

16<sup>th</sup> Pacific Rim Real Estate Society Conference, Massey University, 24<sup>th</sup>-27<sup>th</sup> January 2010.

## **The impact of land supply on prices: A sub-market analysis**

**Dr Steven Rowley and Dr Greg Costello, Department of Property Studies, Curtin Business School, Curtin University, Perth, WA**

**16<sup>th</sup> Pacific Rim Real Estate Society Conference, Massey University, 24<sup>th</sup>-27<sup>th</sup> January 2010.**

### **Abstract**

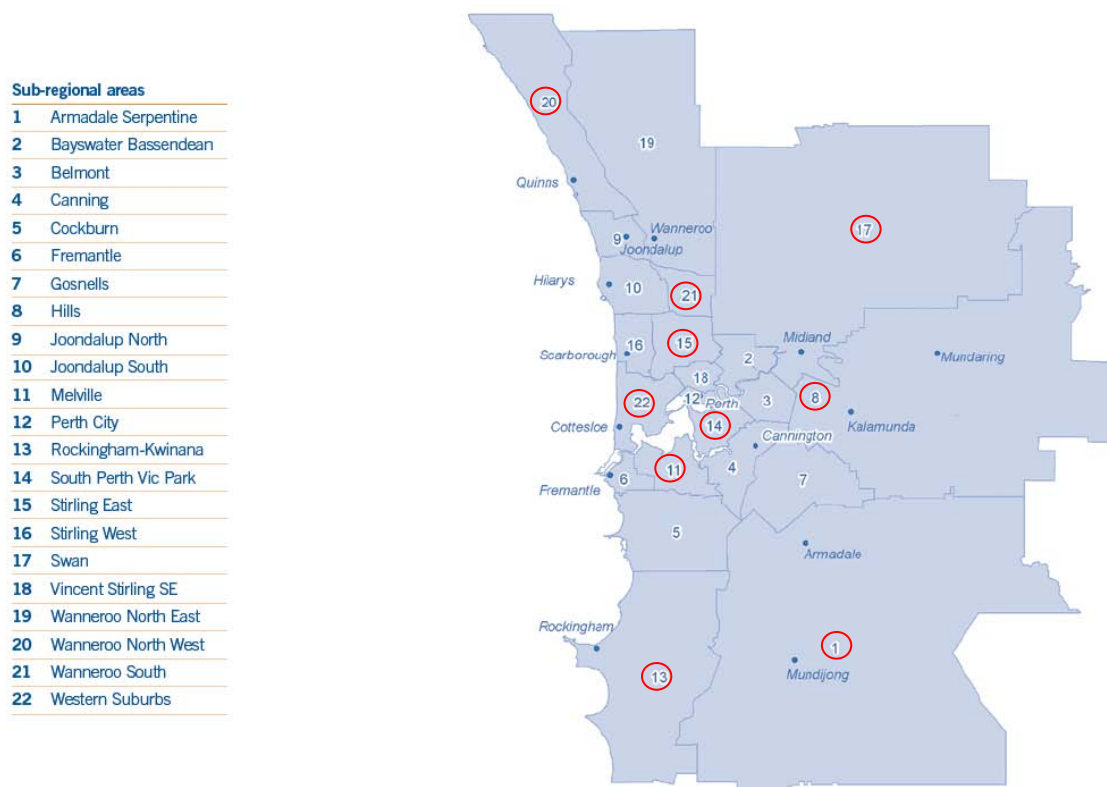
In a paper at last year's PRRES conference the authors examined the relationship between the quantity of new land supply and the growth in house and land prices in over 40 suburbs in the Perth metropolitan area. We found that there was a weak relationship between the quantity of new land and the growth in existing house prices but this relationship was anything but consistent. Many new suburbs with large scale land release experienced price growth well in excess of the average for the Perth Metropolitan area. The paper argued there were a number of reasons for this; first the type of new housing being built pushing up the median price and second, the impact of new infrastructure on the 'quality' of the suburb and therefore demand for housing. This paper extended the analysis by examining land supply and land and house price growth in 153 suburbs across ten housing sub-markets. There is considerable literature on how housing markets operate on a spatial scale much broader than the individual suburb i.e. the sub-market. We used operational sub-markets identified by the Real Estate Institute of Western Australia to identify whether the quantity of land released determined patterns of land and house price growth within the sub-markets. Land release had a weak, but statistically significant, relationship with house prices and those suburbs with high levels of land supply tended to exhibit price growth at a lower rate than suburbs with no new land supply. However, there was no relationship across sub-markets due to the considerable variation within the individual suburbs that constitute the sub-markets. The land supply, house price growth relationship is complicated by issues such as the type of new housing developed, quality of infrastructure accompanying new developments, land banking and land trading. These are issues policy makers need to take address when adopting a large scale land release policy to combat declining housing affordability.

## **Introduction**

The aim of this paper is to establish whether land supply directly affects land and house prices, and hence affordability, in the short term. Previous research by Costello and Rowley (2010 forthcoming) examined the relationship between land supply and house prices in around 50 suburbs in the Perth metropolitan region. They found a weak link between the amount of new land supply and land and house price growth across the period 2001-2008. Supply was just one of a number of factors determining land and house price movements with population growth, interest rates, employment, consumer confidence and income being crucial components in price determination. Some suburbs with significant new land supply actually recorded house price growth rates well above the Perth metro average suggesting improvements in infrastructure and the liveability of a suburb and were being capitalised into prices. Perhaps more important in explaining price movements in these suburbs is the type of housing being built on new land. The large, four by two bedroom houses dominates and, when traded, push up the median price within suburbs that may previously have been dominated by much smaller, older, cheaper housing.

