The Impact of the Opening of Producer Services on the International Competitiveness of Manufacturing Industry

Cuiping Yu 1,*, Decai Tang 1,2,3,*, Acheampong Paul Tenkorang 3 and Brandon J. Bethel 4

1 School of Law and Business, Sanjiang University, Nanjing 210012, China
2 China Institute of Manufacturing Development, Nanjing University of Information Science & Technology, Nanjing 210044, China
3 School of Management Science and Engineering, Nanjing University of Information Science & Technology, Nanjing 210044, China; 20215124001@nuist.edu.cn
4 School of Marine Sciences, Nanjing University of Information Science & Technology, Nanjing 210044, China; 20195109101@nuist.edu.cn
* Correspondence: yu_cuiping@sju.edu.cn (C.Y.); tang_decai@sju.edu.cn (D.T.); Tel.: +86-153-4518-8506 (C.Y.); +86-138-1586-0918 (D.T.)

Abstract: Countries participating in the international division of labor each try to occupy the industrial highlands, obtain competitive advantages, and promote sustainability of economic development. Based on Porter’s Diamond model, it is widely believed that producer services are vital to support the manufacturing industry. Consequently, this paper selects samples of 55 countries and uses data from 2010 to 2017 to empirically test the impact of producer service’s opening on the export competitiveness of the manufacturing industry. The results show that the opening of producer services in a country promotes the improvement of international competitiveness of manufacturing industry, and the improvement effect is more significant in developed countries than in developing countries. Additionally, the negative impact of foreign capital access restrictions on the export competitiveness of the manufacturing industry is greater than the positive impact of service trade opening. It is also found that the restrictions on foreign capital’s opening in the financial sector have the biggest negative impact on manufacturing exports than that of other divisions of the producer service industry. To improve national competitiveness, it is suggested that the integration of service and manufacturing industries should be enhanced and to decrease FDI access to financial and transportation services restrictions.

Keywords: producer services; international competitiveness; manufacturing industry; diamond model; foreign investment

1. Introduction

The rise and fall of a country depends largely on whether it can gain a competitive advantage in the international market and this primarily comes from the competitive advantage of its industries and enterprises [1]. The competitors in the international competition stage are the manufacturing industry, while the service industry is the power that indirectly affects the competitiveness of the manufacturing industry [2]. According to the view of development economics, the manufacturing industry plays an important role in promoting the sustainability of economic development, which can take advantage of economies of scale, technological innovation, and the increase in the stock of human capital to make technology skills and knowledge spill over to other industrial sectors, thereby increasing overall productivity of the whole economy. During the trend of globalization, the sustainability of economic development of each country depends on industries, especially in manufacturing, to compete in the world market and make full use of the world’s raw materials, capital, and technology. After the financial crisis in 2008, developed countries in Europe and The United States formulated active reindustrialization policies to...
attract the return of the manufacturing industry. At the same time, with the advantage of producer services, they intended to further strengthen the high-end control of Global Value Chains (GVCs) and innovation system, to maintain their national competitive advantage. Developing countries are trying to get rid of the fate of lock-ins at the low end of the value chain, and they have introduced various industrial policies to develop producer services and promote the development of the manufacturing industry to enhance the international competitiveness of the manufacturing industry. The international competitiveness of industry represents the productivity of a country. Countries, industries, and enterprises with high productivity are competitive [3,4]. In the context of deepening the division of labor in the GVCs, both producer services and manufacturing provide important production factors for GVCs. To enhance the international competitiveness of the manufacturing industry, producer services should further play their role as provider of knowledge and technical support to help the manufacturing industry upgrade [5]. From an international perspective, this paper selects samples from 55 countries to empirically analyze the impact of producer services opening on manufacturing exports.

The concept of international competitiveness originated from the concept of “national competitiveness” which reflects a country’s ability to accumulate wealth through international trade. Typical definitions include that of Michael Porter, where he proposed to analyze international competitiveness from the perspective of products, enterprises, and industries, and pointed out that “competitiveness refers to the share of a country’s products in the world market”. According to Eurostat’s concept and database, competitiveness is defined as “the ability of enterprises, industries, regions or cross-ethnic regions in the international competition to generate relatively high factor income and factor employment level on a stable basis”. Scholars such as Krugman [4] believe that the international competitiveness of the manufacturing industry is essentially the production efficiency of the manufacturing industry, and the level of efficiency reflects the competitiveness of the manufacturing industry.

