CHINESE GEOGRAPHICAL SCIENCE
Volume 11, Number 4, pp. 306 - 314, 2001
Science Press, Beijing, China

THE BENCHMARK LAND PRICE SYSTEM AND URBAN LAND USE EFFICIENCY IN CHINA

DING Cheng-ri
(Department of Landscape Architecture and Urban Planning, Texas A & M University, Mail Stop 3137 College Station, TX. 77843, USA)

ABSTRACT: China began to introduce market principles and establish price mechanism to better manage land and improve land use efficiency in the late 1980s. Since then, land markets begin to emerge. A benchmark land price system, providing guidelines for land use rights selling and transferring, was established in order to overcome lack of market data and experiences in land transaction. The benchmark prices of land use rights are determined by land use, land use density (floor-land ratio), land grades, land improvement, and tenant resettlement costs. This paper first conducts a formal analysis based on modern urban economic theory. The formal model provides a theoretical foundation in which the benchmark land price system is assessed and evaluated in terms of land use and urban development. The paper then concludes that the benchmark price system has two theoretical problems. One is associated with the fact that floor-land ratio plays an important role in land price determination whereas the theory suggests the other way around. That is, floor-land ratio depends on land prices. The other problem is that the benchmark land price system does not provide adequate room for the substitution between land and capital inputs. The substitution is a key in achieving land use efficiency in land markets and urban development process. It is concluded that the practice of the benchmark land price system is at odd with reforms that aim to introduce market principles and mechanism to guide resource uses. Therefore, it is recommended that further land policy reform should be taken.

KEY WORDS: urban economics; land development; land prices; urban land use; floor-land ratio

CLC number: F293.2   Document code: A   Article ID: 1002-0063(2001)04-0306-09

1 INTRODUCTION

Before 1949, private land ownership existed and land transactions were quite active. A household's wealth is directly correlated with the amount of land it possesses. After that land reform was immediately launched in order to reduce social inequality by confiscating land from the rich (landlords) and distributing to the poor. Later, China started a series of political movement such as the the Great Leap Forward and people's commune movements. During the movement of people's commune, peasants were asked to join production cooperation by donating their large possessed assets such as land and large production materials that had been distributed in land reform. The members of a production cooperation collectively own all its properties including land. In cities, the state confiscated land and declaimed the state ownership. By 1958, land is either state or collectively owned. Roughly speaking, land in cities and towns is state owned whereas farmland is collectively owned (there are a few exceptions) (YANG and WU, 1996; ZHANG, 1997).

Received date: 2001-04-03
Biography: DING Cheng-ri (1963 -), male, a native of Jilin Province, Ph. D., associate professor. His research interests include urban economics, housing, real estate and land development, quantitative research, neighborhood and local economic development, and spatial analysis and GIS.

In urban areas, the state owns land and distributes land use rights free of charge to socioeconomic units, called *Danwei* in Chinese, for infinite time. A unit was a basic social fabric that played dual functions: administrative structures for organizing the society and economy as well as a political tool for inculcating socialist collective ethic. Each individual unit was responsible for both production and housing all of its members. Since these units were state owned too, land use rights and land ownership were legally inseparable so that land transaction was considered unconstitutional. Hence, land markets disappeared. Land allocation depended on political powers to which a unit connects to as well as the political environment in which socioeconomic functions and productions were planned and organized (LI Ling-hin, 1997).

