The Dynamics of the Shanghai Land Market- An Intra-city Analysis

Abstract

In an open market, the land price of a particular site represents a set of attributes that a user is willing to pay for the use of the site. It has long been established that one of the more important attributes is the distance of this site to the city centre. Based on a mono-centric assumption of urban development, land economists since Alonso have almost all agreed that there is a diminishing effect on land price the greater the distance from the city centre. Although there have been various modifications to this locational perspective, this view remains as the core understanding of land market dynamics in a market system. The question therefore arises as to whether a semi-open, but extremely active land market with a heavy government presence will also follow this same principle of the urban structure approach. In this paper, we apply a double-log regression model to examine land price changes in Shanghai from 1992 to 2006. After examining more than seven thousand transactions, our results show that the land price changes in Shanghai follow these dynamics, while a major transportation node also plays an important role.

Introduction

Measuring land price changes and the attributes causing them has always been core in the understanding of the land market dynamics ever since Alonso. Alonso systematically absorbs different theories on land value preceding his time, including the basis from Ricardo's theory of rent, and tries to apply them to explain the relationship between land value and land use from a locational perspective and in an urban context.

Yeates (1965) examines the spatial distribution of Chicago land values over a period of 50 years with an objective of trying to test the validity of the established theory about the factors affecting land values, especially distance from the central business district (CBD), by way of multiple regression analysis. He finds that both transportation and population are becoming less important in explaining land price changes while proximity to service centre and amenity facilities gains in importance.

With such a concept, the importance of locational advantages to the determination of land prices, as stipulated by the traditional land price approach, is reflected on its positive effect on the receipt of future income. This future income in the modern economy would rely very much on the property values and rental values that the developer or landowner can extract from the real estate development. Again, this reinforces the inter-mingled relationship between the property market and the land market, hence the dependence of land prices on property values, and hence land use patterns. However, the conventional assumptions evolving from this urban structure approach are subsequently subject to question, especially the logic that land price depends mainly on distance from the city centre. This has led researchers to examine a much larger set of factors explaining the land price behaviour from a perspective other than the location factor, such as the supply-side effect (Needham, 1981).

Researchers have been putting on a lot of effort in trying to examine the extent to which location actually commands an important role in determining land price changes. McDonald and Bowman (1979) suggest that the actual residential land price function in

Chicago can exhibit complex curvilinear shapes and hence land prices may not decline in direct relation to the distance from the CBD. In their findings, zoning, racial composition and neighborhood effect improve the explanatory power of the regression equations considerably.

Walters (1983), on the other hand, examines rising urban land prices in terms of opportunity cost of using land among different options. The fact is that the supply of valuable land at the city centre cannot be increased but can only be used differently. This means that the choice of use is crucial and so the value of using land in different ways must be assessed in terms of the stream of outputs or returns from the land in its most likely alternative use. However, this opportunity cost of land use may change when constraints on land use is changed, even when the most efficient use remains constant, thus it does not necessarily refer to the net output of land in its next most efficient use. In any case, therefore it seems to be reasonable to assume that the land use option is itself a determinant of land value, in addition to locational factor.

Hidano and Yamamura (2004) analyse land price changes in Japan by means of a hedonic pricing model. They find that, among other variables, industrial investment activities and lending behaviour by the banks accounted for a major impact on land value changes, and also noted the importance of obtaining adequate and reliable market transaction data for any robust analysis.

Kim (2004), on the other hand, examines real estate price changes in Vietnam where there is not yet a proper property rights system. She applies a hedonic pricing model to decipher changes between a set of variables and real estate values and concludes that multiple ownership of property rights is a major force in shaping market prices.

Lewis (2007) analyzes urban residential land price data in Jakarta using a non-linear regression model. He finds that the effect of distance on residential land prices was negatively significant, though the level of significance reduced over time. In addition, he emphasizes the importance of using actual land prices over the appraised land values, as adopted in some previous studies, since the use of actual market land prices significantly influence the impact of other market variables in his study.

Haughwout, et al. (2008) analyse actual transaction land prices in New York using a linear regression model. They come to the same conclusion that land prices in New York also have a significant negative correlation with distance to the CBD. They find this especially true for residential land prices as good residential locations command a special premium in New York.

In the recent years, the urban land market in China's transitional economy has been extensively studied (Zhu, 1994; Yeh and Wu, 1996; Keng, 1996; Huang and Yang, 1996, etc), due to the progressively availability of more market data for quantitative analyses. Li (2003) follows this analysis of land price changes in Shanghai with an angle on bid rent curve behaviour. He illustrates that reform progress in Shanghai is following a

satisfactory manner and market rationalisation is being undertaken. This observation is also noted by Li, et al. (2005) in their examination of the duo land market behaviour in Shanghai.

Ding (2004) examines the characteristics of urban spatial changes in Beijing and concludes that urban development patterns in Beijing closely resemble those in other cities where a market mechanism is in place. Similarly, Zheng and Kahn (2008) by examining the land price changes in Beijing between 1991 and 2005 and other exogenous factors such as transit infrastructure and environmental impacts, also conclude that the classic urban mono-centric model's predictions are largely upheld in Beijing.