The world economy has transitioned to a service economy, with the added value of the service sector accounting for 70% of GDP. Under the Global Value Chains division system, producer services, as an important input and production factor of the manufacturing industry, are increasingly integrated with the manufacturing industry, which has a positive impact on the shaping of industrial competitive advantages. Consequently, it is meaningful to examine the effect of the opening of producer services on the international competitiveness of the manufacturing industry.

To sum up, in this study we use the Least square regression to analyze the opening of producer service impacts on the international competitiveness of the manufacturing industry, based on the data of the main economies of 55 countries from 2010 to 2017. The conclusion shows that the opening of the producer service has positive impacts. The main contribution of this paper may be the following: (1) the empirical analysis is from the aspect of the world with 55 countries and the industry, instead of just one country, which can be practical evidence to the theory of opening economy and means the conclusion should be universal for most economies. (2) we use not only just the ratio of producer services’ trade to GDP to measure the opening of the producer service, but also the regulatory restriction index of FDI on producer services from the opposite side of the producer service’s opening.

The remainder of the paper is structured as follows. Section 2 summarizes the existing research. Section 3 describes model setting, variables, and data description. Section 4 presents the baseline, robustness, and heterogeneity analyses. Section 5 presents the conclusion and recommendations.

2. Literature Review

Many scholars found that the opening of producer services in the form of service trade or through foreign direct investment in the service industry has improved the efficiency and competitiveness of the manufacturing industry from the perspective of the relationship between the two industries. In the early stage, Markusen found that trade in services...
improved the degree of specialization of production through specialized model analysis [6]. Houghton et al., and Eswaran and Kotwal believe that productive services play a positive role in promoting the competitiveness of the manufacturing industry [7,8]. Robinson et al. believes that the opening of the service industry promotes the development of the service industry and other industries [9]. According to an OECD report, the service sector’s liberalization promoted the technological progress and productivity improvement of importing countries [10]. Hoekman points out that the liberalization of trade in productive services is irreplaceable for enterprises to enter the international market, and the cost of avoiding competition is extremely expensive [11].

Some scholars believe that the opening of producer services, as the intermediate input of the manufacturing industry, reduces the production cost of the manufacturing industry and improves its competitiveness through the return to scale and the effect of technology. Markusen [6], Markusen and Venables [12], Ethier and Horn [13], Francois [14], Francois and Woerz [15] analyzed through modeling that producer services as intermediate inputs could increase the returns of the manufacturing industry. Amiti and Konings theoretically analyzed and empirically demonstrated that trade liberalization in services and trade liberalization in goods have the same effect and can improve the productivity of downstream industries [16]. Macpherson found that the import of productive services could promote the technological innovation of the manufacturing industry in New York and thus enhance its competitiveness [17]. Van Marrewijk et al. found that through the optimization of human capital and the spillover effect of high technology, the development of producer trade in services can improve the value chain of the manufacturing industry [18]. Hansen believes that by outsourcing and purchasing services, enterprises can reduce their production risks, improve their professional level, and improve their technical level [19]. Wolfmayer also confirmed that increasing the input proportion of producer services in manufacturing production, especially for knowledge-intensive and technology-intensive enterprises, significantly improves the international competitiveness of products [20]. Marshall et al. believes that producer services, as intermediate inputs of the manufacturing industry, are interdependent in spatial layout and form a benign interaction mechanism by forming positive effects such as labor pool, knowledge spillover, and intermediate input sharing [21]. Feng believes that the effective input of producer service products as intermediate inputs is the channel of knowledge spillover, which is also closely related to the efficiency of the production process [22]. Ming-rong and Ming-xi empirically analyzed the relationship between producer services and the export of manufacturing enterprises in China from 2000 to 2007. Producer services promoted the growth of enterprises’ export scale, profits, and exports by reducing service prices and manufacturing enterprises’ production and export transaction costs [23]. Deardorff believes that the opening of the service industry reduces the input cost of enterprises to use producer services such as finance and transportation and obtain high-quality and inexpensive services [24]. Yu believes that as an important intermediate input of the manufacturing industry, the increase of producer services input significantly improves the export competitiveness of the manufacturing industry [25].

