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Comprehensive Evaluation on Land Supply System Performance: In Terms of System Transformation

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***Abstract*—**This evaluation of land supply system performance in China shall examine the combination of government functions and national goals in order to perform a cost-benefit analysis of system results. From the author's point of view, it is most productive to evaluate land supply system performance at moments of system transformation for the following reasons. The behavior and input-output change of beneficial results at different times can be observed when the system or policy changes and system performance can be evaluated through a cost-benefit analysis during the process of system transformation. Moreover, this evaluation method can avoid the influence of land resource endowment. Different land resource endowment methods and different economy development periods result in different systems. This essay studies the contents, principles and methods of land supply system performance evaluation. Taking Beijing as an example, this essay optimizes and classifies the land supply index, makes a quantitative evaluation of land supply system performance through principal component analysis (PCA), and finally analyzes the factors that influence land supply system performance at times of system transformation.

***Keywords*—**Land supply, System performance, System transformation

I. Introduction

At present, many researchers perform quantitative evaluation of China's land supply system performance by comparing the western land supply system based on land property right privatization with China's land supply system based on land property right nationalization, such as American *Land System Research* [1-3] and *Hong Kong Land System*[4-6]. Some researchers, for example, land supply system evaluation of Nanjing supposed by Qu [7], compare several districts of a city and classify land supply performance into several indexes according to cross-sectional data. These researchers achieve a quantitative evaluation through calculations based on grading by experts and right weight assignment. Other researchers study the land supply system through the relation of inputs and outputs. For example, Chen [8] performs a regression analysis of China's urban production functions through the urban cross-sectional data of China in 1997, and adds 'Urban Land Built Area' into C-D production functions as the urban land scale index. However, a common problem may be found in the above research. Different land property rights systems result in different land supply system goals. Because of the differences in geographic conditions and system environments, land supply system performance evaluation by comparison between different countries or regions may not ultimately be persuasive.

Because institutional arrangements are set by the system structure, system efficiency also depends on how different institutional arrangements perform[9]. In other words, a difficulty in system performance evaluation lies in the inability to separate the interaction of institutional and non-institutional factors. In order to set up a convincing one to one correspondence between an economic system and its performance, it is necessary to separate the institutional factors from other factors to avoid influences from these other factors[10]. Utilizing transaction costs to evaluate system performance is an important task in neo-institutional economics. Coase [11] proposes the concept of transaction cost, but different understandings of transaction cost and the difficulty of obtaining historical data result in an inablity to quantify transaction costs, which hampers the ability to evaluate system performance through transaction cost.

II. Methodology

Knack and Keefer [12]believe that system performance can be indicated by system quality. System quality is mainly determined by aspects of government control including Bureaucracy Quality, Law and Regulation, Misappropriation Risk and Repudiation of Contracts by Government. Based on the above theory, the Aggregate Governance Index is set up to quantify system quality, This is made up of three indexes: game rules, government efficiency and corruption. In reference to this analysis, the present authors believe that system performance tends to be impacted by government management performance for the following reasons. First, as the system provider who makes game rules for all stakeholders in the society, the government should be responsible for enforcing the rules. Moreover, as the main land supplier in China, the government is the central player in the game.

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The contents of land supply system evaluation should reflect the benefits that accrue to all stakeholders and the relationship of those benefits to government functions and national goals. According to the state theory of neo-institutional economics, government land supply goals can be divided into the societal yields maximization goal and rental maximization goal. Evaluation contents of the societal yields maximization goal include improving social welfare, keeping social justice, maintaining market stability and promoting sustainable development. Evaluation contents of the rental maximization goal include improving market participation of the government in land leasing and improving government land supply efficiency and government land leasing profit.

Land supply system performance evaluation is quite complex. System performance can be analyzed on micro, medium and macro levels. The micro view refers to the government land leasing profit, the medium view refers to the real estate market, and the macro view refers to social/economic development. The evaluation includes land supply efficiency and corresponding benefits. The benefit analysis includes social, economic and environmental benefits. From the viewpoint of land supply efficiency and societal equity, the evaluation includes social welfare and justice.