The land tenure system and the lack of land markets in China have resulted in significant inefficiency of urban land use. First, low land use density is persistent across Chinese cities. For example, in Changchun—the capital of Jilin Province—with more than two million population, the average height of all buildings is only 1.74 stories. Residential and commercial land use is a little bit higher, which is 1.99. The average ratios of square feet to land are 1.36 for commercial, 0.33 for industrial, 0.69 for residential land uses (LI Yuan, 1997). Second, Chinese cities have a flattened land use density curve. This is because land use is not arranged based on market principles on which economic activities are organized to maximize profits (DOWALL, 1993). In planned economies, site location was of little importance because maximization was not the primary object for state and collectively owned enterprises. The acquisition of a prime site more likely reflects the sequence of development, random events that cannot explained in rational behavior models, or political atmosphere prevailing at the time when an application for land was made. As BERTAUD and RENAUD (1992) show, land use pattern is not determined according to economic efficiency in planned economies. There is neither land value nor land taxation so that land use and land allocation can be rationalized through a price mechanism. Therefore, it is not surprising to observe that warehouses occupied central locations in Chinese cities. Finally, excessive demand and excessive supply coexists in many cities and there is not economic channel to adjust the balance of supply of and demand for land. Land, once allocated free of charge by the government, is not allowed to transfer to other parties. There is neither economic incentive for units to transfer unneeded land nor economic penalty for them to keep unused land. Whether or not a unit had adequate land supply depended on its political power and connection as well as national policy priorities when land was allocated. As a result, some units had more land then needed whereas others were just opposite.

The land reform was driven partly by overall economic reforms and growth and partly evolved out of the negative consequence of the state land allocation system. In 1988, the constitution was amended so that the right of land use could be transferred in accordance with the law although the state retains land ownership. This new land tenure system, similar to the leasehold system in Hong Kong, changed the legal environment for the creation of land markets (WALKER and LI, 1994; ZHANG, 1997; ZHANG and LI, 1997; CHAN, 1999; LI, 1999). Further reform was taken in 1990 when the State Council enacted the "Provisional Regulations on the Conveyance, Granting, and Transferring of the State Land's Use Rights in Cities and Towns" Under the 1990's regulations, land use rights were separated from ownership and became tradable through auction, tender, or negotiation processes. The regulations apply to all state owned land in cities and towns. It is the first time in the modern Chinese history that land ownership and land use rights are separated. The implication of urban land use and land development is profound [①].

① The objectives and goals of LURs reforms by the Vice Premier ZOU Jia-hua in 1994 are to

- Improve land management through land markets instead of administrative channels.
- Improve land use efficiency. The intention is to make land an important asset and have a value attached to land.
- Increase government revenues. Land related revenues include land use fees, land development fees, and land taxes.
- Manage land supply and coordinate land development throughout the country.
- Preserve farmland and control illegal land conversion from farmland to urban land.

Lack of land market transaction data makes difficult to determine land prices. A benchmark land price system is developed in order to provide a reference system that buyers and sellers can use to negotiate land prices (HU, 1990). Land price behavior varies between local authorities (LI and WALKER, 1996). However, it is believed that benchmark land prices reflect average land prices and land market conditions (HU, 2000). This paper, after the introduction, first presents an urban economic model that demonstrates land development under perfect and competitive markets. The formal analysis provides a theoretical foundation in which the benchmark land price system will be assessed and evaluated. Finally, the paper recommends policy reform that is needed to fully establish price mechanism in managing urban land, determining land use, and improving land use efficiency.

2 URBAN ECONOMIC THEORY OF LAND USE AND URBAN DEVELOPMENT

Following BRUECKNER (1997), DING *et al.* (1999); and DING(1996), we cast our model with perfectly competitive factor and product markets. In such a model, it assumes that the city is located at the center of a homogenous plain in which transportation cost rate is indifferent along all directions. The city's CBD (central business district) contains all employment opportunities and people live outside the CBD and commute to it for work so that they will bear transportation costs which depends on commuting distance. It further assumes that all consumers have identical utility functions, which have arguments of a numeraire good, c, and housing consumption, q. Residents' objective is to maximize their utility by choosing optimal levels of consumption of housing and the numeraire good. The utility function is twice differentiable and concave-shaped, which is a condition for the maximization problem. The maximization problem is subject to the budget constraint, which require that must allocate their income y to the numeraire good, housing, and commuting. Total housing consumption costs are denoted by pq where and transportation costs are kx, where k represents commuting cost per mile, x stands for distance from the CBD, and p is the price of per unit of housing consumption. If the price of the numeraire good is unit, then, the budget constraint is expressed as: $y = c + pt + kx$. The residential utility function can be written as:

$$v(c, q) = v(y - pt - kx, q) = u \qquad (1)$$

where u is the utility level that is exogenously determined ①. Urban residents maximize their utility by choosing optimal level of consumption of numeraire good and housing. The first-order condition for the maximization problem with respect to q is:

$$-\frac{\partial v(y-kx-pq,q)}{\partial pq}\frac{\partial pq}{\partial q}+\frac{\partial v(y-kx-pq,q)}{\partial q}=0 \qquad (2)$$

