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Non-coordination in China′s Urbanization: Assessment and Affecting Factors

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Abstract: Urbanization is a comprehensive concept, a trinity process that is based on the interactions and mutual influences among the population urbanization, economic urbanization and space urbanization, in which, people are the central and leading players in this process, while economic activities serve as the driving force and space is the carrier—the physical or material setting as well as the product. So the coordination among these processes is crucial for a country or region′s sustainable development. China is experiencing rapid growth of cities and a surge in urban population, with the basic national condition of many people and little land, which calls for a systematic study of the issue of coordinated urbanization from theoretical, methodological and practical perspectives. Based on the concept of urbanization and non-coordination of urbanization, this article built a quantitative method to identify and evaluate the urbanization and non-coordination of urbanization, and made an empirical analysis in China between 2000 and 2008. The results show that the non-coordination overall level of China′s urbanization declined during the study period, because population urbanization, economic urbanization, and space urbanization exhibited different trajectories of change. This study also reveals that performance assessment system, household registration system, and urban land expropriation system, *etc*., are the main affecting factors. At the end, we put forward some suggestions to achieve sustainable development of China′s urbanization from the aspects of improving the local government′s objective function, implementing the urban planning system, enforcing public participation aspects and so on.

Keywords: non-coordination of urbanization; coordinated development degree; China

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1 Introduction

Urbanization is one of the most significant transformations occurring in contemporary human society (Chen *et al*., 2010). The 2001 Nobel Economic Prize Winner Stiglitz once prophesied that the process of urbanization of China, together with the development of the high technology of America, would become the most significant event on the influence of the 21st century human society (Stigliz and Yuguf, 2001). In the past few years, China′s urbanization has been accelerated at an unprecedented scale and speed in human history, with an annual average increase of over 1.3×10^7 persons and an annual average rate of 1% (Liu *et al*., 2005; Heikkila, 2007). Friedmann (2006) evaluated the speed of China′s urbanization as a ′breakneck speed′, compressing into one century what will take the world three centuries to accomplish. Along with this unprecedented urban development process, many challenging issues are becoming increasingly apparent in China. Lin (2007) pointed out that the rapid growth of urban scale is one of the key characteristics in the process of China′s urbanization, accompanying by peri-urbanization (Lin, 2006). Lu *et al*. (1997) indicated that a large number of land-

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lost peasants were forced into the cities along with China′s low-density and disorderly urban expansion. However, they can not settle in cities and enjoy the same treatments as city dwellers because of housing and census register management. This led to the emergence of ′driving urbanization′ and ′peri-urbanization′ phenomenon (Lu *et al*., 1997; Lu, 2007). Chen (2007) revealed that China′s high-speed urbanization jeopardized land preservation and grain supply. Gene and Josef (2006) mentioned that China′s growing urbanization was hailed as a sign of progress by scholarly literature and governmental statements. This induced local government (even central government) officials to make strategies to speed up the urbanization process, such as ′Movement of Building Cities′, ignoring its feasibilities and consequences.

It is clear that there exist a lot of problems and issues that should be closely examined and resolved during the process of China′s urbanization, and greater attention ought to be paid to the quality of this process. However, accurately measuring the quality of urbanization, uncovering its underlying mechanisms, and putting forward practical solutions to various problems still remain a challenging task. Existing studies on quality of China′s urbanization (Ye, 2001; Han and Liu, 2009; Wang *et al*., 2010) are helpful, but not quite comprehensive and systematic in approaches. In fact, urbanization is a comprehensive concept, and a process involving the interactions and mutual influences among population urbanization, economic urbanization and space urbanization. We should thus examine this process considering the interaction and coordination among the three sub-processes or subsystems (Sun *et al*., 2012a; 2012b). The quality of urbanization, to a large extent, is also linked to and affected by a country′s (or region′s) institutional or administrative structure, which can be considered as a reflection of one country′s (or region′s) institutional arrangement effect (Song and Michael, 1996; Zhao, 2001). Therefore, this paper aims to develop a new approach to quantitatively evaluate and identify the quality of China′s urbanization—non-coordination of urbanization, and use the institutional structure/arrangement to help interpret the underlying mechanisms.

