# Manufacturing Demand and Producer Services Efficiency in China: Threshold Effect of Economic Development

Wen Wang, Zao Sun[*]

Considering the important role the demand from manufacturing has played in the development of producer services, this paper analyzes the influence mechanism of manufacturing demand on producer services efficiency through two channels, which are the scale effect and innovation incentives. Meanwhile, the paper also evaluates the moderating effect of economic development level on the relationship between manufacturing demand and producer services efficiency. Based on the panel data of China's manufacturing industry and producer services from 1995 to 2014, the empirical result shows that: (1) the demand from manufacturing was helpful to improve producer services efficiency, and compared with the labor-intensive manufacturing, the demand from capital-intensive manufacturing played a more important role in improving producer services efficiency; (2) at different stages of economic development, the promoting effect of manufacturing demand on producer services efficiency showed a nonlinear threshold effect rather than a simple linear effect, namely after crossing a certain threshold of economic development level, the promoting effect would be more significant. More specifically the threshold level faced by capital-intensive manufacturing industry was higher than that faced by labor-intensive manufacturing industry. These findings may be helpful for governments to make industrial development strategy.

**Keywords:** manufacturing demand, producer services efficiency, economic development level, threshold effect

## 1. Introduction

After hundreds of years of economic prosperity brought by the Industrial Revolution, the development of industry in the world has shown an obvious service-oriented trend since 1960s. In the new century, producer services have developed

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rapidly and become an indispensable intermediate input in the development of high-end manufacturing and other industries. Comparatively speaking, China's service industry still lags behind, with the share of the service sector as a whole is still low and the development of producer services is obviously insufficient (Tan, 2015). Based on the development experience of the industrialized countries and the reality of the slowdown of China's economic growth, much literature argues that China should accelerate the development of producer services by increasing resources investment, thus promoting the upgrading of industrial structure and the transformation of economic growth mode (Wu, 2014).

While these studies emphasize the importance of manufacturing demand for the development of producer services, they do not focus on the exact relationship between the change in manufacturing demand for producer services and the efficiency of productive services. First, due to the complexity of the manufacturing industry, different manufacturing industries have different demand for producer services, which will also have different effects on the efficiency of producer services (Guerrieri and Meliciani, 2005); secondly, as a developing country, with the improvement of China's economic development level, national income and a series of other variables that reflect the environment of the market system will also change correspondingly, which will significantly affect the effect of manufacturing demand on the efficiency of producer services (Jiang, 2011; Eichengreen and Gupta, 2013).

Based on the above considerations, this paper first analyzes the specific influence mechanism of changes in manufacturing demand on the efficiency of producer services, and examines the different effects of the demand of capital-intensive manufacturing and labor-intensive manufacturing industry on the efficiency of producer services, and then discusses the moderating effect of economic development level on this effect. This paper not only enriches the existing literature on the relationship between manufacturing demand and producer services development, but also provides possible ideas and directions for the correct formulation of modern (producer) services development policies.

## 2. Literature Review and Research Hypotheses

Unlike traditional service industries, producer services emerged from within the manufacturing industry and depend on the manufacturing industry, and the manufacturing demand for producer services is the decisive driver of its development (Rowthorn and Ramaswamy, 1999). This section first analyzes the influence mechanism of manufacturing demand on producer services efficiency from the three aspects of acquiring economies of scale, promoting innovation incentive and increasing the degree of production roundabout, and points out the differences between the influence of demand of labor-intensive manufacturing and that of capital-intensive manufacturing on the efficiency of producer services. Then we analyze the moderating effect of economic development level on the relationship between manufacturing demand and producer services efficiency, and draw four hypotheses to be tested (see Figure 1).

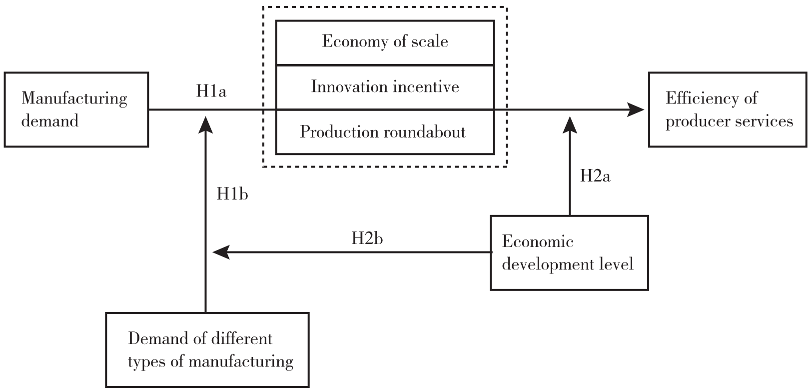


*Figure 1*. The Influence of Manufacturing Demand on Producer Services Efficiency

### *2.1. The Influence of Manufacturing Demand on Producer Services Efficiency*

First, similar to manufacturing, the development of producer services requires a large amount of upfront resource input.[1] When the manufacturing demand for producer services is small, the productive service is usually provided by the original manufacturing enterprise itself, and with the increase of the demand scale of the manufacturing industry, the productive service will be gradually separated from the manufacturing enterprise and turn specialized. Then the economy of scale brought by the specialization will enhance the overall industrial efficiency. Considering that producer services are more of a technology and knowledge-intensive industry (Markusen, 1989), the marginal cost of production is much lower than that of other industries after obtaining a large amount of upfront inputs and getting into the specialized production phase (Buera and Kaboski, 2012). Therefore, the economy of scale brought by the expansion of manufacturing demand will promote the efficiency of producer services.

Second, the productive services built into manufacturing enterprises are generally only to meet their own needs. As there is no other potential demand, nor competitive pressure of similar products, the incentive to carry out innovative activities is weaker. Under the precondition of the huge increase of manufacturing demand, the productive service activities face the pressure of further specialization, and will gradually be separated from the original manufacturing industry. For the fully externalized productive service enterprises, the expanding manufacturing demand will also lead

[1] The upfront inputs of some producer services (such as research and development, financial services, etc.) are even higher than those in the manufacturing sector at the early stages.

to the entry of new enterprises, and the pressure of survival and the instinct of profit-making will accumulate in the context of intensifying manufacturing demand. This will thus promote the innovation power of the enterprise and further promote the efficiency of producer services.

Third, the expansion of manufacturing demand will increase the roundaboutness (complexity) of producer services. The more complex the production, the more refined the internal division of labor and producer services will become more professional and specialized. This will ultimately promote the overall industrial efficiency.

Due to the wide variety of manufacturing industry, the demand of different sectors for producer services varies, and ultimately the impact on the efficiency of producer services will be different. Compared with labor-intensive manufacturing, capital-intensive manufacturing has high technical content, which accords with the technology-intensive characteristics of producer services, and thus its demand for producer services is larger[1] (Guerrieri and Meliciani, 2005). As a result, the promoting effect on producer services efficiency is also higher via the scale effect and innovation incentives for capital-intersive than for labor-intensive industries. So we propose the following hypotheses:

H1a: The increasing demand for producer services in manufacturing industry contributes to the efficiency improvement of producer services.

