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Innovation and Development Imbalance among Cities within the Province

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ABSTRACT

Based on the provincial panel data from 2000 to 2015, we explore the impact of innovation on regional coordinated development from the perspective of the imbalance of development among cities within the province. The results show that innovation significantly aggravates the imbalance of development among cities, but the aggravating effect weakens with the transformation of innovation model to independent innovation and the improvement of economic development level. Further research finds that capital-biased technology make innovation directly aggravate the imbalance of development among cities, the transfer of rural labor force plays a partial intermediary role in the relationship between innovation and imbalanced development among cities.

Keywords: *innovation, development imbalance, transmission mechanism*

INTRODUCTION

In 2017, the report of the Nineteenth National Congress of the Communist Party of China clearly points out that the main social contradiction in our country has transformed into the one between the people's ever-growing needs for a better life and the imbalance and inadequate development. With the rapid growth of China's economy, the problem of imbalance development is becoming more and more serious, which has increasingly become the focus of the Party and the government. In fact, for a long time, the Party and the government have been committed to alleviating the problem of imbalance development, but the problem of imbalance development has not yet been fundamentally solved, and has increasingly become an important factor restricting the healthy development of our national economy as a whole. In the era of knowledge-driven economy, Innovation ability, a core competitiveness of a country and a region, is the decisive factor to promote economic and social development. Can innovation also have an impact on uneven development while promoting economic and social development? If so, what is the direction of its impact, and does its impact vary with innovation patterns and regions? Furthermore, what is the internal mechanism of its impact? The answers to these questions are related to the realization of a better life for the people and how to better implement the innovation-driven strategy to achieve efficiency and fairness.

Although a lot of researches have been carried out on the causes of the imbalanced regional economic development, there are still some issues to be explored. Firstly, most of the research's spatial scales emphasize on the national, regional or provincial level (Lessmann, 2014; Wu Aizhi, et al; 2011), but less on the city, a basic spatial unit whose imbalance development will have an important impact on regional economy in China (Feng Changchun et al., 2015). Secondly, these research mainly focus on spatial structure layout, government intervention, opening up, economic development strategy, factor flow and other aspects (Liu Xiuyan, 2017; Song, 2013; Fleisher et al, 2010; Lessmann and Seidel, 2017), instead of innovation that essential to influence spatial structure layout and factor flow (Zhang Hong, 2016; Alvarez-Cuadrado and Poschke, 2011) -will play a key role in the development imbalance. Finally, even though some scholars have noticed the relationship between innovation and imbalance regional economic development earlier, they mostly conduct theoretical research from the perspective of technological progress. Assuming that other cities can do nothing but purchase technology that only exists in the central city, Sadik (2008) concludes that technological progress is conducive to narrowing the economic disparities among cities that purchase technology. Husen and Liu Junhui (2014) uncover a non-linear relationship between technological progress and inter-regional development gap. For one thing, the former that helps to promote the flow of surplus rural labor to developed areas will widen the latter; for another, when the technological process reaches a certain level, the former that helps to promote the transfer of industries to less developed areas will narrow the latter. Fewer empirical studies on innovation and imbalance of regional economic development remain concentrated on the relationship between innovation and economic convergence, leaving the impact mechanism of innovation on the imbalanced development unanalyzed empirically (Yang Chaofeng, 2015; BaiJunhong and Wang Lindong, 2016).

For the shortcomings of the above research, the provincial panel data from 2000 to 2015 are employed to analyze the relationship between innovation and imbalance development among cities in provinces and its mechanism. The main marginal contribution of this paper lies in identifying and demonstrating the internal mechanism of innovation affecting the imbalance development among cities, which provides theoretical and practical reference for better implementing the strategy of regional coordinated development and advancing economic quality growth.

MECHANISMS ANALYSIS

The mechanism of innovation on imbalance development among cities within provinces is summarized into two types. One is direct mechanism where innovation will make development more imbalance by technical progress bias; the other is indirect mechanism where innovation will affect the imbalance development through the transfer of rural surplus labor force and the evolution of industrial structure.