2 Data and Methodology

2.1 Data source

The data sets used in this study were derived from *China Statistical Yearbook 2001–2009* (NBSC, 2001–2009) directly or indirectly. It should be pointed out that our data do not cover Chinese Macau, Hong Kong and Taiwan for the lack of statistical data. The spatial scale of the data is corresponding to urban built-up areas (municipal urban districts) rather than the city′s administrative region including counties. Non-agriculture population was used as the main indicator to evaluate population urbanization, excluding floating population who did not actually settle down in the city and enjoy urban lifestyle. This is also the reason why we chose the study period from 2000 to 2008 since urban population statistic after 2008 contains significant number of people who did not have urban household registration and were not real urban dwellers.

2.2 Concepts of urbanization and non-coordination and their assessment indexes

2.2.1 Concepts of urbanization and non-coordination

Urbanization has been studied by scholars from many disciplines. However, there still has not a uniform definition. Demographers view urbanization as a phenomenon and process in which rural population is gradually changing into urban residents. Wilson, a well-known demographer, claimed that ′urbanization is a phenomenon that the population proportion living in urban areas is increasing′ (Wilson, 1941). Clark, another famous demographer, looked into urbanization as characterized by the decline of population engaged in primary activities and the increase in population in secondary and tertiary economic activities (Clark, 1988). Urbanization is considered by the economists as a convergence of various development elements/factors of non-agricultural activities (e.g. manufacturing, capital, technology, talents) into the urban areas (Moomaw and Shatter, 1996; Henderson, 2003). Geographers study urbanization from a spatial perspective. Urbanization is thus defined as a process of rural population turning into urban population, which is symbolized by the increase in the number and size of cities, as well as the built-up land area. The occupational structure and lifestyle of people in the city have also been profoundly transformed. Each of the disciplines offers unique insights and catches specific aspects of the urbanization process. However, a more comprehensive and systematic approach is still needed in order to fully understand this profound and highly sophisticated spatial and temporal process.

This study adopted and built upon such a comprehensive research approach. We consider urbanization as an integrated process involving the interactions and mutual influences among population urbanization, economic urbanization and space urbanization. In which, people are the behavior subjects—the central and leading players in this process, while economic activities serve as the driving force and space is the carrier—the physical or material setting as well as the product. And we defined non-coordination in urbanization as the degree to which the three sub-processes or subsystems are uncoordinated or incompatible. For instance, the size of urban population may not be compatible with the level of economic development, the employment opportunities, and regional infrastructures. Space urbanization, the transformation and building-up of urban areas, may not match the size of urban population, the demand from economic activities, as well as city dwellers′ living standard. Thus, whether China′s urbanization is deemed coordinated or harmonious should be judged by fully assessing the degree to which the three urbanization subsystems are compatible with one another.

2.2.2 Urbanization assessment indexes

Based upon the above discussion and following the fundamental principles of system theory and index building (Ou *et al*., 2008; Chen *et al*., 2010; Sun *et al*., 2012a), we developed a set of effective and operational assessment indexes, integrating subsystems of population urbanization, economic urbanization and space urbanization.

The component of population urbanization is mainly characterized by the increase in the size of urban population, population density, as well as the change in the employment structure and quality of population. Operationally, we use the amount of non-agriculture population (U_{P1}), the proportion of non-agriculture population (U_{P2}), population density in built-up area (U_{P3}), secondary and tertiary industry employment size (U_{P4}), and the number of college students per ten thousand people (U_{P5}) to quantify this component or subsystem. Variables used for economic urbanization reflects the extent to which non-agriculture development factors concentrate in cities, including per capita GDP (U_{E1}), per capita gross industrial output (U_{E2}), the proportion of secondary and tertiary industries in GDP (U_{E3}), and the GDP density of secondary and tertiary industries (U_{E4}). While increase in the physical size of cities and changing landscape are the major concerns of space urbanization. Variables chosen for this component contain the built-up area (U_{S1}), per capita built-up area (U_{S2}), per capita public green area (U_{S3}), per capita area of paved road (U_{S4}), and the number of public buses per ten thousand people (U_{S5}).

2.3 Methodology

2.3.1 Entropy method

In order to eliminate the subjective bias in the assessment index, we used the entropy method in determining the weights of variables in the index system. Specifically, the weight of each variable was estimated based on the entropy value (*E*-value) or amount of information of the variable in the index. Generally, an inverse relationship is assumed between the value of information entropy and the rate of index change for benefit index. The faster the change is, the lower the information entropy is, and the larger the weight of index is. However, the relationship is just opposite for the cost index. Detailed discussions and procedures are available in the references (Livesey *et al*., 1987; Swaminathan and Periasamy, 1996; Sun *et al*., 2012b).