Equation (2) can be simplified into

$$\frac{v_2}{v_1}=p \qquad (3)$$

Since $\frac{\partial pq}{\partial q}=p$ ②

Total differentiating (1) with respect to x yields:

$$-v_1\left(k+q\frac{\partial p}{\partial x}+p\frac{\partial q}{\partial x}\right)+v_2\frac{\partial q}{\partial x}=0 \qquad (4)$$

Substituting (3) into (4) yields:

$$\frac{\partial p}{\partial x}=\frac{-k}{q}< 0 \qquad (5)$$

This states that housing prices decrease with the distance to the CBD. According to urban economic theory, falling housing prices with the distance is the driving force for urban pattern in which land price, capital density (floor-land ratio), and population density are all falling or decreasing. This will be illustrated in the following section.

Now let's move to the real estate sector. Following BRUECKNER (1986), suppose that developers maximize their profits out of land development by choosing optimal inputs of land and capital. Housing output is measured as square feet of floor space and specified as:

① The spatial equilibrium condition requires that u is identical across space. Otherwise, some residents can increase their utility by relocating.

② Subscripts denote partial derivatives. That is, $\frac{\partial v}{\partial pq}$ and $\frac{\partial v}{\partial q}$.

$H(N, L)$, where L is land input and N is capital input. Land and capital are substitutable to each other since a same amount of housing output can be produced by either using more land and less capital or the other way around.

Furthermore, it is reasonable to assume that the housing production function is concave and has a constant return of scale. The concavity of housing production has the property of $H_{NN} < 0$, which implies that marginal capital productivity diminishes. In the other words, as buildings become taller, more capital inputs are used in stairways, elevators, and foundations so that smaller increase in output is produced. The constant returns of scale state that the output of housing production will be doubled if both land and capital inputs are doubled. Finally, the housing production function has the property of $H_N(N, L) > 0$ and $H_L(N, L) > 0$, implying that marginal productivity of capital is positive.

The profit of housing production is determined as follows:

$$\pi = pH(N, L) - rL - iN \tag{6}$$

where, π is profit;

p, housing price per square feet;

r, land price per square feet; and

i, interest, which is spatially invariant.

The first term in the right side of (6) is the revenues from housing production. The second is the land costs whereas the third one is capital costs.

Since the housing production function exhibits constant returns, (6) can be rewritten as:

$$\begin{aligned}\pi &= L(pH(N, L)/L - r - iN/L)\\ &= L(pH(N/L, 1) - r - iN/L)\end{aligned} \tag{7}$$

To simplify, let S denote the capital-land ratio N/L①, which is equivalent to building heights (S is called capital density). Substituting S into (7) yields:

$$\pi = L(ph(S) - r - iS) \tag{8}$$

where $h(S) \equiv H(S, 1)$ gives floor space per acre of land. The function h satisfies $h'(S) \equiv H_S(S, 1) > 0$ and $h''(S) = H_{SS}(S, 1) < 0$.

The problem of (8) is same as the maximization of profits per land input. Hence, (8) is simplified by fixing L. The objective function becomes to maximize land development profits by choosing optimal S. The first-order condition for (8) is then expressed as:

$$ph'(S) = i \tag{9}$$

The equilibrium condition in a competitive market requires zero profit. This yields:

$$ph(S) - iS = r \tag{10}$$

From (10), an implicit function of S can be expressed as:

$$S = S(p, h, i, r) \tag{11}$$

Equation (11) says that capital density (capital-land ratio, floor-land ratio) is determined by housing price (which changes across location), housing production function (which depends on technology), interest (related to national economic policy), and land price.

