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Land Leverage Dynamics in Housing Markets

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Abstract

This paper develops an empirical test of the land leverage hypothesis applied to the Perth (Western Australia) housing market over the period 1988-2009. Land leverage reflects the proportion of the total property value embodied in the value of the land (as distinct from improvements), as a significant factor for establishing the future path of house prices. It follows that the value of land and value of improvements on that land are likely to evolve differently over time. Since total property price change is a weighted average of change in both land value and improvements, properties that vary in terms of how value is distributed between land and improvements will show different price changes over time. The land leverage hypothesis suggests that the magnitude of price responses should be positively correlated to the level of land leverage. The hypothesis is empirically tested using data on individual housing transactions in Perth Western Australia. Vacant lots subsequently selling as improved properties are identified and analysed in order to measure the influence of land leverage over a sample period 1988-2009. The results confirm a significant relationship between the extent of land leverage and house price changes over time together with some significant temporal influences corresponding with variations in housing market conditions throughout the sample period.

Introduction

Housing has long been recognized as a composite good. Indeed, a standard legal definition of property being: "land and all things attached thereto" provides a convenient separation of the composite housing good into the land and improvement components[1]. In addition, in many Western economies there is a standard tradition for the rating and taxing of property based on unimproved (land) value. At the individual housing parcel (micro) level of property analysis encountered in valuation applications it is important to also note principles of "balance" and "contribution" with respect to assessment of the highest and best use of an individual property. These principles are generally assessed within the context of market conditions at the time of assessment and are usually considered in association with the appropriate equilibrium between building and improvements (see Reed 2007 for a complete discussion). Within the context of historical (ex-post) empirical research these principles become more difficult to observe.

This paper empirically examines the importance of separating housing into land and improvement components. In order to do this a specific market sample of transactions within the Perth (Australia) housing market 1988-2009 is identified. This sample comprises initial vacant land transactions and subsequent sales of improved houses. It will be demonstrated that changes in a property's overall value will depend critically on how much of the total value is contained in the land component. This proportion of total value comprised in the land component can be called "land leverage" (Bostic, Longhofer, Redfearn, 2007).

[1] A more formal definition of “Real Estate”: “Land and hereditaments or rights therein and whatever is made part of or is attached to it by nature or man.” (REIA: 1979)

Motivation and Related Literature

A general stylized example can demonstrate how variation in the change of land and improvement values can influence house price changes over time. Consider two homes, one located in Sydney and the other in Adelaide. Both homes are valued at $450,000. In Sydney, the $450,000 home would likely be a lower-end home in an established area with older depreciated improvements. Suppose that the improvements on the Sydney home are worth $90,000 and the land is worth $360,000. In Adelaide, however, the home is likely to be a higher-end home of new construction with an allocation of $360,000 to improvements and $90,000 to land value. Assume that in a one year period, economic fundamentals (population, household growth, land supply, transportation costs etc) will cause land prices in both markets to increase by 10% during the year. For simplicity, assume no depreciation associated with the housing structures and that construction costs remain stable. The 10% increase in land prices will translate into a $36,000 increase in the Sydney home, and the overall appreciation for the home would be 8%. In contrast, the same 10% increase in land values will only result in a 2% increase in the value of the Adelaide home. Despite the same magnitude of change in land prices, house prices in Sydney would appreciate four times faster than those in Adelaide.

In summary, the property in Sydney is highly land leveraged. High land leverage has a similar influence to financial leverage. Higher exposure to those factors influencing land prices within a local market will have a more significant influence with increasing land leverage. Land value becomes the major source of price appreciation and volatility. To illustrate this point, note that if economic fundamentals were to weaken so that land values dropped by 10%, it is the Sydney home that would suffer a larger overall decline in property value (- 8%), despite the fact that underlying land values changed by the same proportion in the two markets.

Intuition and empirical evidence suggest that price changes for vacant land and improved property are likely to differ over time. The demand and supply characteristics of vacant land markets should ensure that over the long run, there are periods of both under and excess supply. During these periods the corresponding demand and supply characteristics for improved property would respond in a different manner. Chart 1 provides empirical evidence in the form of repeat sales indices for both vacant land and improved properties in the Perth metropolitan region for the sample period, 1988-2009[2]. It is clearly evident that price changes for vacant land were in excess of price changes for improved property during this period. More careful observation of the time path of price changes indicates quite long periods of consistency for price changes between the two series. There appear to be two distinct periods, 1993-94 and 2004-06 where price changes for vacant land well exceed corresponding price changes for improved property.

