

Chunchao Wang¹
Jiliang Hu²
Jingwen Yu³

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**CAN STRUCTURAL ADJUSTMENT OF GOVERNMENT GOVERNANCE IMPROVE
ECONOMIC PERFORMANCE?
: THE CASE OF WUHAN METROPOLIS CIRCLE IN CHINA⁴**

ABSTRACT

The paper employs M-form and U-form organization theory to analyze the structural innovation of government governance, and tries to study the resources integration and economic performances among different cities in a metropolis circle by using the example of Wuhan metropolis circle in China. Specifically, we focus on analyzing the difference between economic performance before and after the formation of Wuhan metropolis circle. The research result shows that, on the one hand, the formation of Wuhan metropolis circle can make full use of the U-form organization; on the other hand, different cities also benefit from coordinated regional development and rational resources allocation thanks to the formation of metropolis circle. Furthermore, each city has individual characteristics and complementary to other cities. Consequently, the economic performance of these cities greatly differs from each other.

Keywords: *Wuhan Metropolis Circle in China, Government Governance adjustment, M-form and U-form Organization*

I. INTRODUCTION

The concept of metropolis circle was originally introduced by Gottmann in 1957. As a means for economic and social development within a city, the theory of forming metropolis circle becomes increasingly important in explaining the conformation and development of regional economy as well as China economy as a whole. As one of the largest transforming and developing countries, China has been experiencing the process of rapid urbanization and industrialization since the Opening-up and Reform in 1979, during which process some metropolis circles have been set up one after another. According to the existing literatures, it's found that researches on this field mainly focus on the following two aspects: first, the industrial structure and the theory of agglomeration economy, including effect of agglomeration and effect of radiation. Such theories are used to explain the development of metropolis circle (Boudeville 1966, Mills 1967, Fujita, Krugman and Venables 2001, Xiang 2004, Wei Zhao 2005, Bin Yu, et al. 2007, Wu and Liu 2008). In recent years, relevant researches have been expanded to cover the area external to the metropolis circle and its influence on urban capital accumulation, labor mobility and ecological environment (Pauchard et al. 2006, Fu2007, Saks 2008, Tharakan and Tropeano 2009). Furthermore, some literatures show the significance of government

¹ Associate Professor of Economics, Department of Economics JiNan University, China. No. 601 Huangpuadaoxi Road, Department of Economics, JiNan University, Guangzhou, Guangdong Province, China, e-mail: twangcc@jnu.edu.cn

² Candidate for PhD, College of Economics, Huazhong Normal University, China. e-mail: hujiliang_econ@126.com

³ Correspondent author. Candidate for PhD, National School of Development Peking University, China. e-mail: richard.yo2008@gmail.com

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administration and emphasize its important role in economic development of cities, particularly in the overall development of the metropolis circle. A significant issue in this regard lies in the inter-industry coordination and pattern of interests distribution, wherein local governments are required to strengthen coordination and change their coordinating means as well as optionally market intervention (Ostrom, Tiebout and Warren, 1961, Osborne and Gaebler, 1992, Tan, 2000, Feiock, 2004).

It can be understood that previous studies have mainly focused on the interpretation of the metropolis circle in terms of a variety of economic effects, such as agglomeration effects, radiation effects, spatial distribution of such effects and external area. Meanwhile, present research literatures pay little attention to the forming mechanism of metropolis circle and the difference between economic performance before and after its formation. The paper differs from above studies in that it utilizes the M-U theory to analyze regional metropolitan development and presents a new interpretation of the forming mechanism of the metropolis circle from the perspective of inter-organizational structural changes. We try to use exemplary Wuhan Metropolis Circle in China to illustrate the mechanism. The structure of the paper is arranged as follows: the second section is to outline the M-U theory. The third section is to explain the management of organizational performance in Metropolis Circle by applying the M-U theory. The fourth section is a theoretical analysis, wherein an empirical model will be set up to illustrate the improvement of economic performance thanks to the formation of Wuhan Metropolis Circle. The fifth section is a brief conclusion.