In this paper, we are going to examine correlations between land price movements and distance to city centre, as well as land use pattern in very popular market in which strong bureaucratic control of market behaviour, especially in the supply of land, is still common. In this respect, we would like to hypothesize that market forces, due to strong market interest in this economy (over 9,000 pieces of land sold by the government in the period between 1992 and 2006), will inevitably lead to the realisation of land prices in accordance with the basic principles of concentric change, namely, decreasing from the city centre.

Land Market in Shanghai

Shanghai is one of the most intriguing real estate markets in Asia of the last decade. It started as a highly-controlled experiment in an emerging economy. Ever since the commencement of the economic reform in the land market, Shanghai has been one of the forerunners in market development. Land sale (or selling of land use rights in the form of land leases) started in 1988 with just a few transactions, but market response quickly escalated. In 1992, land sale volume soared to more than 150 transactions and this volume almost tripled by the end of 1994. From that point, the city basically has been turned into a huge construction site and demand for land seems to be insatiable. What is interesting is that even with this level of market interest in land development, the Shanghai land market at that juncture of development was still very much state-controlled and land sale was almost entirely conducted by private treaty grant, instead of open market tender or auction (Li, 1997). The political environment dominated market development to a very large extent, at least at the beginning of the reform period. This was evident in that when overheating in the economy was sensed by the central government, the market was slowed by a series of macroeconomic controls stipulated by the central government in 1994.

In addition, the market also went through a segregation period of the dual market structure until 1998 when the artificial barrier between the two sectors (the protected domestic sector and the more open overseas sector) of the market was lifted. With a closed currency system, Shanghai managed to escape the Asia financial crisis that brought down major property markets in the region, and that paved the way for further growth in the late 1990s and later. Since 1999, the administrative allocation of land had

been forbidden in Shanghai, apart from some exceptional cases specified in law.[1] Beginning on 1 August 2001, domestic-sale and overseas-sale sectors in the housing market were merged, followed by merging measures applied to commercial land, multi-use land, and other land in March 2003. Since then, the Shanghai land market has been basically integrated and rationalized towards a single market nature.

Although the land market in Shanghai is still highly regulated, the bureaucratic structure of land administration remains fragmented. District governments within the Shanghai metropolitan hold the power to grant land for sale. It is partly due to the overall changing political environment in China that local government tends to maintain a smaller role on urban development issues and release the initiatives to private enterprises (Han, 2000). Although land auction is always stipulated as a land sale mode in the government policy and open auction procedure has also been well-documented, this mode of land sale is not usually adopted in Shanghai. Similarly, while the central government has encouraged local governments to use open tenders to sell land, most of the sites in Shanghai have been invariably sold by the government via the private treaty grant. This has created a very interesting scenario where the land market is highly controlled at the beginning of the process, but the control is gradually released when the piece of land enters into the market, including availability of market information such as land price and planning controls. In this way, the land market in this city is neither a planned system, nor a completely competitive market, but, rather, a mixed mode. Because of these unique features and characteristics, land market behavior in Shanghai may not follow entirely the

[1] According to the Urban Real Estate Administration Law of P R C that was issued in 1994 and has come into effect since 1995, four categories of land can be administratively allocated. They are: 1. governmental land and military land; 2. urban infrastructure land and

conventional demand-and-supply model, except during market boom periods when the substantial number of market players, namely developers and land users, will help to push the market mechanism towards a more competitive nature. This will be illustrated further in the analyses below.

Theoretical Framework

Although China is a market-socialist economy with a heavy presence of state intervention, especially in the allocation of land resources, it is still expected that land prices are more or less determined in accordance with the overall market indicators, as China is becoming more and more open in terms of market development in all aspects. In other words, one should expect to find similar market attributes affecting land price movements in most economies. Therefore, in Shanghai, land prices are expected to respond to both demand and supply conditions in the property and land market, and land price is therefore specified as general function of demand and supply as follows:

Land Value (expressed as Accommodation Value, AV) = f (Demand, Supply)

In other words, the land price is regressed on a series of both demand-side factors (D_t) and supply-side factors (S_t), i.e.

utilities land; 3. land used by the state-supported projects of energy, transportation and water conservancy etc.; 4. other land uses regulated by law.

$$AV = \alpha_0 + \sum_{i=1}^{n} \alpha_1 D_{it} + \sum_{j=n+1}^{m} \alpha_j S_{jt+\varepsilon_t}$$

Where :

AV is basically the total land price paid for a specific site divided by gross floor area to be built (a measurement of land price Jud (1980) suggests to be more consistent rational). α_0, α_i, α_j are the coefficients to be determined, t represents the current period and ε_t is the current stochastic error term.