Established urban economic theory suggests that land values should generally increase in urban areas with population and economic growth. Increasing competition for individual urban land parcels should impact upon land prices so that in an efficient urban land market economic profit is zero. In contrast, the value of improvements at any given point in time is a function of replacement cost less any accumulated depreciation.

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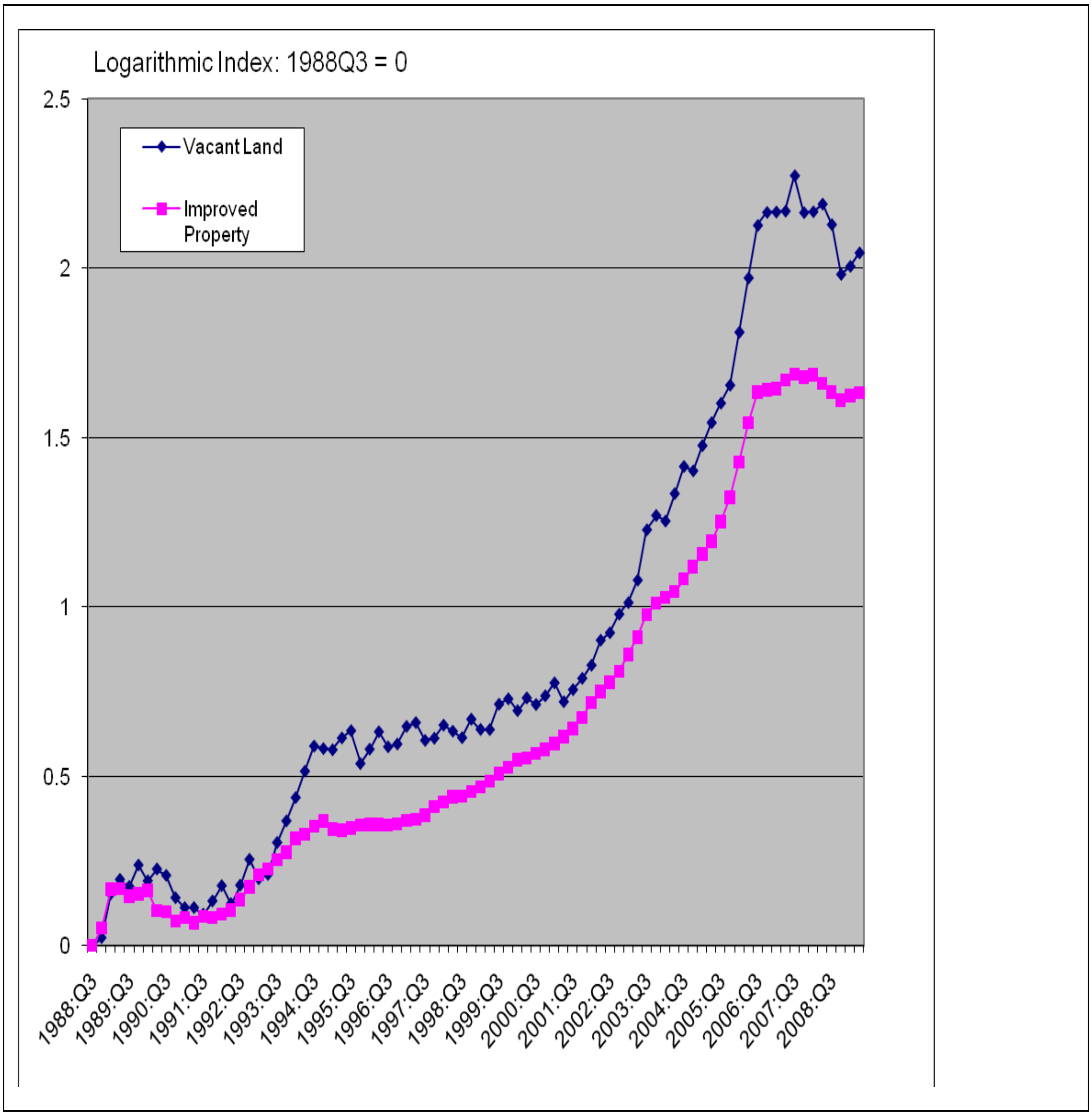
[2] The repeat sales indexes were constructed using the Case-Shiller (1989) three stage weighted least squares (WLS) method.

