

Labor institution environment and labor agglomeration based on provincial panel data analysis

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Abstract: With the shift in regional economic patterns in China, Chinese labor forces are showing a trend toward concentration. Many scholars are analyzing this trend of labor agglomeration from the perspective economies of scale and transaction costs. This study explains the phenomenon of labor agglomeration from the perspective of the labor system environment. First, it considers that the labor system environment includes the social contract environment and labor contract environment. Second, it attempts to show that a good labor system environment can promote labor agglomeration through theoretical analysis, while technological advancement can promote the agglomeration of professional and technical talents. Third, this study uses provincial panel data to conduct an empirical analysis. Finally, the paper presents some policy suggestions for maintaining a good labor system environment, including improving the level of public service of the floating population and building harmonious labor relations.

Keywords Labor Agglomeration; Labor Institution Environment; Panel Data Model

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1 Research background and research status

1.1 Research background

Since the reform and opening up of the Chinese economy, major changes have occurred in China's regional economic pattern. The eastern region's economy has taken the lead in developing international industrial transfer and integration into the international production and trade system. It has also induced the central and western labor force to transfer to the east, creating the trend of labor force gathering from the central and western regions to the eastern region and transferring from rural to urban areas. Recently, some changes have occurred in the patterns of economic agglomeration and labor force agglomeration in China. First, the rural surplus labor force is exhausted, and the trend of labor force concentration from rural to urban areas is gradually weakening. From the perspective of the dual economic structure theory, the differences between urban and rural economic development have led to the migration of the floating population from rural areas to cities. Cai Fang (2011a) believes that, overall, the surplus rural labor force has ended and the Lewis turning point of labor transfer has arrived. According to the survey data of the floating population, the trend of labor mobility has changed, and the proportion of labor force employment nearby has gradually increased. According to the monitoring data of the floating population of the National Health and Family Planning Commission from 2015 to 2017, the total floating population in China shows a steady downward trend. In 2015, the total number of the floating population in China was 247 million, about 6 million lower than that in 2014; in 2016, this number decreased by 1.71 million from that in 2015 and continued to decline by 820,000 in 2017². In the case of a relatively mild trend of the floating population between urban and rural areas, the important form of migration of migrant employees is intercity mobility, which results in the relative concentration of labor in different regions. Second, the rapid economic development of central cities in central and western regions has attracted a large population and labor force to these cities. Typical examples of this include Wuhan and Xi'an³. This also leads to the one-way flow and agglomeration trend

² Data source: China's floating population development report 2018

³ Wuhan began to implement the plan of one million college students staying in Wuhan in 2017. The government

in the labor force from the central and western regions to the eastern region changing to a two-way flow and agglomeration trend. It is, therefore, meaningful to study the motivation of labor force agglomeration in different regions.

The explanation of the new economic geography theory for economic agglomeration lies in the assumption of increasing returns to scale and monopoly competition (incomplete competition) (Krugman, 1991). Rapid economic development can easily result in the phenomenon of economic agglomeration. The expansion of the regional economic scale results in stronger economic competitiveness, stronger attraction for capital, labor, and other production factors, improvement of total factor productivity, and widening of the gap with other regional economies rather than a balanced development among regions. The increasing returns to scale can be explained as a forward market effect, backward market effect, and technology spillover effect. Economic agglomeration certainly leads to labor agglomeration. Undeniably, the labor system environment plays a significant role in population agglomeration. A good institutional environment can reduce labor market transaction costs, promote the matching efficiency of labor supply and demand, and ensure the optimal allocation of labor force.