Firstly, the improvement of marginal capital output caused by technological progress in China makes technological progress in China tend to be capital-biased (Lu Xueqin and Zhang Shangfeng, 2013), which will render cities with more capital elements more advantageous in economic development. Based on the analysis of theoretical model, Liu Fengliang and Yi Xin (2013) concludes that under the premise of the difference in per capita capital accumulation between urban and rural areas, capital-biased technological progress will drive the continuous expansion of urban-rural income gap. Similarly, on the premise of the same difference among cities in the province, technological progress towards capital will aggravate the imbalance development among cities. Innovation, as the direct driving force of technological progress, will also have the characteristics of capital-biased, which will aggravate the imbalance development among cities.

Secondly, as an important source of technological progress, innovation will produce "push effect" and "pull effect" on the transfer of rural labor force. "Push effect" means that technological progress in the agriculture push for agricultural labor productivity and release more rural surplus labor force towards non-agricultural sector; "pull effect" means that industrial technological innovation in the non-agricultural sector will attract more rural surplus labor force to non-agricultural sector (Alvarez-Cuadrado and Poschke, 2011; Yu Jian et al, 2018). Therefore, innovation will be beneficial to the transfer of rural labor to non-agricultural sectors. However, this shift will affect the uneven development among cities when rural labor force flow across regions in pursuit of higher income, that is, from low-wage to high-wage areas and from underdeveloped to developed cities, thereby probably changing the speed of economic development in outflow and inflow areas. Under the paradigm of "labor mobility - economic agglomeration - regional disparity" from the new economic geography theory, labor mobility or transfer will worsen the imbalance development among cities through two aspects. One is that labor mobility will expand inter-regional economic disparities by promoting industrial agglomeration in the inflow areas; the other is that the "local market effect" and "living cost effect" produced by industrial agglomeration will further accelerate labor mobility to the agglomeration areas. Therefore, innovation can aggravate the uneven development among cities by acting on the transfer of rural labor force.

Finally, as a direct driving force for the transformation and improvement of China's industrial structure, innovation affects the imbalance development among cities due to its contribution to the evolution of industrial structure towards rationalization and upgrading (Fu Hong, 2013), which will put forward new requirements for regional spatial structure and promote the change of the agglomeration and diffusion in spatial structure (Lei Yanjun and Lin Kang, 2013; Liu Xiuyan et al., 2017; Desmet and Henderson, 2014). Specifically, on the one hand, the transformation caused by innovation on the evolution of industrial structure can often obtain the withdrawal of declining industries and growth of emerging industries by reset production factors such as capital and labor. According to the principle of industrial gradient transfer, as time and life cycle stage go by, production activities will gradually shift from high to low gradient areas, that is, from central to surrounding cities, which may accelerate the evolution of regional spatial structure, increase the diffusion of spatial structure, and reduce the imbalance development among cities (Li Wenqiang and LuoShougui, 2011). On the other hand, the promotion of industrial structure caused by innovation is inclined to the formation of horizontal and vertical linkages between different cities based on industrial linkages, which will help to enhance the dependence of inter-city industries, strengthen the radiation function of central cities, and reduce the imbalance of inter-city development (Li Wenqiang and LuoShougui, 2011). Therefore, innovation will alleviate the imbalance development among cities by acting on the evolution of industrial structure.

Description of Model, Variables and Data

Construction of Econometric Model

To investigate the impact of innovation on the imbalance development among cities, the econometric models are established as follows:

$$theil_{it} = \alpha_0 + \alpha_1 inn_{it} + \beta_m Z_{it}^{m} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

In this model, Subscript *I* denotes Provinces, *t* denotes Years; *theil* denotes the imbalance of development among cities; inn denotes innovation; Z^m denotes a series of other control variables to be described in detail below; μ_i denotes the fixed effect of regional individual , λ_t denotes the time effect; ε_{it} denotes the random error term. Formula (1) is a static panel model, but as the imbalance development among cities is dynamic, the imbalance pattern in the current period will be influenced by the one earlier. Therefore, following formula (1), the first-order lag term of imbalance development is added to control the possible dynamic effects of the model. The model is set as follows:

$$theil_{it} = \gamma_0 + \gamma_1 theil_{i,t-1} + \gamma_2 inn_{it} + \chi_m Z_{it}^{m} + \mu_i + \lambda_t + \varepsilon_{it} \quad (2)$$

Variables Description

Dependent Variables

The imbalance of development among cities (*theil*). Drawing on Feng Changchun et al (2015) measurement of imbalance development, theil Coefficient is adopted to estimate imbalance. Besides, the weighted coefficient of variation (wsv), a commonly used index to measure regional development imbalance is included for robustness test. Theil coefficient serves as an important index for judging the degree of imbalance development, its concrete calculation formula is as follows:

$$theil = \sum_i \frac{Y_i}{Y} \log\left(\frac{Y_i N}{Y N_i}\right) \quad (3)$$

Among them, Y_i and N_i are the real GDP (based on 2000) and population in city *i* of a province, respectively; Y and N are the real GDP and population of the province, and N is the number of cities in the province.