Chart 1: Vacant Land v Improved Property Prices 1988 - 2009



Hence in general, improvements are unlikely to appreciate at a rate above the increase in construction costs. If depreciation is significant then improvements on individual land parcels can actually decrease rather than increase in value over time. Despite this general observation there are factors that might cause the value of improvements to appreciate at a rate faster than increases in construction costs. For example, the principles of "balance" and "contribution" discussed in the introduction, effective maintenance practices and the specific circumstances of "heritage" properties, deemed as significant due to the historic value of the improvements.

Although detailed empirical studies of land leverage have only been developed very recently in the literature, there is a distinct theoretical relationship to some off the earliest general models of urban economics. Ricardo (1821) developed a general spatial model of land rent relating to intensity of land use (agricultural v urban land). Alonso (1964) Mills (1967, 1972) and Muth (1969) all developed models relating commuting costs and distance from central urban places to explain spatial price trends in the price of land. From this work emerged the body of theory linking price gradients of land within urban areas to specific spatial influences, typically proximity to central points of cities or employment destinations (bid-rent relationships). From this theory emerged the view that the pattern of dwellings that populate traditional urban models will lead to land leverage gradients of the land-to-total-value ratio. A complementary view argues that land leverage relationships will also exist due to the fact that many structures are long-lived and economic factors that generate house price gradients tend to evolve more rapidly in land values than to changes in the overall existing housing stock. These relationships imply that land leverage is likely to vary substantially within urban areas.

Detailed empirical studies of land leverage have only been developed very recently in the literature. Bostic, Longhofer, Redfearn, (2007) define the land leverage hypothesis: "house price appreciation and house price volatility are directly related to land leverage, measured as the ratio of land value to total value" (Bostic, Longhofer, Redfearn, 2007: p.188). In a detailed empirical study of a US housing market (Wichita, Kansas) they demonstrate the importance of separating the composite good of housing into land and improvement components, arguing that changes in a property's overall value depend critically on how much of the total value is contained in the land (land leverage). They further argue that land leverage is relevant for many real estate issues and policies and can significantly improve knowledge of real estate markets. More recently Bourassa et al (2009) hypothesise that houses appreciate at different rates depending on the characteristics of the property and the change in the strength of the overall housing market. They empirically test land leverage dynamics in New Zealand housing markets and report greater price increases for properties with a relatively high land leverage as land values grow at a faster rate than building values.

Data and Methodology

Following Bostic et al (2007), the land leverage hypothesis can be derived through a simple model. The total value of a home (or any) property, V can be separated into the value of the land, L and value of the building (improvements), B:

$$V = L + B$$

Assuming g_L, g_B and g_V represent the periodic percentage change in the land, building and overall property values respectively, the value of a property at date $t+1$ can be expressed in two ways:

$V_{t+1} = V_t(1 + g_V)$ and $V_{t+1} = L_t(1 + g_L) + B_t(1 + g_B)$

By combining these two expressions and rearranging the terms, the overall property appreciation can be decomposed as:

$$g_V = g_B + (g_L - g_B)\lambda_t \qquad (1)$$

Where $\lambda_t = L_t / V_t$ represents the individual property's land-to-total-value ratio, or land leverage, as of date *t*.

Equation (1) is only applicable in describing housing market dynamics if g_L does not equal g_B. If this was not the case, it would be possible to analyse changes in the value of either the land or the improvements and fully capture the market price dynamics within a housing market. If, however, g_L is not equal to g_B then there are two reasons by which housing market price dynamics can differ over time. This allows for more complexity in understanding how market prices evolve over time and how they may evolve differently across regions. The land leverage hypothesis takes the view that g_L can differ from g_B. If land leverage is positively related to price appreciation, then g_L must exceed g_B.