The authors extend their earlier analysis by examining land supply and price growth in 153 suburbs. This paper also includes analysis at the sub-market level to identify whether land supply has a greater effect at a larger spatial scale. 10 of the Perth Metropolitan area's 22 sub-markets are analysed and these are highlighted in figure 1. We also examine the relationship between final lot approvals and land sales. The original analysis quantified land supply through final lot approvals. It could be argued that final lot approvals are not an accurate reflection of final land sales and therefore final dwelling completions if such lots are not brought to the market, sold and then built out. Examining actual land sales through analysis of Valuer General's data eliminates two of these potential criticisms. Of course not all land sales result in a completed product within a defined timescale but this measure is as close to a definitive measure of land supply as we can achieve with available data.

**Figure 1: Sub markets in the Perth Metropolitan Region**



Source: REIWA Market Update June 2009

## Motivation and related literature

In the recent era of the Global Financial Crisis (GFC) 2007-2009, reporting and analysis of housing market activity has been a dominant theme. Recent reports indicate that Australia's major housing markets appear surprisingly resilient, in fact so resilient that a recent speech by the Governor of the Reserve Bank of Australia has been interpreted as warning of a pending housing bubble risk (Murdoch 2009). These recent events ensure the issue of housing affordability remains very prominent in the contemporary macro-economic agenda. Questions surrounding land supply are central to this debate. Our prime motivation in this paper is to examine the important relationships between levels of land supply and house prices with a specific focus on the analysis of appropriate housing sub-markets.

A common supply side view remains in that a general solution to housing affordability is available through large scale release of newly subdivided land. Indeed the view that containment planning policy makes housing less affordable by artificially restricting the supply of land remains a widely held view (Moran: 2008, Demographia: 2007). There exists a general view that economic implications of planning decisions influence the actions of developers. In housing markets the general example is where stringent planning controls over time act to restrict supply and make new

housing expensive to produce. This can occur for several reasons; the supply of land is limited, labour required for production of new housing is scarce, or the restrictive nature of design controls (Nelson et al. 2002). If local housing markets cannot support higher costs new housing will not be developed, or developers and labour will move to regions where planning constraints are less restrictive (Bramley and Leishman 2005, Monk and Whitehead 1999).

Another view suggests that planning systems can have positive economic influences over housing and development outcomes. Through restricting development approval to suitable locations, the planning system protects and maintains the environment and provides valuable infrastructure facilities. It can be argued that planning limitations encourage desirable frameworks for development in urban areas. Examples include concentrations of residential dwellings to support essential services, retail facilities and public transport. Bramley (1996) argues that if development entitlements created through planning regulations are given too liberally they might not be taken up at all as developers will be unwilling to risk an investment that might be devalued by competing developments that might well exceed demand.

There are also convincing demand side arguments for the apparent housing affordability problems. Richards (2008) notes that since 1972 nationwide house prices have risen significantly faster than average household incomes, construction costs and average rents. He argues that there is evidence in Australia to support the view that housing might now be considered as a 'superior good', that is a good to which consumers are allocating an increasing component of their incomes as incomes rise over time. Abelson, Joyeaux, Milunovich, and Chung (2005) examined house prices in Australia between 1970 and 2003 and report that in the long run real house prices are determined significantly and positively by real disposable income and the consumer price index. Prices are also determined significantly and negatively by unemployment, mortgage rates, equity prices and the level of the housing stock (only one of these is an obvious supply side factor).

Another important recent development impacting on both the demand and supply side of housing markets is the land leverage hypothesis. Bostic Longhofer and Redfearn (2007) hypothesise that the appreciation rate of general housing within a local market is a function of the ratio of land value to total property value due to the fact that land values and building values do not appreciate at the same rates. They suggest that historically, land values have appreciated at faster rates than building values implying that highly land leveraged properties will appreciate at a relatively faster rate in response to changes in economic fundamentals. This argument involves both demand and supply side considerations. If it is true that housing is assuming the role of a "superior good" then the land leverage hypothesis suggests demand side pressures are forcing more intensive use of land available for housing and by implication, increasing land leverage. On the other hand, lack of supply of suitable land for housing development could also be viewed as a supply-side cause of more intensive improvement of existing land and increasing land leverage.

Irrespective of specific identification of causes for increasing land leverage the results from the limited number of empirical studies testing this hypothesis confirm that, in general, land leverage is positively related to house price appreciation. It can be demonstrated that land leverage in housing markets has a similar effect to financial leverage in securities markets. This has important implications for housing affordability. If there is a positive shift in the land leverage ratio associated

with transacting properties over time, then historical housing market relationships are transformed. In particular, if high land leverage properties are becoming a larger proportion of total transactions, it is likely there will be higher price responses to changes in economic conditions and more volatile housing markets overall. This important land leverage dynamic must be considered as an important influence in the recent rapid increases in home prices within most Australian capital cities.

The relationship between land prices and house prices is complex. Do high house prices determine high land prices through the residual theory of land price determination or do high land prices contribute to high house prices if house prices are the sum of land, construction costs and profits (Ball 1983)? Ooi and Lee (2006) address this issue in relation to the land and housing market in Singapore. The authors applied a cointegration analysis to determine that land and house prices are integrated in the long run and Granger causality runs from house prices into the land market. They determined that price movements in the land market do not move into house prices in the short term. If such a relationship held true in the Perth metropolitan market we would expect short term increases in land supply to have little impact on existing house prices. Such an analysis also has implications for the land leverage hypothesis.

The Australian Housing and Urban Research Institute (AHURI) promote a number of recent projects examining housing affordability issues. In "Planning, government charges, and the costs of land and housing", Gurran, Ruming, Randolph, and Quintal (2008) appraise existing international and national research on theoretical relationships between planning regulation, residential development costs and house prices. They view one of the main roles of planning as "identifying a sufficient supply of residential land and development opportunities in the right locations and in response to projected demand, while still maintaining an efficient urban structure and environmental performance." (Gurran et al: 2008: p21.) They also note a particular focus in the United States and the United Kingdom, on the impact of planning policy limiting the release of new land for housing and potential house price inflation. They review empirical research over two decades examining the relationship between different planning regimes and housing price impacts. In the more recent studies, they observe that some economists theorise distinct relationships between growth management policies and higher house prices (e.g. Quigley and Raphael 2004, Quigley and Rosenthal 2005). Other researchers utilise econometric methods to evaluate price influences from supply-side changes in high demand housing markets (Aura and Davidoff 2006). This work suggests that relaxing planning constraints in high demand areas does not improve affordability.