Totally differentiating (12) and (13) with respect to x yields

$$h'\frac{\partial p}{\partial x} + ph''\frac{\partial S}{\partial x} = 0 \tag{12}$$

$$(ph' - i)\frac{\partial S}{\partial x} + h\frac{\partial p}{\partial x} = \frac{\partial r}{\partial x} \tag{13}$$

And then we have

$$\frac{\partial S}{\partial x} = -\frac{h'}{ph''}\frac{\partial p}{\partial x} < 0 \text{ (Recall that } \frac{\partial p}{\partial x} < 0, h'' < 0, \text{ and } h' > 0\text{)} \tag{14}$$

$$\frac{\partial r}{\partial x} = (ph' - i)\frac{\partial S}{\partial x} + h\frac{\partial p}{\partial x} = h\frac{\partial p}{\partial x} < 0 \text{ (Recall } ph'(S) = i\text{)} \tag{15}$$

Both capital density (building height) and land value decrease with distance to the CBD. Land gets cheaper relative to capital as distance to the CBD increases. This implies that developers substitute toward land (l) away from capital (N) and results in the capital density (capital-land ratio) decreases as x increases.

Since

$$\begin{aligned}&\frac{\partial r}{\partial x} = h\frac{\partial p}{\partial x}, \quad \frac{\partial r/\partial x}{r} = \frac{h}{r}\frac{\partial p}{\partial x} = \frac{ph}{r}\frac{\partial p/\partial x}{r}\\ &= \frac{pH}{rl}\frac{\partial p/\partial x}{p} = \frac{iN + rl}{rl}\frac{\partial p/\partial x}{p} > \frac{\partial p/\partial x}{p}\end{aligned} \tag{16}$$

① Capital-land ratio, capital density, plot-land ratio, and floor-land ratio are all interchangeable in this paper.

Rearranging (16) yields $\frac{\frac{\partial r/\partial x}{r}}{\frac{\partial p/\partial x}{p}} = \frac{iN + rL}{rl} > 1$. The left side is the elasticity, which is larger than 1. Thus, it is revealed that 1 percent change in housing price will bring in more than 1 percent change in land rent. In other words, (16) implies that land rent function falls faster than the housing price as x increases. As a result, reveals that the ratio of land price to housing price falls as the distance to the CBD increases.

Recognizing that land price falls with the distance, equation (16) also reveals that the ratio of land price to housing price falls as land price decreases. This pattern again is attributed to the substitution law between land and capital inputs with respect to their relative price changes.

Substituting (9) into (10) yields

$$r = p \cdot h(S) - S \cdot p \cdot h'(S) \qquad (17)$$

Differentiating (17) with respect to S yields

$$\frac{\partial r}{\partial S} = p \cdot h'(S) - p \cdot h'(S) - S \cdot p \cdot h''(S)$$
$$= -S \cdot p \cdot h''(S) \qquad (18)$$

Equation (18) reveals that a linear relation between r and S occurs only and only if $h''(S)$ is zero. If is zero, it will violate the assumption of $h''(S) < 0$, which is a key for the existence of maximum value of (6), as well as unrealistic. It is reasonable to have a diminishing housing production function. Thus, (18) proves that land value and floor-land ratio are non-linearly related.

It is difficult to illustrate relationship between r and S using (11). The purpose of this analysis, however, is to illustrate the relationship between r and S. Given the symmetric relationship between r and S, that is, if r is non-linearly related to S, and then S is also non-linearly related to r, the partial derivative $\frac{\partial r}{\partial S}$, which is easy to derive here proves the non-linearity between r and S.