Independent Variables

Core independent variable: Innovation (inn). At present, many scholars believe that the amount of patents is an effective indicator to measure regional innovation, so the amount of patents granted per 10,000 people is chosen to be a measurement of innovation.

Control variables. Considering that factor endowment and developmental environment will also have an influence on the imbalance development among cities, several control variables reflecting these two elements are selected referring to the existing literature, in order to avoid the endogenous errors caused by missing variables, specifically including: a. Opening degree (*open*): the proportion of total imports and exports to GDP.

Generally speaking, the more expanding the openness, the more imbalanced the development (Ezcurra and Rodrguez-Pose, 2013); b. The degree of government intervention (*fisc*): the proportion of government expenditure to GDP. At this stage, the government tends to promote the coordinated development of regional economy, so the greater the government intervention, the more conducive to alleviating the imbalance development among cities (Liu Xiuyan, 2014); c. Material capital investment (*invest*): the proportion of fixed assets investment to GDP. *Invest* is biased, often concentrated in a few cities, which will aggravate the imbalance development among cities (Liu Xiuyan, 2017); d. Foreign Direct Investment (FDI): the proportion of FDI to GDP. FDI is generally considered to be one of the reasons for aggravating the imbalance of development (Lessmann, 2013).

Data Sources and Descriptive Statistics

Prefecture-level administrative regions function as the spatial unit to measure the imbalance development among cities, featuring in higher coverage, more stable in quantitative changes, and more convincing and longitudinal comparability (Feng Changchun et al., 2015). For this reason, four municipalities directly under the Central Government are excluded, namely, Beijing, Shanghai, Tianjin and Chongqing. What's more, Tibet and Hainan will also be excluded due to the lack of data. The regression sample of this paper is the panel data of 25 provinces in China from 2000 to 2015 where the indicators are all from the China Statistical Database of Economic and Social Development. The descriptive statistics of variables are shown in Table 1.

Table1. *The descriptive statistics*

Variable	Sample number	Mean value	Standard deviation	Minimum	Maximum
theil	400	0.1614	0.0945	0.0367	0.5183
inn	400	0.2127	1.2316	-2.0405	3.7477
open	400	0.2288	0.2826	0.0357	1.5807
fisc	400	0.1918	0.0927	0.0689	0.6269
invest	400	0.5895	0.2226	0.2560	1.3283
FDI	400	0.0220	0.0197	0.0007	0.1051

Empirical Analysis

Benchmark Regression Result

Based on the panel data of 25 provinces in China from 2000 to 2015, formula (1) is firstly estimated by using static panel model, the regression results of random effect and fixed effect are shown in model (1) and (2) in Table 2. Based on Hausman test results, fixed effect models are selected as the main estimation methods of static panel models. Secondly, formula (2) is estimated by using dynamic panel model, the regression results of two-step system GMM and two-step difference GMM model shown in model (3) and (4) in Table 2.Because the difference GMM may have the problems of weak instrument variables and finite sample deviation caused by insufficient tool variables, system GMM model are selected as the main estimation methods of dynamic panel model. The differential GMM model is listed in the table as a robustness test.

As a consistent estimation, the premise of GMM is that there is no second-order and higher-order autocorrelation in the residual sequence of difference equation, and the instrumental variables are strictly exogenous. Therefore, Arellano-Bond test and Sargan test are needed for the estimation results. The original hypothesis of AR (2) test that there is no second-order sequence correlation in the residual sequence of difference equation and if the corresponding P is greater than 0.1, the original hypothesis is accepted at 10% significance, that is, the residual sequence of difference equation does not have second-order sequence correlation. The P values of AR (2) test in Table 2 show that there is no second-order sequence correlation in the residual sequence of difference equation, so the model has passed the autocorrelation test. The original hypothesis of Sargan test that all the instrumental variables are valid and if the corresponding P is greater than 0.1, the original hypothesis is accepted at 10% significance level, the result of which shows that all tool variables are valid. The model has passed Arellano-Bond test and Sargan test, so the estimation results of system GMM and differential GMM are consistent and reliable.