An important implication of the land leverage hypothesis is that within a local market area, where land values are subject to the same economic fundamentals and influenced by the same aggregate rate of price change, each property's overall rate of price change should be positively related to its land leverage. To estimate this effect, specify:

$$g_V = \beta_0 + \beta_1 \lambda_t + \varepsilon \tag{2}$$

In estimating this regression, we obtain separate estimates of $g_B = \beta_0$ and $g_L = \beta_1 + \beta_0$. The land leverage hypothesis implies $\beta_1 > 0$, which in turn implies that $g_L > g_B$.

In equation (1) the land leverage identity is developed using periodic appreciation rates and the reduced form regression model in equation (2) assumes that g_V can be observed for each individual property in each time period. Empirically, we can only observe transaction prices at irregular intervals, and these intervals will differ for individual properties. To account for this empirical reality, it is necessary to compute total appreciation over the individual property's holding period.

Equation (1) can be rewritten as:

$$(1+g_V)^T = (1+g_B)^T + [(1+g_L)^T - (1+g_B)^T]\lambda$$

or

$$g_V = ((1+g_B)^T + [(1+g_L)^T - (1+g_B)^T]\lambda)^{1/T} - 1 \qquad (3)$$

In equation (3) we account explicitly for varying holding periods for different properties. This functional form is nonlinear in the independent variables T and λ. Equation (3) is estimated using nonlinear least squares to estimate population parameters g_B and g_L for a sample of homes in the Perth metropolitan area. In the next section we use data from this sample to estimate both the reduced form (equation 2) and structural versions (equation 3) of this model to test the implications of the land leverage hypothesis.

Empirical Tests of the Land Leverage Hypothesis

In this section we estimate equations (2) and (3) using residential sales data from Perth, Western Australia. The data comes from an historical sales database maintained by *Landgate* a statutory authority administered by the Western Australian government. In order to calculate land leverage for an individual property, the value of the land must be identified separately from the value of the improvements. We do this by using a “market approach" in that we obtain market values of land and improvements directly. This is only possible for new construction, where the sale of a vacant lot can be identified prior to the sale of a completed home. To be included in the sample an individual property must have sold three times, first as a vacant lot and then twice as a completed home. A further criterion was added in that the completed home must have sold within two years of the vacant lot, and the final sale must have occurred at least one year after that. This one year restriction on the second sale is a guard against short-term speculative transactions being included in the sample. Let pL denote the sale price of the vacant lot, $p1$ and $p2$ the prices of the first and second sales of the property after the new home is constructed and T the time between the post-construction sales in years. For each individual property, land leverage for the market approach is calculated as $\lambda = pL / p1$ and an individual property's gross annual appreciation rate is $g_V = (p2 / p1)^{1/T} - 1$.

Table 1: Summary Statistics of Market Sample

Market Sample: 1988:Q3 – 2009:Q3					
Variable	Min.	Median	Max.	Mean	Std. Dev.
Lot Sale	1988:Q3	1998:Q3	2007:Q1	1998:Q3	3.75 years
$Sale_1$	1989:Q1	1999:Q4	2008:Q1	2000:Q1	3.75 years
$Sale_2$	1995:Q1	2004:Q2	2009:Q3	2004:Q3	3.25 years
Const. time	1.00 years	1.00 years	2.00 years	1.00 years	0.40 years
Resale time	1.25 years	3.50 years	20.00 years	4.25 years	1.25 years
Age at $Sale_2$	1.00 years	4.00 years	20.00 years	4.00 years	3.00 years
Bldg. SQM	73	182	576	185	49
Lot SQM	158	600	2,000	593	148
Lot Price	$9,750	$66,000	$1,160,000	$83,819	$67,237
$Price_1$	$34,000	$195,000	$2,950,000	$236,605	$155,690
$Price_2$	$18,500	$322,500	$3,495,000	$357,437	$232,471
g_V	-18.41%	9.60%	49.73%	10.83%	8.83%
λ	12.70%	33.78%	90.00%	36.33%	12.24%
N	3,495				

Table 1 provides a summary of individual property characteristics and their sale dates for the market sample. The vacant land sales took place between 1988:Q3 ending 2007:Q1, while the most recent sale of a completed house occurred in 2009:Q3. On average, it took one year to build a home on a vacant lot and about 4.25 years for the initial owner of the improved property to resell it. The vacant lots ranged between 158 and 2,000 square metres in size, with a medium lot size of 600 square metres. The homes contained between 73 and 576 square metres of building area with a median size of 182 square metres[3]. It is evident that prices vary considerably in the sample. Unimproved lot sales range from $9,750 - $1,160,000 and final sale prices range from $18,500 - $3,495,000. This wide range in sale prices must be considered within the context of the length of the time series 1988-2009. Median prices through the sample period tend to be closer to the lower end of the ranges suggesting a skewed distribution. The key variable, land leverage also displays a considerable range 12.70% - 90% with a mean of 36.33%. The similar median value also suggests a skewed distribution towards the lower end of the range.

