Factor Endowment, Institutional Constraints and Regional Economic Development Potential—Empirical Analysis Based on the Perspective of New Structural Economics

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Abstract. The new structural economic theory holds that the factor endowment structure has an important relationship with economic development, but a country must be accompanied by institutional constraints in the process of industrial upgrading and economic restructuring. Therefore, this paper divides the factors affecting China's regional economic development into two parts: factor endowment and institutional constraint. By constructing a panel stochastic frontier model, this paper explores the impact of factor endowment and institutional factors on China's regional economic development. The empirical results show that: (1) China's economy cannot exert its maximum development potential in the presence of institutional constraints, and foreign direct investment, infrastructure construction, marketization and foreign trade can alleviate the inherent constraints of China's current economic development to a certain extent. (2) There are great differences in the economic development patterns among the eastern, central, and western regions. The western regions depend on government expenditure to some extent, while the eastern regions pay more attention to the role of foreign trade in promoting economic development.

Introduction

In 2007, the US subprime mortgage crisis ignited the global financial crisis, which had a huge impact on the US economy and the global economy. China's economic growth rate has changed from the previous high-speed growth to the medium-high speed growth. In order to cope with the impact of the international financial market, China has also launched various macroeconomic measures such as the "four trillion" investment plan, expanding government expenditure to stabilize economic growth. However, the decay of the main driving forces supporting China's economic development in the past few years has undoubtedly proved that the impact of economic development in China is not only from foreign factors, but also from domestic factors. What internal factors will have an impact on China's economic development? For a long period of time, a country's economic growth depends mainly on three factors, capital, labor, and technology. Therefore, economic growth is largely determined by the scale of input of factor endowments.

A country's economic growth will also be affected by domestic institutional factors, such as foreign investment, infrastructure conditions, government fiscal expenditures, domestic marketization levels, and foreign trade, all of which have obvious economic policy characteristics. The imbalance of regional development is a typical feature of China's economic development. There is a clear trend of “club convergence” in the eastern, central, and western regions. The characteristics of China's economic transformation have made the regions show institutional differences. Although China has achieved good economic results in recent years, the existence of institutional constraints still hinders China's economic development. How to deal with the relationship between institutional constraints and economic development, and to achieve sustained economic growth is the focus of this paper.

Literature Review

The new structural economic theory in the study of foreign capital denied that old structural
economics favored the strict control of all forms of international financial flows. It also believes that foreign direct investment is a form of foreign capital flow that is most beneficial to developing countries, and that foreign direct investment generally brings technology, management, market channels and social networks, which will be beneficial to industrial upgrading in developing countries (Lin 2011)[1]. Infrastructure construction is the general material condition for social development. It enlarges the possible boundary of social production by providing better services and facilities for the private sector and the public, and promotes the productive efficiency of all sectors of society. Infrastructure construction under the new structure economic theory has become a way for government departments to stabilize economic development. As a non-market behavior, government expenditure can influence economic growth by influencing the efficiency of factor use. Rao and Liu (2014)[2] through the establishment of a dynamic stochastic general equilibrium model to study the relationship between government expenditure and economic fluctuations in China, pointed out that government expenditure will cause the externality of production, and the impact of government productive expenditure on consumer consumption and private investment will cause short-term crowding-out effect. A notable feature of marketization is the extent to which non-state-owned enterprises play a role in the market. Liu and Zhang (2007)[3] pointed out that the development of China's non-state-owned economy has promoted the quantitative expansion of economic growth. The main reason is that the non-state-owned reform as a system innovation makes the interests within the system achieve Pareto-type growth.

Variable Selection and Data Sources

Variable Selection

(1) Output variables
Actual gross domestic product (\textit{RGDP}). Based on the nominal GDP of various regions in China, this paper uses the GDP reduction index to discount the real GDP, and the base period is 2006.

(2) Input variables
Technological innovation (\textit{Z}). The neoclassical economic growth theory points out that the fundamental driving force of economic growth comes from technological progress and technological innovation.
Labor force (\textit{L}). This paper selects the number of employed people at the end of each year as the representative labor force.
Capital stock (\textit{K}). This paper uses the perpetual inventory method to measure the capital stock, the base period is 2006.