From Table 2, estimates of the static panel fixed effect model show that the impact of innovation (*inn*) on the imbalance of urban development (*theil*) is significantly positive, the innovation coefficient up to 0.0125. After putting the dynamic effect of the model into consideration, the first-order lag term of imbalance development among cities is added, the estimated results of the system GMM and the differential GMM model demonstrate the significantly positive impact of innovation on the imbalance of development as well, with innovation coefficient in the system GMM reaching 0.0114, similar to that in the static model. All these indicate that innovation in China will not be good to decrease the unbalance at this stage. At the same time, certain robustness of the result indicates that the "aggravating effect" of innovation on the imbalance development among cities is greater than the "mitigating effect" at present. The reason behind may be that China is still in the initial stage of the evolution of industrial structure towards rationalization and upgrading, hard to drives the evolution of regional spatial structure quickly and brings the evolution effect of industrial structure into full play .

The regression results of model (3) and (4) show that the first-order lag term of imbalance development among cities is significantly positive at the 1% significant level prove it has certain path dependence and "Matthew effect". It's difficult to self-regulate and needs for government intervention. For other control variables, there are some differences between dynamic and static panel model. Because the latter does not take into account the possible missing variables and endogenous problems, the estimation results of the former is the focus in this paper. Having a positive impact on the imbalance development among cities, according to estimated results of system GMM and differential GMM models, the degree of openness will aggravate the imbalance development among cities, consistent with that of Ezcurra and Rodrguez-Pose (2013). On the contrary, having a significant negative impact, Government intervention (fis) is conducive to alleviating the situation, consistent with that of Liu Xiuyan et al. (2017). Governments at all levels usually tend to use fiscal transfer means to reduce the imbalance development of the region before the gap gets too wide. The higher the proportion of fiscal expenditure in GDP, the greater the intensity of fiscal transfer payments, the lower the imbalance. The impact of material capital investment (*invest*) on the imbalance development among cities are not robust and need to be further tested. The impact of foreign direct investment（FDI）is significant positive, so FDI is partly not good to the reduction of imbalance development among cities, consistent with Lessmann's (2013) research. The explanation for the above situation is that for provincial regions, FDI prefers to a few developed cities within the province, and this bias will make it more imbalances.

Table2. *Benchmark regression results*

	(1)	(2)	(3)	(4)
	RE	FE	SYS-GMM	DIFF-GMM
L.theil			0.8473***	0.6840***
			(0.0187)	(0.0866)
inn	0.0125***	0.0137***	0.0114***	0.0028**
	(0.0042)	(0.0042)	(0.0012)	(0.0014)
open	0.0801***	0.0682***	0.0055	0.0012
	(0.0179)	(0.0184)	(0.0044)	(0.0058)
fisc	0.0656	0.0419	-0.0570***	-0.0404***
	(0.0426)	(0.0428)	(0.0101)	(0.0104)
invest	0.0351**	0.0391**	-0.0096**	0.0030
	(0.0161)	(0.0159)	(0.0041)	(0.0075)
FDI	-0.1131	-0.0832	0.1888***	0.2108***
	(0.1291)	(0.1275)	(0.0533)	(0.0563)
_cons	0.1328***	0.1372***	0.0443***	0.0533***
	(0.0156)	(0.0083)	(0.0049)	(0.0143)
Time effect	Controlled	Controlled	Controlled	Controlled
N	400	400	375	350
R^2	0.1487	0.1505		
Hausman		0.0015		
AR(2)			0.1506	0.1511
Sargan			0.8879	0.2594

Note: **, ** and *** mean significance in 10%, 5% and 1% intervals respectively; standard errors are in parentheses; Hausman, AR (2) and Sargan indicate corresponding probabilities respectively. Same below.*

Robustness Test

The weighted coefficient of variation (*wsv*) replaces the Theil coefficient (*theil*) to measure the imbalance development among cities for further testing the robustness of the conclusions. At the same time, a static and a dynamic panel model are constructed for regression estimation, with the estimated results shown in Table 3.