Table 2 shows the geographic distribution of the data in the sample. In this case, the Perth metropolitan area has been disaggregated according to specific geographic regions corresponding with local government authorities. The central part of the city has been allocated into a central core (Central) and specific central submarkets (Central East, Central North etc). The outlying and peripheral areas of the metropolitan region are denoted as Northwest, South etc. It is evident that the highest land leverage is in the central and west regions, corresponding with the oldest established areas of the city.

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[3] The building area variable was not available for all observations.

Table 2: Geographic Distribution of Market Sample

Region	*N*	λ	g_V	HPIΔ	HPIσ	VLIΔ	VLIσ
Central	73	43.98%	8.65%	7.84%	7.81%	10.35%	19.15%
Central East	93	38.23%	9.99%	7.61%	9.22%	8.90%	21.39%
Central North	149	39.13%	9.78%	7.60%	9.63%	9.43%	12.72%
Central South	97	42.78%	9.31%	7.88%	8.11%	9.90%	13.83%
East	74	33.62%	11.86%	7.32%	9.29%	9.49%	15.73%
North	782	35.47%	11.65%	7.44%	11.79%	10.13%	18.17%
North-east	415	36.24%	10.03%	7.44%	10.39%	11.74%	16.91%
North-west	379	37.68%	7.59%	6.93%	8.61%	10.79%	13.30%
South	587	32.47%	12.31%	6.68%	10.60%	10.09%	18.14%
South-east	465	36.96%	10.53%	6.78%	10.53%	9.28%	16.49%
South West	317	37.18%	10.39%	7.30%	10.32%	10.53%	19.69%
West	64	41.33%	10.32%	8.75%	8.93%	10.60%	17.65%
Total	3,495	36.33%	10.83%	7.64%	9.12%	9.75%	14.33%

Note: regions are defined according to local government authority areas. These general classifications indicate geographic location with respect to Perth city centre.
HPIΔ and HPIσ are the average annualised change and standard deviation respectively in a repeat sales house price index measured for the sample period 1988-2009. VLIΔ and VLIσ represent the same statistics for a corresponding vacant land price index.
λ = land leverage; g_V = annualised appreciation

It is apparent that there is also regional variation in the individual property annual appreciation rates as measured by g_V. This result is also supported by the individual repeat sales indexes estimated for houses (HPI) and vacant land (VLI). It is apparent that in all regions price levels for vacant land have risen faster than for improved property. This is associated with higher volatility in the vacant land index as measured by the standard deviation. Volatility in the vacant land sales also tends to be greater when measured at the individual region level as compared to the citywide level index for vacant land.

Structural Regression Results

Table 3 shows the estimated results from the nonlinear structural model defined in equation 3. Estimates from the market sample confirm highly significant estimates for both land and building appreciation rates. These estimates indicate that in our specific sample, building values grew at an average annual rate of 9% and land values grew at an average annual rate of 14.7%. This is consistent with earlier results and the prediction of the land leverage hypothesis. Land values in Perth have been growing at a faster rate than building values. By reference to Table 2 it is evident that land rates and the overall appreciation rates in our test sample appear to be higher than for the estimated repeat sales indexes for the larger samples. One reason for this could be that according to the restrictions for sample selection there are more new properties and shorter holding periods. This indicates that a number of these sales could be motivated by effective market timing to maximise returns for sellers. This observation is supported by some further results below.