(3) Institutional constraints
Foreign investment (\textit{FINV}). Reflecting the openness of China's domestic market to foreign investors and the ability to attract foreign investors.
Infrastructure (\textit{INFA}). Infrastructure construction reflects a country's public services for residents and enterprises, which is used to ensure the orderly social and economic activities of the country and region.
Government expenditure (\textit{GOVE}). Government expenditure includes two parts: government purchase and transfer payment. As China's economic development is faced with many uncertainties, the government plays a great role in economic and social development, allocating resources and maintaining social stability.
Marketization (\textit{MARK}). The level of marketization reflects the institutional reform of China's transition from a planned economy to a market economy, including economic, social, and legal changes.
Foreign trade (\textit{TRAD})This paper uses the proportion of total import and export trade to actual GDP to reflect China's foreign trade.

Data Source
This paper uses the panel data of 31 provinces and municipalities in China in 2006 and 2016. The
data mainly comes from China National Bureau of Statistics, China Statistical Yearbook and EPS database. For a few missing data, the moving average method is used to make up.

**Panel Stochastic Frontier Model Setting**

This paper adopts a panel stochastic frontier model containing technological innovations, which are as follows:

\[ Y_t = A(t)K^\alpha L^\beta Z^\eta \exp(u_t - v_t) \]  

(1)

Among them, \( Y_t \) represents the actual GDP; \( A(t) \) represents total factor productivity; \( K_t \) represents capital stock which is calculated using perpetual inventory method; \( L_t \) represents labor input; \( Z_t \) represents technological innovation; \( \alpha \) represents the output elasticity of capital; \( \beta \) represents labor output elasticity; \( \eta \) represents the output elasticity of technological innovation; \( u_t \) obeys a standard normal distribution. \( v_t \) represents output inefficiency term, assuming a semi-normal distribution.

The above formula (1) only gives the production relationship between factor input and economic output, and does not reveal which institutional factors will affect the output efficiency. Considering the factors affecting output efficiency, it also includes institutional factors such as foreign investment, infrastructure construction, government budget, marketization level and foreign trade. Therefore, the expectation of the inefficiency term is taken as the independent variable, and the institutional factors affecting the inefficiency are taken as the independent variable to model. Supposing the inefficiency function form is as follows:

\[ \tilde{\omega}_t = \exp(b_0 + \theta_1 FINV + \theta_2 INFA + \theta_3 GOVE + \theta_4 MARK + \theta_5 TRAD) \]  

(2)

The conditional expectation of the inefficiency term can be expressed as:

\[ E(\tilde{\omega}_t | z_t) = \exp(b_0 + \theta_1 FINV + \theta_2 INFA + \theta_3 GOVE + \theta_4 MARK + \theta_5 TRAD) \]  

(3)

In the above formula, \( b_0 \) represents a constant term, and \( Z_t \) represents an institutional factor affecting inefficiency. Here, it refers to foreign investment, infrastructure, government expenditure, marketization, and foreign trade; \( \theta \) represents the parameter to be estimated. If the estimated coefficient is positive, it has a negative impact on output efficiency. If the estimated coefficient is negative, it has a positive impact.

**Empirical Analysis**

The model was estimated using Frontier 4.1 software. The estimated results are shown in Table 4. Model 1-Model 5 respectively incorporates foreign investment, infrastructure, government expenditure, marketization and foreign trade into the regression model. Model 6 is the regression result obtained by adding all factors to the model at the same time. The output elasticity of technological innovation in model 1-6 is between 0.123 and 0.224, the output elasticity of labor force is between 0.128 and 0.176, the output elasticity of capital is between 0.465 and 0.571, and the output elasticity of capital is obviously greater than that labor force and technological innovation, which indicates that China’s economic development mainly depends on capital at this stage. This is consistent with the reality of China’s economic development.

Table 4 shows that the inefficiency is mainly caused by the inefficiency term, while the contribution of the random error term to the total inefficiency is small. Therefore, technical inefficiency can be regarded as an important factor hindering economic output. At the same time, the likelihood ratio test shows that the test results significantly reject the null hypothesis. This shows that institutional constraints will have a significant impact on China’s economic development.