H1b: Compared with labor-intensive manufacturing, the increasing demand of capital-intensive manufacturing plays a more important role in improving the efficiency of producer services.

### *2.2. The Moderating Effect of Economic Development Level on the Relationship between Manufacturing Demand and Producer Services Efficiency*

In the process of catch-up, economic development will undergo significant changes from low level to high level. With the rising economic development level, the constraint of resources and environment becomes more and more obvious, and the industrial structure faces the urgent need of transformation and upgrading. The “Made in China” created in an export-oriented economy could not be accomplished only by incremental upgrades, but by promoting productivity and boosting manufacturing to the top of the industrial chain (Liu and Chen, 2014), further fueling the manufacturing demand for high-quality producer services. On the other hand, economic development will increase residents’ income and bring about a corresponding change in the consumption structure, which will have a significant impact on the relationship between manufacturing demand and producer services efficiency. Zhang and Liu

[1] According to *Input-Output Table of China 2012*, we found that the proportion of productive service capital inputs used in all manufacturing industries was about 27%, of which the proportion of capital-intensive manufacturing was 20%, and that of labour-intensive manufacturing was only 7%.

(2012b) introduced consumer preferences into the two-sector model of industrial development, and their theoretical analysis and empirical tests based on Chinese consumption data found that, with the increase in per capita income and service consumption price, representative Chinese households preferred to use industrial consumer durables as substitutes for service consumption, which will directly promote the scale of manufacturing enterprises and deepen the division of labor, increase the demand for productive services, and further improve the efficiency of producer services through the above scale effect and innovation incentive mechanism (see Figure 2).

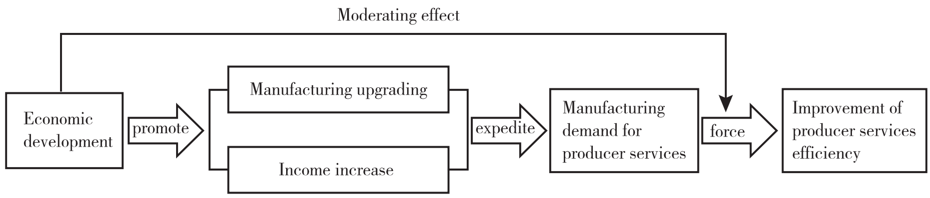


*Figure 2*. The Moderating Effect of Economic Development on the Relationship between Manufacturing Demand and Producer Services Efficiency

Although it is a general trend that the service industry develops with the rising level of economic development, the relevant empirical studies show that the specific performance of this trend at different stages of development is not exactly the same (Jiang, 2011). Eichengreen and Gupta (2013) conduct cross-country data analysis and find that the service industry shows an obvious “two-waves” feature. This paper focuses on the study of producer services, so we expect that there may be a threshold of per capita income, and when the threshold is crossed, manufacturing demand contributes more to the efficiency improvement of producer services.

Considering the different influence of the demand of capital-intensive manufacturing and labor-intensive manufacturing on the efficiency of producer services, we further expect that under different economic development levels, the two types of manufacturing demand will have different effects on the efficiency of productive services. Based on the above analysis, we propose the following two hypotheses:

H2a: At different stages of economic development, the promoting effect of manufacturing demand on the efficiency of producer services shows a threshold effect, and the promotion will be significantly enhanced when the level of economic development crosses a certain threshold.

H2b: The threshold for labor-intensive manufacturing is at a relatively low level of economic development, and after reaching the threshold, the demand of labor-intensive manufacturing industry will enhance the efficiency of producer services significantly; the threshold of capital-intensive manufacturing industry is at a relatively high level of economic development, and after reaching the threshold, the promoting effect of capital-intensive manufacturing demand on the efficiency of producer services will be significantly enhanced.

## 3. Models, Variables and Data

### *3.1. Model Setting*

In order to empirically examine the impact of manufacturing demand changes on the efficiency of producer services, we set up the following panel data model:

$$\mathrm{Ln}PS_{it} = \alpha_0 + \alpha_1 Manf_{it} + \Omega' \cdot \vec{X} + \mu_i + \theta_t + \varepsilon_{it} \tag{1}$$

Here, $PS_{it}$ is the efficiency of producer services; $Manf_{it}$ is the core explanatory variable, indicating the overall manufacturing demand for producer services. $\vec{X} = (Scale_{it}, Comp_{it}, Rd_{it}, State_{it}, DemS_{it}, DemF_{it}, Consu_{it})$ is a vector composed of a group of control variables that affect the efficiency of producer services. Among them, *Scale* is the average industry scale, *Comp* is the industrial market competition, *Rd* is the industrial research and development intensity, and together these three variables reflect the industrial market structure; *State* reflects the degree of nationalization of industrial ownership structure; *DemS* reflects the service industry's demand for producer services. *DemF* indicates the demand of manufacturing industry for foreign producer services; *Consu* is a variable that reflects the structure of resident consumption.

Hypothesis 1 examines at the same time the different effects of demand from manufacturing industries with varying capital intensity on the efficiency of producer services, and on the basis of equation (1), we divide the demand of manufacturing industry into the demand of capital-intensive manufacturing and the demand of labor-intensive manufacturing, and construct the following model:

$$\mathrm{Ln}PS_{it} = \beta_0 + \beta_1 ManfK_{it} + \beta_2 ManfL_{it} + \Omega' \cdot \vec{X} + \mu_i + \theta_t + \varepsilon_{it} \tag{2}$$

Here, $ManfK_{it}$ and $ManfL_{it}$ indicate the demand for producer services in capital-intensive manufacturing and labor-intensive manufacturing respectively.

Hypothesis 2 focuses on the impact of the economic development level on the relationship between manufacturing demand and producer services efficiency. The threshold effect estimation model is established to validate Hypothesis 2. Using the method of Hansen (1999), we establish the following dynamic panel threshold regression model:

$$LnPS_{it} = \phi_1 Manf_{it} I(C_t \le \gamma_0) + \phi_2 Manf_{it} I(C_t > \gamma_0) + \phi_3 C_t + \Omega' \cdot \vec{X} + \mu_i + \theta_t + \varepsilon_{it} \tag{3}$$

Here, $C$ is the threshold variable—economic development level; $\gamma_0$ is the threshold value to be estimated; $I(\cdot)$ is the indication function, whose value is 1 when the expression in parentheses is true, otherwise the value is 0. Hypothesis 2b points out that the threshold values may vary when it comes to the moderating effect of economic development level on the relationship between the demand of capital-intensive manufacturing and labor-intensive manufacturing industry and the efficiency of producer services. To verify Hypothesis 2b, we extend equation (3) as follows:

$$\begin{aligned}\mathrm{Ln}PS_{it} = {}& \varphi_1 ManfK_{it} I(C_t \leqslant \gamma_1) + \varphi_2 ManfK_{it} I(C_t > \gamma_1) + \varphi_3 ManfL_{it} I(C_t \leqslant \gamma_2) \\ & + \varphi_4 ManfL_{it} I(C_t > \gamma_2) + \varphi_5 C_t + \Omega' \cdot \vec{X} + \mu_i + \theta_t + \varepsilon_{it}\end{aligned} \tag{4}$$