Suppose that the housing production function takes the Cobb-Douglas form, which is specified as $H = H(L, N) = AL^{1-\lambda\lambda}N^{\lambda}$, where A and λ are parameters ($0 < \lambda < 1$). It is straightforward to derive $S = \left(\frac{r}{p\lambda}\right)^{\frac{1}{1-\lambda}}$ following (7 – 11). Thus we have

$\frac{\partial S}{\partial r} = \frac{\lambda}{1-\lambda}\left(\frac{1}{p\lambda}\right)^{\frac{1}{1-\lambda}} r^{\frac{\lambda}{1-\lambda}} > 0$ and

$\frac{\partial^2 S}{\partial r^2} = \frac{\lambda}{1-\lambda}\frac{1}{1-\lambda}\left(\frac{1}{p\lambda}\right)^{\frac{1}{1-\lambda}} r^{\frac{2\lambda-1}{1-\lambda}} > 0$. The signs of the first-order and the second-order partial derivatives of S over r indicate that building density (or floor-land ratio) increases exponentially with land prices ①.

3 BENCHMARK PRICE SYSTEM OF LAND USE RIGHTS

Immediately after the adoption of the land use rights system, the first real challenge that local scholars and officials face is how to determine land prices because there is not market data. This problem is overcame by inventing the benchmark land price system that is used as a reference to guide price negotiation between local officials and developers (HU, 1990).

The benchmark land price consists of four components (ZHANG and LI, 1997; YANG and WU, 1996; LI and WALKER, 1996; DING *et al.*, 2000). They are:

1) land use rights fee paid to the government;

2) infrastructure costs paid to the government for land improvement;

3) demolition cost; and

4) land acquisition cost, in most cases, paid to tenants directly or indirectly.

The formula of calculating the benchmark land price is expressed as ②:

$$P = \alpha(R) \cdot F + R \cdot I + \beta \cdot D + A \qquad (19)$$

① A similar conclusion is obtained if the housing production function takes a constant elasticity of substitution (CES) form, which is expressed as: $H(L,N) = \lambda(\beta L^{-\rho} + (1-\beta)N^{-\rho})^{-\varepsilon/\rho}$ Where $\rho = \frac{1-\sigma}{\sigma}$, denotes the elasticity of substitution between land and capital; and ε is the parameter of increasing return. Mathematical exercises will be available upon request.

② See DING, KNAAP, and WU (2001) for detail discusses of the benchmark land price system and the difference between "Shu Di" and "Sheng Di" prices. In the former case, developers pay governments for urban infrastructure that has been installed whereas in the latter case, developers have to provide infrastructure themselves so that infrastructure costs are not a part of land prices but included in total development costs.

where,

P is prices of land use rights per square meter;

α, floor-land adjustment coefficient;

F, land use rights fee;

R, floor-land ratio;

I, infrastructure cost;

β, demolition adjustment coefficient, which is dependent upon land uses ①;

D, demolition cost; and

A, land acquisition cost.

Clearly, equation (1) states that land prices depend on land development density (floor-land ratio), land grade, and land use. Land is classified into ten levels (grades), depending on population density, economic and commercial activities, infrastructure, and accessibility (HU, 1990). Land use rights fees depend on grades and land uses (Table 1). The coefficient is determined by floor-land ratio as illustrated in Table 2. There are two parts of infrastructure costs. One is for urban infrastructure and another is for community construction. Both are set as flat rates ②. Same as infrastructure costs, both demolition and land acquisition costs are set as flat rates (Table 1, Table 2).

Table 1 Land sale price

Land price grade	Land use right sale price			
	Commerical	Appartment	Residential	Industrial
1	3200 - 5400	3000 - 4600	2000 - 2700	320 - 540
2	2400 - 3200	2200 - 3000	1500 - 2000	240 - 320
3	2000 - 2400	1800 - 2200	1000 - 1500	180 - 240
4	1500 - 2000	1400 - 1800	800 - 1000	140 - 180
5	1000 - 1500	1000 - 1400	600 - 800	100 - 140
6	500 - 1000	500 - 1000	400 - 600	70 - 100
7	400 - 500	300 - 500	150 - 400	30 - 70
8	70 - 400	70 - 300	50 - 150	25 - 30
9	50 - 70	40 - 40	30 - 50	20 - 25
10	45 - 50	30 - 40	20 - 30	15 - 20