In model 1, the estimated coefficient of foreign investment is - 4.863, which is significant at the
level of 1%, indicating that foreign investment will have a positive impact on China's economic efficiency. In Model 2, the estimated coefficient of the infrastructure is 0.266, but the estimation results are not significant. However, from the estimation results of Model 6, the infrastructure has a significant positive impact on economic efficiency, which shows that infrastructure construction will play a certain role in promoting economic development. In Model 3, the estimated coefficient of government expenditure is 0.922, and it is significant at the level of 1%, indicating that the current government fiscal expenditure will have a certain inhibitory effect on the improvement of economic efficiency. In model 4, the estimated coefficient of marketization is -0.101, and it is significant at the level of 1%, indicating that the improvement of marketization level will have a positive effect on economic efficiency. In Model 5, the estimated coefficient of foreign trade is -0.216, which is significant at the level of 1%, indicating that foreign trade will have a positive impact on China's economic efficiency. Model 6, as a robustness test, is the regression result of incorporating all institutional constraints into the model at the same time. From the estimation results, the conclusion is basically consistent with the model 1-Model 6.

**Conclusions and Implications**

Based on the new structural economic theory and the panel stochastic frontier model, this paper examines the impact of factor endowments and institutional constraints on regional economic development potential. The empirical results show that foreign direct investment, infrastructure construction, marketization and foreign trade will have a significant positive impact on economic development, and government fiscal expenditure will have a negative impact on economic development efficiency. Based on the above conclusions, this paper has the following implications for improving China's economic output efficiency and institutional constraints.

1. Improve foreign business environment and promote foreign investment.
2. Optimize the structure of foreign trade and promote industrial upgrading.
3. Improve the level of marketization and increase the vitality of the non-state-owned economy.

**Table 4. Panel random frontier model estimation results.**

|        | Model 1     | Model 2     | Model 3     | Model 4     | Model 5     | Model 6     |
|--------|-------------|-------------|-------------|-------------|-------------|-------------|
| ln(Z)  | 0.205***    | 0.223***    | 0.215***    | 0.210***    | 0.224***    | 0.123***    |
|        | (26.882)    | (2.749)     | (5.120)     | (17.002)    | (2.718)     | (5.692)     |
| ln(L)  | 0.143***    | 0.128*      | 0.143***    | 0.123***    | 0.132*      | 0.176***    |
|        | (18.665)    | (1.864)     | (9.592)     | (10.390)    | (1.838)     | (14.624)    |
| ln(K)  | 0.557***    | 0.538***    | 0.465***    | 0.582***    | 0.540***    | 0.571***    |
|        | (28.030)    | (2.723)     | (5.536)     | (25.053)    | (2.658)     | (16.124)    |
| C      | 1.324***    | 1.292       | 2.193***    | 1.124***    | 1.292       | 1.857***    |
|        | (10.420)    | (1.316)     | (5.518)     | (6.909)     | (1.315)     | (9.041)     |

**Technical inefficiency function**

|        | Model 1  | Model 2  | Model 3  | Model 4  | Model 5  | Model 6  |
|--------|----------|----------|----------|----------|----------|----------|
| FINV   | -4.863***| (5.358)  |          |          |          |          |
|        | (14.924) |          |          |          |          |          |
| INFA   | 0.266    | (0.274)  |          |          |          |          |
|        |          |          |          |          |          |          |
| GOVE   | 0.922*** | (18.784) |          |          |          |          |
|        |          |          |          |          |          |          |
| MARK   |          |          | -0.101***| (-7.04)  |          | -0.205***|
|        |          |          |          |          | (6.444)  | (10.86)  |
| TRAD   |          |          |          |          | -0.216***| -2.577***|
|        |          |          |          |          | (-6.197) | (-6.299) |
| C      | 0.537*** | 0.170    | 0.183***  | 1.060***  | 0.163    | 0.482***  |
|        | (14.924) | (0.784)  | (2.290)   | (11.971)  | (1.603)  | (8.663)   |
| variance | 0.068  | 0.104    | 0.060    | 0.082    | 0.107    | 0.027     |
| Y      | 0.999*** | 0.933*** | 0.999***  | 0.999***  | 0.926    | 0.999***  |
| Log – L | 53.548  | 28.630   | 99.473    | 56.005    | 27.351   | 152.378   |
| LR test | 69.167***| 19.331***| 161.019***| 74.082***| 16.774***| 266.828***|

Note: () represents t-value; *, **, *** respectively indicates significant at 10%, 5% and 1% levels.
(4) The government's primary responsibility should be to make good rules and supervise economic activities, and to encourage technological progress and private investment to achieve a reasonable allocation of resources by creating strong external conditions.

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