## 3.2. Variable Description

### 3.2.1. Explained Variables

We use the TFP of producer services to measure their efficiency, and the parameter regression method based on SFA is used to calculate the TFP.[1] In this paper, the Frontier Production Function is set in C-D form, and the logarithmic Stochastic Frontier Production Function model can be expressed as:

$$\mathrm{Ln}Y_{it} = \gamma_0 + \gamma_1 \mathrm{Ln}K_{it} + \gamma_2 \mathrm{Ln}L_{it} + \gamma_3 t + v_{it} - u_{it}, u_{it} = u_i \exp[\eta(t-T)] \sim \mathrm{iid}\, N^+(\mu, \sigma_u^2) \tag{5}$$

Here, $Y_{it}$, $K_{it}$, and $L_{it}$ represent respectively the added value, capital stock and labor input of the industry $i$ in the year $t$, and original data processing methods are consistent with Wang *et al.* (2015). $t$ is the time trend variable, $v_{it}$ the random error term in general sense, $u_{it}$ the technical inefficiency and is mutually independent of $v_{it}$.$\eta$ is the rate of change for the technical efficiency index. Based on the stochastic frontier model in equation (5), TFP of industry $i$ in the year $t$ can be expressed as $TFP_{it} = \exp[\gamma_0 + \gamma_3 t] \times TE_{it}$, where $TE_{it} = E[\exp(-u_{it}) \mid e_{it} = v_{it} - u_{it}]$, being the technical efficiency calculated from the Stochastic Frontier model.

### 3.2.2. The Core Explanatory Variables

This paper measures *Manf* by the proportion of productive service capital goods used in the manufacturing sector. The specific method of calculating the demand

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[1] TFP reflects the contribution of other factors to output after excluding labor and capital, and its estimation methods include Nonparametric analysis (DEA), semiparametric analysis (OP, LP) and parametric analysis (SFA). DEA can only estimate the rate of TFP change, the more popular OP, LP and other semiparametric methods are mainly aimed at the micro-enterprise TFP estimation, and the research sample used in this paper is the industry panel data. Based on this understanding, we use the parametric regression method based on SFA to estimate TFP of service industry.

of manufacturing industries for a particular producer service industry is the sum of intermediate inputs of a particular producer service industry into the manufacturing sector/the total output of that particular producer service industry.

As for the demand of capital-intensive and labour-intensive manufacturing for productive services (*ManfK*, *ManfL*), we divide the manufacturing industry into two groups in accordance with the size of capital-to-labor ratio (K/L). the group with a larger K/L being capital-intensive manufacturing, and the group with a smaller K/L being labor-intensive manufacturing. Therefore, *ManfK* is measured by the proportion of productive service capital inputs for capital-intensive manufacturing. Similarly, we measure *ManfL* by the proportion of productive service capital goods used in labor-intensive manufacturing.

### 3.2.3. Threshold Variable

As mentioned above, national income is the most direct reflection of the level of economic development, so per capita GDP (*Pgdp*) is used to measure the level of economic development.

### 3.2.4. Control Variables

The scale of the Enterprise (*Scale*) is measured by the ratio of the added value of each industry to the number of legal entities; the degree of market competition (*Comp*) is measured by the number of legal entities in each trade: the larger the number of legal entities in the industry, the fiercer the competition of the industry. Research and development intensity (*Rd*) is measured by the proportion of R&D personnel in urban employment of the industry, and the degree of state ownership (*State*) is measured by the proportion of state-holding in the fixed assets investment of each industry. In addition to the impact from manufacturing demand, demand from the service industry itself (*DemS*) may have an impact on the efficiency of producer services, so we also control this effect with the “proportion of investment in productive services capital goods for the service sector”; the demand for foreign producer services (*DemF*) is reflected approximately by the import proportion coefficient, which is the proportion of the industry’s imports in the domestic use of the industry (including “the total of the intermediate use, total consumption, and the total capital formation”). Generally speaking, a higher proportion of producer services imports corresponds to a higher proportion of intermediate inputs to the manufacturing industry from abroad; as some industries in producer services are not only used in production processes, there is also a large part of direct personal consumption (such as transportation services, finance, etc.), so the increase in consumer demand and demand levels may also affect the efficiency of producer services. This paper uses the information entropy index of consumer structure to control these effects.

Referring to the practice of Gu and Zhu (2016), if resident consumption contains *n* kinds of items,[1] the consumption expenditure for each item being $M_i(i=1,\ldots,n)$, and proportion of total expenditure being $\kappa_i = M_i / \sum M_i$, then the information entropy index of consumption structure can be defined as $Consu = -\sum \kappa_i \ln \kappa_i$. The bigger the *Consu*, the higher the consumption demand of residents and the more advanced the consumption structure. The definition of the main variables is shown in Table 1.

Table 1. Variable Definition

| Variable type | Variable name | Symbols | Measuring indicators |
|---|---|---|---|
| Explained variable | Producer services TFP | *TFP* | Using Stochastic Frontier Analysis (SFA) to calculate TFP in various industries of producer services |
| Core explanatory variables | Demand of manufacturing industry for producer services | *Manf* | Proportion of investment in productive services capital goods for manufacturing (%) |
| | Demand of capital-intensive manufacturing industry for producer services | *ManfK* | Proportion of investment in productive services capital goods for capital-intensive manufacturing (%) |
| | Demand of labor-intensive manufacturing industry for producer services | *ManfL* | Proportion of investment in productive services capital products for labor-intensive manufacturing industries (%) |
| Threshold variable | Economic development | *Pgdp* | Per capita GDP |
| Control variables | Enterprise scale | *Scale* | Ratio of the value added to the number of legal entities in each industry |
| | Market competition | *Comp* | Number of legal entities in each industry |
| | Research and development intensity | *Rd* | Number of R&D personnel / urban employment of each industry |
| | Degree of state-ownership | *State* | Proportion of state-owned holding in fixed assets investment in various industries (%) |
| | Demand of service industry for producer services | *DemS* | Proportion of productive service capital goods inputs for services |
| | Demand of manufacturing industry for foreign producer services | *DemF* | Proportional coefficient of imports of producer services |
| | Household consumption structure | *Consu* | Information entropy index of resident consumption structure |

### *3.3. Data Source*

This paper selects the yearly data from 1995 to 2014, with raw data from *China*

[1] According to the statistical classification of *China Statistical Yearbook*, the consumption categories of residents mainly include food, tobacco and alcohol, clothing, housing, daily necessities and services, transportation and communication, educational and cultural entertainment, medical care, other supplies and services.

*Statistical Yearbook*, *China Statistical Yearbook of the Tertiary Industry*, *China Statistical Yearbook on Science and Technology, China Statistical Yearbook of Fixed Assets*, and world input-output table. To obtain data consistency in statistical scopes, we explain the selection of industry and years as follows.