II. M-U THEORY AND ITS ANALYSIS FRAMEWORK

M-form organization refers to an organization with quasi-autonomous departments classified in terms of products, trademarks and geographical location. It is an organizational form of corporate governance. U-form organization refers to an organization governed according to the department functions. Qian and Xu (1993) gave a more specific definition. It is said that M-form organization covers many organizations and include all kinds of departmental functions. It emphasizes the combination of all complementary tasks. In such case, it can be regarded as a single complex department, in which every sector is an equivalent to a small U-form organization. On the contrary, U-form organization is formed by similar tasks. For example, as a typical M-form organization, Procter & Gamble organizes shampoo products in terms of the trademark by self-managing. In earlier years, the Ford Company was organized in the form of organizational departments based on production functions. By way of example, the production of car axles and car doors were divided in two different sectors to maintain professional production and economy scale. Hill (1985) further specified the difference between the U-form organizations and the M-form organizations. He believed that the M-form organization has the following five functions not owned by the U-organization: first, the chief manager of the M-form organization can assign full responsibility to various quasi-autonomous departments and each department has its own manager just like a small U-form structure. Second, the decision-maker is only responsible for formulating development strategies, including allocating resources to different sectors within the M-form organization. Third, a group of elites are gathered in the management of the M-form organization to act as leaders. Fourth, the management has resources sufficient to provide incentives and measures so as to make employees work as hard as required by the head. Fifth, the top leader may have a clear understanding of contributions made by various departments within the M-form organization, and thus can facilitate performance evaluation of these departments.

Further research on the U-M organization is aimed at seeking for a form of organization by means of which cities may achieve higher economic performance. Williamson (1975) has proposed an M-form hypothesis. He said that as compared to the U-form organization, people's behavior is closer to the goal of profit maximization within the M-form organizations. In other words, the M-form organization is more efficient than the U-form organization. In fact, as early as in 1962, Chandler conducted studies on the U.S. companies. In the early 20th century, some giant companies, such as General Electronics and the DuPont, have adopted the M-form in response to the increasing complexity of the organization structure. Also, it reflected the diversity of product categories. Burton and Obel (1980) confirmed that the M-form organization is more efficient than the U-form by using the methodology of computational simulation; Qian (1994), Maskin, Qian and Xu (2000) believed that the M-form organization is capable of enhancing the competitions among different sectors. The competition will more effectively force the individual to pursue better economic performance. The researchers set up a theoretical model and used the data of the Chinese state-owned enterprises to validate the theoretical hypothesis. Subsequently, Qian, Roland, and Xu (2006) applied the M-U theory to study the efficiency of a company's governance structure in a transforming economy. Herein we will take a further step to apply the M-U theory in the field of regional economics, especially in the study of metropolis circle. We believe the economic development and cooperation between cities can also be regarded as a huge system. The performance of an economic organization can mostly be determined by the type of organization structure it adopts, that is to say, in practice, different structures of urban governance usually obtain different economic performances. Why the governance structures have a great impact on the economic performance and how it runs? The following analysis is made on both theoretical and empirical bases through a comparative research on urban organizations depending on the framework of the M-U theory.

III. ECONOMIC PERFORMANCE OF METROPOLIS CIRCLE UNDER GOVERNANCE

The study introduces the U-M theory into an analytic framework of regional metropolis circle. It studies administration structure of a government, which leads to different economic performance concerning U-form and M-form metropolis circle. On the one hand, the central government divides the administrative districts according to the economic function, such as the Soviet Union and the Eastern Europe. This is referred to as U-form. In such case, the district runs under the coordination of the central government. The functions of local government should be coordinated among various regions, for instance, a change in one region will inevitably affect the other adjacent ones. As a result, such type of organization facilitates the control of local force by the central government. On the other hand, within the M-form organizations, the central government is capable of reducing the adverse effect of incomplete information by granting local governments more responsibilities and rights in a more decentralized way. It allows the local governments to take actions in the economy based on their own resources, since the local officials know better of local economic characteristics than any others. Moreover, the M-form organization will improve the competitiveness of regional economy, which is conducive to the urban economic development and the prosperity of urban economy. It means that local government has certain economic independence, which may lead to a competition within the local government and improve the operating efficiency. From the comparison, it can be seen that both the M-form organizations and the U-form organizations have their own advantages and disadvantages. Therefore, we need to further discuss the benefits brought by the formation of metropolis circle and an accurate forming mechanism. The preceding issue lies in whether the overall economic performance significantly changes with the local governance restructuring within the metropolis circle. We believe that the formation of metropolis circle has its inherent