The labor system environment includes the labor contract environment between workers and enterprises as well as the social contract environment between workers and local governments. The labor contract environment is mainly reflected in labor contracts, wages and benefits, the settlement of labor disputes, and other factors; the social contract environment is mainly reflected in public social service and social welfare. The main economic motivations of labor flow and agglomeration can be considered from two aspects: labor contract environment and social contract environment. A good labor contract environment can meet the expectations of workers

has made relevant supporting measures and implemented subsidies and subsidies in housing and employment to attract college students to stay in Hubei and work in Wuhan. By 2019, the target has been exceeded. "According to the Organization Department of the Wuhan municipal Party committee, since the implementation of the" million college students' employment and Entrepreneurship Project "in Wuhan in 2017, a total of 1.095 million college students studying in Han have been added, and the original plan has been completed two years in advance." <https://hb.qq.com/a/20200107/022121.htm>. In 2018, Xi'an also proposed the "five-year retention of millions of talents" plan, providing certain subsidies in terms of household registration, housing, employment, and entrepreneurship.

concerning wages and benefits, working conditions, and labor relations. A good social contract environment enables the labor force to enjoy better social welfare and public services. Williamson (1981) believes that the external environment impacts transaction costs. An external environment with stable expectations can reduce the transaction costs of both sides of labor supply and demand; otherwise, the transaction costs of both sides increase. Some scholars are introducing transaction costs into a new theory of economic geography. Stephan Russek (2010) established a new analytical economic geography model, asserting that the agglomeration of unskilled labor has led to the agglomeration of skilled labor. At high transaction costs, the flow of both parties is mutually reinforcing. In the low transaction costs context, skilled labor is still concentrated, while unskilled labor will flow again. The transaction cost of a labor contract can be divided into prior cost and after cost. A good labor system environment can reduce both these transaction costs, improve matching efficiency, and promote labor agglomeration.

1.2 Review of relevant research literature

There is a phenomenon of urban-rural segmentation in the labor market in developing countries. Economists generally believe that a reasonable flow of labor in different regions plays a key role in economic development. Cai Fang (2011b) believes that since the reform and opening up, much of the surplus rural labor force has entered the city, contributing enormous labor resources and demographic dividends to economic development, bringing about sustainable economic prosperity. From the human capital theory perspective, Schultz (1970) postulates that labor mobility is an important means of promoting the accumulation of human capital, and breaking the institutional barriers hindering labor mobility can promote economic growth. The classic model of labor mobility includes the Lewis model (1954), which considers that economic factors lead to labor flow from rural to urban areas. When the marginal output of labor in urban and rural areas is equal, the surplus rural labor force will cease to flow to the city, and the Lewis turning point will be established. Harris and Todaro (1970) proposed a two-sector model for labor mobility. The model considers that the expected income gap between urban and rural areas leads to the labor flow from rural to urban areas, which occurs not only before the Lewis turning point, but also when there is no

surplus labor force in rural areas. With industrial agglomeration and labor concentration, technological advancement is more likely to occur in the city, increasing the income gap between urban and rural areas to a certain extent, with a significant impact on labor mobility. Generally, advancement in agricultural technology will lead to a decline in the demand for agricultural labor and promote the transfer of labor force from the agricultural to the industrial sector; urban technological advancement will lead to the rebalancing of labor force, which may have an agglomeration or dispersion effect (Peng Guohua, 2015; Xiao Linzi, 2014; Mikhail, 2011; J. Simonen, 2016; Liang Xiangdong, 2017).

A good institutional environment can reduce transaction costs, promote the development of contract-intensive and labor-intensive industries, and promote the agglomeration of high-quality labor. As an embodiment of social contract relationships, high-level public service may, to a certain extent, promote the labor agreement between workers and employers. Through empirical analysis of data, scholars have verified the role of public services in the promotion of population agglomeration (Tiebout, 1956; Day, 1992; Dahlberg et al. 2012). In addition, some domestic scholars use survey data to find that more public services for the floating population will contribute to stable work in cities (Xia Yiran, 2015; Hou Huili, 2016). Some scholars have also studied the impact of the social security system on the cross-border flow of labor. Doris (1998) believes that if a country's social security system is not comprehensive, it will lead to the migration of talent and capital from that country to a country with a perfect social security system. Hassler (2005) developed a dynamic general equilibrium model to analyze the transnational labor flow and found that increasing the unemployment insurance standard will reduce the likelihood of labor flow. Mariano Sana (2000) analyzed a questionnaire survey of Mexico in the United States and found that the perfect pension security system is an important driving force for the migration of the Mexican labor force to the United States.