First, on the selection of the industry. The dependent variable of this paper is the efficiency of producer services. Different from the industrial sector, the industry-specific data on the service sector in relevant yearbooks is confined to industries based on the tertiary industry (one-digit industry) because of the complex composition of the service industry. Considering the availability of data, this paper selects the producer services sector as one-digit industry of services. In reference to Sheng and Lu (2013), producer services comprise 5 specific industries: Transport, warehousing and postal, Information transmission, compoter services and software industries, Finance, Leasing and business services, and Scientific research, technical services and geological prospecting. In the classification of manufacturing industry according to capital-to-labor-ratio, this paper uses two-digit manufacturing classifcation.[1]

Second, on the selection of the year. In order to increase the sample capacity and improve the reliability of the conclusion, we analyze it in a long time span because the main measure index of the threshold variable is the time series data of GDP per capita. After the adjustment to the classification of national economic sectors made by National Bureau of Statistics in 1994, there is inconsistency in statistical scopes as well as a lack of data before 1994. To obtain robust estimations, the sample year in this article starts from 1995 and the span of the sample finally selected is from 1995 to 2014.

## 4. Empirical Results and Analysis

### *4.1. Benchmark Model Regression Results*

The estimation of Model (1) and Model (2) belongs to the common panel data model estimations in literature, mainly involving the selection among the three models of mixed OLS, fixed effect (FE) and random effect (RE). We will select the appropriate model through F test, BP-LM test (Breush-Pagan Lagrange Multiplier test) and Hausman test. Model (3) is the standard Hansen (1999) panel threshold effect model (single threshold variable-single explanatory variable). Model (4) is a single threshold variable-double explanatory variable threshold model, and the estimation idea is consistent with the double threshold model of Hansen (1999).

The estimated results of the benchmark Model (1) and (2) are reported in Table 2. From the test results of Model (1), the fixed effect model (FE) is superior to the

[1] According to *China Industry Economy Statistical Yearbook 2015*, we rank the two-digit industries in the manufacturing sector above designated size according to capital per labor, with a smaller group comprising 15 industries and a larger group of 16 industries.

mixed OLS model, and the random effect model (RE) is not superior to the mixed OLS model, and the Hausman test shows that the fixed effect model is superior to the random effect model. The test results of Model (2) also support the fixed effect model. Therefore, the results of the fixed-effect model estimation based on column (2) and column (5) are analyzed.

Column (2) in Table 2 shows that every 1% increase in the demand for producer services in the manufacturing sector will lead to a 0.0752% increase in TFP of producer services, with significance at the statistical level of 5%. In other words, the increasing demand of manufacturing for producer services contributes to the improvement of TFP of producer services, so Hypothesis 1a is validated. Column (5) shows that every 1% increase in the demand of capital-intensive manufacturing and labor-intensive manufacturing for productive services leads to a 0.1651% and 0.0683% increase in the productivity of productive services, with significance at 10% and 1%, respectively. It shows that the promoting effect of increasing demand of capital-intensive manufacturing on the TFP of producer services is greater than that on the TFP of labor-intensive manufacturing. This is consistent with our expectations, which means that, compared with labour-intensive manufacturing, capital-intensive manufacturing, on the one hand, is the main demand for producer services, on the other hand, it requires a higher technological level of productive service inputs. The effect of the two aspects together leads to greater promoting effect of increasing demand of capital-intensive manufacturing on the TFP of producer services. Hypothesis 1b is thus validated.

Table 2. Benchmark Model Estimation Results

| Variables | Model (1) | | | Model (2) | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Pool—OLS | FE | RE | Pool—OLS | FE | RE |
| *Manf* | 0.1020* | 0.0752** | 0.0961** | | | |
| | (1.68) | (2.43) | (2.01) | | | |
| *ManfK* | | | | 0.2054** | 0.1651*** | 0.1675*** |
| | | | | (2.38) | (11.81) | (4.15) |
| *ManfL* | | | | 0.0534* | 0.0683* | 0.1130 |
| | | | | (1.83) | (1.71) | (0.35) |
| *Scale* | 0.1032** | 0.1751** | 0.0938* | 0.1001 | 0.1268** | 0.1832 |
| | (2.41) | (2.23) | (1.75) | (0.27) | (2.38) | (1.01) |
| *Comp* | 0.4851*** | 0.2681*** | 0.3142*** | 0.2084** | 0.5413*** | 0.2220*** |
| | (6.83) | (2.96) | (10.58) | (2.12) | (6.35) | (15.32) |
| *Rd* | 0.0365** | 0.0230** | 0.0125 | 0.0258** | 0.0548* | 0.0651*** |
| | (2.13) | (2.37) | (0.85) | (2.11) | (1.68) | (9.42) |
| *State* | –0.0554 | –0.0520** | –0.0734** | –0.1384 | –0.2151* | –0.0875*** |
| | (–0.96) | (–2.02) | (–2.45) | (–0.18) | (–1.86) | (–9.35) |

| Variables | Model (1) | | | Model (2) | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| | Pool—OLS | FE | RE | Pool—OLS | FE | RE |
| *DemF* | –0.0235 | –0.1028** | –0.0295 | –0.0203* | –0.0547 | –0.0235* |
| | (–0.05) | (–2.35) | (–0.51) | (–2.01) | (–0.32) | (–1.79) |
| *Consu* | 0.0336* | 0.0068 | 0.0196** | 0.1546** | 0.0209 | 0.1067*** |
| | (1.82) | (0.63) | (2.31) | (2.45) | (0.65) | (10.32) |
| constant | 0.6485 | 0.3875* | 1.2534 | 6.2465 | 2.2424 | 3.4192* |
| | (0.01) | (1.78) | (0.23) | (0.02) | (0.82) | (1.91) |
| F test (p value) | | 0.0049 | | | 0.0148 | |
| LM test (p value) | | | 0.3130 | | | 0.1360 |
| Hausman test (p value) | | 0.0118 | | | 0.0331 | |
| Adjust-$R^2$ | 0.3587 | 0.3038 | 0.4241 | 0.3189 | 0.3591 | 0.3362 |
| N | 100 | 100 | 100 | 100 | 100 | 100 |

Notes: The number in parentheses is *t* statistic, with *, ** and *** representing the significance level of 10%, 5% and 1% respectively. The same notations are used in the next table.
Source: The authors' calculation based on the stata12.0 estimation results.

Table 2 also shows that the coefficients of enterprise scale (*Scale*), market competition (*Comp*) and research intensity (*Rd*) (which reflect the industrial market structure) are positive in most of the regression, indicating that there are economies of scale in producer services. Moreover, the market competition and the increase of investment in research and development all contribute to the TFP of producer services, which shows that the "structure-behavior-performance" paradigm of industrial organization theory also applies to the analysis of the development of producer services in China. In line with the expectation, the state ownership (*State*) has not played an effective role in promoting the TFP of producer services, instead it has a significant negative effect. This may be because with increasing administrative monopoly, producer service enterprises tend to neglect the cultivation and investment of core competitiveness, thus restricting the promotion of TFP. This also means that in a transition economy such as China, with the same changes in industrial performance, TFP is not only influenced by market structure, but also closely related to the change of ownership structure of industry (Chen and Bao, 2013). The demand of service industry (*DemS*) has a significant positive effect on the TFP of producer services, which indicates that the service industry has a strong "self added mechanism", and that the intermediary demand from the service industry is another important impetus to promote the efficiency of producer services. It is worth noting that the estimation coefficient of *DemF* is not high, but it is negative, indicating that the increasing manufacturing demand for foreign service industry will adversely affect the efficiency of domestic producer services, which shows that the demand of manufacturing industry for foreign producer services has squeezed domestic demand. The estimation coefficient of *Consu* is positive at the higher significance level, which indicates that the increasing personal consumption demand and consumption level have greatly promoted the efficiency of producer services.