Table 2 Relationship between adjustment coefficient and floor-land ratio

	Adjustment coefficient of floor-land ratio								
Floor-land ratio	<1	2	3	4	5	6	7	8	9	10
Coefficient	1	1.9	2.7	3.5	4.2	4.9	5.6	6.3	7	7.7

It is interesting to examine the relationship between land prices and floor-land ratio. Differentiating (1) with respect to land-floor ratio yields:

$$\frac{\partial p}{\partial R} = \alpha'(R) \cdot F + I \quad (20)$$

The second-order partial derivative of P over R is then obtained as:

$$\frac{\partial^2 p}{\partial R^2} = \alpha''(R) \cdot F \quad (21)$$

All other things being equal, the term F in the right hand side of (21) is constant. Therefore, the relationship between P and R depends on $\alpha''(R)$. If $\alpha''(R)$ equals zero, it implies that there is a linear relationship between P and R. Otherwise, P and R have a non-linear relationship. Table 2 and Figure 1 suggest that land price has a linear relationship with floor-land ratio. DING, KNAAP, and WU (2001) also provide evidence of linear relationship between land price and floor-land ratio using sales data in Beijing ③ (Fig. 1).

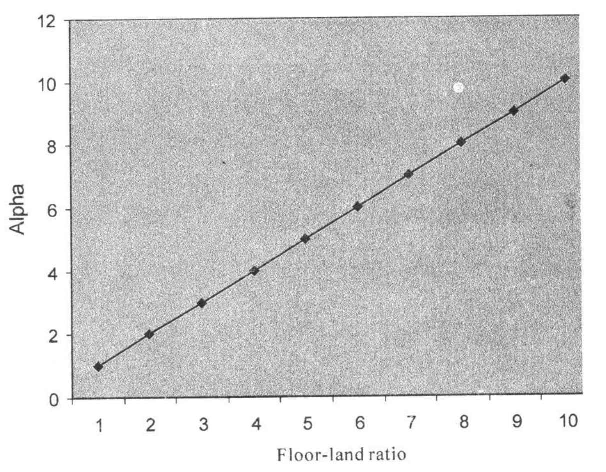

Fig. 1 Relationship between α and floor-land ratio

The formal model suggests that the benchmark land price system have two theoretical problems. One is associated with the fact that floor-land ratio plays an important role in land price determination whereas the theory suggests the other way around. That is,

① β is set to 1, 2 and 4 for residential, enterprise, and commercial development, respectively.

② The rates range from 460 to 800 yuan RMB and from 150 to 400 yuan RMB, respectively in Beijing.

③ They use a transcendental function form to estimate the land price function. Coefficients of the floor-land ratio variable, however, range between 0.86 - 1.035, approximating to 1.00. This indicates the linear.

floor-land ratio depends on land prices. The other problem is that it does not provide adequate room for substitution between land and capital inputs, which is a key in achieving land use efficiency under market principles.

4 IMPLICATIONS TO LAND USE AND URBAN DEVELOPMENT

According to the urban economic model, developers maximize profits by choosing optimal level of land and capital inputs. Developers maximize profits of land development by choosing optimal levels of land and capitals, depending on relative prices of both inputs. If land prices increase, it makes capitals relative less expensive so that developers will use more capitals and less land to maximize their profits. Following the same logic, developers will use less capital and more land in order to maximize their objective function if land prices decrease. In doing so, market efficiencies are achieved. Thus, it is land prices that determine floor-land ratio, not the other way around. This market efficiency depends on free substitution between land and capital inputs. If the substitution is prohibited, market efficiency will suffer. The relative levels of capital and land inputs determine floor-land ratio, by definition.

According to (13), floor-land ratio depends upon housing prices, land prices, interests, and technology for housing production. Housing prices affect capital density (or floor-land ratio). This is because increasing housing prices provide incentive for developers to build more houses. This in turn increases the demand for land. Since land supply is fixed (fixed geographic boundaries) and inelastic, land price will arise. Therefore, it triggers developers to substitute capitals for land in order for them to maximize profits. As a result, it increases floor-land ratio. If housing prices are falling, an opposite effect will occur. The technology of housing construction affects the floor-land ratio in a similar way. An improvement of housing construction technology reduces the construction costs, which in turn decrease housing prices. As illustrated above, decreasing housing prices will decrease floor-land ratio. Similarly, national economic policy, which affects interest rates, affects urban development. High interest rates make land relatively cheap so that more land will be substituted for capitals. Therefore, buildings get taller.