From Table 3, it can be seen that the regression results of *wsv* are basically consistent with the above mentioned one, that is, the impact of innovation on imbalance development among cities is significantly positive, which guarantee the credibility and reliability of the conclusions.

Table3. *Robustness test: regression results*

	(1)	(2)	(3)	(4)
	RE	FE	SYS-GMM	DIFF-GMM

L.wsv			0.7971***	0.6958***
			(0.0206)	(0.0634)
inn	0.0217**	0.0261**	0.0284***	0.0060*
	(0.0103)	(0.0103)	(0.0036)	(0.0034)
open	0.1935***	0.1759***	0.0542***	-0.0240
	(0.0432)	(0.0449)	(0.0165)	(0.0148)
fisc	0.1100	0.0263	-0.0471	-0.1072***
	(0.1037)	(0.1044)	(0.0475)	(0.0355)
invest	0.0723*	0.0800**	-0.0198*	-0.0030
	(0.0392)	(0.0387)	(0.0120)	(0.0171)
FDI	0.1730	0.2622	0.2980*	0.3303**
	(0.3151)	(0.3113)	(0.1806)	(0.1548)
_cons	0.5262***	0.5396***	0.1536***	0.2004***
	(0.0353)	(0.0204)	(0.0197)	(0.0405)
Time effect	Controlled	Controlled	Controlled	Controlled
N	400	400	375	350
R^2	0.1576	0.1602		
Hausman		0.0009		
AR(2)			0.1130	0.1157
Sargan			0.8757	0.1904

The Heterogeneity of Innovation Effect

The Difference of Innovation Pattern

Innovation's effect may change with its mode. According to Wenhao's research in 2018, China's innovation from 2000 to 2005 mainly focuses on integrated innovation and secondary innovation and gradually takes independent innovation as the main mode since 2006. Therefore, with 2005 as the time node, the sample is divided into two periods: 2000-2005 and 2006-2015, introducing the interaction term (*innP*) of time variable P and *Inn* to examine the impact of the changing innovation mode on the role of innovation in different periods. Among them, in 2000-2005, P = 0; in 2006-2015, P = 1. The regression results can be seen in the models (1)(2) of Table 4 in which the Arellano-Bond test and Sargan test show that the two-step SYS-GMM estimation results are consistent. From the model (1) and (2) in Table 4, the interaction term (*innP*) is significantly negative, which indicates that the change of innovation mode will have an impact on the role of innovation in different periods. The reason is that compared with independent innovation, integrated and secondary innovation are mainly based on existing technology .Under the assumption that the existing technological progress is biased towards capital and the bias of technological progress has diffusion effect, the technological progress caused by integrated innovation and secondary innovation may be more biased towards capital (Pan Wenqing and Wu Tianying, 2018).

Regional Differences in the Role of Innovation

The role of innovation may be heterogeneous as regional innovation models may vary with different economic development. Per capita GDP (*Gdppc*) is applied to measure the level of economic development by dividing the sample into two groups according to the average number. The results shown in Table 4 (3) - (6) dedicate that the innovation have significantly higher effect in low economic development level areas than that in high one on the imbalance development among cities. The reason is the relatively weak foundation of economy and innovation in low economic development areas, which make its innovation, may mainly be integrated innovation and secondary innovation.

Table4. *Heterogeneity of Innovation（SYS-GMM）*

	(1)	(2)	(3)	(4)	(5)	(6)
	theil	*wsv*	*theil*		*wsv*	
			Gdppc_l	*Gdppc_h*	*Gdppc_l*	*Gdppc_h*
L.theil/wsv	0.8098***	0.7815***	0.8828***	0.9180***	0.8269***	0.8407***
	(0.0333)	(0.0204)	(0.0110)	(0.0209)	(0.0184)	(0.0283)
inn	0.0130***	0.0344***	0.0064***	0.0029*	0.0249***	0.0141***
	(0.0014)	(0.0042)	(0.0007)	(0.0016)	(0.0029)	(0.0041)
innP	-0.0025***	-0.0060***				