2.3.2 Measures of coupling degree and coordinated development degree

(1) Coupling degree. The concept of ′coupling′ is derived from physics, which is a phenomenon of the intimacy of a dependency and interaction between two or more (sub) systems. The coupling degree is a quantification of the degree of dependency or interaction. It determinates the future structure of a system once it arrives at its critical value. The synergistic effect within a system is the key for the system to transform from a chaotic status to an orderly status, and also governs the characteristics of a system (Sun *et al*., 2012b). ′Population-economic-space′ urbanization coupling degree is the extent to which population urbanization, economic urbanization and space urbanization interact with each other. The value reflects the degree of coordinated development among the three subsystems, and can be calculated by the following functional relationship (Ngai, 2003, Sun *et al*., 2012b)

$$C_n = \left\{ \left(U1 \times U2 \times \ldots \times U_n \right) \Big/ \left[\prod \left(U_i + U_j \right) \right] \right\}^{\frac{1}{n}}$$
$$(n = 1, 2, 3;\ i, j = 1, 2, 3,\ i \neq j) \qquad (1)$$

where $C_n \in [0,1]$ is the coupling degree; U_i is the value of the urbanization subsystem i; n equals the number of urbanization subsystem. Usually, the bigger the value of C_n is, the more coordinated the subsystems is.

(2) Coordinated development degree. While C_n captures the degree of coupling among the urbanization subsystems, it may not be able to reflect the overall level or state of the whole system. For example, when the values of population urbanization, economic urbanization and space urbanization are equal and yet very small, coupling degree could be high. However, the overall level of system development remains low. To manage this situation, a separate model was developed to measure the degree of coordinated development of the system: (Ngai, 2003, Sun *et al*., 2012b)

$$D = (C_{\mathrm{n}} \times T)^{\frac{1}{2}} \tag{2}$$

$$T = a \times U_1 + b \times U_2 + c \times U_3 \tag{3}$$

where D is the degree of coordinated development; $T \in [0,1]$ is an index designed to represent the comprehensive level of urbanization; U_1, U_2, U_3 are the values of population urbanization, economic urbanization and space urbanization respectively; a, b, c are the coefficients to be estimated. In this study, in order to make the T value arrive to 1 possibility based on the calculated U_i values, we assumed that population urbanization, economic urbanization and space urbanization have the same weight equal to 4 ($a = b = c = 4$) (Sun *et al*., 2012b). According to the degrees of coordinated development, the process of urbanization can be divided into four stages: period of low coordinated development ($0 \leq D \leq 0.4$), period of moderate coordinated development ($0.4 < D \leq 0.5$), period of high coordinated development ($0.5 < D \leq 0.8$), period of exceptional coordinated development ($0.8 < D \leq 1$). According to the inverse relationship between coordination and non-coordination, we can say that higher value of D means lower non-coordination, while lower value of D means higher non- coordination. Therefore, we classify the non-coordination into four stages in a similar manner: stage of exceptional non-coordination ($0 \leq D \leq 0.2$), stage of high non-coordination ($0.2 < D \leq 0.5$), stage of moderate non-coordination ($0.5 < D \leq 0.6$), and stage of low non-coordination ($0.6 < D \leq 1$).

3 Recognition of Non-coordination in China′s Urbanization

3.1 Assessing level of China′s urbanization

We presented empirical results by using entropy method (Table 1 and Table 2). It can be seen from Table 1 that the proportion of secondary and tertiary industries in GDP exhibited highest weight (0.1311), followed by population density in built-up areas (0.1223) and per capita areas of paved road (0.1000). It indicates that economic growth and the increase in urban construction land are the main features of China′s urbanization. Table 2 shows that the value of population urbanization fluctuated and went down slightly (0.0429–0.0311) from