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1) Efficiency and Equity Principle. Economics studies how to improve resources allocation efficiency. Neo-institutional economics studies how to develop systems to reduce transaction costs and improve market transaction efficiency. Therefore the efficiency principle must be taken into consideration in system performance evaluation. Improper land resources allocation by the state may destroy social justice because land property rights are a benefit of all classes. The principle of equity must be taken into consideration in land supply system performance evaluation.
2) Sustainable Development Principle. The quantitative limit of China's land resources and the continuing increase in land requirements form a special contradiction in land resources sustainable utilization. Sustainable land resources allocation is required to improve social and economic sustainable development and is its primary basis.
3) System Principle. The land supply system is the result of the correlations and interactions of the economy, society, natural resources, the environment and many other factors. Unreasonable changes or inharmonious development of any one of several factors will influence government land supply system goals.
4) Overall Efficiency Principle. Land resources allocation efficiency includes economic, social and ecological efficiencies that interact positively with each other. Only by applying the overall efficiency principle can the optimized allocation of social resources be realized.

Land supply system evaluation contents should reflect changes in benefits to all stakeholders and relate them to government functions and national goals. This essay proposes a way to evaluate China’s land supply system performance at moments of system transformation. Advantages of this method lie in the following aspects. The behavior and input-output change of the benefits received can be observed when the system or policy changes and system performance can be evaluated through cost-benefit analysis of the process of system transformation. Moreover, this evaluation method can avoid the land resource endowment influence. Different land resource endowment methods and different economy development periods result in different systems. As there are many factors affecting land supply performance and many correlations and causal relations among the inner indexes, this essay adopts PCA for the system performance evaluation.

III. Evaluation index syste

This paper is based on data collected on Beijing with 86 main statistical indicators, including I-grade market and II-grade market. The data has been processed based on following principles:

1) Technical papers submitted for publication must advance the state of knowledge and must cite relevant prior work.
2) The length of a submitted paper should be commensurate with the importance, or appropriate to the complexity, of the work. For example, an obvious extension of previously published work might not be appropriate for publication or might be adequately treated in just a few pages.

Specifically speaking, the selected indicators must address the government market, the efficiency of the government monopoly of land markets, the intensive land utilization level, social welfare, the operation condition of land development enterprises, the control policy of the real estate market, the social fairness level and the relationship between land and financial markets, etc. to reflect the management performance of

government. After analysis, 25 indicators have been chosen and divided into four types: cost, efficiency, region and stabilization (see Table 1). Time based analysis data was acquired by reviewing system performance from a time of institutional transformation, so the statistical data during 1999-2007 has been collected. The data is mainly derived from the *Beijing Statistical Yearbook* and the *Statistical Yearbook of Land and Resources of China*.

TABLE I
INSTITUTIONAL EVALUATION INDICATORS FOR LAND SUPPLY

Indicator	Indicator types	Purpose of Evaluation indicator	1999	2000	2001	2002	2003	2004	2005	2006	2007
x1	Region	Intensive land utilization	56.18%	59.39%	50.44%	38.81%	36.54%	39.35%	42.09%	43.28%	44.81%
x2	Cost	Intensive land utilization	3.79%	2.07%	302.70%	236.25%	82.13%	0.90%	10.98%	31.90%	10.84%
x3	Efficiency	Indicator of social welfare	15.88	16.75	17.62	18.20	18.70	19.00	19.50	20.06	20.30
x4	Efficiency	Operation condition of	41.96%	85.36%	79.00%	44.21%	77.20%	40.33%	40.61%	242.11%	47.67%
x5	Efficiency	Government marketization	0.00%	0.00%	0.12%	5.33%	2.12%	4.29%	6.24%	8.88%	8.07%
x6	Efficiency	Government marketization	0.00%	0.00%	0.75%	7.44%	4.55%	8.63%	20.12%	24.81%	24.32%
x7	Efficiency	Government marketization	0.00%	0.00%	1.60%	12.56%	13.69%	18.23%	68.28%	75.44%	76.08%
x8	Efficiency	Efficiency of government	2	2	1	2	3	3.5	4	4	4
x9	Region	Efficiency of government	19.38%	28.39%	36.88%	35.83%	61.50%	76.02%	17.02%	27.58%	30.87%
x10	Efficiency	Market competition among	1.0	1.215	1.497	1.059	2.249	2.608	4.607	20.472	18.374
x11	Cost	Intensive land utilization	15.00%	18.80%	17.22%	8.23%	6.79%	6.47%	13.59%	8.31%	5.42%
x12	Efficiency	Intensive land utilization	54825	64496	49614	41515	42564	51256	57383	62677	73070
x13	Region	Regulation of real estate	15.73%	16.51%	21.11%	22.84%	23.93%	24.31%	22.15%	21.87%	21.33%
x14	Region	Regulation of real estate	17.94%	18.36%	18.08%	16.83%	16.80%	12.98%	14.57%	10.36%	11.53%
x15	Stabilization	Stabilization of real estate	101.7	98.8	100.1	100.2	100.6	104.3	107.1	109.6	112.8
x16	Stabilization	Stabilization of land market	110.2	121.5	123.2	105.3	81.6	117.2	95.3	147.3	122.9
x17	Efficiency	Market concentration	3851	7446	15380	9656	10305	2345	1006	2769	925
x18	Cost	Market competition among	4.39	2.20	2.21	2.35	2.05	3.00	2.21	2.47	2.30
x19	Region	Relationship between land and	20.50%	16.65%	19.37%	20.91%	20.04%	21.00%	22.00%	17.54%	15.00%
x20	Stabilization	Regulation of real estate	95.40%	95.46%	97.09%	102.04%	100.40%	103.27%	105.52%	108.62%	110.16%
x21	Region	Indicator of social welfare	14.66%	12.38%	11.46%	10.08%	9.03%	8.54%	9.33%	10.38%	10.64%
x22	Region	Social equality	10.10%	12.89%	13.71%	9.65%	12.41%	9.72%	8.62%	8.46%	6.50%
x23	Efficiency	Social equality	3.30%	3.31%	3.18%	3.44%	3.23%	3.42%	3.75%	6.28%	4.96%
x24	Region	Indicator of social welfare	11.91%	16.61%	19.89%	22.24%	18.25%	20.06%	15.39%	17.19%	14.06%
x25	Region	Relationship between land and financial market	81.30%	81.60%	81.45%	81.30%	81.90%	80.50%	79.10%	80.30%	85.26%