characteristics, which will be explained in the summary of improvement in organization efficiency. Furthermore, the radiation effect is also critical to this issue. First, the metropolis circle area may include several cities with different professional functions. Then, the demand for efficiency improvement may lead to structural innovation of both the central and the local government. As a result, a vigorous metropolis circle comprising some adjacent cities can be formed in the end. On the one hand, a provincial government constituted by the local governments becomes an independent M-form organizations so that the issue of incomplete information can be resolved through the metropolis circle. In the M-form organization, each region still runs based on its own comparative advantages, while achieving scale economy without losing their own inherent advantages.

The establishment of Wuhan metropolis circle in China is consistent with above scenarios. A “1+8” city’s industrial chain has been set up and an integration of industrial structure has been realized since 2005⁵. These cities have different natural resources within the circle, forming different comparative advantages. Meanwhile, cities with different industrial structures can be integrated to take the advantage of scale economy, despite they have their own particular leading industries. For example, Wuhan City is leading in the industries such as photoelectron information industry, auto manufacturing, steel manufacturing, environmental protection industry, new non-metallic materials, biological engineering; Huangshi City in textile, metallurgy, building materials and machinery; Ezhou City in metallurgy and clothing; Huanggang City in materials and textiles; Xianning City in textiles, foods and pharmaceutical chemicals; Xiantao City in textiles, light industry and food; Qianjiang City in salt chemicals, petrochemical and pharmaceutical chemicals; Tianmen City in foods, produce processing and textiles. In addition, these cities are also adjacent to each other, allowing them to enjoy benefits and advantages in this kind of spatial organization by division of work and cooperation. These nine cities within Wuhan metropolis circle complements with each other. To date, the coordinated development among the cities and appropriate allocation of resources has laid a solid foundation. In such scenario, the metropolis circle may effectively improve economic performance, provided that there is a good organization.

The existing theory about M-form and U-form can be correspondingly extended. In the following, a detailed theoretical illustration of the formation of the metropolis circle will be given and the differences between economic performance before and after the formation of Wuhan metropolis circle will be shown and explained.

IV. THEORETICAL ANALYSIS AND EMPIRICAL STUDY

In Wuhan metropolis circle, all prefecture-level cities have their own unique resource endowments and characteristic industry structure. Consequently, these cities are greatly complementary in function. From a theoretical model, we can recognize key features of the formation of metropolis circle. Under the leadership of the provincial departments, there are various cities, specialized division of labor within some specific industrial cities in a relatively perfect labor market; other cities will have a great impact on this type of industry. Thus, it's assumed that the equivalent of a city has a functional organization. Due to its influence, it can coordinate the functions of other cities. The development of functional departments in each city must be in advantage of the functional status of the city coordinated to the development of functional departments. The provincial government can collect information to coordinate the

⁵ The Wuhan Metropolis Circle contains of 8 cities and another 1 central cities, which is as follows: Huangshi, Erzhou, Xiaogan, Huanggan, Xianning, Xiantao, Qianjiang, Tianmen, and the central one is Wuhan City. All the 9 cities constitute of urban communities within 100 km radius, and Wuhan City is the centre within the urban communities.

strategy in this case. However, cities with different functions cannot effectively communicate the business information with each other. It is just like a U-form organization. After the formation of Wuhan metropolis circle, the development of all cities included in Wuhan circle may work well together and the complementary features between different industries will be utilized by the member cities. This makes such formation a self-contained structure, and forms a local government organization of M-form.