Some scholars have also analyzed the impact of economic agglomeration on different types of labor mobility. Timo Mitze (2015) analyzed Denmark's data on the impact of agglomeration economies on the flow of different skilled labor types and

found that knowledge-intensive industrial agglomeration promoted labor inflows. The incomplete contract theory (Grossman, 1986) revealed that a good contract environment can reduce the likelihood of speculation and encourage specific investment. Li Junqing (2016) found that better contract execution could promote the optimization of the industrial structure. Rafiqi (2009) showed that the institutional environment can reduce uncertainty and have an impact on economic agglomeration; Michael Storper (2010) suggested that the institutional environment has some impact on population agglomeration and urban expansion.

From the a forementioned literature review, there are two mechanisms concerning the impact of the institutional environment on labor agglomeration. The first is that the institutional environment can reduce transaction costs, increase contract-intensive and technology-intensive industrial investment, and attract high-quality talent. The second aspect is the theory of new economic geography, which holds that agglomeration can achieve economies of scale, generate higher returns, and promote labor agglomeration. This study analyzes the internal impact of the labor system environment on labor agglomeration from a transaction costs perspective.

2 Theoretical analysis frameworks

2.1 Static analysis

According to the new economic geography theory, monopoly competition is the cause of the developmental imbalances among regions. Theoretically, the economies of scale and technological advantages of economic agglomeration must be maintained by continuous gathering of high-quality talent. A region can maintain a monopoly advantage (economic agglomeration advantage) from the perspective of cost advantage. Assuming that the cost of a typical initiative is related to the population size of the region $C(L)$, $C(L)$ can be considered an inverted U-shaped curve. With population agglomeration, there is a positive agglomeration effect, that is, an increase in economic efficiency and a decrease in costs. With the increase in regional population agglomeration, there is a negative agglomeration effect. Economic efficiency starts to decrease and costs begin to increase. The benefit spectrum of economic agglomeration (labor agglomeration) is the opportunity cost (minimum cost of other cities L_2, L_3),

represented in Figure 1 by \bar{C} ; the portion lower than the opportunity cost (shadow area) can be viewed as the benefit of agglomeration economy. If the institutional environment is added to the model, the search and ex-post contract costs can be reduced by a good institutional environment. The cost curve will therefore be reduced to $C'(L)$, which will expand the scope and benefits of the agglomeration economy.

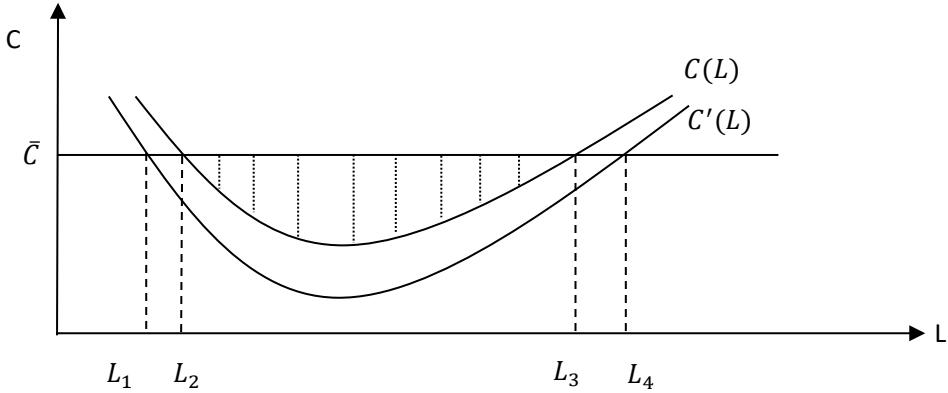


Figure 1 Impacts of institutional environment on labor agglomeration.