The previous analysis illustrates that the substitution between land and capital inputs is a key in improving land market efficiency. If land markets are perfect and competitive, and operated by peoples with rational behaviors, it is developers rather than government officials who should decide the optimal levels of land and capital inputs. The building density is a consequence of land development in competitive markets. This substitute is necessary to maintain market efficiency. The degree of substitution depends on housing production technology and housing prices.

This paper suggests that the current benchmark land price system does not lift land use efficiency to the level that can be achieved through the pure land markets by limiting the roles of land prices in land use and land allocation. This is because land prices depend on floor-land ratio, which restricts the substitution between land and capital inputs. Developers are not provided rooms to adjust capital and land inputs to reflect prices in land markets. Moving toward to the so-called socialism markets need to carry out further land policy reform so that land prices mechanism will be established and used to manage and allocate land resources.

Using the land price mechanism to manage land does not mean that economic principle is the only factor that needs to be considered. Of course, environment, culture, history, and ecology system should also be taken into account. Particularly, many Chinese cities have a long and rich history and historical preservation is of importance in urban planning. Quite often, it is challenging to resolve the conflicts and disputes over land between urban growth and historical preservation. Historical sites have high cultural, religious, and social values as well as economic merits. The importance of historical preservation, however, does not justify the fact that land price mechanism should not be one of the most important factors in managing and allocating land. In fact, economic principles, environmental concerns, and cultural and historical preservation can be coordinated so that each of them contributes to urban development and land use efficiency in its own way. Given the fact that historical sites only take a small portion of vast urban land and are geographically limited, the predetermination of floor-land ratio across Chinese cities undermines land allocation through land markets and the contribution of price mechanism in land use and urban development. It should be cautious in predetermining building heights in urban areas so that market efficiency will not be over-suffered due to historical preservation.

Recognizing the gaps between land policy in China and urban economic theory, the following policy recommendations are made in order to improve land use efficiency and promote urban development.

First, the bureau of land administration should be authorized to systematically document land transaction data such as location, price, data, grantors and grantees, land use, and structural attributes. These data are essential to understand land markets.

Second, systematical empirical studies should be conducted to better understand relationships among land prices, land markets, urban development, urban land use, and urban spatial pattern. The balance between urban development and historical preservation need fully understanding of costs and benefits of land development socially and economically.

Third, it is needed to establish land policy to capture land value. Lack of the channel and mechanism of capturing land value increment due to public efforts will result in substantial revenue losses and increases in social injustice. Social conflicts arise when governments fail to capture land value increases due to public investments that vary cross geographic areas so that residents located in economically prosperous areas gain windfall wealth from land. A portion of this—windfall gains from land should be taxed away (MILLS, 1998; NECHYBA, 1998).

Fourth, the benchmark land price system should be reformed in order to allow the substitution between land and capital inputs. In doing so, floor-land ratio will depend upon land prices and market efficiency will be achieved. Finally, auction and tender should be the approach in land sales and transfers and local governments are less intervening land markets. Thus, land prices will be determined based on the balance of demand and supply for land. In doing so, land use and land use density will be determined by market principles and price mechanism.

5 CONCLUSIONS

China has gained initial success by reforming its land tenure system. The introduction of land prices in land allocation and land use has improved the efficiency of land use as well as generated tremendous revenues that enable governments to finance urban infrastructure. Land policy reform also boosts real estate development, which creates job opportunities and ease rising pressure of unemployment. This paper, however, demonstrates that the current benchmark land price system is at odd with market principals in managing land. The system limits the roles that land prices can play in urban land use and urban development because it does not allow the substitution between land and capital inputs and hurts market efficiency. In addition, under the regime of the benchmark land price system since land prices depend on floor-ratio, whereas the urban economic theory suggests the opposite. Therefore, future land policy reforms are needed in China in order to improve land management. Land policy reform is challenging partly because of common misunderstanding of both land value theory and linkage between land prices and urban land use and partly because of persistent influence of planned economies, in which centralization has dominated socioeconomic life for decades.