IV. EVALUATION PROCESS OF LAND SUPPLY SYSTEM PERFORMANCE

1) There are four types of indicators for land supply system evaluation with different standards, and the data shall be non-dimensional.
2) The related coefficient matrix shall be generated through statistical analysis with SPSS11.5
3) The analytical statement on principal components will be generated through statistical analysis (see Table 2).

There is sufficient correlation shown in Fig. 1, so the principal components can be analyzed. From Fig. 2, the proportion of the first 5 principal components is 92.34%>90%, so five principal components are selected this time.

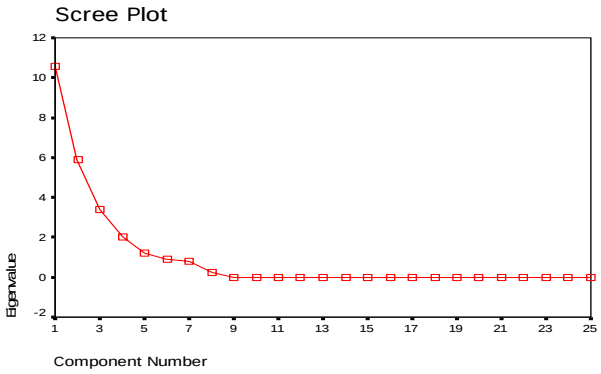

Fig. 1 Land Supply Institutional Performance Evaluation

TABLE II
VARIANCE DECOMPOSITION PRINCIPAL COMPONENT EXTRACTION ANALYSIS

Component	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.556	42.223	42.223	9.111	36.443	36.443
2	5.907	23.626	65.849	4.989	19.955	56.397
3	3.402	13.608	79.457	3.881	15.522	71.919
4	2.038	8.154	87.610	2.613	10.453	82.373
5	1.183	4.733	92.344	2.493	9.971	92.344

4) Indicator load matrix: for purposes of analysis, the load matrix is transformed to a rotated indicator load matrix. Refer to Table 3 for calculation results.

TABLE III
LOAD MATRIX OF ROTATION FACTORS

	Component				
	1	2	3	4	5
X1	.657	.709	-.135	-.010	.090
X2	-.037	-.053	-.050	-.150	**-.953**
X3	.802	.499	.189	.212	.050
X4	.163	-.039	.101	**.940**	.100
X5	**.907**	.247	.105	.170	.138
X6	**.934**	.090	.157	.228	.171
X7	**.917**	.021	.155	.245	.213
X8	**.914**	.110	.032	.176	-.206
X9	-.109	-.282	.415	.136	.777
X10	.734	-.064	.472	.422	.135
X11	.573	.530	.386	-.171	-.254
X12	.462	-.544	.602	.168	-.049
X13	-.377	**-.897**	.154	-.030	.086
X14	**.922**	.241	.032	.112	-.247
X15	.319	-.095	**.788**	.148	.484
X16	.264	.335	-.118	**.708**	.285
X17	-.837	.379	.021	.062	.328
X18	-.073	.617	.293	.256	.420
X19	-.104	.203	**-.934**	-.259	-.065
X20	.157	-.725	.560	.248	.138
X21	.409	**.859**	-.123	.099	-.110
X22	**-.943**	.127	-.097	.190	-.034
X23	.698	-.100	.304	.569	.137
X24	-.307	**.806**	-.141	.082	-.045
X25	-.049	-.022	**-.882**	.356	-.114

The factor with absolute value closest to 1 is selected for principal component cluster analysis. See the bold numbers in Table 3.