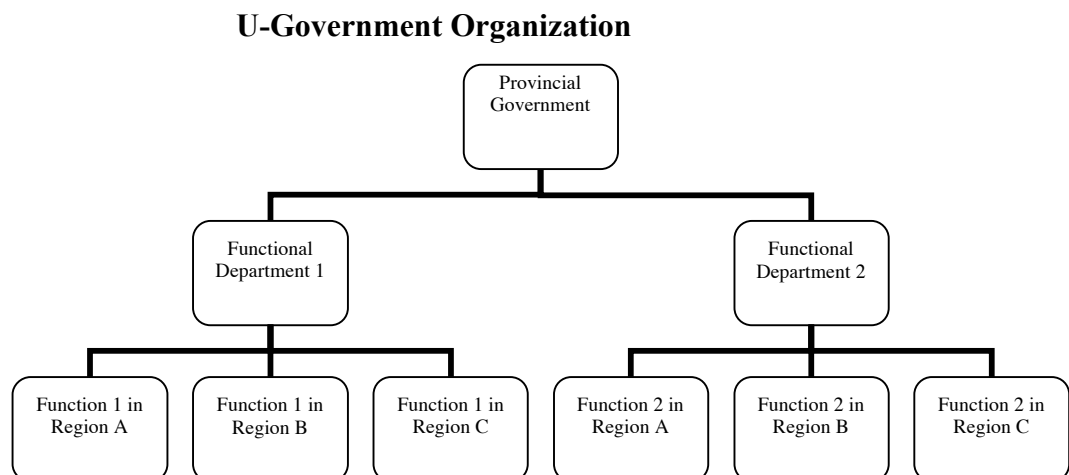
The theory is based on the analysis framework by Qian, Roland, and Xu (2006). The overall uncertainty and the distance between regions as well as resources will be integrated into the cost analysis framework. It's assumed that there are three regions, i.e., A, B and C, each region has two functions: function 1 and function 2, and these two functions emerge to the complementary relationship in economic functions. It's further assumed that there is an economic development strategy requiring the two functions to run on a coordinated basis at a certain ratio. If a region contains only 2 functions, then the local government's information can be identified as belonging to local information. It means that the regional governments can acquire all information. As a result, there is no distortion in information communication under the M-form organization. On the contrary, if an area is subject to the U-form organization, then various functional sectors may have to communicate information with each other. An additional information cost will incur. We make further assumptions as follows: A is the center of the metropolis circle. B and C are located at the periphery of the central city and gain $R/2$ benefits. The process of economic development and the implication of development strategy require a certain cost, indicated as C . Implementation of any development strategy requires a certain kind of cost. Once the development strategy is carried out, the chief executive officer of local government will no longer need to pay additional costs so that C can be regarded as a learning cost.

Assumption: $\frac{R}{2(1-\delta)} - C > 0$, i.e., if a regional development strategy can be implemented correctly by probability 1, then net income of the region must be greater than 0.

A. the situation before the formation of metropolitan

In the foregoing analysis, we can regard the provincial and local urban governments as an M-form organization in China. Within the M-form organization, each region can be deemed as a small U-form organization, and the regions are also subject to their internal functions. Before full formation of the metropolis circle, organization of each regional government under this structure is of U-form, as shown in Figure 1.

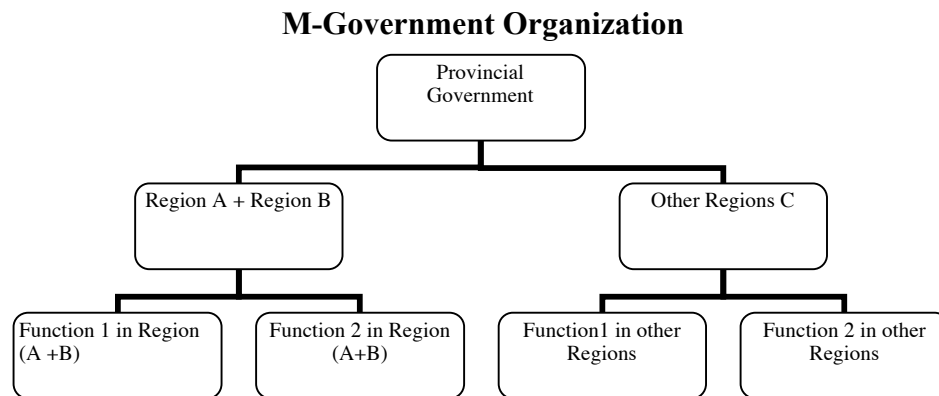
Figure 1



B. the situation after the formation of metropolitan

If the plan of establishing the metropolis circles is implemented, then these complementary features of different regions will be organized together into a independent organizational system that can be seen as an M-form structure, as shown in Figure 2.