Dawkins and Nelson (2002) argue that in analysing the influence of planning factors on house prices a difficulty exists in isolating planning policy factors from other contributing factors, such as natural constraints on the supply of developable land, population growth and housing demand. It is suggested that in some of those factors could actually stimulate more restrictive planning policy as a form of management. Other authors have focused on whether land supply issues can be addressed by mechanisms other than the land-use regulation. Evans (2004) suggests that a taxation regime could provide an effective and equitable means to manage some of the negative externalities associated with development. He argues that a tax system is desirable in that initially it would have no impact on the cost of land itself.

In this paper we adopt a specific sub-market analysis framework to investigate relationships between land supply and house prices. Recently, several authors argue that a reappraisal is required in economic analysis of housing markets and significant benefits can be achieved through effective micro-economic analysis of local markets. Watkins (2008) argues that numerous factors contribute to the rigidity of the submarkets structure within local housing markets. These influences tend to reinforce the importance of neighbourhood level price differentials. On the supply side, the constraints of the planning system restrict the ability of developers to react effectively to important local price influences. Other authors have empirically analysed the effects of new development at the specific neighbourhood level (Jones et al., 2005; Leishman & Watkins, 2004). This research suggests that even where the flow of new supply is large, price effects tend to be limited both within specific submarkets and in other related parts of the general market. These authors comment that in general, price changes tend to be dominated by the "second-hand" part of the market, or subsequent sales of existing property initiated through the provision of new land supply. Through this influence, the price impacts of new supply only tend to emerge over an extended period of time. In a comprehensive recent UK study, Bramley Leishman and Watkins (2008) examine propositions concerning housing market outcomes in England, particularly price changes over a period of 20 years. They focus upon the influence of supply within local housing markets and report evidence that increasing supply can lower prices at the general market area level, but have ambiguous effects at neighbourhood levels. They report that supply-demand effects tend to predominate at the market area level, while at the neighbourhood level environmental, market confidence and social composition effects are at work, potentially in different directions, depending on the type of area.

### **The relationship between final lot approvals and Land Sales**

The remainder of the paper discusses the empirical findings from an analysis of land supply and house prices. Final lot approvals were derived from the WAPC State Lot Approvals publication over the period 2001-2008. Land sales were derived from an analysis of WA's Valuer General's dataset which records all residential property transactions. All land sales within the 153 suburbs with a land area up to 2,000m<sup>2</sup> were identified and recorded. This size limit was imposed to reflect lot sizes which would mainly result in individual land sales. The vast majority of sales were between 400 and 1000m<sup>2</sup>. A dataset for the 153 suburbs was established for the period 2001-2008.

To establish the relationship between final lot approvals and land sales we compared the two datasets for each suburb. There was a very strong correlation (0.94 sig at 1%) between the total number of lot approvals and land sales across the 153 suburbs. Lot approvals are a very strong indicator of final land sales and therefore supply for new housing development. The question still remains how many land sales actually produce dwelling units as this will have a significant influence on the impact of land supply can exert on existing house prices. Land banking and land trading reduce the extent and rate of land being built out and are barriers to an efficient supply response. However, the number of lot approvals is a good proxy for a land supply policy measure.

Table 1 shows the aggregation of lot approvals and land sales at the submarket level. The dwelling stock from the 2006 census provides an indicator of market size. The table shows that between 38% and 63% of final lot approvals resulted in land sales. The gap can be explained by lots failing to sell, multiple approvals on the same site over time, developers not implementing planning approvals and

the exclusion of land sales above 2,000m<sup>2</sup>. On the land sales side, land trading was particularly prevalent in large scale subdivisions on the urban periphery in both the North and South of the metro area, particularly during the latter part of the study period. This will increase the overall number of land sales.

There is significant variation between sub markets. Allowing for a lag of 12 months from approvals to sales creates even more variation. It is not the purpose of this paper to explore in detail the relationship between lot approvals and sales but to establish that the level of approvals in a suburb reflect the number of sales and are therefore a good indicator of land supply.

**Table 1: Lot approvals and Land Sales.**

<b>Sub Market</b>	<b>Total private dwellings 2006 Census</b>	<b>Total Number of New Lot approvals 2001-2008</b>	<b>Total number of land sales 2001-2008</b>	<b>Land Sales/Lot Approvals</b>	<b>Land Sales 2002-2008/Lot Approvals 2001-2007</b>
Rockingham/Kwinana	43,153	13,175	7,893	60%	58%
Hills	28,213	3,112	1,766	57%	57%
Western Suburbs	39,187	1,472	825	56%	52%
Wanneroo North West	14,461	9,137	5,729	63%	59%
South Perth/Victoria Park	31,356	1,790	683	38%	31%
Melville	39,535	2,536	1,081	43%	39%
Armadale/Serpentine	22,184	3,990	2,332	58%	88%
Swan	34,943	7,662	3,357	44%	40%
Wanneroo South	14,958	4,533	2,187	48%	46%
Stirling East	45,682	3,520	1,535	44%	45%

Source: WAPC Periodical, ABS Census Quickstats, Valuer General's Data, Landgate

### **Land Supply and House Prices**

Costello and Rowley (2010 forthcoming) established a weak relationship between land supply and house prices. Generally, suburbs with a high level of land supply exhibited slightly lower levels of house price growth across a five year period. However, this relationship was complex with many suburbs receiving little or no new land showing price growth at or below the median level for the Perth Metro area. The reverse was also true where relatively new suburbs receiving significant new land releases grew at a rate greater than the Perth average. The research concluded large scale land release was not the housing affordability panacea many policy makers believe.

Previous research concentrated on the suburb level. It was suggested that land supply may have an effect at a much wider spatial scale, for example the sub-market, as price changes diffuse across the substitute markets. Our hypothesis contends that house price growth across sub markets with above average levels of land supply would be lower than the average for the Perth market if land supply had a direct and significant impact on prices.