5) *Principal component analysis:*

First principal components are: X5, X6, X7, X8, X14 and X22;
Second principal components are: X13, X21 and X24;
Third principal components are: X15, X19 and X25;
Fourth principal components are: X4 and X16;
Fifth principal component is: X2.

The main factors which may affect the performance of the land supply system are: the market level of land transference, social welfare, the effect of real estate market regulation by government, the influence on operation of real estate enterprises by the land supply system, as well as the influence on intensive land use by the land supply system. In order for the principal component analysis of the land supply system performance evaluation to reveal distinct effects, good indicators are required. However, it is difficult to achieve unified cluster standards from the above principal component indicators.

6) *Evaluation order:*

The expressions of F1, F2, F3, F4 and F5 can be generated by dividing the initial factor load matrix by the feature vector of five principal components. The proportion of total eigen values of the principal components to the eigen value of extracted principal components is deemed as weight, which is used to calculate the comprehensive model F of principal components. Sequentially, the comprehensive evaluation order for land supply system performance is obtained (see Table 4).

TABLE IV
COMPREHENSIVE EVALUATION ORDER FOR LAND SUPPLY SYSTEM PERFORMANCE

Year	F1	F2	F3	F4	F5	F	F1	F2	F3	F4	F5	F
1999	0.521	-1.037	0.311	0.266	0.226	0.088	8	8	8	4	6	9
2000	0.634	-1.144	1.007	0.129	0.539	0.245	7	9	5	6	2	8
2001	0.471	-0.551	1.489	0.161	0.377	0.376	9	6	1	5	5	7
2002	1.389	0.493	1.249	-0.063	0.000	0.857	6	3	4	7	8	6
2003	1.561	0.723	1.475	0.311	0.440	1.103	5	2	2	3	3	4
2004	1.699	1.100	-0.052	-0.109	0.629	0.955	4	1	9	8	1	5
2005	2.464	0.301	0.708	0.481	-0.002	1.211	3	4	7	2	9	3
2006	3.486	-0.448	1.330	0.915	0.392	1.648	1	5	3	1	4	1
2007	3.430	-0.979	0.864	-0.253	0.055	1.265	2	7	6	9	7	2

V. Conclusion

From Fig. 2, it is apparent that the management performance of the Beijing government as regards the land supply system has improved on the whole shown by F1-F5 and F. The value of F was 0.088 (No. 9) in 1999 and 1.265 (No. 2) in 2007. However, it should be noted that management performance decreased in 2003-2004 and 2006-2007.

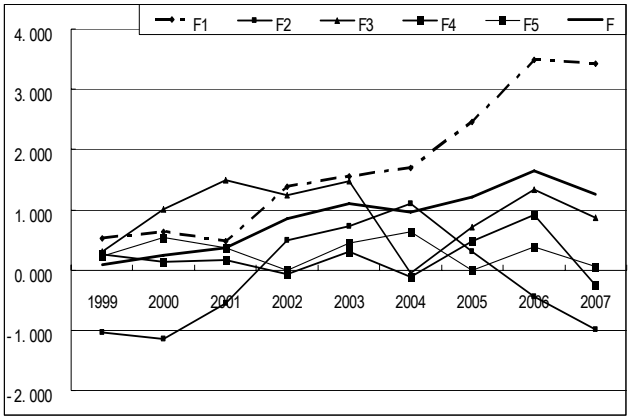

Fig. 2 Comprehensive Evaluation of Land Supply System Performance in Beijing (1999-2007)