2.2 Dynamic analysis

According to the traditional Cobb Douglas production function, the economic output function of a region is assumed to be

$$Y_t = A_t K_t^\alpha (\theta_t L_t H_t)^{1-\alpha}$$

where A_t is the regional technical level, K_t is the level of capital investment, L_t is the size of the labor force in the region, H_t is the level of human capital in the region, and θ_t is the proportion of labor matching in the region. The equilibrium growth rate can be obtained as follows:

$$\frac{\Delta Y}{Y} = \frac{\Delta A}{A} + \alpha \frac{\Delta K}{K} + (1 - \alpha) \left(\frac{\Delta \theta}{\theta} + \frac{\Delta L}{L} + \frac{\Delta H}{H} \right) \dots (1)$$

From formula (1), the balanced growth rate depends not only on the capital growth rate, technological advancement rate, and comprehensive human capital growth rate, but also on the matching rate, labor growth rate, and human capital growth rate.

At the same time, according to the model established by Blanchard and Diamond (2010), the labor market matching model is constructed as

$$m_t = B_t (L_t (1 - \theta_t))^\beta (v_t)^{1-\beta}$$

where B_t is the matching efficiency, which is positively correlated with the labor system environment; v_t is the number of vacant posts, which is related to the technical level. $v_t = \varphi A_t^\varepsilon m_t$ can be expressed as a new labor force, and the labor force growth rate can be expressed as

$$\frac{m_t}{L_t} = B_t(1 - \theta)^\beta \left(\frac{v_t}{L_t}\right)^{1-\beta} \dots (2)$$

From formula (2), we can see the labor growth rate and matching efficiency. Since the institutional environment can reduce the transaction cost and promote the matching efficiency of the labor market, the labor growth rate and the institutional environment are positively correlated. The labor force growth rate is positively correlated with the number of vacant jobs (technical level) and inversely proportional to the overall employment scale. When formula (2) is introduced into formula (1), the following conclusions can be obtained:

- 1) Technological advancement is the main driving force behind economic growth. In addition to promoting the advancement of overall factor productivity, technological advancement can generate more jobs, encourage integration with the labor market, and contribute to economic growth.
- 2) A good labor system environment can promote the integration of human and technological resources and foster economic development.

3 Empirical analysis of labor market environment on labor force agglomeration

3.1 Selection of statistical indicators of labor market environment

The supply and demand of the labor market are determined not only by labor supply and demand but also by the government's labor regulation measures; the government's important regulatory measures for the labor market lie in the coordination of labor relations. With the introduction of the labor contract law in 2008, the government's labor relations adaptation has become more standardized. Relevant legal provisions apply, from the signing of labor contracts to the purchase of social insurance and then to the settlement of labor disputes. From the reference theory perspective, the government's regulation of labor relations is an important reference point for both sides of labor relations. The change in the government's regulation measures is equivalent to

the change in the reference point that will have an impact on the behavior of employers and employees. The scale of law enforcement differs, but there are certain variations in the actual labor system environment. In addition, there are great differences in the level of economic development and the level of public services. These institutional environments, which may be directly or indirectly related to labor employment, significantly impact labor agglomeration and dispersion.

In the empirical analysis, we analyze the causes of labor agglomeration from three aspects: first, the availability of employment in the local labor market before employment, that is, whether the labor demand is strong. If the labor market demand is strong, it will lead to more labor agglomeration. Second, employment is a level of security for workers' rights and interests, which may arise from the signing of labor contracts and labor disputes, and the level of social welfare. If workers have access to better social welfare, including medical and education services, and better public services, labor agglomeration will be more conducive.