Table 1 Urbanization assessment results

System	Subsystem index	Variable (unit)	*E*-value	*D*-value	Weight
Urbanization comprehensive index	U_{P}	U_{P1} amount of non-agriculture population (10^4 person)	0.9017	0.0983	0.0390
		U_{P2} proportion of non-agriculture population (%)	0.8971	0.1029	0.0409
		U_{P3} population density in built-up area (person/km^2)	0.6921	0.3079	0.1223
		U_{P4} second and tertiary industry employment size (10^4 person)	0.8616	0.1384	0.0550
		U_{P5} college students per ten thousand people (person)	0.8845	0.1155	0.0459
	U_{E}	U_{E1} per capita GDP (yuan (RMB))	0.7884	0.2116	0.0841
		U_{E2} per capita gross industrial output (10^4 yuan)	0.7738	0.2262	0.0899
		U_{E3} proportion of secondary and tertiary industries in GDP (%)	0.6700	0.3300	0.1311
		U_{E4} GDP density of secondary and tertiary industries (10^4 yuan/km^2)	0.7705	0.2295	0.0912
	U_{S}	U_{S1} built-up area (km^2)	0.8859	0.1141	0.0454
		U_{S2} per capita built-up area (m^2/person)	0.8650	0.1350	0.0536
		U_{S3} per capita public green area (m^2/person)	0.8587	0.1413	0.0561
		U_{S4} per capita area of paved road (m^2/person)	0.7486	0.2514	0.1000
		U_{S5} number of public buses per ten thousand people	0.8854	0.1146	0.0455

Table 2 Urbanization scores in China (2000–2008)

Urbanization	2000	2001	2002	2003	2004	2005	2006	2007	2008
U_P	0.0429	0.0224	0.0099	0.0189	0.0179	0.0347	0.0318	0.0264	0.0311
U_E	0.0012	0.0048	0.0064	0.0164	0.0259	0.0432	0.0808	0.0964	0.1199
U_S	0.0031	0.0076	0.0141	0.0251	0.0292	0.0405	0.0491	0.0616	0.0704
U_{COM}	0.0472	0.0348	0.0304	0.0604	0.0730	0.1183	0.1617	0.1845	0.2214

Notes: U_P, U_E, U_S, U_{COM} represent index scores of population urbanization, economic urbanization, space urbanization, and comprehensive urbanization, respectively

2000 to 2008. As compared with Chen Mingxing′s evaluation of China′s urbanization which shows a steady increase in the level of population urbanization (Chen *et al*., 2010), our results using non-agriculture population as the main variable more accurately depicts China′s current urbanization conditions. Because non-agriculture population was used as the main indicator to evaluate population urbanization, excluding floating population who did not actually settle down in the city and enjoy urban lifestyle. Economic urbanization (0.0012–0.1199) and space urbanization (0.0031–0.0704) show an obvious growth trend from 2000 to 2008, which also indicates that they are more important features and characteristics than population urbanization in China′s urbanization. The comprehensive level of China′s urbanization had improved continuously from 0.0472 in 2000 to 0.2214 in 2008.

In the index of population urbanization, population density in built-up areas had the highest weight (0.1223), followed by the secondary and tertiary industry employment size (0.0550), while the weights of other variables differ only slightly (average level is 0.0419) (Table 1). It is clear from Fig. 1 that population density in built-up area declined from 2000 to 2008, so its contribution to population urbanization decreased significantly. This means that the rate of the increase in urban built-up areas surpassed that of the population, which helps interpret the fluctuation in the value of population urbanization. The highest weight in the index of economic urbanization is the proportion of secondary and tertiary industries in GDP (0.1311), while the weights of other variables differing only marginally (average level is 0.0884) (Table 1). The highest weight in the index of space urbanization is the per capita area of paved road (0.1000), followed by the per capita public green area (0.0561) and the per capita built-up area (0.0536), with the weights from the rest of the variables very similar (average level is 0.0455) (Table 1). This could verify indirectly that the road construction is a key reason for the urban sprawl, causing China′s urban expanding in a low-density and disorderly manner. Comparatively, the mean of weights in economic urbanization subsystem index is higher than those of the other two subsystem indexes, which implies that economic development, to a large extent, dominates the whole urbanization process.

3.2 Assessing non-coordination level of China′s urbanization

Using equations (1), (2) and (3), we calculated the coupling degrees (C_n), the T values and the degree of coordinated development (D) (Table 3).