These estimates are consistent in suggesting that land values have been growing at a faster rate than building values. It is possible to rewrite equation 1 as:

$$g_V = g_B(1-\lambda) + g_L\lambda \, .$$

Through this specification we can demonstrate that the growth rate in overall property values can be decomposed as the weighted average of the building and land growth rates, with the weights based on land leverage. From the regression coefficients in Table 3 and the average land leverage rate in our market sample of 36.33%, we see that the average predicted property value growth rate is 11.07%[4]. This estimate is very close to our market sample mean growth rate of 10.83%, providing confirmation of the validity of estimates.

Table 3: Nonlinear Regression Results

Market Sample	
g_L	0.147 (73.5)**
g_B	0.090 (17.3)**
Observations	3,495
Adj. R-squared	0.466

Absolute value of *t* statistics in parentheses.
** significant at 1%.

[4] From $g_V = g_B(1-\lambda) + g_L\lambda$ calculated as:
0.1107 = 0.090(1 – 0.3633) + (0.147 x .3633)

Reduced Form Regression Results

The advantage of the structural specification (equation 3) is that this model accurately accounts for different holding periods among individual properties in the sample. The main disadvantage is that it is very difficult to include and test other independent variables to check for stability of the model specification. It is intuitive that other factors such as the physical characteristics of an individual house, or time of sale, or location, may affect either land, g_L or the building appreciation rate, g_B and hence an individual properties overall appreciation rate, g_V. Table 4 provides results from various reduced form model specifications. The first model is a simple linear regression of initial land leverage on annualised growth (equation 2). Following the earlier discussion of this model, the constant term provides an estimate of, g_B the building value growth rate, while the land value growth rate g_L is the sum of the coefficient on λ and the constant term. The reduced form regression estimates of g_B = 7.3% and g_L = 16.3% for the market sample are roughly consistent with the more technically accurate nonlinear regression results. As for previous results, land values grow faster than building values implying that land leverage can help explain an individual property's overall appreciation rate. Since the varying time between sales is the factor that motivated the use of the nonlinear specification, Model 2 includes the time between the vacant lot sale and the first sale (Time to resale) and the time between the two sales (Time to first sale), in years as independent variables. These time variables are highly significant and their inclusion in the model lowers the estimated coefficients of the constant term and increases λ in the market sample. It is important to note here that by definition, the time between the first and second improved sales (time to first sale) is also a proxy variable for the building age.

Table 4: Reduced Form Regression Results

	Model 1	Model 2	Model 3	Model 4	Model 5
Constant g_B	0.073 (15.52)**	0.069 (9.73)**	0.061 (8.64)**	0.008 (1.30)	0.026 (2.21)*
$\lambda(g_L - g_B)$	0.090 (7.33)**	0.111 (9.10)**	0.094 (6.78)**	-0.060 (0.93)	-0.062 (0.96)
Time to resale		0.014 (4.75)**	0.015 (5.07)**	0.018 (7.32)**	0.018 (7.24)**
Time to first sale		-0.006 (10.20)**	-0.005 (9.48)**	0.004 (6.71)**	0.004 (6.73)**
East x λ			0.062 (2.02)*	0.106 (4.07)**	0.105 (3.98)**
North x λ			0.050 (3.99)**	0.057 (5.36)**	0.057 (5.20)**
North-east x λ			0.025 (1.71)	0.073 (5.91)**	0.071 (5.72)**
North-west x λ			-0.042 (2.83)**	0.039 (3.13)**	0.042 (3.27)**
South x λ			0.084 (6.03)**	0.074 (6.22)**	0.073 (5.83)**
South-east x λ			0.030 (2.19)*	0.041 (3.50)**	0.043 (3.52)**
South West x λ			0.028 (1.81)	0.049 (3.73**)	0.048 (3.62**)
1992 x λ				-0.031 (0.45)	-0.030 (0.44)
1993 x λ				-0.021 (0.32)	-0.022 (0.34)
1994 x λ				0.011 (0.17)	0.011 (0.16)