REFERENCES

BERTAUD A, RENAUD B, 1992. Cities without Land Markets [R] . World Bank Discussion Paper NO. 227. Washington, DC: World Bank.

BRUECKNER J K, 1986. A model analysis of the effect of site value taxation[J]. *National Tax Journal*, 39: 49 – 58.

BRUECKNER J K, 1997. Infrastructure financing and urban development: the economics ofimpact fees[J]. *Journal of Public Economics*, 66: 383 – 407.

CHAN Nelson, 1999. Land-use rights in mainland China: problems and recommendations for improvement[J]. *Journal of*

Real Estate Literature, 7: 53 - 63.

DING Cheng-ri, 1996. *Managing Urban Growth for Efficiency in Infrastructure Provision: Dynamic Capital Expansion and Urban Growth Boundary Models*[D]. Ph. D. Dissertation, University of Illinois at Urbana-Champaign.

DING Cheng-ri, KNAAP G, HOPKINS L D, 1999. Urban growth boundary model: a formal analysis[J]. *Journal of Urban Economics*, 46: 53 - 68.

DING Cheng-ri, KNAAP G, WU Yi-guang, 2000. *Land Values and the Emergence of Land Markets in Beijing, China*[R]. In: 5th Asia Real Estate Annual Meeting, Beijing, P. R. China

DOWALL D E, 1993. Establishing urban land market in the People's Republic of China[J]. *Journal of the American Planning Association (spring)*, 12: 182 - 192.

HU Chun-zhi, 1990. *On the Development, Methodology and Management of Land Value Appraisal System*[R]. Internal Report, State Land Administration, Beijing.

HU Chun-zhi, 2000. *Land Markets, Land Prices, and Land Policy*[R]. In: 5th Asian Real Estate Annual Conference, Beijing, China.

LI Ling-hin, WALKER A, 1996. Benchmark pricing behavior of land in China's reform[J]. *Journal of Property Research*, 13: 183 - 196.

LI Ling-hin, 1997. The political economy of the privatization of the land market in Shanghai[J]. *Urban Studies*, 34(2): 321 - 335.

LI Ling-hin, 1999. *Urban Land Reform in China*[M]. St. Martin's Press, Inc.

LI Yuan, 1997. *Surviving and Developing: Strategies and Prospective of Agricultural Land Preservation in China*[M]. Beijing: Zhongguo Dadi Publisher.

MILLS E, 1998. *The Economic Consequences of a Land Tax, in Land Value Taxation: Can It and Will It Work Today?* [M]. In: Dick Netzer(ed.). Lincoln Institute of Land Policy, Cambridge, Massachusetts.

NECHYBA T, 1998. *Replacing Capital Taxes with Land Taxes: Efficiency and Distributional Implications with an Application to the United States Economy, in Land Value Taxation: Can It and Will It Work Today?*[M]. Dick Netzer(ed.). Lincoln Institute of Land Policy, Cambridge, Massachusetts.

WALKER A, LI L H, 1994. Land use rights reform and real estate market in China[J]. *Journal of Real Estate Literature*, 2(2): 199 - 211.

YANG Chong-guang, WU Ci-feng, 1996. *Ten-Year Reform of Land Use System in China*[M]. Beijing: Zhongguo Dadi Publisher. (in Chinese)

ZHANG Xin-quan, 1997. Urban land reform in China[J]. *Land Use Policy*, 14(3): 187 - 99.

ZHANG Xiao-hua, LI Yu, 1997. *Chinese Land Management Comprehensive Book*[M]. Beijing: Zhongguo Dadi Publisher. (in Chinese)

ZOU Jia-hua, 1994. Intensify reform, strengthen management, and establish a healthy and speedy economic growth[R]. In: *The 1994 National Meeting on Land Use Rights Reform*.