

An Empirical Analysis about the Effect of Technology Transfer on Equipment Manufacturing Industrial Structure in Shaanxi Province

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Abstract. This paper constructs the technology transfer index system of Shaanxi Province, and then establishes vector autoregression between the comprehensive index of technology transfer and the index of the equipment manufacturing industrial structure, finally this paper analyzes the results by combining variance decomposition and shows that strengthening the technology transfer can accelerate the upgrading of equipment manufacturing industrial structure and optimizing the industrial structure of equipment manufacturing has a positive reaction to the technology transfer, but the positive effect of the technology transfer on the upgrading of equipment manufacturing industrial structure needs to be further improved.

Introduction

At present, in Shaanxi Province, the scale of equipment manufacturing is expanding and asset size is expanding, energy consumption is at a low level, the output value had a continued steady growth, by 5.4% year on year in 2015, 19% in 2016. However, the development still has some problems: First, the number of high-end equipment manufacturing enterprises is small less than the national average, this didn't reflect the competitive advantage of Shaanxi. Second, the economic benefits is in the middle and lower levels in recent years. Third, research capital investment is higher than the national level, but the scientific and technological innovation is not ideal.

Empirical Analysis

SPSS19.0 is used to do factor analysis of the indicator data for technology transfer, calculates the annual comprehensive scoring, and uses the equation(1) to calculate the technical transfer index based on the year 2006.

$$I = 100 + 100 * (F_t - F_{2006}) / |F_{2006}| \quad (1)$$

This paper chooses indicators, including the ratio index of high-tech equipment manufacturing industry output value (HI), energy output rate index (N) and new product output value index (NP), to characterize the industrial structure of the equipment manufacturing. Taking into account the impact of the technical transfer on equipment manufacturing industrial structure has a lag, this paper establishes vector autoregression between the comprehensive index of technology transfer and the index of the equipment manufacturing industrial structure. In order to avoid the influence of violent data on VAR model, TI, HTI, NI and NPI is logarithmized, the new data is recorded as lnTI, lnHTI, lnNI and lnNPI. The VAR is as follows:

$$\ln TI_t = c_1 + a_{11} \ln TI_{t-1} + a_{12} \ln TI_{t-2} + b_{11} \ln Y_{t-1} + b_{12} \ln Y_{t-2} + e_{1t} \quad (2)$$

$$\ln Y_t = c_2 + a_{21} \ln TI_{t-1} + a_{22} \ln TI_{t-2} + b_{21} \ln Y_{t-1} + b_{22} \ln Y_{t-2} + e_{2t} \quad (3)$$

This paper establishes three VAR models and Y represents different values in every VAR model, Y is HTI, NI, NPI respectively. The VAR is established by using Eviews6, then the most reasonable lag order is selected by Lag Length Criteria to determine the final estimate of VAR.

Table 1: VAR Lag Order Test Results

	Lag	LogL	LR	FPE	AIC	SC	HQ
<i>lnTI</i> and <i>lnHTI</i>	0	19.471	NA*	0.000	-4.367	-4.348	-4.502
	1	24.795	6.655	3.37e-05*	-4.699*	-4.639*	-5.101*
	2	25.649	0.640	0.001	-3.912	-3.813	-4.582
<i>lnTI</i> and <i>lnNI</i>	0	2.007	NA	0.003	-0.002	0.018	-0.136
	1	10.136	10.161	0.001	-1.034	-0.974	-1.436
	2	23.348	9.909*	0.001*	-3.337*	-3.237*	-4.007*
<i>lnTI</i> and <i>lnNPI</i>	0	3.611	NA	0.002	-0.403	-0.383	-0.537
	1	14.401	13.486*	0.001	-2.100	-2.041	-2.502
	2	21.185	5.088	0.001*	-2.796*	-2.697*	-3.466*

From the results, it is reasonable to establish VAR lag 1 between *lnTI* and *lnHTI*, *lnNPI*, and establish VAR lag 2 between *lnTI* and *lnNI*. And the reciprocal values of all the eigenvalues are within the unit circle, the VAR model is stable and satisfies the stability requirement.

VAR Analysis of *lnTI* and *lnHTI*. The goodness of fit R^2 is: $R^2 \ln TI = 0.7230$, $R^2 \ln HTI = 0.4604$.

The VAR is as follows:

$$\ln TI_t = 0.7271 * \ln TI_{t-1} - 5.8214 * \ln HTI_{t-1} + 19.4005 \quad (4)$$

$$\ln HTI_t = -0.0177 * \ln TI_{t-1} + 0.1987 * \ln HTI_{t-1} + 5.8879 \quad (5)$$

When the other factors remain unchanged, the NTI for last year drops by one percentage point, the TI rises by 5.8214 percentage points, the reduction of the high-tech equipment manufacturing value in GDP will increase technology transfer activities and improve the intensity of technology transfer. The technology transfer index for last year rise by one percentage point, the high-tech equipment manufacturing output value index will drop 0.0177 percentage points. In the short term, technology transfer activities will not increase the high-tech equipment manufacturing output value. According to the variance of *lnTI*, the impact of the HTI on the NI is zero in the first period, indicates the impact has a lag. From the variance of *lnHTI*, the effect of TI on the HTI is increased from 1.7686% in the first period to 21.6553% in the fourth period, and then remained 21.3%. The impact of technology transfer on the development of high-tech equipment manufacturing is increasing, the strengthening of technology transfer activities will be conducive to the development of high-tech equipment manufacturing.