Land supply was quantified through a comparison of new lot approvals with the existing stock of housing. A sub-market (or suburb) with an existing housing stock of 1,000 dwellings receiving new land supply of 100 lots over a defined period would have a land supply measure of 10%. A sub-market (or suburb) with the same dwelling stock receiving 300 new lot approvals over the same period would have a supply measure of 30%. Our hypothesis suggests that price growth would be lower in the suburb with the higher supply measure.

Running the analysis at the suburb level for all 153 suburbs within the study showed virtually no relationship between land supply and 1 year price growth. This reflects the volatile nature of the market over the last 12 months with some suburbs seeing price rises and others dramatic falls. However, there was a relationship between 5 year house price growth and land supply. The 5 year price growth figure records annualised growth over the period 2003-2008. Using two measures of land supply based on final lot approvals and land sales from 2001-2005 (to allow time for lots and sales to deliver completed dwellings) and 2003-2008 (less of a lag assuming a more direct relationship between supply and prices) produced similar results with a statistically significant correlation of around -0.38. This provides some support for the contention that increasing land supply will reduce the rate of price growth in the short (but not immediate) term.

**Table 2: Relationship between Land Supply and House Price Growth**

	<b>Final Lot Approvals 2001-2005</b>	<b>Final Lot Approvals 2003-2008</b>	<b>Land Sales 2001-2005</b>	<b>Land Sales 2003-2008</b>
House Price 5 Year Growth	-.381**	-.377**	-.286**	-.367**
House Price 1 Year Growth	-.094	-.116	-.091	-.119

\*\*Sig at 1% (2 tailed)

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. 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 2001-2005 would have a lower price growth rate than those suburbs with a weak supply of new land if supply was a significant determinant of price growth. The growth rates were determined for the 30 suburbs with the strongest levels of supply and the 30 with the weakest. The growth rates were also compared to the overall rate for the whole sample (144 reliable observations). The means were then compared to identify any statistical differences between rates of price growth and land supply.

The mean growth in the strong supply suburbs was 76.18 compared to 84.45 for weak supply suburbs and 81.91 for all observations (table 3.) The one-way Analysis of Variance (ANOVA) test produced results that showed a statistically significant difference in the mean rates of price growth (at the 10% level) indicating the level of price growth was related to levels of land supply (table 4). The paired sample t-test also produced a statistically significant relationship between average price growth across the two groups (table 4). Both parametric tests allow us to reject the null hypothesis that there is no relationship between land supply and rates of house price growth.



**Table 3: Price Growth by Suburb Type**

	N	Mean	Std. Deviation
Strong Supply 2003-2008	30	76.18	15.91
Weak Supply 2003-2008	30	84.45	19.45
All suburbs 2003-2008	144	81.91	18.95

**Table 4: Results of ANOVA test**

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1241.12	1	1241.12	3.52	.063
Within Groups	50081.36	142	352.69		
Total	51322.45	143			

**Table 5: Results of Paired Samples t-Test**

		Paired Differences				t	df	Sig. (2-tailed)	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower				Upper
Pair 1	Strong Supply 2003-2008 Weak Supply 2003-2008	-8.27	26.07	4.76	-18.00	1.47	-1.74	29	.093

Tables 6 and 7 describe price growth in individual suburbs at the extreme ends of the land supply scale. Given the link between price growth and land supply we would expect to see suburbs of low growth in table 3 where supply is greatest. The relationship is not clear cut with only a third of suburbs experiencing 5 year price growth below the average for the Perth Metro region. These suburbs are characterised by median prices close to the Perth average with only Stirling East significantly above (20% growth). Many of the suburbs are relatively new explaining why land supply is so strong. Despite the level of land supply, many of these new suburbs have achieved better than average growth. This may be because the suburbs are becoming more attractive as they are developed and the improved quality of infrastructure is reflected in the prices of existing and new dwellings. It may also be because the type of housing being built has a much higher median price than existing dwellings in that location. The propensity towards developing the largest possible house on a given block within the Perth market ensures upward pressure on the existing median price when such dwellings are re-sold.

**Table 6: Strong Supply**

Suburb	Sub Market	Median Price December 2006	1 yr Growth	5 yr Growth	Supply measure 2001-2005 Lots
Darch	Wanneroo South	\$565,000	5%	15%	159%
Butler	Wanneroo NW	\$430,000	-4%	13%	123%
Ridgewood	Wanneroo NW	\$390,000	-4%	15%	122%
Bertram	Rockingham/Kwinana	\$380,000	-5%	15%	116%
Secret Harbour	Rockingham/Kwinana	\$465,000	-3%	12%	102%
Madeley	Wanneroo South	\$550,000	3%	15%	99%
Baldivis	Rockingham/Kwinana	\$421,000	-6%	10%	97%
Wattle Grove	Hills	\$468,000	2%	17%	76%
Ellenbrook	Swan	\$395,000	-5%	16%	70%
Wellard	Rockingham/Kwinana	\$410,000	-12%	8%	61%
Clarkson	Wanneroo NW	\$375,000	-5%	17%	50%
Forrestdale	Armadale/Serpentine	\$375,000	-7%	18%	49%
Port Kennedy	Rockingham/Kwinana	\$365,500	-6%	13%	42%
Stirling	Stirling East	\$780,000	4%	20%	40%
Henley Brook	Swan	\$422,750	-11%	14%	39%
Perth Metro Region		\$440,000	-5%	14%	11%

Source: REIWA Market Update June 2009 and authors' calculations.

In contrast to table 6, table 7 describes those suburbs with the weakest supply. These 15 suburbs received virtually no new land supply during 2001-2005 so we would expect prices to grow significantly above the Perth metro average during this period. This is indeed the case. Only one of the 15 suburbs saw 5 year price growth below the Perth average: Viveash at 8%. Interestingly, although weak supply suburbs show greater variation in median prices, the majority of prices are still around the Perth average and, perhaps surprisingly, the table is not dominated by very high price, 'exclusive' suburbs. The high land supply suburbs tended to be in the North and South peripheral sub-markets but the tight supply suburbs tend to be in the East; an area characterised by greater physical development constraints, for example industry and the topography.