1995 x λ				0.037 (0.58)	0.037 (0.58)
1996 x λ				0.090 (1.38)	0.091 (1.41)
1997 x λ				0.120 (1.85)	0.122 (1.88)
1998 x λ				0.158 (2.44)**	0.159 (2.46)**
1999 x λ				0.224 (3.46)**	0.226 (3.47)**
2000 x λ				0.280 (4.28)**	0.281 (4.28)**
2001 x λ				0.329 (5.04)**	0.329 (5.04)**
2002 x λ				0.402 (6.14)**	0.402 (6.13)**
2003 x λ				0.420 (6.43)**	0.420 (6.42)**
2004 x λ				0.242 (3.66)**	0.242 (3.65)**
2005 x λ				0.156 (2.33)*	0.156 (2.33)*
2006 x λ				0.219 (3.26)**	0.219 (3.26)**
Land Area					0.000 (0.502)
Room Count					-0.002 (1.98)*
Observations	3,495	3,495	3,495	3,495	3,495
Adj. R-squared	0.015	0.051	0.071	0.296	0.355

Absolute *t* statistics in parentheses
*significant at 5%; **significant at 1%

In this case this variable is also capturing some of the influence of building depreciation influences over time and hence the influence on the constant term, g_B.

Model 3 introduces additional independent variables in the form of regional dummy variables interacting with land leverage, λ. Assuming that construction costs should be generally equivalent throughout the Perth metropolitan region, location effects should only impact g_L, not g_B. In order to test this proposition, regional variables are included as interaction terms with the central and western regions serving as the omitted category. By reference to Table 2 it is evident that these regions carry the highest proportion of land leverage, λ. This regression demonstrates that land values have grown at different rates throughout the Perth metropolitan region. The results for many of these regional land leverage interaction variables are highly significant. It is evident, that the South, East and North regions demonstrate the highest rates of change, while the north-west region demonstrates negative change relative to the omitted category. These results should be treated with some caution as results to follow confirm some significant temporal patterns, indicating that the time of the sale of the vacant land and economic conditions during specific time periods could have a significant influence in some of these regions.

Models 4 and 5 include independent variables interacting land leverage with a dummy variable for the year in which the vacant lot was purchased. Since there are only a relatively small number of sales in the early part of the sample 1988-91, these years serve as the omitted category. The significant feature of these results is the impact on the overall land leverage variable, λ. Note that in models 4 and 5, where interacting time variables are included, the overall impact of land leverage, λ becomes insignificant at the market-wide level, however there are highly significant coefficients for a number of yearly periods. These results confirm significant temporal variation in the influence of land leverage. It is evident that the most significant influence for land leverage is associated with vacant lot purchases in the later period of the sample 1998-2006. Model 5 also introduces variables to test the influence of physical characteristics for individual properties. These variables are entered into the model directly (not interaction terms). The size of an individual vacant lot is insignificant and the size of the building as measured by total rooms (room count) is slightly negative and statistically significant. Note also the significant change in the constant term, g_B and the significant increase in explanatory power for the model arising from the inclusion of this construction variable. Remembering that the dependent variable in these regressions is the annualised growth in the property's value, g_V the coefficients are interpreted as the impact on growth rates rather than the direct impact of these characteristics on home values. Therefore, a negative coefficient on the size of the home (room count) implies that large homes have appreciated at a slower rate than have smaller homes.

Overall these results confirm the central proposition of the land leverage hypothesis in that land values have increased at a faster rate than building values and homes and regions with high land leverage appreciated at a faster rate than those with lower land leverage. In some respects, the results are significantly different from similar tests completed by Bostic et al. (2007) who tested a smaller market sample and a shorter time period. While the overall results are generally consistent with the Bostic et al. (2007) study, these results also indicate that there are significant temporal influences at work interacting with land leverage in the Perth housing market. These influences appear to be associated with the recent boom market period and rapid population increase in certain areas of the Perth metropolitan region.

Conclusion

By following closely the methodology of Bostic et al (2007), this study represents a further empirical test of the land leverage hypothesis. The land leverage hypothesis asserts that the value of land and the value of improvements on that land are likely to evolve differently over time. These results confirm significant land leverage influences within the Perth housing market for the sample period 1988-2009. These results confirm a significant positive influence for land leverage. Higher land leverage for individual properties and within regions impacts positively on a property's overall appreciation rate. Our results also confirm significant temporal influences, suggesting that the influence of land leverage is not constant through time. These results can be supplemented by extending the sample and methodology to incorporate established homes in addition to the market sample. Bostic et al. (2007) confirm similar results by using an “assessment sample”. The land leverage hypothesis is an important emerging area of research with some important implications in understanding the price dynamics of urban regions, together with issues of housing affordability, town planning policy and the measurement of house price changes.

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