### *4.2. Regression Results of Threshold Effect Model*

The threshold effect test results of Model (3) and Model (4) are reported in Table 3. According to Table 3, Model (3) significantly rejects the original hypothesis without threshold value, while the double threshold test accepts the original hypothesis, so Model (3) is suitable for estimating with a single threshold effect model, and the threshold value is 8050 yuan (constant price in 1990). Further, the authenticity test of the threshold value of Model (3) indicates that the likelihood ratio (LR) test cannot reject the original hypothesis that the threshold value is real under the 5% significance level, and the confidence interval of *Pgdp* threshold is [7700, 8370] at 95% confidence level. The threshold value obtained is within the confidence interval of 95%, and it can be seen from the width of the confidence interval that the threshold value of Model (3) is basically accurate.

Table 3. Test of Threshold Effect

| | | Model (3) | | Model (4) | | | |
|---|---|---|---|---|---|---|---|
| Explanatory variable | | *Manf* | | *ManfK* | | *ManfL* | |
| Threshold variable | | | | *Pgdp* | | | |
| Significance test | Original hypothesis | $H_0:\phi_1=\phi_2$ | | $H_0:\varphi_1=\varphi_2$ | | $H_0:\varphi_3=\varphi_4$ | |
| | Number of thresholds | odd | even | odd | even | odd | even |
| | Value of thresholds | 8050 | – | 10820 | – | 6800 | – |
| | F value | 35.36*** | 1.53 | 40.56*** | 2.36 | 50.63*** | 5.37 |
| | P value | 0.001 | 0.360 | 0.001 | 0.227 | 0.000 | 0.423 |
| Authenticity test | Original hypothesis | $H_0:\gamma_0=\hat{\gamma}_0$ | | $H_0:\gamma_1=\hat{\gamma}_1$ | | $H_0:\gamma_2=\hat{\gamma}_2$ | |
| | LR value | 5.202 | | 4.634 | | 4.024 | |
| | 5% Critical value | 7.352 | | 7.352 | | 7.352 | |
| | 95% Confidence interval | [7700,8370] | | [9900,11170] | | [6360,7120] | |

Note: P value of the threshold model's significance test is obtained by the sampling method (Bootstrap) repeated 300 times.

Consistent with Model (3), all tests of Model (4) significantly reject the original hypothesis without threshold values, and the double threshold test accepts the original hypothesis. Therefore, for Model (4), the paper also analyzes the single threshold effect model. In Model (4), the threshold value of the *Pgdp* affecting the *ManfK* and *ManfL* coefficients is 10820 and 6800 respectively. The threshold authenticity test results show that the likelihood ratio (LR) statistic is below the critical value 7.352 at 5% significance level, and the original hypothesis with true threshold values should be accepted. This conclusion is supported by the fact that both the two thresholds are within their 95% confidence interval.

After the threshold value is obtained, we further estimate the threshold model parameters based on Model (3) and (4), and the results are reported in Table 4. The threshold parameter estimation of Model (3) shows that when per capita GDP is higher than the threshold value, the promoting effect of manufacturing demand on TFP of producer services industry has spiked. Specifically, when per capita GDP is less than 8050 yuan, every 1% increase in manufacturing demand for producer services will lead to a rise of 0.0413% in TFP of producer services, and once per capita GDP exceeds 8050 yuan, the promote effect will rise to 0.1468%. Just as analyzed in the above sections, when the per capita income reaches a certain level, the consumption structure tends to be more advanced, and representative Chinese families prefer to use industrial consumer goods instead of more expensive service consumption, resulting in the expansion of manufacturing industry and the deepening of division of labor, further improving the efficiency of producer services by the influence mechanism of scale effect and innovation incentive. Hypothesis 2a of this paper has been validated.

Table 4. Threshold Effect Model Estimation and Grouped Estimation Results

| Variables | Threshold effect model estimation | | Grouped estimation results | |
|---|---|---|---|---|
| | | | Model (3) | |
| | Model (3) | Model (4) | $Pgdp \leqslant 8050$ | $Pgdp > 8050$ |
| $Manf_{it} I(C_t \leqslant \gamma)$ | 0.0413* | | | |
| | (1.84) | | | |
| $Manf_{it} I(C_t > \gamma)$ | 0.1468** | | | |
| | (2.01) | | | |
| $ManfK_{it} I(C_t \leqslant \gamma_1)$ | | 0.0634*** | | |
| | | (5.61) | | |
| $ManfK_{it} I(C_t > \gamma_1)$ | | 0.1936** | | |
| | | (2.23) | | |
| $ManfL_{it} I(C_t \leqslant \gamma_2)$ | | 0.0323** | | |
| | | (2.25) | | |
| $ManfL_{it} I(C_t > \gamma_2)$ | | 0.1686* | | |
| | | (1.78) | | |
| *Manf* | | | 0.0832** | 0.1935** |
| | | | (1.98) | (5.63) |
| *Scale* | 0.1053** | 0.0124 | 0.0841* | 0.0838** |
| | (1.79) | (0.32) | (1.75) | (2.36) |
| *Rd* | 0.0236* | 0.0668** | 0.0336* | 0.0301*** |
| | (1.74) | (2.01) | (1.86) | (10.63) |
| *State* | –0.0338** | –0.0515* | –0.0862** | –0.0785* |
| | (–2.22) | (–1.79) | (–2.20) | (–1.74) |

| Variables | Threshold effect model estimation | | Grouped estimation results | |
|---|---|---|---|---|
| | | | Model (3) | |
| | Model (3) | Model (4) | *Pgdp*≤8050 | *Pgdp*>8050 |
| *DemS* | 0.0861* | 0.1023** | 0.0634* | 0.0972*** |
| | (1.71) | (2.35) | (1.98) | (10.26) |
| *DemF* | –0.1625* | –0.2136 | 0.1568 | –0.1102** |
| | (–1.82) | (–0.22) | (0.08) | (–2.43) |
| *Consu* | 0.0236 | 0.1826** | 0.1835 | 0.0682 |
| | (0.16) | (2.36) | (0.37) | (1.23) |
| $\gamma_0$ | 8050 | | | |
| $\gamma_1$ | | 10820 | | |
| $\gamma_2$ | | 6800 | | |
| Adjust-$R^2$ | 0.35 | 0.31 | 0.28 | 0.46 |
| N | 100 | 100 | 65 | 35 |

Note: $\gamma_0$, $\gamma_1$ and $\gamma_2$ are the threshold values.

Source: The authors' calculation based on the R2.11.1 estimation results.