VAR Analysis of *lnTI* and *lnNI*. $R^2 \ln TI = 0.984$, $R^2 \ln NI = 0.8783$, the model has a high good fit. The VAR is as follows:

$$\ln TI_t = 0.6016 * \ln TI_{t-1} + 0.0541 * \ln TI_{t-2} - 1.01381 * \ln NI_{t-1} + 0.6391 * \ln NI_{t-2} + 4.4404 \quad (6)$$

$$\ln NI_t = 0.4057 * \ln TI_{t-1} + 0.1465 * \ln TI_{t-2} - 0.0218 * \ln NI_{t-1} + 0.1052 * \ln NI_{t-2} + 3.0194 \quad (7)$$

When the other factors remain the same, the energy output rate index for lag 1 is dropped one percentage point, the technology transfer index will rise by 1.0138 percentage points. The energy

output rate index for lag 2 is increased by one percentage point, the technology transfer index will rise by 0.6391 percentage points, which is indicated long-term improvement in energy output will be conducive to the enhancement of technology transfer. The technology transfer index for lag 1 rise by one percentage point, the energy output rate index will rise by 0.4057 percentage points. The technology transfer index for lag 2 rise by one percentage point, the rate index will rise by 0.1465 percentage points, which is indicated the increase in technology transfer activities will help improve the energy output rate. From the variance of $\ln TI$, the effect of energy output rate on the technology transfer has a lag, but the effect of the second period is 68.915%. The energy output rate has a great impact on the technology transfer in late period. From the variance of $\ln NI$, the effect of technology transfer index on energy output rate index is increased from 35.2977% in the first period to 36.8761% in the second period, and then maintain stable. The strengthening of technology transfer will help enterprises to improve technology, reduce energy consumption.

VAR Analysis of $\ln TI$ and $\ln NPI$. $R^2 \ln TI = 0.8862$, $R^2 \ln NPI = 0.8855$, the model has a high good fit. The VAR is as follows:

$$\ln TI = 0.7528 * \ln TI_{t-1} - 1.5454 * \ln NPI_{t-1} + 11.579 \quad (8)$$

$$\ln NPI = 0.2463 * \ln TI_{t-1} - 0.9083 * \ln NPI_{t-1} + 9.4665 \quad (9)$$

When the other factors remain unchanged, the proportion of new product output value index of the equipment manufacturing in last year is decreased by one percentage point, the technology transfer index will rise 1.5454 percentage points, the reduce of the proportion of new products of equipment manufacturing will enhance the current technology transfer and strengthen the application of technology development. At the same time, the technology transfer index rise one percentage point in last year, the proportion of new product output index will rise 0.2463 percentage points. Enhancing technology transfer activities will enable enterprises to develop the new products and improve the proportion of new product output value. From the variance of $\ln TI$, the development of new products in equipment manufacturing has lagged behind the technology transfer. From the variance of $\ln NPI$, the effect of technology transfer index on the production of new products is increasing from 9.7278% in the first period to the maximum 57.8766% in the ten period, which fully reflects the technology transfer has a significant and long-term positive impact on the new product production of equipment manufacturing.

Conclusions

Effect of Technology Transfer on the Equipment Manufacturing Industrial Structure. The technology transfer is conducive to strengthening the innovation consciousness and ability, transforming the traditional equipment manufacturing and changing the input-driven mode to technology development-based productive model. The effect hasn't lag, the technology transfer will promote the optimization of equipment manufacturing from the current period. The transfer to the enterprise will make the equipment manufacturing enterprises apply new technology, improve the productive model, improve the production of new products and the proportion of high-tech industry. The positive effect is still small of the technology transfer on the optimization and upgrading of the industrial structure of the equipment manufacturing. The impact on the HTI is 21.6554%, the NI is 36.8761%, only the NPI is 57.8766%. The extent of its impact is at a low level, the role of technology transfer need to be improved and strengthened.

The Reverse Influence of Equipment Manufacturing Industrial Structure on Technology Transfer. The effect of industrial structure of equipment manufacturing has a lag on technology

transfer. At present, the ability to develop new products of the equipment manufacturing enterprises need to be rapidly improved, the demand for high-tech industry is growing. In addition, improving energy output rate becomes the main target of equipment manufacturing with a large demand for fuel. Therefore, the production of equipment manufacturing enterprises need the strong support and help of science and technology, which will enhance the technology transfer activities in Shaanxi Province, speed up the transfer of technology from universities and research institutions to enterprises and improve the efficiency of production technology.

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