	(0.0009)	(0.0013)				
open	0.0116**	0.0562***	0.0609***	0.0040	0.3065***	0.0143
	(0.0058)	(0.0188)	(0.0064)	(0.0039)	(0.0298)	(0.0090)
fisc	-0.0348**	-0.0425	0.0445***	0.0044	0.1826***	0.1212**
	(0.0170)	(0.0462)	(0.0051)	(0.0149)	(0.0321)	(0.0581)
invest	-0.0099*	-0.0121	-0.0098***	-0.0081**	-0.0362***	-0.0008
	(0.0051)	(0.0115)	(0.0010)	(0.0038)	(0.0062)	(0.0147)
FDI	0.0914	0.3050	0.1217***	0.3661***	0.1242	0.6058***
	(0.0901)	(0.1955)	(0.0340)	(0.0292)	(0.1304)	(0.0656)
_cons	0.0487***	0.1646***	0.0186***	0.0038	0.0977***	0.0768***
	(0.0056)	(0.0161)	(0.0020)	(0.0041)	(0.0120)	(0.0184)
Time effect	Controlled	Controlled	Controlled	Controlled	Controlled	Controlled
N	375	375	170	205	170	205
AR(2)	0.1492	0.1145	0.1017	0.2278	0.1248	0.2446
Sargan	0.9545	0.8998	0.9131	0.9369	0.9535	0.9213

Test of Action Mechanism

In order to test whether innovation affects the imbalance development among cities through the transfer of rural labor (*labor*) and the evolution of industrial structure (*indus*), the following recursive model is constructed by taking into account the dynamic effect of imbalance development among cities and borrowing the test method of intermediary effect (Baron and Kenny, 1986):

$$theil_{it} = \gamma_0 + \gamma_1 theil_{it-1} + \gamma_2 inn_{it} + \chi_m Z_{it}^{\ m} + \varepsilon_{it} \quad (4)$$

$$labort_{it}(indus_{it}) = \sigma_0 + \sigma_1 labort_{it-1}(indus_{it-1}) + \sigma_2 inn_{it} + \eta_m Z_{it}^{\ m} + \zeta_{it} \quad (5)$$

$$theil_{it} = \omega_0 + \omega_1 theil_{it-1} + \omega_2 inn_{it} + \omega_3 labort_{it}(indus_{it}) + \kappa_m Z_{it}^{\ m} + \varphi_{it} \quad (6)$$

Conduction Path of Transfer of Rural Labor Force

Referring to Zhao Dezhao (2018), the transfer of rural labor force is expressed by the difference between the total number of workers in mining, manufacturing and construction industries and the corresponding number of state-owned workers in these three industries.

Since the model (3) in Table 2 has mentioned the estimation results of the first step in the recursive model, here reports the the second and third steps of the mediation effect, as shown in Table 5. Arellano-Bond test and Sargan test of model (1) - (2) show that the results of two-step SYS-GMM estimation are consistent.

In Table 5 Model (1), the coefficient of innovation is significantly positive at the level of 1%, and it's value reaches 0.2379, which indicates that innovation is beneficial to promoting the transfer of rural labor force. In Model (2),the estimated coefficients of innovation and rural labor transfer are significantly positive at the 1% level, with the coefficients of 0.0091 and 0.0036 respectively, and the coefficients of innovation are significantly smaller than the estimated coefficients of benchmark regression results (0.0114), showing that rural labor transfer plays a part of intermediary role in the relationship between innovation and imbalance development among cities.

In other words, innovation can indirectly aggravate the imbalance development among cities through rural labor transfer, consistent with theoretical expectations. In the meantime, the innovation coefficient of model (2) is significantly positive, which also confirms the direct aggravating effect of innovation on the imbalance development among cities.

Conduction Path of Industrial Structure Evolution

The evolution of industrial structure refers to the continuous self-renewal and upgrading of industrial structure and content. The ratio of tertiary to secondary industry output value is adopted to measure industrial structure evolution as it can better capture its "service" development trend. As shown in Table 5, Arellano-Bond test and Sargan test of model (3) - (4) show that the results of two-step SYS-GMM estimation are consistent.