3.2.1 Population-economic-space urbanization

As for coupling, the degree of population-economic-space urbanization′s coupling had risen from 0.2632 to

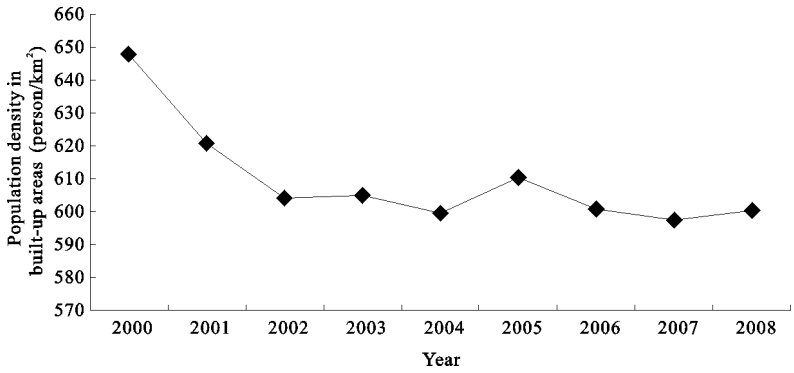

Fig. 1 Population density in built-up area of China: 2000–2008

Table 3 Scores of coordination in China′s urbanization (2000–2008)

Index	Sub-index	2000	2001	2002	2003	2004	2005	2006	2007	2008
C	C_{PES}	0.2632	0.4317	0.4811	0.4943	0.4921	0.4984	0.4742	0.4512	0.4481
	C_{PE}	0.1626	0.3801	0.4886	0.4988	0.4917	0.4970	0.4502	0.4109	0.4043
	C_{PS}	0.2497	0.4351	0.4920	0.4950	0.4856	0.4985	0.4885	0.4583	0.4610
	C_{ES}	0.4493	0.4865	0.4632	0.4890	0.4991	0.4997	0.4848	0.4877	0.4827
T	T_{PES}	0.1886	0.1392	0.1215	0.2417	0.2919	0.4733	0.6466	0.7380	0.8855
	T_{PE}	0.1763	0.1088	0.0650	0.1413	0.1753	0.3115	0.4504	0.4915	0.6041
	T_{PS}	0.1838	0.1202	0.0959	0.1759	0.1883	0.3005	0.3234	0.3522	0.4057
	T_{ES}	0.0171	0.0495	0.0821	0.1661	0.2202	0.3347	0.5195	0.6323	0.7612
D	D_{PES}	0.2228	0.2452	0.2418	0.3456	0.3790	0.4758	0.5537	0.5770	0.6299
	D_{PE}	0.1693	0.2033	0.1782	0.2655	0.2936	0.3934	0.4503	0.4494	0.4942
	D_{PS}	0.2142	0.2287	0.2172	0.2951	0.3024	0.3871	0.3975	0.4018	0.4325
	D_{ES}	0.0876	0.1552	0.1950	0.2850	0.3315	0.4090	0.5018	0.5553	0.6062

Notes: C_{PES}, C_{PE}, C_{PS}, C_{ES} represent the coupling degree among the three subsystems, the coupling degree between population urbanization and economic urbanization, the coupling degree between population urbanization and space urbanization, and the coupling degree between economic urbanization and space urbanization, respectively; D_{PES}, D_{PE}, D_{PS}, D_{ES} represent the degree of coordinated development among the three subsystems, population urbanization and economic urbanization, population urbanization and space urbanization, and economic urbanization and space urbanization, respectively; T_{PES}, T_{PE}, T_{PS}, T_{ES} represent the comprehensive of urbanization of three subsystems, population urbanization and economic urbanization, population urbanization and space urbanization and economic urbanization and space urbanization

0.4481, a growth of 70.25%, but with apparent fluctuation during the study period (Table 3). In terms of the three subsystems, the value of population urbanization decreased a little bit, while the values of the other two went up obviously. The value of population urbanization was bigger than those of the other two subsystems before 2003, and became smaller thereafter (Table 2). This led to shrinking gaps among them before 2004 and increasing gap after 2004, with the magnitude of the gaps much smaller than that in 2000.

The degree of coordinated development rose dramatically from 0.2228 in 2000 to 0.6299 in 2008, a growth of 182.72% (Table 3). It can be seen that the coordinated development of population-economic-space urbanization system had been transformed from the low coordinated development stage in 2000 to the moderate coordinated development stage in 2005, and then to the high coordinated development stage in 2006. Conversely, the non-coordination of population-economic-space urbanization system had moved from the high non-coordination stage to the moderate non-coordination stage in 2006, then to the low non-coordination stage in 2008.

3.2.2 Population-economic urbanization

The coupling degree of population-economic urbanization was raised from 0.1626 to 0.4043, an increase of 148.65% during the study period (Table 3). A rapid growth in the coupling degree was observed between 2000 and 2003, while a small decline was witnessed during 2004–2008 period. The reason is that the value of population urbanization went down, while the economic urbanization went up obviously.