**Table 7: Weak Supply**

Suburb	Sub Market	Median Price	1 yr Growth	5 yr Growth	Supply measure 2001-2005 Lots
		December 2006			
Golden Bay	Rockingham/Kwinana	\$410,000	-16%	16%	0.0%
Bedfordale	Armadale/Serpentine	\$730,000	13%	17%	0.0%
Serpentine	Armadale/Serpentine	\$555,000	2%	24%	0.0%
Brookdale	Armadale/Serpentine	\$292,000	-5%	19%	0.0%
Mundijong	Armadale/Serpentine	\$405,000	3%	21%	0.0%
Bullsbrook	Swan	\$345,000	-4%	22%	0.0%
Stoneville	Hills	\$442,250	-10%	17%	0.0%
Viveash	Swan	\$381,000	-5%	8%	0.0%
Stratton	Swan	\$325,000	-3%	18%	0.0%
Kiara	Swan	\$395,000	3%	14%	0.0%
Bickley	Hills	\$637,500	24%	16%	0.0%
Cooloongup	Rockingham/Kwinana	\$300,000	-5%	15%	0.1%
Winthrop	Melville	\$825,000	11%	15%	0.1%
Camillo	Armadale/Serpentine	\$285,000	-1%	19%	0.1%
Guildford	Swan	\$540,000	9%	17%	0.1%
<b>Perth Metro Region</b>		<b>\$440,000</b>	<b>-5%</b>	<b>14%</b>	<b>11%</b>

Source: REIWA Market Update June 2009 and authors' calculations.

The 153 suburbs provide evidence that supply does have an impact on price. However, the sub-market analysis is less definitive. Table 8 describes price growth and land supply across 10 sub-markets. The supply measure quantifies supply for each sub-market and is directly comparable with the overall supply measure of 11% for the Perth Metro area. Four of the ten sub markets received a land supply above the Perth average. However, none of these four sub markets experienced 1 or 5 year price growth below average. Indeed the sub-market with the second highest level of supply, Wanneroo South, had the second highest level of annualised five year price growth: 18.5%. South Perth/Victoria Park, Melville and Stirling East all had very weak land supply but all achieved annualised growth rates below the Perth Metro level. Wanneroo North West had by far the greatest level of supply, 44%, but still achieved price growth above the Perth average at 15.7%. This analysis strongly suggests that land supply does not have an impact on price across these sub-markets. However, it must be noted that these are not statistically derived sub-markets but operational sub-markets drawn up by REIWA. The sub-markets rely more on local authority boundaries than any statistical relationship between housing markets. The analysis does suggest that releasing land in one suburb will not necessarily have a price impact within the suburb's sub-market.

**Table 8: Sub Market Land Supply and House Price Growth**

<b>Sub Market</b>	<b>Median House Price Dec 2008</b>	<b>1 yr Price Growth</b>	<b>5 Yr Price Growth (2003-2008)</b>	<b>Supply Measure</b>	
Rockingham/Kwinana Hills	\$360,000	-4.6%	16.6%	23%	Good Supply
Western Suburbs	\$430,000	-3.4%	16.5%	7%	Weak Supply
Wanneroo North West	\$1,317,500	-3.1%	17.0%	2%	No Supply
South Perth/Victoria Park	\$405,000	-4.7%	15.7%	44%	Excellent Supply
Melville	\$605,000	-3.6%	13.9%	4%	Weak Supply
Armadale/Serpentine	\$630,000	-4.5%	13.0%	4%	Weak Supply
Swan	\$335,000	-1.5%	19.5%	7%	Weak Supply
Wanneroo South	\$380,000	-3.3%	16.8%	14%	Good Supply
Stirling East	\$420,000	2.2%	18.5%	23%	Good Supply
Perth Metro Region	\$405,000	-8.2%	13.0%	5%	Weak Supply
	\$440,000	-5.4%	14.3%	11%	Good Supply

Source: REIWA Market Update June 2009 and authors' calculations.

Theoretically, two sub-markets with very different supply measures should have different overall price growth rates if supply is a dominant price determinant. Even in sub-markets where only a small number of suburbs have received large quantities of new land, the supply should have affected all suburbs as new supply creates substitute goods which ease demand pressures on other suburbs. Table 9 describes the growth of individual suburbs which are aggregated to form two very different sub-markets.

Wanneroo North West has a supply measure of 44% for the lot approval period 2001-2005. This is a rapidly expanding residential area about 45 minutes north of Perth CBD with a number of large, new subdivisions in coastal locations. The suburb of Jindalee was too small to calculate an accurate median price in 2003 but received over 400 new lots in a five year period to add to the 52 private dwellings recorded in the 2006 census. Two other suburbs had supply measures of over 100%. Despite the rapid expansion of many suburbs within the sub-market, price growth was still higher than the Perth Metro region. This shows land supply is only one of many price drivers. In Wanneroo the demand for relatively affordable coastal property has driven price growth. Without the observed level of land supply, price growth may have been even more extreme.