A. Transformation of land supply system

1) Between 1999 and 2007 the Chinese government began to pay more attention to land supply system management. On Jan. 27, 1999, the *Notice on Further Promotion of Transfer of State-owned Land Use Right by Bidding and Auction* was formulated, which specified that no state-owned land use right can be transferred by agreement, except for the administrative land allocation by Land Management Law and Urban Real Estate Administration Law. All construction land shall be paid for acquisition.
2) In June, 2002, the *Rules for Transferring State-owned Land Use Right by Auction* was formulated by the Ministry of Land and Resources, which clearly specified that the state-owned land use right of all operational lands must be acquired through bidding, auction or listing, such as land for commerce, tourism(?), entertainment and commercial residence, beginning July 1, 2002.
3) However, local governments still implemented land transfer agreements. The central government had to put forward the *Notice on Law Enforcement Supervision of the Continued Operation of the Bidding Auction of Land Use Right Transfer Case* in March, 2004, which specified that after August 31 of that year, no operational state-owned land use right could be transferred by agreements made prior to that date. All land use rights must be acquired through public bidding, auction and listing.
4) In 2006, the *Rules for Transferring State-owned Land Use Right by Auction* and the *Regulations for State-owned Land Use Right Transfer by Agreement* separately specify the detailed procedures for state-owned land use right transfer through bidding, auction, listing and agreement. These regulations finally perfected the current state of the land supply system.

B. Explanation of the influence on land supply system performance by institutional transformation.

The main reason for the improvement in the performance of the land supply system in Beijing is the increase in land market transfer, government revenue and intensive land use. This paper mainly focuses on the reasons for land supply system performance decreases in 2003-2004 and 2006-2007. From the history of institutional transformation we can see the following.

1) The main reason for system performance decrease is the conspiracy between the government and development enterprises. After the transfer of land use right through agreement was forbidden in 2002, local governments instead speeded up the transfer of land use rights by agreement in 2003-2004, with a total transfer of 109,540,000 m2 during the two years, which constitutes over 33% of the total transferred area since the establishment of the paid transfer system in 1988 (see Fig. 3). That is, during the process of transformation, local governments did not set the maximization of rents as their primary goal. Instead local governments conspired with development enterprises and intervened in the land transfer market contrary to the goals of the central government. Both local governments and development enterprises made use of the lag in enforcement of new regulations promulgated during the process of institutional transformation to obtain rent revenue by alternative methods. This is the reason for the system performance decrease in 2003-2004.

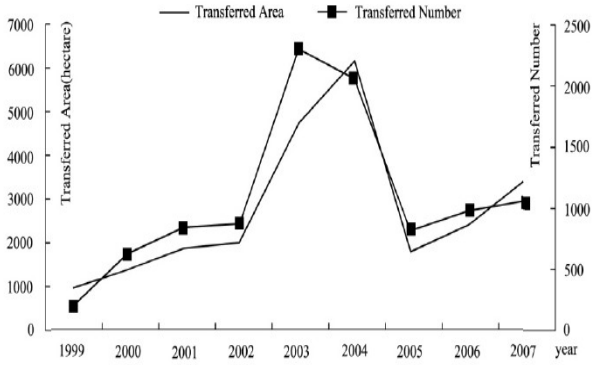

Fig. 3 Area and Quantity of Land Transfer in Beijing (1999-2007)

2) Although the proportion of market transfer increases gradually, the agreement transfer is still the main type of land transfer in Beijing. The bidding, auction and listing system shows better system performance. X7 (Action price/ total transfer price) in 2005, 2006 and 2007 is 68.28%, 75.44% and 76.08% respectively, and X5 (Number of land auctions/ total number of land transfers) is 6.24%, 8.88% and 8.07% respectively, which means that the agreement transfer (mainly for industrial land) is still one of the most common land transfer methods in Beijing now (see Fig. 4).

The reason is that the local government still uses industrial land as an attractive vehicle for for investment absorption, and refuses to transfer by bidding, auction and listing. It affects the ratio of X5 as well as the overall trend of system performance.

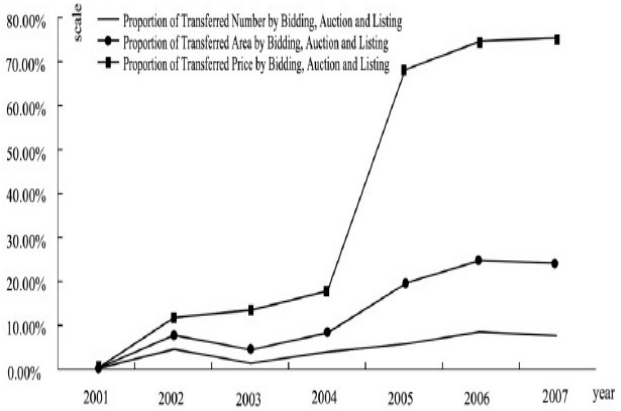

Fig. 4 Proportion of Land Use Right Transfer by Bidding, Auction and Listing (2002-2007)

3) System performance decreases because of the decrease in social security expenditures by the government (Did I understand this correctly):

From Fig. 5, the value of X22 (social security residential land/ total residential land) increased in 1999-2001 and has decreased since 2003, which is in stark contrast with the sharp increase of land transfer revenue and real estate prices after 2003. This caused the poor performance of the land supply system in 2006-2007. That is, in this period of institutional transformation, the government neglected social benefits while maximizing benefits to itself.