The equation concentrates on the economic factors that indicate the demand- and supply-side influence on the accommodation value. In this paper, we will examine the dynamics of the Shanghai land market by looking at a number of variables. Since it is very difficult to assess a core central point in Shanghai to measure actual distance from each site in the dataset, given the fact Pudong New District is now a very prosperous and still developing area, we will measure the variable of location by proxy of the district and will use the Huangpo District as our centre. Administratively, Shanghai is divided into 17 districts (including Pudong) and one rural county (Chongming) (See Figure 3). For convenience, most people consider the 17 districts as being urban or sub-urban; or by being on the eastern or western side of the Huangpu River. In any case, the central district is widely accepted as the Huangpu District, and distance from the central district can therefore be proxied by how far away each of these districts is relative to the Huangpu District.

In order to increase the explanatory power of the regression model and remove the effect

of different numeric base of the specified variables, the double-log regression model is used. Under the double-log regression system, individual regression coefficients can be interpreted as elasticity. Since regression coefficients are constant, a double-log equation is able to meet the requirement of a constant elasticity; also it is able to show the percentage change of the function. In the logarithmic specification, variables are expected to add a percentage, either constant or multiplicative to accommodation value and the slopes are no longer constant. Therefore both sides of the equation, explanatory side and explaining side are logged.

Dummy variables such as land use dummies and location dummies that can take on the value of zero are not logged but still can be used in the double-logged equation.

The equation is finalized as follows,

$$LOG(AV) = \alpha_0 + LOG(GDP\text{-}lag1year) + LOG(HseHold) + LOG(FlrSpace) + RES + COM + MIX + IND + District\ Dummies + \boldsymbol{\varepsilon_0}$$

Where $\boldsymbol{\varepsilon_0}$ is the stochastic error term of the estimate model, and

$$AV = \frac{Total\ Market\ Price\ for\ Land\ Use\ Right}{Gross\ Floor\ Area}$$

Independent Variables

We classify the independent variables into three major categories. The first group is the market variables that include Gross Domestic Product (GDP) as a proxy for economic performance; Number of Household as a proxy for population factor; and Floor Area Completed as a proxy for market supply. The second group is land use variables that indicate whether the particular site was sold for residential, commercial, industrial, or mixed (residential and commercial) use. Finally, there is the district variables that indicate the relative location of the site to the city centre in Huangpu District, excluding all transactions in the Pudong New District. The following explain these variables in a more detailed manner.

Gross Domestic Product (GDP)

Gross Domestic Product (GDP) is a commonly accepted indicator for measuring a country's overall economic performance. It is commonly accepted that the higher the economic performance, the higher the demand for land, leading to higher land prices.

<< insert Figure 1 here>>

Population

In general it is expected that the higher the population density, the higher should be the price of the land. In addition, according to Shoshany and Goldshleger (2002), when population increases, there will be increase in demand for built-up and infrastructure area, leading to potentially higher prices of land. In this study, we use the number of household to represent the variable for population.

Supply of Property

Supply of Property is proxied by Floor Space of Building Completed, which, according to the *Shanghai Statistical Yearbook*, is defined as the floor space of buildings that are completed in the reference period in accordance with the requirement of the design that is up to standard for putting them into use and have been accepted by relevant government departments as qualified ones. Naturally, the higher the supply of floor space, the lower the property price, and hence lower the expected land prices. In other words, the new usable floor completed will, at a certain time, affect the price of land. This is due to the fact that when there is a sufficient supply of property units, developers' and investors' demand for land will decrease, hence the price of land is unlikely to increase. It is commonly believed that this effect will take some time to emerge as amount of floor space completed is not exactly the same as the supply on the market. However, due to the lack of quarterly data from the relevant statistical yearbooks, this paper will only

utilize this variable on a yearly basis (Figure 2).

<< insert Figure 2 here>>

Land Use Dummies

The land use variables are identified as Residential, Commercial, Industrial, and Mixed (commercial and residential). This provides a means to examine if land prices are sensitive to the use put on the land. In other words, if land users are willing to pay more for land that would allow them to use it for relatively higher returns such as residential and commercial, and vice versa.

Location Dummies

A total of 17 dummy variables are included, representing different districts of land sale in Shanghai. These districts are :

Core Urban districts: Huangpu, Luwan, Xuhui, Changning, Jing'an, Putuo, Zhabei, Hongkou, and Yangpu.

Sub-urban districts (in clockwise order): Nanhui, Minhang, Fengxiang, Jinshang,

Songjiang, Jiading, Qingpu, and Baoshang.

Rural county: Chongming County.

Figure 3 below illustrates the relative positions of these 17 areas. As mentioned above, the largest district, Pudong New District, is not included in this analysis due to the size of the district.

<< insert Figure 3 here>>

Data Specification

A total of 9,219 land transaction records were obtained from the official magazine *Shanghai Real Estate Market.*[2] After subtracting outliers and transactions in the Pudong New District, there are a total of 7,976 transaction records spanning the years 1992 to 2006. The yearly distribution of the final dataset is shown in Table 1 below :

<< insert Table 1 here>>

Empirical Results and Analysis

<< insert Tables 2 and 3 here>>

[2] Published by the Office of the Shanghai Municipal Committee for Land Use System Reform of the Shanghai State Land Administration Bureau; Municipal Statistical Bureau of the Shanghai and the China Statistical Publishing House.