This study selects the panel data of 31 provinces and cities in mainland China from 2001 to 2017. The following are the variables: the size of employed population (y) in each region is replaced by the size of employed people in the China Labor Statistical Yearbook; the gross domestic product (GDP) of each region is replaced by the GDP of each region; the annual investment is replaced by the fixed asset investment data in the Statistical Yearbook; and the research and development level (R&D) of each region is represented by the patent application volume of each region. For the index of the labor system environment, there are two different indicators: one is the number of labor dispute cases filed, and the other is the rate of case closure; the number of labor dispute settlement cases is used to remove the labor disputes. Table 1 illustrates descriptive statistics of variables. For the number of cases filed, the following regression model is established:

$$\begin{aligned} \ln y_{it} = & \beta_0 + \beta_1 \ln gdp_{it} + \beta_2 \ln invest_{it} + \beta_3 \ln trade_{it} + \beta_4 \ln ss_{it} + \beta_5 \ln rd_{it} \\ & + \beta_6 \ln institution_{it} + \beta_7 rate_{it} + \lambda_i + \mu_t + \varepsilon_{it} \end{aligned}$$

Table 1 Descriptive statistics of variables

Variable	Observation number	Average value	Standard error	Minimum value	Maximum value
lny	527	7.484	.91	4.839	8.82
lngdp	527	8.943	1.203	4.936	11.404
lninvest	527	8.4	1.297	4.422	10.919
Intrade	527	15.892	2.3	6.871	20.286
lnss	527	7.308	1.077	4.369	9.618
lnrd	527	8.666	1.834	1.946	12.715
Instit01	527	.987	.048	.73	1.268
Instit02	527	1.514	1.005	-.875	4.298
rate	527	3.581	.709	1.2	6.5

3.2 Empirical analysis results

1) Regression results of fixed effect model

Since panel data regression is selected for regression analysis and 31 provinces and autonomous regions in mainland China are selected for regression analysis, the fixed effect model is selected when selecting the regression method. At the same time, the Hausman test finds that the fixed effect model is more suitable for this regression model.

Table 2: Impact of labor institutional environment on labor agglomeration (FE model)

Variable	Explained variable (total employment)							
	Model I		Model II		Model III		Model IV	
	coefficient	P-value	coefficient	P-value	coefficient	P-value	coefficient	P-value
intercept	6.178	0.000***	6.679	0.000***	5.976	0.000***	6.439	0.000***
lngdp	0.125	0.000***	0.125	0.007***	0.181	0.000***	0.155	0.000***
lninvest			-0.111	0.000***			-0.108	0.000***
Intrade			-0.036	0.000***			-0.031	0.001***
lnss			0.169	0.000***			0.170	0.000***
lnrd			-0.015	0.179			-0.010	0.331
Instit01	0.189	0.015**	0.149	0.038**				
Instit02					-0.074	0.000***	-0.065	0.000***

rate		-0.013	0.166		-185.05	0.007***
F values	404.04	0.000***	125.08	0.000***	427.68	0.000***

* indicates significance at the 10% significance level.

** indicates significance at the 5% significance level.

*** indicates significance at the 1% significance level.

Instit01 is the closing rate of labor disputes—the number of labor disputes settled / the number of labor disputes filed in the current year; instit02 is the number of cases filed per 10,000 people, which is replaced by the number of labor disputes filed in the current year and the total number of employees (logarithm). From the regression results, as a positive indicator, the closure rate plays a positive role in promoting labor agglomeration. A negative number of cases filed per 10,000 people indicator plays a negative role in labor agglomeration; this is consistent with the expected research hypothesis. Conversely, regression analysis shows that public financial expenditure also plays a significant role in the promotion of labor agglomeration (Lnss coefficient is positive and significant), which also responds to the relevant analysis in this study—a good social contract relationship can promote labor agglomeration. See Table 2 for details.

2) Robustness test

GDP, fixed asset investment, and patent authorization are all related to the overall employment—the endogenous problem of explanatory variables. The empirical analysis department adopts the first-order lag term of these variables as the instrumental variable (IV) of these explanatory variables. Through regression analysis, it was found that the instrumental variable method does not affect the overall regression conclusion.

See Table 3 for details.