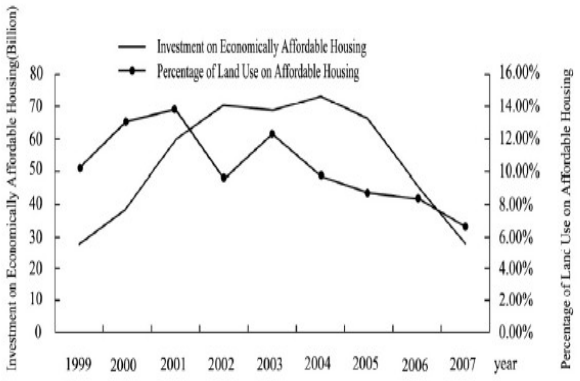

Fig. 5 Investment and Land-use Proportion of the Social Security System in Beijing (1999-2007)

Our conclusion is that after years of game playing between local governments and the central government on implementation of a new land supply system in China, the new system has gradually been accepted as the standard for restricting each interested party in a land transaction. Whenever there is a rule, there is a way to get around it. It is the norm in the process of institutional transformation of the land supply system in China. Government actions are the main factors which influence system performance. With centralized authority and decentralized responsibilities, it is difficult for local governments to realize or balance the maximization of rents and social benefits, so it is necessary for the central government to put strict restrictions on the actions of local governments. In the future, local governments will pay more attention to revenue generation by land transfer by bidding, auction and listing, and will put more of this revenue into economically affordable housing (social security residences).

REFERENCES

[1] Li Rui, 2005. Perfection of Land Expropriation System in China in Perspective of American Jurisprudence. [J]. Guangxi Social Sciences. 2005 (12): 88-91

[2] Zhang Jun, 2008. Learn from American Soil Value Capture System. [J]. China Land, 2008 (1): 34-36

[3] Liu Yulu, 2002. International Comparison of Urban Land System and the Implications. [J]. China Real Estate, (6): 2-4

[4] Zhang Juanfeng and Jia Shenghua, 2007. Analysis and Experience of Urban Land Value Capture System in Singapore and Hong Kong. [J]. Modern Urban Research, 2007 (11): 80-87

[5] Feng Xinming, 1993. Analysis of Real Estate Title System in Hong Kong and the Advantages and Disadvantages. Social Sciences in Guangdong, 1993 (2): 21-23

[6] Jia Shenghua, 2000. Land Supply System of the Hong Kong Government and its Implications. [J]. China Real Estate,2000 (4): 72-76

[7] Qu Zhongqiong and Pu Lijie, 2006. Study of Urban Land Supply System Performance Evaluation System – taking Nanjing as Example. [J]. China Land Science, 2006 (2): 23-26

[8] Chen Fujun, 2001. Preliminary Study of Urban Production Functions in China. (1): 13-15

[9] Ghertmen, Michel, 1998. Measuring Macro-economic Transaction Costs: A Comparative Perspective and Possible Policy Implications [R]. Second Annual Meeting of the International Society for New Institutional Economics, September,Paris.

[10] Wallis, Joseph and North, Douglass C.,1986. Measuring the Transaction Sector in the American Economy,1870-1970, Long-term factors in American economic growth. [M]. Edited by Stanley Lengerman and Robert G., Chicago: University of Chicago Press.

[11] Coase, North, Williamson, 2003. Translations of the New Institutional Economics masterpiece: Institutions, Contracts and Organizations: Perspectives from New Institutional Economics [M].Beijing, Economic Science Press.

[12] Knack, Stephen and Keefer, Philip, 1997. Does Social Capital Have An Economic Payoff: A Cross-Country Investigation , Quarterly Journal of Economics, November 1997, Vol. 112, No. 4, Pages 1251-1288.M. Young, *The Techincal Writers Handbook.* Mill Valley, CA: University Science, 1989