Model (4) divides the whole manufacturing industry into capital-intensive manufacturing and labor-intensive manufacturing, and the estimated results are basically consistent with Model (3), indicating that economic development level has a significant moderating effect on the relationship between the two manufacturing demands and the efficiency of producer services. When the per capita income reaches a certain level (threshold value), the effect of demand of capital-intensive manufacturing and labor-intensive manufacturing on the efficiency of producer services has been greatly enhanced. The difference is that the economic development thresholds for the two manufacturing industries are not the same, and the promotion of labour-intensive manufacturing demand to TFP of productive services has jumped at a relatively lower threshold compared with capital-intensive manufacturing. Hypothesis 2b of this paper has also been validated.

In order to test the robustness of the threshold effect model, we further evaluate Model (3) by group estimation. Specifically, we divide all samples into two sub samples, based on the threshold value of per capita income. Table 4 shows that the *Manf* estimation coefficient of the sub sample with per capita income higher than the threshold value is significantly higher than that of the sub sample with per capita income below the threshold value. The results of the group test further show that, when the per capita income is higher than the threshold value, the demand of manufacturing industry promotes the TFP of producer services more strongly.

As can be seen from Table 4, although the impact of manufacturing demand on TFP of producer services industry is non-linear, for both the demand of manufacturing industry as a whole for producer services and the demand for producer services of capital-intensive manufacturing and labor-intensive manufacturing industry, their coefficients are always significantly positive, indicating Hypothesis 1 of this paper is validated. Although the demand of labor-intensive manufacturing industry is facing a lower threshold of economic development than capital-intensive manufacturing, the promotion of TFP of producer services is obviously lower than that of capital-intensive manufacturing (whether the threshold level is reached or not). However, when the threshold variable is between two threshold levels (i.e., GDP per capita is within the interval of [6800, 10820], labor-intensive manufacturing demand has a stronger promoting effect on TFP of producer services than capital-intensive manufacturing demand, which has provided some empirical evidence for the priority given to labor-intensive manufacturing in the appropriate period. The estimated coefficients of each control variable in Table 4 are basically consistent with those of Table 2, which shows to some extent that the influence of each control variable on the TFP of producer services is stable.

## 5. Further Discussion: Endogeneity and Robustness Test

### *5.1. Endogeneity Settlement*

While discussing the influence of manufacturing demand change on the TFP of China's producer services, we should also pay attention to endogeneity that may exist between them. In other words, while the increase in manufacturing demand for producer services is beneficial to the TFP of producer services, there may also be a reverse causal relationship. From the perspective of industrial linkage, producer services with higher technological development level will attract more demand from (high-end) manufacturing. Endogeneity makes the causal relationship between related variables difficult to confirm, resulting in deviations from traditional estimation. To obtain a more robust estimated value, this paper further introduces the instrumental variable and uses two-stage IV-2SLS to estimate the model. In this paper, two commonly used methods are applied to construct tool variables: the first is to use the one-order lags of endogenous variables as the tool variable (tool variable 1); the second is to draw on the idea of Lewbel (1997), using the product of "the difference between the independent variable and its mean value" and "the difference between the endogenous variable and its mean value" as the tool variable of endogenous variable, i.e. (TFP of all producer services -TFP mean value of all producer services) x (manufacturing demand -the average value of manufacturing demand) as a tool variable (tool variable 2) for manufacturing demand variables. The feature of this method is that it is possible to construct a valid tool variable without the help of external variables.

Table 5 reports the two-stage least squares estimation results of the tool variables of Model (1)-(4). To verify the effectiveness of tool variables, this paper uses a number of related statistical tests. The four estimates in Table 5 show that the Kleribergen-Paap rk LM Test rejects the original hypothesis that the tool variable is not identified at the significant level of 5%, and the Anderson-Rubin test rejects the original hypothesis that the tool variable is irrelevant to the endogenous variable at 1% level. Hansen-J test does not reject the original hypothesis of excessive recognition of tool variables at 10% level, and three tests indicate that the selected tool variable is reasonable. In accordance with the results of Table 4, Model (3) and (4) are suitable for a single threshold effect model after replacing endogenous variables with tool variables. Comparing the estimated results of Table 5 and Table 2 with those of Table 4, we find that, with the two-stage least squares estimation of tool variables, the coefficients of the key variables in this paper and the significant levels are basically consistent, further validating the robustness of the results.

Table 5. IV—2SLS Estimation Results

| Variables | Tool variables 1 | | | | Tool variables 2 | | | |
|---|---|---|---|---|---|---|---|---|
| | Model (1) | Model (2) | Model (3) | Model (4) | Model (1) | Model (2) | Model (3) | Model (4) |
| *Manf* | 0.1028*** (3.36) | | | | 0.1213** (2.23) | | | |
| *ManfK* | | 0.1612** (2.32) | | | | 0.1623** (1.99) | | |
| *ManfL* | | 0.0685*** (10.23) | | | | 0.0813* (1.88) | | |
| $Manf_{it}I(C_t \leqslant \gamma)$ | | | 0.0730* (1.69) | | | | 0.0836** (2.45) | |
| $Manf_{it}I(C_t > \gamma)$ | | | 0.1502** (2.10) | | | | 0.1901*** (6.32) | |
| $ManfK_{it}I(C_t \leqslant \gamma_1)$ | | | | 0.0823*** (4.51) | | | | 0.0735*** (6.21) |
| $ManfK_{it}I(C_t > \gamma_1)$ | | | | 0.1920** (2.35) | | | | 0.2175** (2.41) |
| $ManfL_{it}I(C_t \leqslant \gamma_2)$ | | | | 0.0415* (1.74) | | | | 0.0425* (1.71) |
| $ManfL_{it}I(C_t > \gamma_2)$ | | | | 0.1153** (2.37) | | | | 0.1454* (1.89) |
| Kleibergen-Paap rk LM test | 0.0202 | 0.0234 | 0.0071 | 0.0152 | 0.0114 | 0.0207 | 0.0231 | 0.0458 |
| Anderson-Rubin test | 0.0009 | 0.0024 | 0.0043 | 0.0036 | 0.0016 | 0.0053 | 0.0062 | 0.0001 |
| Hansen-J test | 0.3127 | 0.4680 | 0.2210 | 0.2488 | 0.2560 | 0.3677 | 0.2540 | 0.3311 |
| $\gamma_0$ | | | 8800 | | | | 8550 | |

| Variables | Tool variables 1 | | | | Tool variables 2 | | | |
|---|---|---|---|---|---|---|---|---|
| | Model (1) | Model (2) | Model (3) | Model (4) | Model (1) | Model (2) | Model (3) | Model (4) |
| $\gamma_1$ | | | | 11800 | | | | 11490 |
| $\gamma_2$ | | | | 7500 | | | | 7300 |
| N | 95 | 95 | 95 | 95 | 100 | 100 | 100 | 100 |

Notes: The estimated results of control variables are not reported due to limited space. The numbers in parentheses are *t* statistics. Kleribergen-Paap rk LM test, Anderson-Rubin test and Hansen-J test are all validity test of tool variables. $\gamma_0$,$\gamma_1$and $\gamma_2$ are threshold values.
Source: The authors' calculation based on stata12.0 and R2.11.1 estimation results.

