent in terms of indicating any relationship between changes in supply and changes in prices for vacant land.

This time Darch, although achieving price growth in the existing house market, saw a fall in land prices greater than the Perth metro average. New land supply may not have improved affordability of existing houses but the price of new land declined over the last 12 months (although 5 year growth was still above the Perth average). Some

¹ F = 0.045, sig 0.833

² t= 0.237, sig 0.816

suburbs with the highest levels of growth also exhibit the highest levels of supply, perhaps indicating the impact of developing infrastructure on land prices. In a similar manner, some of the low-priced suburbs also have the lowest levels of supply. Contrary results are obtained in both the upper and lower land price growth sets. In fact, the sample is split approximately 50% in both the upper and lower price groups in terms of the magnitude of supply influence. The suburb with the lowest level of new supply, 2.3% in City Beach, also achieved the lowest level of 5 year growth, 5%. Parametric statistical analysis of all 30 suburbs confirmed no significant relationship at all between land supply and land price growth.

Table 5: Land supply and land price growth

Top 10: Tightest Supply	1 Yr Growth (%)	5 Yr Growth(%)	Supply Measure (%)	Median Land Price Dec 2008
City Beach	-21.0	5.0	2.3	\$830,000
Armadale	-4.7	22.0	3.8	\$176,355
Scarborough	-7.2	13.2	5.9	\$385,000
Fremantle	12.9	13.2	5.9	\$482,500
Rivervale	22.2	21.1	6.3	\$366,500
Claremont	11.2	20.6	5.6	\$745,000
Morley	-18.7	11.2	7.6	\$227,500
Joondalup	-1.0	19.9	10.6	\$485,000
Gosnells	-0.8	24.4	10.2	\$193,500
Bayswater	-9.0	15.7	11.4	\$312,000
Perth Metro Region	-8.1	17.7	11.1	\$239,000

Top 10: Greatest Supply	1 Yr Growth (%)	5 Yr Growth(%)	Supply Measure (%)	Median Land Price Dec 2008
Darch	-12.3	18.8	159.4	\$271,750
Tapping	-4.8	21.1	152.8	\$247,500
Butler	-2.2	19.3	122.6	\$220,000
Secret Harbour	-8.8	18.9	101.8	\$232,500
Madeley	-7.4	15.3	99.0	\$275,000
Baldivis	-9.8	17.8	97.3	\$203,000
Ellenbrook	-9.7	20.1	69.8	\$238,000
Success	-4.0	16.7	69.6	\$240,000
Canning Vale	-11.8	14.4	47.6	\$225,000
Port Kennedy	-10.1	26.5	41.9	\$223,800
Perth Metro Region	-8.1	17.7	11.1	\$239,000

CONCLUSIONS

The simple analysis presented in this paper confirms that there are many important factors outside land supply that determine land and house price growth and therefore housing affordability. The strength of the economy, interest rates, population growth, consumer confidence and incomes are all vital components of house price determination along with the characteristics of the individual suburb and the sub-market within which it sits.

Our results suggest that there is a weak relationship between house price growth and land supply. Markets receiving little new land supply tend to be well established, prestige suburbs where demand pressures have forced up prices above the average for the Perth Metro region. However, there was little relationship between suburbs with very high quantities of new land supply and their price growth characteristics. It seems that the impact of large scale land release on existing house prices, and the price of new land, depends on the characteristics of the market. It could also be the case that the land supply effect occurs at the sub-market level. Large scale land release in a single suburb may not have a price effect in that suburb due to a restricted supply in other suburbs within the same sub-market.

Releasing large quantities of land in an area does not automatically increase housing affordability. There is no 'one size fits all' effect. Our results indicate that in some suburbs increasing the supply of new land can actually decrease affordability by making an area more desirable through improvements in infrastructure and the overall 'quality' of a suburb. A policy of large scale land release targeted at the urban periphery may not have the desired effect, particularly if the land produces identical housing products. However, this product has been successful in the market and developers and landowners have secured their required returns. If land supply in an area does produce a price effect then these returns may no longer be achievable and developers may engage in land banking activity and wait until they are able to release a product that will deliver the required profit margins. This extent of land banking depends on whether developers are price takers or price setters in the Perth Metro market and this is an area in need of further research, as such activity will be a significant determinant of the success of any land release strategy.

Our initial results do suggest that the current pattern of land release in Perth has had little widespread impact on existing house prices for a number of reasons – the strength of demand being key. It may be the case that large scale land release has a much greater price effect in more normalised markets i.e. outside the boom conditions which characterised the Perth market of 2004-2007. For a land supply policy to achieve its desired goal of improving housing affordability, land release needs to be targeted at locations (sub-markets) under the greatest demand pressures, but equally important are the type of lots released. Rather than a single product which results in a

standard house type, usually the large four bedroom, two bathroom house, policy makers need to ensure the delivery of a range of lots resulting in a diversity of final housing product. Such a strategy can target those in housing need.

The issue of sub-markets raises issues for further research. Our current research examines the relationship between land supply and house prices within suburbs. Of course, housing markets are more complex than this and numerous sub-markets exist within the Perth metropolitan area. The patterns of land supply and house price movements within these sub-markets, which may consist of one or a number of suburbs, is much more complex. A significant supply of land within one suburb may have a significant impact on prices within other suburbs which together form the housing sub-market. These sub-markets are characterised by substitutable housing products and just because land supply has had little or no impact on prices in the subject suburb does not mean it has had little or no impact on prices in a neighbouring suburb.

Another key issue is the implementation gap. Final lot approvals will not necessarily result in the development of a final housing product. Speculators may purchase and hold lots and it may take a number of years before these lots are built out. Additionally, lots may remain unsold if there is an oversupply or market conditions become unfavourable. Even if all lots are purchased and developed, it may take a number of years for completed housing units to reach the existing housing market and affect median house prices.

One of the most interesting results from this analysis concerns those suburbs where there is a contrary relationship to our research hypothesis. These are the areas where high levels of land supply correspond with higher levels of existing house and new land price growth. The issue of new land development and associated improvements in infrastructure increasing the median price of existing dwellings is an important one. These are areas where large scale land release was designed to improve affordability not make it worse. This is an issue in need of further research.

Finally, it is important to note that this analysis only applies to the city of Perth, Western Australia, a city characterised by very low density development, during a short period of significant price growth in both established housing and vacant land. In this sense, our results should not be interpreted as being broadly applicable to other regions in Australia or other parts of the world.

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