The model summary shows a Durbin-Watson (D-W) test coefficient of 1.009. This indicates a reasonable and acceptable test result without the problem of autocorrelation. By using a stepwise entry mode, the Log-Linear model shows a 53% R-Square coefficient, which, though not very high, is still acceptable. The variables selected to be significant are included in Table 4 below.

<< insert Table 4 here>>

Due to the constraints on yearly data, we have only included three major market variables in the model. These three variables all are shown to be significant, but to different degrees and directions. The result shows that GDP growth from the previous year is very likely to have an impact on stimulating demand for land in the current year. This occurs because the impact of prosperity is felt only after the actual gain has been received. In this respect, the coefficient of LogGDP1yr indicates a figure of 5.126, the highest positive contribution to land price among all variables. On the other hand, number of household seems to produce a negative effect on land price, a result that may contradict to other studies where a larger population serves as higher potential demand for properties. A possible explanation for this negative significant correlation is the fact that land development in mainland China involves a complicated compensation package on the part of the developers. Nevertheless, the Variance Inflation Factors (VIFs) of these two variables show a strong sign of autocorrelation, which means the actual effect may not have been completely known at this stage. However, given the unavailability of quarterly data, further analyses cannot be accomplished.

Moreover, the result shows a positive correlation between floor area completed and land price. This once again, shows some significant difference from other markets. A possible explanation for this outcome is the fact that higher volume of construction activities also indicates popularity of the district. In an emerging and large market such as Shanghai, this represents important market information for the developer when committing their investment to land development, and hence leading to higher land prices due to higher demand.

For the land use variables, the outcome conforms to general land use principles. As predicted, residential, commercial, and mixed (residential and commercial) land use types all contribute positively to land price. These land use types are commercially viable in most urban settings and thus allow the land developers to pay more for the use of land. According to bid-rent theory, the high demand for residential and commercial properties allows land developers to outbid relatively low return land use types such as industrial. As a result, we also see that the Industrial variable has a negative coefficient with land price. We need to point out that this pattern has been a major land use change in Shanghai, as well as other major cities in China. According to various studies, industrial had been the dominant use of land in the centre of Shanghai in the pre-reform period (Li, 1997; Zhu, 2004). The exceptional heavy dominance of industrial land, when compared with other cities in a market economy, in the city centre was partly due to the planned economic system that relied on heavy manufacturing sector, and partly due to the lack of a price mechanism to allocate land uses under a socialist economic system. With the

advent of the market reforms in China in the late 80s, this mis-match pattern has been gradually adjusted and corrected.

We can further examine the issue by looking at the spatial changes of different land use types among all these districts (excluding Pudong New District) in Shanghai between 1991 and 2008. From Figures 4-7, we can observe that commercial- and office-use types, are on a constant increase in all districts. On the other hand, housing floor space in the two core central districts, Huangpu (HP) and Luwan (LW), has experienced a sluggish growth over the same period, while maintaining a steady growth pattern in most other districts. What is interesting is the diminishing industrial floor space in most of the core urban districts, namely the first nine districts in Figure 7. Once beyond the Minhang District, the situation is reversed and industrial floor space has escalated over this period. This is a clear indication of land use redistribution and rationalization due to market forces.

<< insert Figures 4-7 here >>

Finally, for the district variables, the core central districts attract higher demand, and the degree and magnitude of impact decreases concentrically from the central district of Huangpu. This is evident from the decreasing coefficient when we move away from Huangpu District (HP). From Figure 8, we can observe that this core central district, Huangpu (HP), has a contribution to the (Log) land price of 0.647. When we move

further away, the immediately-neighbouring urban districts, Luwan (LW) and Xuhui (XH) districts rank number two and three respectively. Moreover, the magnitude of decrease is stronger towards the northern part of the city. This shows that bid-rent behaviour in Shanghai, excluding the Pudong New District, extends in a southwesterly manner from city centre, until it reaches the Minhang District, which basically sets the boundary for sub-urban industrial districts in Shanghai. As a result, we find the coefficient negative in both the Songjiang and Qingpu districts. A rather interesting phenomenon occurs in the Changning District (CN) when it is observed that the coefficient is relatively large compared to the district immediately west of Huangpu, namely the Jing'an District (JA). This is likely to be the result of the location of the former international airport at Hongqiao (now a major domestic air transportation node) and the new intra-province high-speed train station within Changning District.

On the other hand, the northwesterly part of the city is relatively less popular and fulfilling for land developers. The relatively weak market demand is also therefore reflected in the lower land price coefficient around these few districts such as Zhabei (ZB) and Hongkou (HK). Moreover, it is also interesting to note that the sub-urban districts in the north, Jiading and Baoshang, do not exert any significant influence on land price determination at all.

