

Empirical Analysis on Contribution Rate of Factors of Production on China Oil and Gas Industry - Based on Provincial Panel Data

Qisheng Yang^{1*}, Liang Jian² and Guilin Dai¹

***Corresponding author:** Qisheng Yang, Ocean University of China, China, Tel: 0086-18669846221; E-mail: 407122738@qq.com

Received July 02, 2018; **Accepted** August 17, 2018; **Published** August 24, 2018

Citation: Yang Q, Jian L, Dai G (2018) Empirical Analysis on Contribution Rate of Factors of Production on China Oil and Gas Industry - Based on Provincial Panel Data. Oil Gas Res 4: 153. doi: [10.4172/2472-0518.1000153](https://doi.org/10.4172/2472-0518.1000153)

growth varies from region to region [5,6]. The contribution rate of FDI on the economic growth in the eastern region of China is significantly greater than that in the central and western regions. That is, for every one percentage point increase in FDI across the country, the GDP of China can grow by 0.07 percentage points, in which the GDP growth in the eastern region accounts for 0.02 percentage points. Some scholars [Zhang Erzhen and Dai Xiang, Pei Changhong, et al.] believe that the factor of human input has played a pivotal role in China's long-term and rapid economic development since its reform and opening up, especially after it joined the WTO. In these decades, China has made full use of its cheap human capital advantages with the help of an open economic system in the world and the international division of labor [7].

In terms of regions, Lihong and Yajun analyzed the contribution rate of domestic capital, FDI, and labor force on the economic growth in Shaanxi Province through an empirical study, using the Douglas production function as the theoretical basis [8]. They concluded that the domestic investment acts more in promoting the economic growth, while the FDI, although the scale is small, has much greater unit contribution rate on economy than the domestic capital, which is roughly a five-fold relationship. Xiaoqing studied the technological level of the manufacturing industry in Guangdong Province through a DEA (data envelopment analysis) model and believes that the introduction of FDI can promote the improvement of the technological level in various industries.

Lifeng and Jiaying studied the investment and output issues in the energy industry with their focus on the oil and gas industry. They believe that the investment in the oil and gas industry has seen rapid increase in recent years, but the increase in investment has not led to a significant increase in production; the relative

According to the research needs, in order to distinguish the different effects of domestic capital and FDI on output, this paper divides the capital into the domestic capital and the foreign direct investment (FDI) and uses two variables related to domestic capital, namely the total fixed assets (Asset) and the annual fixed assets investment (k) in consideration of the specific characteristics of the oil and gas industry. Among the two variables, the total fixed assets represent the previous asset stock, and the fixed assets investment represents the current fixed assets investment [11]. Meanwhile, this paper also introduces such variables as the annual production value of oil and gas, described as Y (or gdpoil), the annual employment population of oil and gas industry (Labor), the annual consumption of oil and gas (Con), and the proven reserves of oil and gas (Sto).

This paper assumes that the domestic capital and the foreign capital are homogeneous and there is a scale economy effect in the oil and gas industry. A basic input and output model of oil and gas industry is established according to the theory of Cobb-Douglas production function by taking the logarithm on both sides of the production function; the basic model is described as the following equation:

$$Y = \ln A + \beta_1 \ln \text{asset} + \beta_2 \ln k + \beta_3 \ln \text{fdi} + \beta_4 \ln \text{labor} \quad (1)$$

According to Solow's economic growth equation, the contribution rates of FDI and other factors on economic growth can be defined by taking the derivative of both sides of the basic model. The result is:

$$\frac{\Delta Y}{Y} = \frac{\Delta A}{A} + \beta_1 \frac{\Delta \text{asset}}{\text{asset}} + \beta_2 \frac{\Delta k}{k} + \beta_3 \frac{\Delta \text{fdi}}{\text{fdi}} + \beta_4 \frac{\Delta \text{labor}}{\text{labor}} \quad (2)$$

In which $\frac{\Delta Y}{Y}$ indicates the economic growth rate, $\frac{\Delta A}{A}$ indicates the economic growth rate related to the technological progress, and $\beta_3 \frac{\Delta \text{fdi}}{\text{fdi}}$ indicates the economic growth rate related to FDI; same for other variables.

Sample Data Description and Data Processing

Data source

In this paper, we collected relevant data about oil and gas industry from 19 oil and gas producing provinces (some of them are municipalities and autonomous regions) in China. The nineteen provinces are Shandong, Liaoning, Hebei, Shanghai, Guangdong, Tianjin, Jiangsu, Hainan, Inner Mongolia, Jilin, Heilongjiang, Henan, Hubei, Chongqing, Sichuan, Shaanxi, Gansu, Qinghai, and Xinjiang, of which the first 8 provinces are coastal provinces, and the latter 11 provinces are inland provinces. Due to limited available data, only the data in 2000~2015 in these 19 provinces is obtained for the variables of gdpoil, asset, k, fdi, and labor.

The data in this paper mainly comes from the China Industry Statistical Yearbook [data including the gross industrial output value of the oil and gas industry (gdpoil, described in RMB 100 million), the average annual employment population of oil and gas industry (labor, described in 10 thousand people), the total fixed assets of the oil and gas industry (asset, described in RMB 100 million)] and the National Bureau of Statistics of China [data including the gross domestic product (GDP, described in RMB 100 million), the total investment of fixed assets in the oil and gas industry (k, described in RMB 100 million), and the total amount of investment by foreign-invested enterprises (described in USD 1 million)].

For the missing data of some years in the Statistical Yearbook, we have conducted a survey and made some inquiries under the help of the system working personnel of the National Bureau of Statistics on its intranet, and have supplemented the missing data.

For the oil and gas industry, since there is no statistical data on FDI at the provincial level, we assume that the utilization rate of FDI in the oil and gas industry is the average level of all other industries in each province. The following method is used for data substitution:

$$= \text{total amount of investment by foreign-invested enterprises} * \frac{\text{gdpoil}}{\text{gdp}}$$

The reason why we used the total amount of investment by foreign-invested enterprises in each province rather than the fixed assets investment (described in RMB 100 million) is that we believe that a large part of the foreign investment introduced into the oil and gas industry is the investment in exploration and drilling services. The use of the fixed assets investment data cannot fully reflect the industry characteristics of oil and gas industry. At the same time, according to

Fixed assets investment (k) on oil and gas output value is not obvious in inland provinces, but more obvious in coastal provinces; in terms of labor output elasticity, 8 coastal provinces are larger than 11 inland provinces. The population of inland provinces has a weak impact on oil and gas output; in terms of output elasticity of foreign investment, inland provinces are higher than coastal provinces; coastal provinces are greater than inland provinces when it comes to the impact of technological progress on output.

By analyzing inconsistency of marginal output elasticity between coastal provinces and inland provinces in terms of oil and gas industry, the main reasons can be understood as: (1) the offshore oil and gas

production accounts for a certain proportion of oil and gas production in coastal provinces, and commonly seen cooperation with foreign countries in offshore oil and gas industry attracts more foreign investment, more technology input and less labor input, thus, per capita oil and gas output is greater and technological progress has a significant impact on output. (2) Due to the state-owned background

Citation: Yang Q, Jian L, Dai G (2018) Empirical Analysis on Contribution Rate of Factors of Production on China Oil and Gas Industry - Based on Provincial Panel Data. Oil Gas Res 4: 153. doi: [10.4172/2472-0518.1000153](https://doi.org/10.4172/2472-0518.1000153)