Figure 2



C. Empirical Analysis

1) Data

Herein we use the panel data of Wuhan metropolis circle from 2002 to 2008. The data from 2002 to 2007 is obtained from Hubei Statistics Yearbook in 2008 and the data of 2008 from the Bulletin Economic and Social Development in China. The data covers the overall individuals rather than sampling data, so we can use the econometric model of fixed effects. We have arranged the panel data for every city included in Wuhan metropolis circle in China.

2) Econometric Model

We calculate the difference between economic performance before and after the formation of Wuhan metropolis circle. The basic econometric model is derived from the Cobb-Douglas production function. Y is output, K represents capital inputs and L represents labor input. In addition, A is the residual, which means the Solow's total factor productivity. The basic equation is as follows:

$$Y = AK^\alpha L^\beta \quad (1)$$

Equation (1) is the fundamental product function of a firm, which is used to depict the economic development of the whole metropolis circle. According to equation (1), we obtain the following econometric equation (2).

$$\begin{aligned}
LnY_{it} = & LnA + \beta_{11}LnLU_{it} + \beta_{12}LnLR_{it} + \beta_2LnK_{it} + \beta_3D_{2003} + \beta_4D_{2004} + \beta_5D_{2005} \\
& + \beta_6D_{2006} + \beta_7D_{2007} + \beta_8D_{2008} + \beta_9D_{2009} + BX + \varepsilon_{it}
\end{aligned}
\tag{2}$$

In the above equation (2), Y_{it} means gross product of region i in year t ; A is the efficiency coefficient; LU_{it} means the total number of employees in the urban areas of region i in year t ; LR_{it} means the total number of employees in the rural areas of region i in year t ; K_{it} means the total investment in fixed assets of region i in year t ; D_t ($t = 2003, 2004, 2005, 2006, 2007, 2008, 2009$) is a dummy variable, and $D_t = \begin{cases} 1, & \text{Year } t \\ 0, & \text{others} \end{cases}$, which captures two effects: first, the time effect of GDP, i.e., characterized by possible changes of GDP with time; second, the marginal effect of establishment of Wuhan Metropolis Circle, which is of interest herein; LnA is the efficiency in year 2002, which is the benchmark; X represents a group of control variables: FDI_{it} , which stands for foreign direct investment; and $Fiscal_{it}$, which means fiscal expenditure.

In order to eliminate the policy effect of establishment of Wuhan Metropolis Circle, the framework by Wooldridge (2005) is used here to make comparison research on the economic performance within and outside the metropolis circle, including specific analysis steps as: first, the samples composed of all cities within Wuhan Metropolis Circle are used to estimate each parameter in model (2), with coefficient D_t of interest; second, the samples composed of all cities outside Wuhan Metropolis Circle are used to re-estimate each model (2), with coefficient D_t of interest; finally, a sequence of disparities between economic performance within and outside Wuhan Metropolis Circle can be obtained after coefficient D_t from estimate of samples within Wuhan Metropolis Circle minus by coefficient D_t from estimate of samples outside Wuhan Metropolis Circle, and then the change in the sequence before and after the formation of Wuhan Metropolis Circle can be studied. If there's remarkable change, then it shows the formation of metropolis circle has marked influence on economic performance, indirectly evidencing the effectiveness of the policy of establishing metropolis circle.

The paper collects sample data from both area within and outside Wuhan Metropolis Circle, and employs fixed effect model to estimate formula (2), with results shown in table 1. The values of Rho and F in Model I and Model II both pass 1% significance test, indicating the model is tenable. Since certain relevance may exist between the variables, the significance and parameter symbols of part of control variables in these two models may differ from those in existing literatures. However, it is neither an interest of this research, nor will it impose any material impact on this research and its conclusions. Thus, we will focus on the analysis of parameter D_t . In Model I, all D_t s pass 5% significance test while D_{2005} fails to pass 10% significance test, indicating the presence of significant time effect or policy effect in GDP of each city within Wuhan Metropolis Circle. In Model II, D_{2004} passes 10% significance test, while other D_t s fails, indicating both the absence of equivalent policy effect in GDP of cities outside Wuhan Metropolis Circle and the lack of time effect which changes as time lapses. Consequently, whether the policy of establishing metropolis circle is effective can be concluded by simply studying Model I. However, for the purpose of robustness, the paper also calculates the marginal effect of the policy of establishing metropolis circle based on the previous methods to validate the reliability of the conclusion. See last column in table for detailed results.