Conclusions

We have seen from the analysis above that land price dynamics in Shanghai follow a pattern that can reasonably be predicted by urban land economic theories. In spite of the relative small size and strict controls on redevelopment especially along the waterfront (the Bund area), Huangpu District, the core central district, remains the most popular and most expensive district in terms of general land price movement. This degree of popularity then diminishes slowly from this centre, but not in a concentric manner. It seems the relative importance of contribution to land price in terms of distance from the centre is skewed towards the south-western direction of the city moving down from Luwan District to Xuhui District and then Changning District. In particular, we notice that Changning's importance is very likely to be sustained by the existence of a major transportation node, the domestic Hongqiao Airport, as well as the high-speed train station. Once again, the case of Shanghai shows that despite the heavy presence of government control over land supply and land use, land price movements remain a very dynamic and market-led behaviour due to the much stronger market force of demand mechanism.

Figures and Tables

Fig. 1. GDP of Shanghai between 1992-2006 (unit in 100 million Yuan)

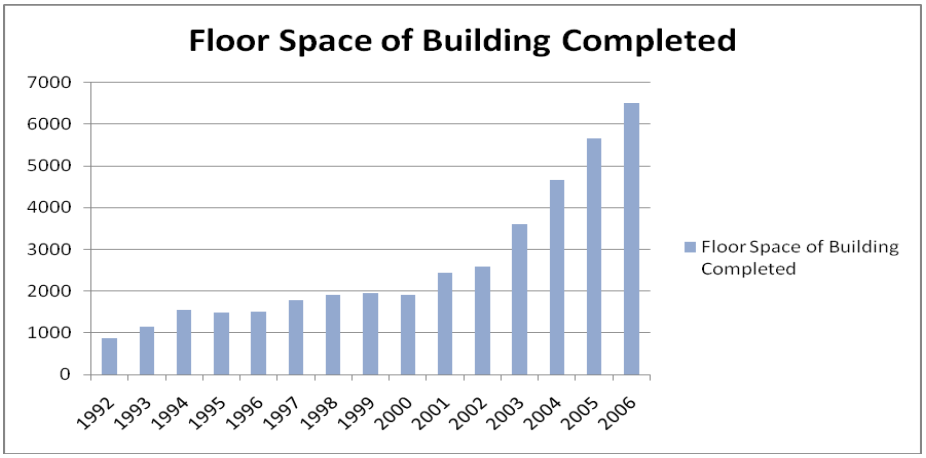

Fig. 2. Floor Space Completed in Shanghai (unit in 10,000 sq.m.)