The degree of coordinated development demonstrated a noteworthy rise from 0.1693 to 0.4942, a 191.22% jump between 2000 and 2008 (Table 3). Accordingly, the population-economic urbanization system had evolved from the low coordinated development stage to the moderate coordinated development stage in 2006 and thereafter. Conversely, the level of non-coordination of population-economic urbanization system had been lowered from the exceptional non-coordination stage to the high non-coordination stage in 2003.

3.2.3 Population-space urbanization

The coupling degree of population-space urbanization grew by 70.93% from 0.2497 in 2000 to 0.4610 in 2008 (Table 3). The gap between the values of population urbanization and space urbanization became increasingly smaller until 2005, and the trend was reversed since then.

The degree of coordinated development grew remarkably by 101.91% from 0.2142 to 0.4325 in the study period. In accordance with the *D* values, two stages can be clearly identified: low coordinated development stage 2000–2006; moderate coordinated devel-

opment stage from 2007. But the non-coordination of population-space urbanization system still remained in the high non-coordination stage.

3.2.4 Economic-space urbanization

The average coupling degree of economic-space urbanization had a higher value of 0.4825 between 2000 and 2008, but only a slow growth of 3.34% from 0.4493 to 0.4827 (Table 3). It implies that economic development and space expansion have an intimate relationship, interacting with and influencing each other closely. There had been a rapid increase in the values of both economic urbanization and space urbanization, and the gap between them was very small, which explains the high level of coupling between them.

The degree of coordinated development increased remarkably by 592.01% from 0.0876 to 0.6062 (Table 3). According to the *D* values, the coordinated development of economic-space urbanization system had been transformed from the low coordinated development stage to the moderate coordinated development stage by 2005, and then to the high coordinated development stage in 2006. Conversely, the non-coordination of economic-space urbanization system stayed in the exceptional non-coordination stage before 2002, and improved to the moderate non-coordination stage from 2006, then moved to the low non-coordination stage in 2008.

4 Factors Affecting Non-coordination Level of China′s Urbanization

From the above empirical results, we can find that the non-coordination in China′s urbanization is mainly caused by the asynchronously development among population (real city dweller) growth, economic development and urban construction (especially the road construction). In order to explain the affecting factors, the growth rate of each variable used in urbanization index system was computed for the period between 2000 and 2008 (Fig. 2).

It can be seen that the growth rates of the proportion of non-agriculture population (U_{P1}) (–0.0224) and the population density in built-up area (U_{P3}) (–0.1102) are negative, which means both of them were declining during the study period (Fig. 2). The decline in the proportion of non-agricultural population implies that the growth of the real urban dwellers was much slower than that of people who actually live in the city but without an official urban residency status (*hukou*). The increasingly larger number of rural migrant laborers and students (the growth rate of college students per ten thousand people (U_{P5}) supports this, 2.2200) belong to the latter group. The declining population density in built-up area indicates that the increase in urban construction land was much faster than the growth of population, a phenomenon similar to urban sprawl in the United States. Considering China′s limited land resources, particularly agricultural land, this is indeed an uncontrolled and irrational process. In the economic urbanization subsystem index, the growth rate of all the variables was around 2, except that of the proportion of secondary and tertiary industies in GDP(U_{E3}) (0.0429). In the space urbanization subsystem index system, almost all the variables expanded at a rate of 1. Therefore, China′s urban economic development was largely established on the basis of large number of deprived rural migrant workers, as well as the extensive and inefficiently use of land resource.

But what is the reason that some variables rose quickly while the others went down slowly? This study thinks that the non-coordination in China′s urbanization is a

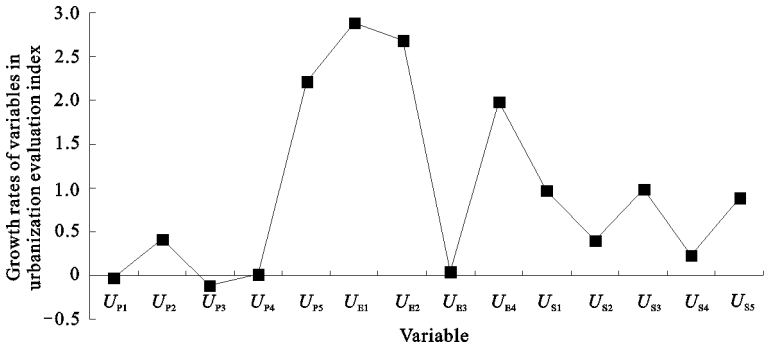

Fig. 2 Growth rates of variables in urbanization evaluation index. U_{P1}, U_{P2}, U_{P3}, U_{P4}, U_{P5} are the variables in population urbanization subsystem index; U_{E1}, U_{E2}, U_{E3}, U_{E4} are the variables in economic urbanization subsystem index, while U_{S1}, U_{S2}, U_{S3}, U_{S4}, U_{S5} are variables in space urbanization subsystem; all of them have the same meanings as in Table 1