Table 3 Impact of labor system environment on labor agglomeration (method IV)

Variable	Explained variable (total employment)							
	Model I		Model II		Model III		Model IV	
	coefficient	P-value	coefficient	P-value	coefficient	P-value	coefficient	P-value
intercept	6.203	0.000***	6.712	0.000***	6.055	0.000***	6.453	0.000***
Lngdp01	0.123	0.000***	0.114	0.012**	0.175	0.000***	0.158	0.000***

Lninvest01	-0.095	0.000***	-0.091	0.000***
Lntrade01	-0.029	0.002***	-0.025	0.006***
Lnss01	0.160	0.000***	0.154	0.000***
Lnr01	-0.024	0.027**	-0.024	0.025**
Instit01	0.197	0.009***	0.129	0.070*
Instit02			-0.075	0.000***
Rate01	-0.015	0.087*	-0.066	0.000***
F values	383.10	0.000***	120.24	0.000***
	453.36	0.000***	138.77	0.000***

* indicates significance at the 10% significance level,

** indicates significance at the 5% significance level,

*** indicates significance at the 1% significance level.

3) Categorical regression analysis

This study analyzes the effect of the labor system environment on talent concentration. In the Statistical Yearbook, the number of employees with a college degree or above in some years in Tibet is zero. Therefore, in this regression analysis, the data of the Tibet region are excluded, and the data of the remaining 30 provinces and cities are analyzed. From the analysis results, the institutional environment also has a significant role in promoting the concentration of professional talents; the closing rate is positively correlated with the number of employees with college degrees or higher, and the number of cases filed per 10,000 people is negatively correlated with the number of employees with college degrees or higher. This is consistent with the preset conclusion of the study. In this regression, it is also found that the regional R&D level has a significant positive effect on the agglomeration of professional talents. In the regression, the coefficient of patent licensing is positive, indicating that the index is positively correlated with the explained variables, and it also verifies hypothesis 2 in the theoretical model. At the same time, it also verifies the positive promotional effect of public financial expenditure on talent agglomeration (Lnss coefficient is positive and significant), indicating that a good social contract relationship is conducive to talent agglomeration. In this study, the robustness of the regression is verified and passes the robustness test. This study also conducts an empirical analysis on the number of

employments requiring a degree or higher, and the conclusion is consistent with the results in Table 4 below.

Table 4: Impact of labor system environment on talent agglomeration (FE model)

Variable	Explained variable (number of employees with college degree or above)											
	Model I		Model II		Model III		Model IV		Model V		Model VI	
	coefficient	P-value	coeffici	P-value	coeffici	P-value	coefficie	P-value	coefficie	P-value	coefficient	P-value
ent nt												
intercept	-1.495	0.000***	-0.272	0.297	0.558	0.326	-2.016	0.000***	-0.838	0.001***	0.108	0.840
Lngdp	0.657	0.000***	0.252	0.000***	0.276	0.052*	0.848	0.000***	0.435	0.000***	0.325	0.018**
Lninvest					-0.142	0.013**					-0.145	0.009***
Lntrade					-0.058	0.066*					-0.032	0.289
Lnss					0.206	0.068*					0.304	0.006***
Lnr&		0.290	0.000***	0.266	0.000***				0.288	0.000***	0.251	0.000***
Instit01	0.841	0.000***	0.714	0.001***	0.644	0.003***						
Instit02							-0.246	0.000***	-0.232	0.000***	-0.231	0.000***
Rate					-0.040	0.174					-0.034	0.234
F values	964.16	0.000***	769.24	0.000***	339.83	0.000***	1041.93	0.000***	836.85	0.000***	370.20	0.000***

* indicates significance at the 10% significance level,

** indicates significance at the 5% significance level, and

*** indicates significance at the 1% significance level.

4 Conclusion and policy implications

The spatial agglomeration of the population (labor force) in China continues to be a trend of economic and social development, and the characteristics and paths of this agglomeration are also changing. The surplus rural labor force is almost exhausted, and the labor force has shifted from rural to urban concentration to the transferring of labor between cities; the reason for labor migration has shifted from direct economic motivation to comprehensive factors—direct economic motivation and indirect economic motivation. The institutional environment factors related to labor employment play a significant role in labor agglomeration. Based on the empirical analysis of provincial panel data from 2001 to 2017, this study draws the following

conclusions: first, establishing a good social contract relationship with workers and providing good public services will promote labor agglomeration; second, handling labor disputes properly, building harmonious labor relations, and improving the labor system environment will promote labor agglomeration; and third, promoting the ability of science and technology to innovate in a region will promote labor agglomeration, promoting the clustering of professional and technical personnel.