**Table 9: Sub Market Land Supply and Price Growth**

	<b>Median House Price</b>	<b>1 yr Price Growth</b>	<b>5 Yr Price Growth</b>	<b>Supply Measure</b>	<b>New Lot Approvals 2001-2008</b>
<b>Wanneroo NW</b>	<b>\$405,000</b>	<b>-4.7%</b>	<b>16%</b>	<b>44%</b>	<b>9,137</b>
Two Rocks	\$390,000	-5.50%	16%	7%	182
Mindarie	\$645,000	0.80%	14%	18%	619
Merriwa	\$339,500	-5%	16%	23%	524
Quinns Rocks	\$459,763	-5.20%	16%	25%	844
Yanchep	\$420,000	-5.60%	16%	31%	883
Clarkson	\$375,000	-5.10%	17%	50%	2,081
Ridgewood	\$390,000	-3.70%	15%	122%	792
Butler	\$430,000	-4.40%	13%	123%	2,810
Jindalee	\$582,500	-10%	NA	571%	402
<b>Western Suburbs</b>	<b>\$1,317,500</b>	<b>-3.1%</b>	<b>17%</b>	<b>2%</b>	<b>1,472</b>
Floreat	\$1,130,000	-2.20%	17%	0%	15
City Beach	\$1,900,000	5.40%	18%	0%	55
Daglish	\$785,000	-18.70%	10%	1%	5
Peppermint Grove	\$3,525,000	3.40%	18%	1%	18
Dalkeith	\$1,750,000	3.80%	20%	1%	27
Shenton Park	\$1,010,000	2.80%	16%	1%	40
Subiaco	\$1,165,000	-9.90%	16%	1%	86
Wembley	\$945,000	10.50%	18%	1%	107
Nedlands	\$1,700,000	10.90%	19%	2%	119
Swanbourne	\$1,600,000	25.50%	19%	3%	128
Mosman Park	\$1,475,000	9.30%	20%	3%	259
West Leederville	\$1,037,500	22.10%	18%	3%	77
Claremont	\$1,400,000	4.10%	20%	4%	200
Cottesloe	\$2,015,500	7.10%	19%	4%	197
Jolimont	\$1,195,000	25.80%	25%	4%	25
Mount Claremont	\$1,275,000	-1.90%	15%	5%	114

Source: REIWA Market Update June 2009 and authors' calculations.

In stark contrast to Wanneroo is the prestige sub-market of the Western suburbs. This market contains many of Perth's most desirable suburbs including Cottesloe and Peppermint Grove (Perth's most expensive suburb). These are all very well established suburbs only two of which have a median price under \$1m. A number of these suburbs suffered significant price drops in the latter half of 2008 and first half of 2009 (not reflected in the 1 year growth figures above which cover just 2008) as confidence slumped due to the global financial crisis. Many have since started to recover. The market is characterised by a lack of new supply as most areas are already fully developed with only infill activity and the occasional small subdivision adding to supply. However, 5 year price growth is not far ahead of Wanneroo North West despite the great differences in land supply.

What is interesting to note is the variation in 1 and 5 year price growth between suburbs within the same sub-market. In Wanneroo North West, suburb growth is tightly spread around the sub-market average providing some evidence that the suburbs are substitute markets with closely related market growth. In the Western suburbs there is a much greater variation in prices indicating suburbs of very different characteristics. Land supply is likely to have a much more significant impact in sub markets containing similar suburbs due to the substitute effect.

Returning to the suburb level, table 10 examines three different land supply outcomes. First; consistent strong supply where there is good land release throughout the study period (2001-2008). Here there are no consistent patterns of price growth with suburbs both outperforming (in bold) and underperforming average growth. Second; strong early supply which then dries up towards the end of the study period. All suburbs perform around the Perth average. Finally; no early supply but strong late supply. There appears to be a tendency for suburbs to grow quicker than the Perth average. This may be because of a low starting point for the median price which is then increased as new, larger type properties are developed increasing the median price.

In summary, the analysis shows that price effects seem to be localised and it is very much the characteristics of the individual suburb which drive house price growth. The pattern of supply has an impact across the whole Metro area but not necessarily the sub-market. This makes it very difficult to predict what affect large scale land supply will have on individual suburbs without examining the market characteristics of that suburb.

**Table 10: Patterns of Land Supply**

<b>Suburb</b>	<b>Sub Market</b>	<b>Median House Price</b>	<b>5 Yr Price Growth (2003-2008)</b>
<b>Consistent strong supply</b>			
Ellenbrook	Swan	\$395,000	<b>16%</b>
Baldivis	Rockingham/Kwinana	\$421,000	10%
Butler	WNW	\$430,000	13%
Secret Harbour	Rockingham/Kwinana	\$465,000	12%
Clarkson	WNW	\$375,000	<b>17%</b>
Port Kennedy	Rockingham/Kwinana	\$365,500	13%
Darch	Wanneroo South	\$565,000	<b>15%</b>
Madeley	Wanneroo South	\$550,000	<b>15 %</b>
Bertram	Rockingham/Kwinana	\$380,000	<b>15%</b>
Stirling	Stirling East	\$780,000	<b>20%</b>
Rockingham	Rockingham/Kwinana	\$344,000	14%
High Wycombe	Hills	\$380,000	<b>18%</b>
Beechboro	Swan	\$380,000	<b>17%</b>
Byford	Armadale/Serpentine	\$410,000	<b>16%</b>
Landsdale	Wanneroo South	\$500,000	13%

**Strong early supply drying up**

Mindarie	WNW	\$645,000	14%
Caversham	Swan	\$386,250	16%
Henley Brook	Swan	\$422,750	14%
Quinns Rocks	WNW	\$459,763	16%
Merriwa	WNW	\$339,500	16%

**No early supply, strong late supply**

Seville Grove	Armadale/Serpentine	\$333,000	18%
The Vines	Swan	\$630,000	13%
Ridgewood	WNW	\$390,000	15%
Two Rocks	WNW	\$390,000	16%
Leda	Rockingham/Kwinana	\$310,000	19%
Wellard	Rockingham/Kwinana	\$410,000	8%
Forrestdale	Armadale/Serpentine	\$375,000	18%

Source: REIWA Market Update June 2009 and authors' calculations.

**Land Supply and Land Prices**

We extended our analysis to examine the direct relationship between land supply and land prices. Again the hypothesis is that a large increase in land supply should lead to a fall in prices, or at least a reduction in price growth. Table 11 shows that the relationship is not as expected. For 1 year price growth there is a very weak, and not statistically significant, negative relationship between land price growth and land supply. The land market was very volatile in Perth in 2008 with large price falls in many areas but significant growth in others. The correlation suggests that markets with large scale land supply over the specified 5 year period did see a price fall but this is likely to be due more to a short term fall in demand rather than a large scale oversupply. Land supply and 5 year price growth shows a positive relationship over the study period. The lack of land price data means only 43 suburbs were included in the analysis but the results show an increase in price linked to increases in land supply. This may be a coincidence but it could be due to newly developing suburbs being relatively affordable and strong demand pushing up prices from their low starting point. Another explanation could be as these developing areas become more attractive over time new land releases are built out and infrastructure improves increasing the price of land. More data is required to produce a more reliable statistical analysis but the evidence presented at the suburb and sub-market level (table 12) seems to support this contention.