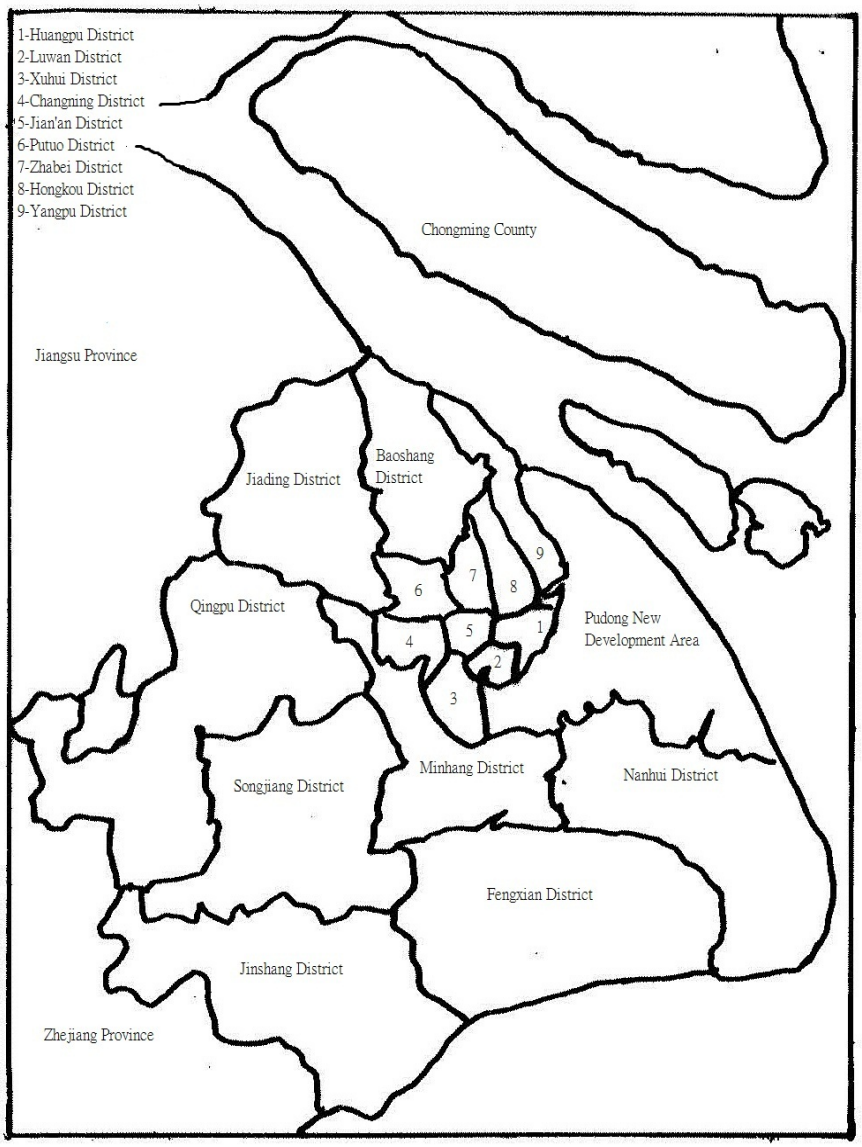

Figure 3: Map of All Districts in Shanghai

Year	Number of Land Sales
1992	**80**
1993	**159**
1994	**290**
1995	**202**
1996	**198**
1997	**183**
1998	**119**
1999	**141**
2000	**213**
2001	**257**
2002	**1229**
2003	**1092**
2004	**1371**
2005	**1182**
2006	**1259**

Table 1: Land Sale Record in Shanghai (excluding the Pudong New District)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.731[a]	.535	.533	.43624	1.009

a. Predictors: (Constant), Industrial, LogHseHold, Residential, Songjiang, LogGDP1yr, Huangpu, Xuhui, Changning, Fengxiang, Qingpu, LogFlrSpace, Jinshan, Commercial, Mixed, Luwan, Putuo, Hongkou, Yangpu, Jingan, Minghang, Zhaibei

b. Dependent Variable: LogAV

Table 2: Model Summary

ANOVA[b]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1739.349	21	82.826	435.228	.000[a]
	Residual	1513.689	7954	.190		
	Total	3253.038	7975			

a. . Predictors: (Constant), Industrial, LogHseHold, Residential, Songjiang, LogGDP1yr, Huangpu, Xuhui, Changning, Fengxiang, Qingpu, LogFlrSpace, Jinshan, Commercial, Mixed, Luwan, Putuo, Hongkou, Yangpu, Jingan, Minghang, Zhaibei

b. Dependent Variable: LogAV

Table 3: ANOVA Table

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	617.396	30.686		20.120	.000		
	Industrial	-.232	.025	-.173	-9.162	.000	.164	6.115
	LogHseHold	-101.881	5.178	-2.393	-19.676	.000	.004	252.770
	Residential	.507	.036	.169	14.204	.000	.413	2.421
	Songjiang	-.172	.016	-.113	-10.904	.000	.548	1.825
	LogGDP1yr	5.126	.325	1.824	15.749	.000	.004	229.273
	Huangpu	.647	.040	.133	16.091	.000	.855	1.170
	Xuhui	.382	.030	.114	12.875	.000	.740	1.352
	Changning	.350	.031	.097	11.115	.000	.761	1.315
	Fengxiang	-.184	.021	-.076	-8.784	.000	.773	1.294
	Qingpu	-.130	.017	-.075	-7.809	.000	.631	1.586
	LogFlrSpace	.735	.070	.257	10.570	.000	.099	10.088
	Jinshan	-.130	.022	-.050	-5.787	.000	.795	1.258
	Commercial	.302	.030	.123	9.894	.000	.379	2.636
	Mixed	.183	.027	.112	6.847	.000	.219	4.559
	Luwan	.428	.056	.061	7.653	.000	.927	1.078
	Putuo	.230	.039	.047	5.899	.000	.915	1.093
	Hongkou	.208	.038	.046	5.513	.000	.832	1.203
	Yangpu	.212	.043	.040	4.958	.000	.900	1.111
	Jingan	.209	.050	.034	4.189	.000	.908	1.102
	Minghang	.059	.019	.028	3.120	.002	.702	1.424
	Zhaibei	.108	.050	.017	2.187	.029	.923	1.083