### *5.2. Robustness Test*

To test the reliability of the conclusion of this paper, the robustness test is carried out from two aspects. Firstly, we use other measure dimensions of the economic development level to replace the per capita income to estimate; secondly, we use labor productivity instead of TFP to estimate the explained variables.

#### 5.2.1. Other Dimensions of Economic Development

In addition to income level, economic development also includes a series of variables reflecting the market and institutional environment, in which marketization and the legal environment have an important impact on the relationship between manufacturing demand and the development of producer services. Based on theoretical research and empirical observation, market opening has stimulated the process of large-scale entry and dynamic competition with non-state-owned enterprises as the main players, thus promoting the great development of Chinese economy (especially manufacturing industry) (Li *et al.*, 2012). Therefore, the degree of marketization has a positive moderating effect on the relationship between manufacturing demand and services efficiency. At the same time, due to the intangible nature of producer services' output, supply and consumption are completed at the same time, combined with the obvious differentiation and diversity of the products and the lack of uniform standards as most products are customized (Eswaran and Kotwal, 2002). As a result, personalized trading methods are used between the producer services and demand side (manufacturing sector), easily leading to the mutual locking of the transaction parties. Based on this understanding, we hold that the effect of manufacturing demand on service efficiency is also closely related to the legal environment, that is, the more perfect the legal environment, the more the manufacturing demand can promote the services efficiency. Therefore, in this section, we take the marketization level and the legal environment as another two dimensions of economic development to further confirm the relationship between manufacturing demand and producer services efficiency. The marketization level variable (*Market*) is measured by the marketization index of Fan *et al.* (2011).[1] The data of *Economic Freedom of the World Annual Report*[2] is used for the variable of the legal environment (*Law*) with Wang *et al.* (2007) as reference. Table 6 gives the estimation results with marketization degree and the legal environment as the threshold variables.

Based on the estimated results of Model (3) in Table 6, the increase of marketization and the improvement of the legal environment can promote the positive effect of manufacturing demand on producer services efficiency, that is, after the threshold value is exceeded, the promoting effect will be enhanced significantly.[3] The estimated results of Model (4) show that, for both capital-intensive manufacturing and labor-intensive manufacturing, marketization degree and the legal environment have obvious moderating effects on the efficiency of producer services, and the capital-intensive manufacturing faces higher thresholds of marketization and legal environment than labor-intensive manufacturing. Therefore, when marketization and legal environment are used to reflect the level of economic development, Hypothesis 2 is still valid. It can also be seen from Table 6 that the coefficients of *Market* and *Law* are significantly positive in most of the regression, indicating that marketization and legal environment not only indirectly affect the TFP of producer services by influencing the relationship between manufacturing demand and producer service TFP, they will also directly affect the efficiency of producer services. As the estimation results of other control variables are consistent with the discussions above, we will not go into details here.

Table 6. Robustness Test with Marketization and the Legal Environment as the Threshold Variables

| Variables | Model (3) | | Model (4) | |
|---|---|---|---|---|
| | Threshold variable *Market* | Threshold variable *Law* | Threshold variable *Market* | Threshold variable *Law* |
| $Manf_{it}I(C_t \leqslant \gamma)$ | $0.0512^{**}$ | $0.0657^{**}$ | | |
| | (2.42) | (2.03) | | |
| $Manf_{it}I(C_t > \gamma)$ | $0.1686^{***}$ | $0.1502^{*}$ | | |
| | (6.32) | (1.71) | | |

[1] Given that the marketization index contains indicators that reflect the degree of non-nationalization, there may be duplication with the control variable *State*. After calculating the variance expansion factor (VIF), the maximum VIF is 6.59, less than ten (the greater the VIF, the more serious the multiple collinearity problem, and an empirical rule is the largest VIF should be no more than 10), so there is no need to worry about the existence of multiple collinearity.

[2] Free the World.com gives a rating of economic rule of law, such as contracts and property rights in the world, with a range of 0~10, with higher scores representing higher levels of the rule of law. In this paper, the weighted results of ratings for court justice, property protection and contract enforcement are regarded as the measures of the legal environment.

[3] Both the Model (3) and (4) are suitable for the single threshold effect model, whether the threshold variable is the marketization degree or the legal environment. Due to limited space, detailed results of two variables' threshold effect test are not given.

| Variables | Model (3) | | Model (4) | |
|---|---|---|---|---|
| | Threshold variable *Market* | Threshold variable *Law* | Threshold variable *Market* | Threshold variable *Law* |
| $ManfK_{it}I(C_t \leqslant \gamma_1)$ | | | 0.0758** | 0.0836** |
| | | | (2.21) | (2.15) |
| $ManfK_{it}I(C_t > \gamma_1)$ | | | 0.1937** | 0.2001** |
| | | | (2.32) | (2.20) |
| $ManfL_{it}I(C_t \leqslant \gamma_2)$ | | | 0.0435*** | 0.0506*** |
| | | | (5.63) | (7.82) |
| $ManfL_{it}I(C_t > \gamma_2)$ | | | 0.1323** | 0.1402** |
| | | | (2.12) | (1.98) |
| $\gamma_0$ | 8.12 | 6.5 | | |
| $\gamma_1$ | | | 8.95 | 6.8 |
| $\gamma_2$ | | | 7.23 | 5.6 |
| Adjust-$R^2$ | 0.31 | 0.28 | 0.26 | 0.30 |
| N | 100 | 100 | 100 | 100 |

Notes: The estimated results of control variables are not reported due to limited space. $\gamma_0$, $\gamma_1$ and $\gamma_2$ are threshold values.

Source: The authors' calculation based on the software R2.11.1 estimation results.

### 5.2.2. Other Methods of Calculating the Efficiency of Producer Services

In the above analysis, we used SFA to measure the TFP of producer services to reflect the efficiency of producer services. As it is the most core index variable, it is necessary to use other methods to measure it further to verify the reliability of this conclusion. In this section, we use productivity in all sectors of producer services to measure the efficiency of producer services, which is calculated as the ratio of the value added to the number of employment in VA/L. The estimated results show that when labor productivity is used to measure the efficiency of producer services, the symbol and the significance of the coefficients of the core explanatory variables have not changed much, further validating the reliability of the estimated results.[1]

## 6. Conclusions and Implications

In recent years, as Chin's economic growth slows down, "to promote the development of modern service industry, accelerate industrial structure optimization and upgrading" has increasingly become the consensus of economists and policymakers, and scientific analysis of the relationship between manufacturing and producer services development has become an important research topic. This paper mainly discusses the

[1] Due to the space limitation, the estimated results are not displayed here. please contact the authors for more information.

relationship between the demand change of manufacturing industry and the efficiency of producer services, and focuses on the threshold (moderating) effect of economic development level on the relationship between the two.