directly or indirectly reflection to the country′s institutional arrangement (Song and Michael, 1996; Zhao, 2001), and believes that the governmental performance evaluation system, household registration system, and land expropriation system are the main factors.

(1) Performance Evaluation System. In China, the promotion of local government officials is basically determined by the central government (or state government). The GDP growth rate, tax revenues paid to the state government and urban residents′ welfare level are the most important indicators in evaluating local officials. All are closely linked to and very much determined by the financial condition of local government. Improving local financial condition and boosting disposable income have thus become the predominant goal of local government officials in order to get promising performance evaluation. The local governments fervently push economic growth to generate as much taxes as possible, and make an utmost effort to improve the urban residents′ welfare level. But in most of the cases, these actions are motivated only by the pursuit of only short-term goals or benefits. For instance, local governments invest a lot of resources (especially the land) to drive economic growth without paying much attention to the efficiency of resource use and urban environment. The size of the city dweller is rigorously and arbitrarily restricted by the local governments in order to maintain a high welfare level for urban residents (especially the high employment) in statistics. In many cities, the guiding principle for urban development is to promote the construction of production infrastructure rather than the infrastructure needed for people′s daily lives and cities′ development. All these activities motivated by the performance evaluation system have led to rapid economic growth, but slow growth in the proportion of non-agriculture population and slow negative growth in population density in built-up areas. Along with the large-scale construction of production infrastructure (especially the transportation construction), extensive amount of farmland has been converted into urban land and a lot of land has been wasted and misused. All these help to account for the disparities in the change of variables in the urbanization indexes.

(2) Household Registration System. The local governments have an obligation to improve the level of urban residents′ (the real city dwellers) welfare. It is one of most important components in the evaluation of the local officials and their promotion. One cost-effective way to help raise the residents′ welfare level in statistic is to restrict the number of the real city dwellers who receive various welfare benefits through the household registration system. Just as Pan (2012) pointed out that, most farmer migrants who go into town/city still remain the rural household status because of the household registration restriction. They can not really settle in the city and enjoy the city lifestyle and benefits such as social security①. As a result, the proportion of non-agriculture population has been declining although the overall number of people living in the city has been booming drastically in China.

(3) Land Expropriation System. Capital, labor and land are the key production factors in the economic development, and to certain extent each could be substituted by others. Considering the differentiation in the availability (especially lack of capital) and cost of production factors, the local governments choose to reduce the capital investment by putting a lot of land into urban use because land is not privately owned and virtually free for the government. It is well known that the administrative economy is kind of systematic result in the peculiar national conditions background of China, which makes the local government acted as a rational economic man to participate in regional games. Local governments in China are competing with one another in attracting investments from outside. In order to prevail in the competition, local governments usually reduce the land transfer fee to attract the capital by changing land use codes or rules, or converting natural virgin land into cultivated or developed land, This process is frequently dubbed the ′building a nest for attracting the phoenix′. The local governments′ practice of inputting and developing large amount of land to reduce the cost is a driving force behind the rapid increase of built-up area and per capita built-up area. The land expropriation system makes all these practices possible in China. According to the ′Land Utilization Law of the People's Republic of China′, the land ownership belongs to the state and the rural collectives, and the local government represents the country to exercise the land management right. When it comes to the request of the

① http: //boxun.com/news/gb/china/2009/09/200909110131.shtml

land construction for public undertakings, the local government has the right to expropriate the land from the farmers by compensating them. But the compensation standard is usually not only very low but also quite arbitrary. In most cases, the total value of the compensation is no more than 30 times the value of the average land-outputs for the past three years, with cropland compensation varying from 6 to 10 times and the resettlement compensation from 4 to 15 times. This practice provides much needed soil of growth for the local government′s ′rent-seeking/maximizing behavior′ and furthers the local government′s land expropriation desire. It has, in turn, led to the inefficient and disorderly land development, the waste of land resources, as well as the non-coordination between space urbanization and other urbanization subsystems.