**Table 11: Relationship between Land Supply and Land Price Growth**

	Final Lot Approvals 2001-2005	Final Lot Approvals 2003-2008	Land Sales 2001-2005	Land Sales 2003-2008
Land Price 5 Year Growth	.196	.234	.255	.202
Land Price 1 Year Growth	-.179	-.173	-.166	-.140

Table 12 describes land supply and land price growth at the sub-market level. Three of the four sub-markets with above average land supply measures experienced 5 year growth above the Perth average. Three of the five sub markets with below average land supply saw below average land price growth. The main conclusion of this analysis can only be that other factors have been more important than supply in determining price movements.

**Table 12: Sub Market Land Supply and Land Price Growth**

Sub Market	Median House Price Dec 2008	1 yr Price Growth	5 Yr Price Growth (2003-2008)	Supply Measure	
Rockingham/Kwinana	\$205,500	-6.6%	19.6%	<b>23%</b>	Good Supply
Hills	\$230,000	<b>-11.5%</b>	22.2%	<b>7%</b>	Weak Supply
Western Suburbs	\$1,010,000	-2.4%	19.9%	<b>2%</b>	No Supply
Wanneroo North West	\$225,000	-8.2%	<b>16.5%</b>	<b>44%</b>	Excellent Supply
South Perth/Victoria Park	\$369,000	<b>-26.2%</b>	<b>8.5%</b>	<b>4%</b>	Weak Supply
Melville	\$479,738	-3.9%	<b>12.6%</b>	<b>4%</b>	Weak Supply
Armadale/Serpentine	\$228,500	-0.7%	22.0%	<b>7%</b>	Weak Supply
Swan	\$225,000	<b>-8.2%</b>	20.4%	<b>14%</b>	Good Supply
Wanneroo South	\$275,000	-6.8%	18.2%	<b>23%</b>	Good Supply
Stirling East	\$381,000	16.5%	<b>11.1%</b>	<b>5%</b>	Weak Supply
Perth Metro Region	\$239,000	<b>-8.1%</b>	<b>17.7%</b>	<b>11%</b>	Good Supply

Source: REIWA Market Update June 2009 and authors' calculations.

Analysis at the sub-market and individual suburb level shows very little relationship between land supply and land price although, theoretically, this link should be stronger than land supply and house prices. It may be the lack of available land price data prevents a comprehensive analysis of the relationship. It may also be that the land market is more volatile than the housing market or that land price is affected dramatically as an area develops and improvements in infrastructure are reflected in increased land prices. Land trading is also an issue to consider where land is held for a short period of time and then sold for a profit (in a rising market at least). Such activity will feed through into the data as a greater number of land sales and a rapidly increasing land price; however lot approval numbers would remain unchanged.

## Conclusions

The analysis within this paper has established a weak link between land supply and house price growth across the Perth Metropolitan area. Suburbs with little or no new supply seem to achieve price growth above the average for Perth, as would be expected in a housing market that has been through an unprecedented period of growth. However, the relationship is less clear cut in areas where there is a significant supply of new land. Rather than all suburbs with strong supply achieving below average 5 year growth, some of these suburbs actually outperformed the market. Analysis at the sub-market level was completed to try and smooth the price effects of individual suburbs. It was hypothesised that while some suburbs received significant land supply the price effects would be diffused across the whole sub-market. We would expect there to be a much clearer relationship between the quantity of land supplied across a whole sub-market and price growth within that



market. This did not prove to be the case with prices in high supply sub-markets actually growing at a rate greater than sub-markets with a tight supply.

There are a number of reasons why the theoretical relationship between land supply and price growth is weaker than many policy makers would like to believe. Supply is only one determinant of price. The Perth market of 2001-2008 experienced an unprecedented period of price growth caused mainly by a huge increase in the demand for property caused by population growth, strong employment, income growth etc; partly as a result of the 'resources boom'. The extent of the demand shift meant supply was never going to be able to keep pace and have a significant influence on prices. Some areas delivered an average of 20% per annum price growth over a 5 year period. Even the doubling of land supply had little impact on price growth in many areas. In order to isolate the impact of supply on price, other price determinants would need to be removed from the analysis or the analysis completed during a period of relative price stability.

Using average price growth in the Perth Metro area as a benchmark it was possible to compare market performance for areas with different supply characteristics. As noted above, many suburbs with restricted supply had price growth well above the Perth average but so did some suburbs with very high levels of new supply. This could be due to improvements in infrastructure and the liveability of an area. It could also be because areas characterised by large scale land supply tend to be in peripheral locations where median prices are at or below Perth Median levels. With the demand shift across the Perth metro area many buyers have had to move further away from the city to find affordable land and property. Previously underdeveloped areas with older, smaller house types have seen subdivisions resulting in large, standard four bedroom two bathroom products, which now dominate new dwelling supply in Perth. These large, expensive products feed through into higher median prices for these suburbs when traded. The relationship between price and supply might be much stronger if new supply wasn't changing the characteristics of suburbs and actually reducing the affordability of these previous affordable areas.

Price falls, or at least slower growth rates, in suburbs could be the result of large scale land supply affecting the characteristics of a suburb and not just the supply demand balance. A loss of open space or agricultural land may reduce the attractiveness of an area, for example. Land trading also complicates the relationship. A large proportion of new land sales resulted in the lots being held and then resold in the short term. In the booming land market of Perth 2003-2007, short term gains were easily achievable through land trading. Such trading reduced the land supply response; it takes much longer for lots to be built out and add to the supply of new housing. This partly explains why large scale land release has only a limited impact on prices across the metro region. To maximise the impact of land supply, measures would need to be implemented to reduce land trading and ensure development within a specified timescale. This did occur on a number of subdivisions in Perth at the height of the boom to prevent such land trading activity. Of course land banking has a similar impact where developable land does not reach the market to increase supply.