The key policy implications of this study include the following: first, the local governments should vigorously enforce public service equalization and promote the agglomeration of the floating labor force. There is a wide gap between the floating population and the registered population in terms of enjoying public services, which also affects the job security of the floating population in the inflow region. To ensure the stability of the floating population's employment in coastal developed areas and inland central cities and promote labor force agglomeration, local governments should actively promote the construction of the labor system security mechanism for the floating population and earnestly safeguard the floating population's labor rights and interests, especially of those with low skills and low education levels. At the same time, the extent of public service equalization should be increased and floating population arrangements should be made more convenient pertaining to children's enrollment, accommodation, and transportation arrangements, to ensure the stability of enterprise employment and encourage the growth of migrant labor agglomeration and regional economic and social development. Third, a sound labor dispute settlement system must be developed and a harmonious labor relationship created. We should encourage all government departments to effectively collaborate and cooperate, set up an early warning system for labor disputes, settle labor disputes promptly, and minimize the number of labor disputes. We should strengthen the labor dispute mediation system, actively facilitate the reconciliation of all sides of labor disputes, and improve the effectiveness of labor dispute resolution. We should also improve the mediation system for labor disputes.

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Figures

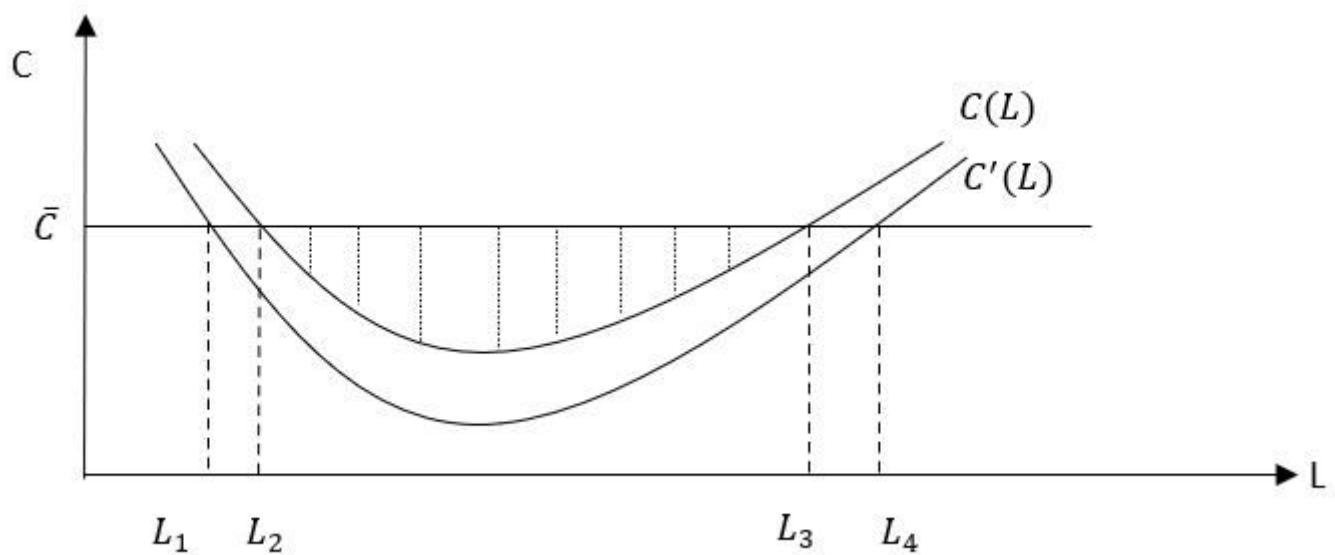


Figure 1

Impacts of institutional environment on labor agglomeration.