(4) Other factors. Urban planning in China has long lacked the fundamental scientific principles, legal binding and long-lasting authority. It has been used, to a large extent, as an instrument to serve the administrative need of local governments, and thus has changed constantly from time to time corresponding to the terms of the local administrations. As a result of the absence of authority and effective supervision, urban land development has long been quite arbitrary and out of order in many Chinese cities. Large-scale transportation development is one of the forces causing apparent urban sprawl which drives the growth of urban built-up areas and per capita areas of paved road. Other factors, such as local history, locational and physical settings, and increasingly economic globalization factors, also play a part in China′s urbanization process as well as its state of non-coordination.

5 Conclusions and Suggestions

Empirical data analysis in this study based on entropy method and coordinated development degree came up with some important findings regarding China′s rapid urbanization process, its subsystems and state of non-coordination, as well as underlying affecting factors.

Urbanization is a comprehensive and multifaceted process involving the interactions and mutual influences among three subsystems—population urbanization, economic urbanization and space urbanization. The functional and temporal compatibility and coordination among the three subsystems are the key for a healthy and balanced urban development, as well the overall sustainable development. The uncoordinated relationship among the three subsystems, on the contrary, will lead to disorderly urban growth at the expense of environment, land resources, living standard and welfare of people living the city, as well as long-term economic development.

This paper developed a set of quantitative indexes to assess China′s urbanization, and more importantly, the degree of coupling and coordinated development at which the three subsystems interact with one another. It was revealed that economic growth and the increase in city construction land are the main features of China′s urbanization process, while the value/level of population urbanization fluctuated and even slightly went down over the study period from 2000 to 2008. Overall, the non-coordination level of urbanization weakened from 2000 to 2008, but not by a significant margin. As a result, China′s urbanization evolved from the high non-coordination stage to the moderate non-coordination stage in 2006, and then to the low non-coordination stage in 2008, a trend which merits compliment but also close watch in the coming years.

This research revealed that the non-coordination in China′s urbanization is a directly or indirectly reflection to the country′s institutional arrangement. The practice of government officials′ performance evaluation, the household registration system, and the land expropriation system are the main factors among others underlying China′s uncoordinated urban development. They help explain the change in urbanization evaluation index in empirical results. It is clear that the changes in non-agricultural population (real city dwellers), economic growth, and urban land development (especially the road construction) have not been advancing side by side in a well synchronized manner. This calls for system-wide reform in China′s urban development policy and strategy in order to achieve a balanced, coordinated and sustainable urbanization process. China′s local governments are the most important layer of the administrative structure. They are directly in charge of the setting and implementing urban development goals and strategies, and therefore at the forefront of the reform. The goals or utility function of local government, to a great extent, determine the process and, more importantly, the efficiency of urban development. Adjusting and optimizing the utility function of local governments are crucial to the achieving sustainable development in China′s urbanization. The performance evaluation system focusing

solely on the growth of GDP and local disposable income, which has led to ′driving urbanization′ and ′peri-urbanization′, must be reformed. Local government must realize that growth in GDP and income is not equivalent to the true development. For instance, development is for everybody, not just residents with urban household registration, to live healthy lives with dignity, and to have access to the resources needed for a decent standard of living and to be able to participate in the life of the city**.** The current discrimination against farmer migrants in Chinese cities marginalizes this important group of people from city′s mainstream and urban lifestyle although they have contributed significantly to the city development. Also, development of urban infrastructure, particularly road construction and the expansion of residential areas and utilities need follow environmentally friendly practices. Increasing efforts should be made to conserve and preserve environment and precious natural resources, especially natural land and cultivated land. At the same time, implementing new and scientific urban planning principles, enforcing public participation, and enhancing effective supervision are just as critical for China′s urbanization to achieve long-term healthy and coordinated development with synchronization among internal subsystems and in harmony with the natural environment.

This study can be extended in many ways and new research questions can be developed out of this work. The index system of this paper can be expanded and refined so that more direct measures of the interaction among the three urbanization subsystems can be developed to facilitate thorough examination of the changing relationship among subsystems and their dynamics. Regional patterns of non-coordination in urbanization across China can be explored. In addition, cities and their levels of non-coordination in development can be more closely researched and assessed according to the city′s population size, physical and human conditions, and functionalities. In all, the study of non-coordination in urbanization is much needed in China, and insights from the research have significant practical and policy implications.

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