a. Dependent Variable: LogAV

Table 4: Regression Results

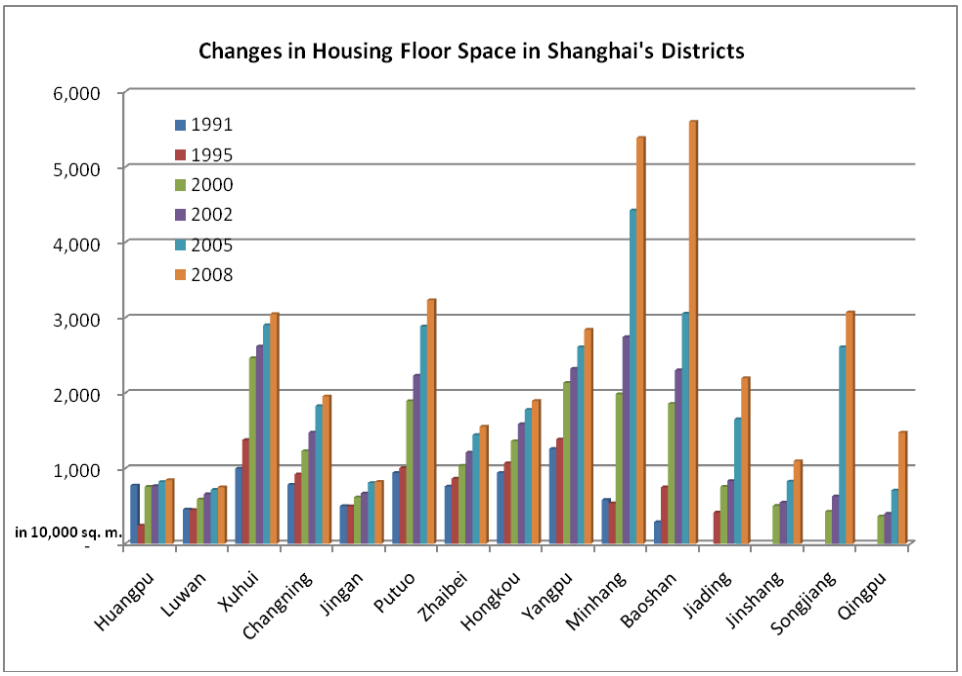

Figure 4: Changes in housing floor space in Shanghai's districts

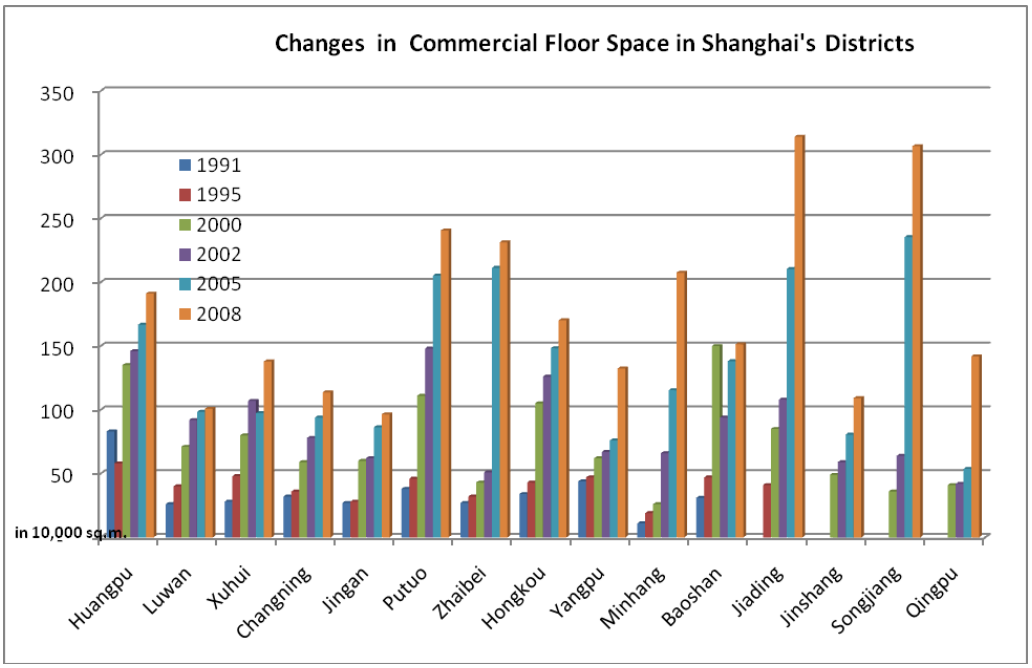

Figure 5: Changes in commercial floor space in Shanghai's districts

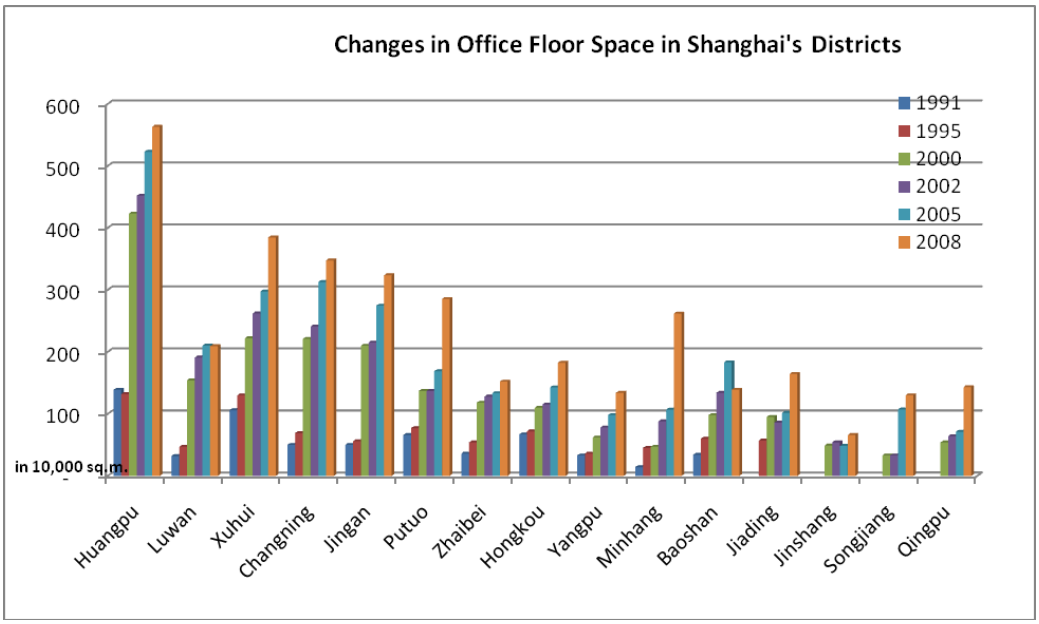