The estimated results are shown in Table 1.

Table1**Estimation Result of Fixed Effect Model**

Variables	<i>Model □ (samples collected from within the metropolis circle)</i>		<i>Model □ (samples collected from outside the metropolis circle)</i>		<i>Disparity Coefficient= (1) - (2)</i>
	(1) Coefficient	Standard Deviation	(2) Coefficient	Standard Deviation	
D_{2003}	0.0758*	0.0430	0.0519	0.0512	0.0239
D_{2004}	0.1872***	0.0661	0.1600*	0.0914	0.0272
D_{2005}	0.1454	0.1001	0.0589	0.1571	0.0865
D_{2006}	0.4753***	0.1477	0.2803	0.2284	0.1950
D_{2007}	0.4193**	0.1944	0.2012	0.3039	0.2181
D_{2008}	0.6108**	0.2504	0.3161	0.3956	0.2947
D_{2009}	0.6716**	0.3241	0.3277	0.5287	0.3439
$LnLU_{it}$	-0.1388**	0.0612	-0.2056**	0.0904	-
$LnLR_{it}$	0.0688	0.1851	-0.1759	0.2556	-
LnK_{it}	0.4347***	0.1334	-0.1003	0.0962	-
$LnFDI_{it}$	-0.0267	0.0193	0.0053	0.0318	-
$LnFiscal_{it}$	-0.2622	0.2183	0.4021	0.3334	-
Constant	4.2524***	0.7364	6.2601***	1.4321	-
Sample	72		48		-
Rho	0.9936		0.9808		-
F	11.81		27.63		-

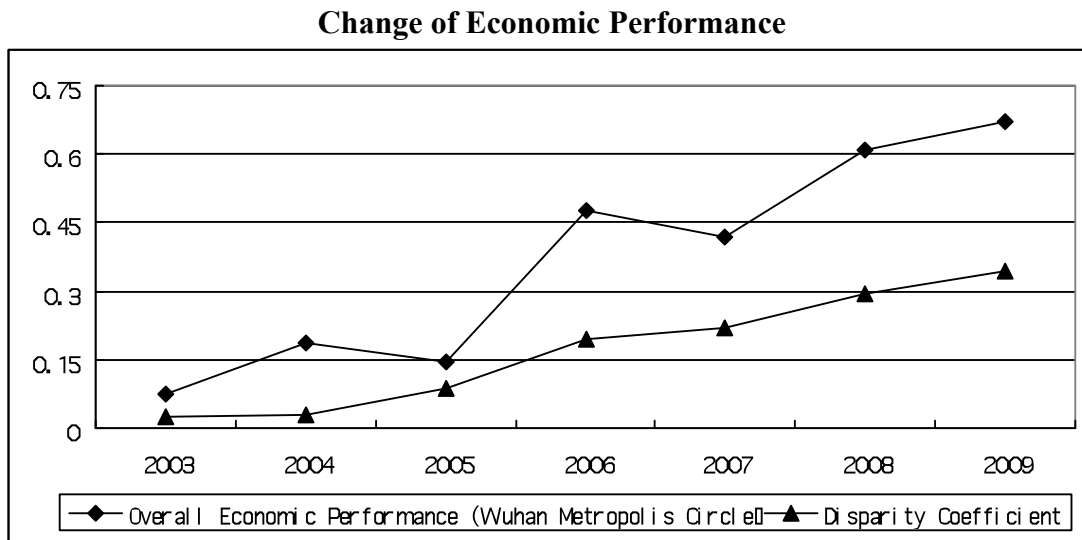
Notes: * means significant at the level of 10%; ** means significant at the level of 5%; *** means significant at the level of 1%.