From Table 5 Model (3), the coefficient of innovation to industrial structure evolution is significantly positive at the level of 1%, and the coefficient value is 0.0631, which indicates that innovation is conducive to promoting industrial structure evolution. From the model (4), the estimated coefficients of industrial structure evolution on imbalance development among cities is negative, but not significant, added with small difference between the innovation coefficients and the estimated coefficients of the benchmark regression results (Table 2 Model

(3)), which indicates that industrial structure evolution has not played a intermediary role at this stage. The possible reason is that in the initial stage of evolution, the process of regional spatial structure evolution is relatively slow.

Table5. *The testing for Conduction Mechanism*

	(1)	(2)	(3)	(4)
Mediation effect	Labor Transfer Effect		Evolution Effect of Industrial Structure	
Dependent variables	*labor*	*theil*	*indus*	*theil*
Estimation steps	Second	Third	Second	Third
The lag period of Dependent variables	-0.1573***	0.8372***	0.9714***	0.8279***
	(0.0316)	(0.0236)	(0.0367)	(0.0250)
inn	0.2379***	0.0091***	0.0631***	0.0112***
	(0.0204)	(0.0020)	(0.0072)	(0.0012)
labor		0.0036***		
		(0.0014)		
indus				-0.0014
				(0.0015)
open	1.6387***	0.0041	-0.1184**	0.0095*
	(0.3305)	(0.0059)	(0.0545)	(0.0050)
fisc	-3.2805***	-0.0349***	-0.7074***	-0.0503***
	(1.2381)	(0.0102)	(0.1070)	(0.0107)
Invest	0.0548	-0.0057	0.4756***	-0.0065
	(0.0983)	(0.0052)	(0.0455)	(0.0046)
FDI	9.9869***	0.2141***	-1.5694	0.2016***
	(2.7518)	(0.0714)	(1.0405)	(0.0577)
_cons	4.3868***	0.0256***	0.1068**	0.0467***
	(0.3328)	(0.0058)	(0.0478)	(0.0059)
Time effect	Controlled	Controlled	Controlled	Controlled
N	375	375	375	375
AR(2)	0.9852	0.1463	0.1152	0.1504
Sargan	0.6364	0.9675	0.6792	0.9252

CONCLUSIONS AND POLICY SUGGESTIONS

Withing the development of our economy, the main contradictions in our society have changed.

The problem of imbalance development has increasingly become the focus of the Party and the government and a problem that the government urgently needs to solve in the new era. Under this background, it is first theoretically analyzed that the relationship between innovation and imbalance development among cities in the province. Then, the relevant empirical analysis is carried out through the construction the static and dynamic panel models constructed after calculating the imbalance development and innovation.

The research shows that① at the present stage, innovation in China will make the development more imbalances among cities. ②The impacts of innovation on the imbalance development among cities have patterned and regional heterogeneity. The aggravating effect of innovation on the imbalance development among cities decreases with the transformation of innovation mode from integrated innovation, secondary innovation to independent innovation, and decreases with the improvement of economic development. ③There are two paths for the impact of innovation on the imbalance development among cities. One is the direct mechanism where the bias of technological progress makes innovation directly aggravate the imbalance development among cities; the other is the indirect mechanism, that is, innovation can indirectly do it by promoting the transfer of rural labor force. But it is still unconfirmed that innovation can indirectly alleviating the uneven development among cities by promoting the evolution of industrial structure.

It is an important goal of China's current economic development and socialist construction to reduce the imbalance development among cities, promote the coordinated development of regions and provide the development achievements to more regions.

In view of how to promote the coordinated development of regional economy, the following suggestions are come up with on the basis of the research conclusions. Firstly, the government should strengthen the implementation of supportive policies in less developed areas, increase transfer payments and policy subsidies to under developed cities, and promote the transfer of capital from developed to underdeveloped areas by administrative forces, so as to realize the accumulation of material capital in under developed areas.

Secondly, it is necessary to adopt appropriate incentive policies and measures to support and guide innovation toward labor force-biased technological progress that is more compatible with the characteristics of China's large population, thereby improving the share of labor elements in national income.

Finally, the government should give more support and guidance to the development of innovation, enhance the status of independent innovation. Meanwhile, growing innovation subsidy for emerging and high-tech industries, it can better play the evolutionary effect of industrial structure, and promote the evolution of regional spatial structure by industrial structure evolution for promoting the coordinated development of regional economy.

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