Based on the panel data of China's manufacturing and producer services from 1995 to 2014, the results of the fixed effect model and threshold effect model show as follows. (1) The increase in manufacturing demand for producer services contributes to the efficiency improvement of producer services and, compared with labor-intensive manufacturing, the increase in demand of capital-intensive manufacturing has a greater promoting effect on the efficiency of producer services. (2) Although the increase in manufacturing demand is generally beneficial to the efficiency of producer services, at different stages of economic development, this promotion does not show a simple linear effect, but rather a non-linear threshold effect. If the level of economic development is reflected by per capita income, when the threshold of per capita income exceeds 8050 yuan (constant price in 1990), the promoting effect of manufacturing demand on the TFP of producer services will be significantly enhanced. (3) For the relationship between the two types of manufacturing demand and the efficiency of producer services, the moderating threshold of economic development level is not the same. When the per capita income exceeds the threshold of 6800 yuan, the increase in demand of labor-intensive manufacturing remarkably promotes the efficiency of producer services, and when per capita income exceeds the threshold of 10820 yuan, the increase in demand of capital-intensive manufacturing will significantly enhance the efficiency of producer services. (4) After the endogenous nature of manufacturing demand variables and other dimensions of the level of economic development (marketization and legal environment) are taken into account, the hypotheses of this paper are still valid.

Based on the above research, we can get the following policy implications.

(1) We should promote overall planning on the strategic level, and continue to build a strong competitive manufacturing system, focusing on high-end capital-intensive manufacturing, so as to promote the efficiency of production services. With the Chinese economy entering the "new normal", the effective manufacturing development strategy should avoid the low-end duplicate production mode, and ensure the "innovation-driven strategy" to build a solid foundation for China's high-end manufacturing. To this end, the government should, on the one hand, focus on promoting human resources cultivation, increase innovation input, encourage innovative activities, promote the combination of production and research; on the other hand, support the R&D, engineering and commercialization of emerging and cutting-edge technology through subsidies, tax incentives and other policy tools. In order to ensure the efficiency and transparency of the use of funds, the management of the use of subsidized funds and project evaluations should also be strengthened.

(2) We should take full account of the difference of development level in different regions, wisely choose industrial policies, and formulate tailored manufacturing

development strategy. In areas where economic development and income levels are relatively low, the increasing demand of labor-intensive manufacturing can promote the efficiency of producer services, so industrial policy should give priority to the development of labor-intensive manufacturing with regional comparative advantage. In areas with high economic development and income levels, the choice and implementation of industrial policy should focus on capital-intensive manufacturing with high technology and knowledge content.

(3) We should accelerate the transformation of selective industrial policy to functional industrial policy. Compared with the traditional selective industrial policy, the functional industrial policy focuses on providing a perfect system basis for the market mechanism to play its full role. With the deepening division of labor and the extension of global value chain, the links between manufacturing and services are becoming increasingly close and the boundaries are becoming blurred. In this case, the selective industrial policy for a specific industry (enterprise) is far less effective than functional industrial policy, therefore, the new industrial policy should focus on promoting the marketization level of industrial development, improving the desirable institutional environment and providing better infrastructure services.

**References**

Buera, F., & Kaboski, J. (2012). The Rise of the Service Economy. *American Economic Review*, 102(6), 2540-2569.

Chen, Y., & Bao, Z. (2013). Industry Effect or Enterprise Effect? — Decomposition of Profit Margin of Chinese Producer Services Enterprises. *Management World* (*Guanli Shijie*), 10, 81-94.

Eichengreen, B., & Gupta, P. (2013). The Two Waves of Service-sector Growth. *Oxford Economic Papers*, 65(1), 96-123.

Eswaran, M., & Kotwal, A. (2002). The Role of the Service Sector in the Process of Industrialization. *Journal of Development Economics*, 68(2), 401-420.

Fan, G., Wang, X., & Zhu, H. (2011). *China Market Index: Relative Process Report of Regional Marketization*. Beijing: Economic Science Press. (in Chinese)

Gu, N., & Zhu, J. (2016). Impact of RMB Exchange Rate on China's Consumption Structure. *Hunan Social Sciences* (*Hunan Shehui Kexue*), 29(1), 154-159.

Guerrieri, P., & Meliciani, V. (2005). Technology and International Competitiveness: The Interdependence between Manufacturing and Producer Services. *Structural Change and Economic Dynamics*, 16(4), 489-502.

Hansen, B. (1999). Threshold Effects in Non-Dynamic Panels: Estimation, Testing and

Inference. *Journal of Econometrics*, 93(2), 345-368.
Jiang, X. J. (2011). Services Growth: Real Meaning, Multiple Impacts and Trends. *Economic Research Journal* (*Jingji Yanjiu*), 4, 4-14.
Lewbe, A. (1997). Constructing Instruments for Regressions with Measurement Error When No Additional Data are Available, with an Application to Patents and R&D. *Econometrica*, 65(5), 1201-1213.
Li, P., Jian, Z., & Jiang, F. (2012). Entry-Exit, Competition and Productivity in China's Industrial Sector—Open Competition as an Efficiency Enhancement Process. *The Journal of Quantitative & Technical Economics (Shuliang Jingji Yu Jishu Jingji Yanjiu*), 9, 3-21.
Liu, S., Zhang, R., & Liu, L. (2010). Industrial Correlation of Producer Services and Manufacturing Industry in China. *Nankai Economic Studies* (*Nankan Jingji Yanjiu*), 6, 65-74.
Liu, Z., & Chen, L. (2014). Policy Standards, Paths and Measures: Further Reflection on Economic Restructuring and Upgrading. *Journal of Nanjing University* (*Philosophy, Humanities and Social Sciences*) (*Nanjing Daxue Xuebao* (*Zhexue Renwen Shehui Kexue Ban*)), 5, 48-56.
Markusen, J. (1989). Trade in Producer Service and in Other Specialized Intermediate Input. *American Economic Review*, 79(1), 85-95.
Rowthorn, R., & Ramaswamy, R. (1999). Growth, Trade and Deindustrialization. IMF Staff Papers.
Sheng, L., & Lu, G. (2013). China's Producer Service Industry Agglomeration and Its Influencing Factors—Based on Industry and Regional Analysis. *Nankai Economic Studies* (*Nankan Jingji Yanjiu*), 3, 115-129.
Tan, H. (2015). Is There Industrial Bias in Chinese Factor Market Distortion—Based on the Empirical Study of China's Provincial Panel Data. *Management World* (*Guanli Shijie*), 12, 95-105.
Wang, D., Zhang, Z., & Bai, C. (2007). Government Size, Rule of Law and Service Development. *Economic Research Journal* (*Jingji Yanjiu*), 6, 51-64.
Wang, W., Sun, Z., & Liu, Z. (2015). Resource Allocation and TFP in China's Non-Agricultural Sector—Based on the Analysis of Resource Mismatch between Manufacturing and Services. *Economic Theory and Business Management* (*Jingji Lilun yu Jingji Guanli*), 7, 87-99.
Wu, J. (2014). *China's Growth Model Choice* (*4th edition*). Shanghai: Shanghai Century Publishing Co., Ltd. Far East Press. (in Chinese)
Xiao, W., & Fan, W. (2011). Development of Producer Services under Industrial Linkage—Based on Demand Scale and Demand Structure. *Economist* (*Jingji Xuejia*), 6, 72-80.
Zhang, Y., & Liu, Z. (2012). Consumer Preferences and China's Service Industry Development Dilemma—Evidence under the General Equilibrium Framework. *Economics Information* (*Jingjixue Dongtai*), 10, 57-64.