The above econometric results indicate that the overall economic performance of all the cities within Wuhan metropolis circle markedly improves after the formation of Wuhan Metropolis Circle. From 2003 to 2009, the coefficients of dummy variables generally indicate the increasing trend in both Model □ and Model □. The most important conclusion is that the overall economic performance has been gradually increasing since the formation of Wuhan Metropolis Circle as shown in Figure 3. In the analytic framework, the change of the coefficients concerning dummy variables generally shows the change of the economic performance due to the restructure of governance. It's noted that the most important conclusion

is that, 2005 is the ‘skip year’ for the overall economic performance, when the reform of organizational structure in Wuhan metropolis circle occurred. Upon the occurrence of the reform, the economic performance exhibited an increasing trend in the next few years. In addition, all the dummy variables are significant except for dummy one for 2005. Therefore, it can be seen that there is great difference between before and after the reform of organizational structure in Wuhan metropolis circle. The above empirical conclusion testifies the theoretic conclusion on the economic difference between U-form and M-form organization structure. The M-form shows a better performance for cities in metropolis circle than U-form.

To validate the robustness of above conclusion, the economic performance of samples within Wuhan Metropolis Circle is compared to those outside Wuhan Metropolis Circle (see sixth column in Table 1 and Fig. 3). From the trend reflected in the disparity coefficient in Table 1 and Fig.3, it can be seen there's little disparity between economic performance of cities within and outside the circle before its formation. However, the disparity in economic performance between cities within and outside the circle greatly expands from 0.02 at the early stage to 0.20 in 2006, till 0.34 in 2009, indicating the formation of Wuhan Metropolis Circle indeed contribute to the economic performance, and thus the conclusion is robust and reliable.

Figure 3



V. CONCLUDING REMARKS

The paper is intended to study the resource integration and economic performance among different regions in metropolis circle. We use the example of Wuhan metropolis circle in China to explain the change caused by the transformation of governance structure. We utilize the M-U organization theory to analyze the development of metropolis circle and the change of economic performance of adjacent cities. We particularly focus on the difference of economic performance between before and after the formation of Wuhan metropolis circle. We believe that the formation of Wuhan metropolis circle makes full use of U-form organization. Furthermore, different regions also make use of M-form organization due to the coordination of regional development and rational resources allocation. In the case of China, each region in metropolis circle has local characteristics and complements to other regions. As a result, the economic performance of each region will show a significant discrepancy. It's shown that M-form organization will probably result in higher economic performance, and reduce the co-operation cost among the cities in metropolis circle. The implication obtained from the theoretic model can

be testified through data from different developing countries or districts around the world. Specifically, we use the Wuhan metropolis circle as an evidence. Indeed, the empirical conclusion tells us that for a developing district, only during the transforming process of urban development can you give an impetus to the economic performance of the whole metropolis circle. Specifically, the government can formulate appropriate policy to promote cooperation among adjacent cities. The simplest way is to construct a metropolis circle. We believe that the development of metropolis circle is probably a key pathway for urban development. Adjacent cities joining in a metropolis circle will reduce the cooperation cost. In conclusion, M-form organization structure is conducive to the management among cities.

The analysis framework and methodology in the paper may be widely used to study economic performance of some other organizations in developing countries and areas. And for some specific organizations, we should especially pay attention to the specific operation conditions among the internal departments of a whole organization.

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MOGU LI STRUKTURALNE PRILAGODBE VLADINOG UPRAVLJANJA POBOLJŠATI EKONOMSKE UČINKE? SLUČAJ WUHANSKOG VELEGRADSKOG PODRUČJA U KINI⁶

SAŽETAK

Rad koristi organizacijsku teoriju M-forme i U-forme za analizu strukturalnih inovacija vladinog upravljanja, te pokušava proučiti integraciju resursa i ekonomske učinke vladinog upravljanja među raznim gradovima velegradskog područja koristeći primjer wuhanskog velegradskog područja u Kini. Posebno je usredotočen na analizu razlike između ekonomskih učinaka prije i nakon stvaranja wuhanskog velegradskog područja. Rezultati istraživanja pokazuju da, s jedne strane, stvaranje wuhanskog velegradskog područja može u potpunosti iskoristiti U-formu organizacije, dok s druge strane, različiti gradovi također profitiraju radi koordiniranog područnog razvoja i racionalne raspodjele resursa zahvaljujući stvaranju velegradskog područja. Osim toga, svaki grad ima individualne karakteristike i one komplementarne drugim gradovima. Stoga se ekonomski učinci ovih gradova uvelike razlikuju jedni od drugih.

Ključne riječi: wuhansko velegradsko područje, prilagodba vladinog upravljanja, M-forma i U-forma organizacije

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