Figure 6: Changes in office floor space in Shanghai's districts

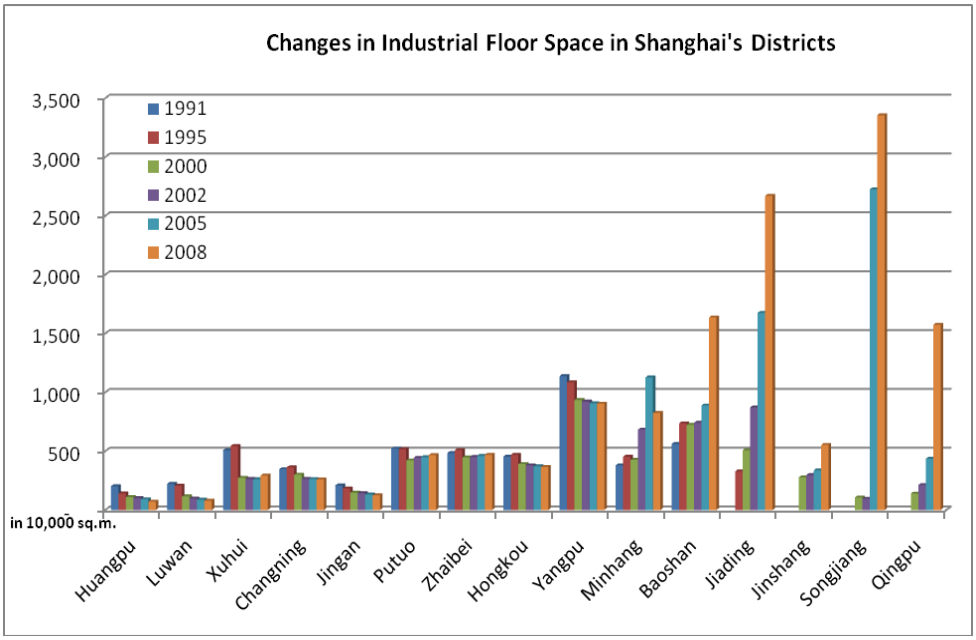

Figure 7: Changes in office floor space in Shanghai's districts

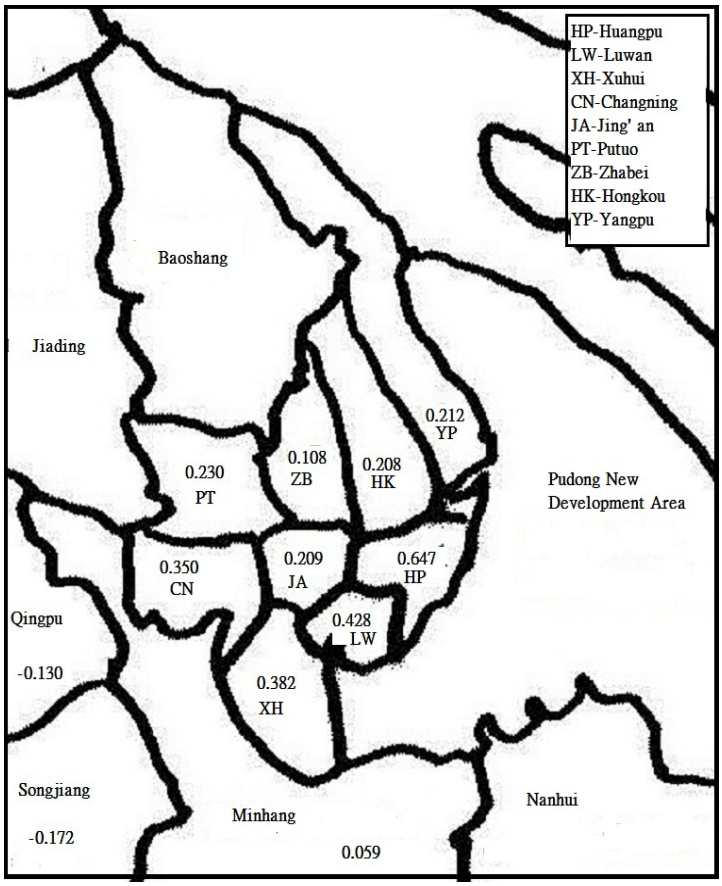

Figure 8-: Coefficients of urban districts contributing to land price changes in Shanghai

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