This research shows the complex nature of the supply:price relationship. Increasing supply does have some price effect but it is impossible to predict just what effect that will be without first exploring the individual characteristics of a suburb. Analysis at the sub-market level seems unable to offer an explanation of the likely effects of land supply in one suburb on prices in the remainder of

that sub-market. There is no relationship between overall levels of land supply and growth rates at the sub-market level. Large scale land supply is not the housing affordability panacea many policy makers would like to believe but it can have an impact on prices at the suburb level even in a market characterised by rapid price growth. However, different suburbs respond differently to supply increases depending upon their existing characteristics and the nature of new supply. New land supply should be carefully directed but, more importantly, should produce a housing product which adds to the diversity of the housing market. The propensity to release large lots, 400m<sup>2</sup> and above, which result in large houses will only increase the median price of newly developing suburbs rather than delivering a variety of housing products that actually offer a supply of affordable housing to the market.

## References

- Abelson, P., Joyeaux, R., Milunovich, G., Chung D. (2005). 'Explaining House Prices in Australia: 1970-2003', *The Economic Record*, Vol 81 (special issue).
- Aura, S. and T. Davidoff. (2006) 'Supply Constraints and Housing Prices', CESIFO (Centre for Economic Studies, Ifo) Working Paper No. 1738, Boston.
- Ball, M (1983) *Housing Policy and Economic Power*. Methuen, London, 1983
- Bostic, R.W., Longhofer, S.D., Redfearn, C.L., (2007). 'Land Leverage: Decomposing Home Price Dynamics', *Real Estate Economics*; Summer 2007; 35, 2, pp. 183-208.
- Bramley, G. (1996) 'Impact of Land-use Planning on the Supply and Price of Housing in Britain: Reply to Comment by Alan W. Evans', *Urban Studies*, 33(9), pp. 1733-1737.
- Bramley, G. and C. Leishman. (2005) 'A local housing market model with spatial interaction and land-use planning controls', *Environment and Planning A*, 37(9):1637-1649.
- Bramley, G., Leishman, C. Watkins, D. (2008). 'Understanding Neighbourhood Housing Markets: Regional Context, Disequilibrium, Sub-markets and Supply', *Housing Studies*, Vol. 23, No. 2, 179
- Costello, G and Rowley, S (2010) The Impact of Land Supply on Housing Affordability in the Perth Metropolitan Region. *Pacific Rim Property Research Journal*, Vol 16, No. 1
- Dawkins, C. J. and A. C. Nelson. (2002) 'Urban containment policies and housing prices: an international comparison with implications for future research', *Land Use Policy*, 19:1-12.
- Demographia (2007) Third Annual Demographia International Housing Affordability Survey: 2007 (Pavelich Properties Limited).
- Evans, A. (2004) *Economics and Land Use Planning*, Blackwell Publishing, Oxford.
- Gurran, N., Ruming, K., Randolph, B., Quintal, D., (2008). "Planning, government charges, and the costs of land and housing", *AHURI positioning paper No. 109*, October 2008, ISBN: 1 921201 32 0, ISSN: 1834-9250.

16<sup>th</sup> Pacific Rim Real Estate Society Conference, Massey University, 24<sup>th</sup>-27<sup>th</sup> January 2010.

Jones, C, Leishman, C and Watkins, C (2005). "Housing market processes, urban housing submarkets and planning policy", *Town Planning Review*, 76, 2, 33-52

Leishman, C. & Watkins, C. (2004) The impact of urban regeneration policies on house prices. Paper presented at the ENHR Housing Economics Workshop, Vienna.

Ooi, J. T. L. and Lee, S. (2006) "Price Discovery Between Residential Land and Housing Markets", *Journal of Housing Research* 15(2), 95 -112.

Monk, S. and C. Whitehead. (1999) 'Evaluating the economic impact of planning controls in the United Kingdom: Some implications for housing', *Land Economics*, 75(1):74-93.

Moran, A. (2008). "How land supply restrictions have locked young people out of the housing market, and how Australia is starting to figure it out". *Review - Institute of Public Affairs* 60, no. 3 (July 1): 54-55.

Murdoch, S. (2009). 'RBA Warns of Housing Bubble Risk', *The Australian, Business*, July 28, 2009. From: <http://www.news.com.au/business/story/0,27753,25847312-462,00.html>

Nelson, A., Pendall, R., Dawkins, C. and Knaap, G. (2002). 'The Link Between Growth Management and Housing Affordability: The Academic Evidence'. A Discussion Paper Prepared for the Brookings Institution Centre on Urban and Metropolitan Policy, Washington.

Quigley, J. M. and L. A. Rosenthal. (2005) 'The Effects of Land Use Regulation on the Price of Housing: What Do We Know? What Can We Learn?', *Cityscape*, 8(1):69-185.

Quigley, J. M. and S. Raphael. (2004) 'Is Housing Unaffordable? Why isn't it more affordable?', *Journal of Economic Perspectives*, 18(1):191-214.

Real Estate Institute of Western Australia (2008) *REIWA market update: Quarterly review of the Western Australian property market*. June Quarter 2009. REIWA

Richards, A. (2008). 'Some Observations on the Cost of Housing in Australia', Address to 2008 Economic and Social Outlook Conference by Anthony Richards, Head of Economic Analysis Department, Reserve Bank of Australia. From: [http://www.rba.gov.au/Speeches/2008/sp\\_so\\_270308.html#t1](http://www.rba.gov.au/Speeches/2008/sp_so_270308.html#t1)

Watkins, C., (2008). 'Microeconomic Perspectives on the Structure and Operation of Local Housing Markets', *Housing Studies*, Vol. 23, No. 2, 163-177.

Western Australian Planning Commission. (Quarterly Publication 1999-2009) *State Lot Activity*. WAPC.