Scholars from different countries take different regions as samples to empirically verify that the opening of the service industry or some sub-industries in the service industry improves the productivity of manufacturing enterprises or industries. For example, Arnold et al. found that FDI in the Czech service industry and liberalization of service trade both promoted the improvement of total factor productivity of domestic manufacturing enterprises [26]. Matthias et al. used a sample of 1000 enterprises in ten Sub-Saharan African countries to study and found that the total factor productivity of manufacturing enterprises was significantly positively correlated with the performance of service input enterprises [27]. Konan and Maskus found that enhancing international competition in Tunisia’s service industry reduced the “cartel effect” [28]. Javorcik and Li found that FDI in the retail service industry in Romania had a positive effect on manufacturing productivity [29]. Coucke and Sleuwaegen found that Belgian service industry imports improved manufacturing productivity through the competition effect [30]. Banga and Goladar be-
lieve that the increase in the proportion of the service industry as an intermediate input in India leads to the productivity increase of the manufacturing industry in India [31]. Tarr, Fernandes, and Paunov took Chile and Eastern European countries as samples and found that the opening of the service sector could promote the productivity improvement of the downstream manufacturing industry [32,33]. Bourles used the panel data of OECD countries to conduct an empirical analysis and found that reducing the regulation of the service sector promoted the productivity of the downstream manufacturing industry [34]. Forlani empirically analyzed, from the perspective of FDI, that the opening of France’s service industry had a significant impact on the performance of manufacturing enterprises [35]. Based on the input–output perspective, Bas and Strauss-Kahn conducted an empirical analysis showing that the opening of upstream productive services in India increased the possibility and proportion of exports of manufacturing enterprises [36]. Papaioannou and Dimelis empirically analyzed the openness of information, communication, and technology industry (ICT) in the European Union and the United States, showing a significant impact on reducing the inefficiency of downstream low-technology manufacturing enterprises [37]. Yang, Yang et al. find China’s manufacturing productivity is positively associated with producer service inputs based on firm-level data [38]. Su, et al. think restrictiveness of services sector trade can have a negative impact on the level of export sophistication, using panel data from 36 countries over the 2005–2014 period [39].

Generally, existing studies show that the opening of producer service will bring the manufacturing firms or industry greater improvements, such as efficiency, technology innovation, cost-saving mechanisms. Mostly, they focus on one region or country, which leaves the following questions. For example, what will the impacts of the producer service’s opening be from a global perspective? Therefore, this study looks to answer this question from a global view and also from the perspective of industries in countries.

3. Theoretical Analysis and Empirical Model

3.1. Theoretical Analysis: Producer Services’ Opening and the Export Competitiveness of Manufacturing Industry

In the books Competitive Strategy, Competitive Advantage, and National Competitive Advantage, Michael Porter comprehensively analyzed the source and formation of competitive advantage from the perspectives of the nations, industries, and enterprises, and analyzed the composition of industrial competitiveness by using the Diamond Model. According to Michael Porter’s theory, the competitiveness of the manufacturing industry depends on the following four aspects: the production factors, demand, related industries and supporting industries of an economy, and enterprise strategy. Comparative advantage is also affected by government performance and opportunities. Concerning factors of production, these factors of the diamond work as a system that affects the countries’ and industries’ international competitive success. Porter thinks that “in the sophisticated industries that form the backbone of any developed economy the most important factors of production of a nation are created than inherited” [1]. If compared to other international competitors, a country has more robust related and supporting industries, these industries will create competitive advantage for their downstream industries. The upstream industry has international competitive advantages, which will make the downstream industry form higher efficiency, lower cost, and other advantages accordingly. The competitive industry will promote the competitiveness of related industries [1]. In the Global Value Chains division, the goods and services in the production process are decomposed as production elements. Therefore, producer services, as not only the important related and supporting industries of the manufacturing industry, but also necessary input factors of the manufacturing industry, have many impacts on the export competitiveness of the manufacturing industry. In the GVCs division, producer services are always advanced production factors with the characteristics of knowledge, technology, human capital intensive. In the manufacturing industry industrial value chain, a growing proportion of high value-added financial, professional business, research and development technology, information technology, and other services are provided. The opening of producer services
will enable the local manufacturing industry to obtain the input of more differentiated producer services at relatively lower costs, of higher quality in the international market, to reduce the production cost of the manufacturing industry, improve the efficiency of the manufacturing industry, and enhance the export competitiveness of the manufacturing industry [40].

With the deepening of the international division of labor, the opening of producer service, as Porter mentioned as the global competitors, further promotes specialization in various countries, intensifies competition, and thus provides more professional and efficient service input for the manufacturing industry. At the same time, producer services have strong technological spillover effects, and its opening to other countries will bring the advanced management experience, technology spillover, and technical expertise, and other benefits, of an advanced service sector from the developed countries to local productive service and manufacturing industries. These can promote the technology improvement of local manufacturing industries and upgrade the manufacturing industry to higher value-added stages of the GVCs. Thus, all these result in lifting the export competitiveness of the manufacturing industry. Based on the above analysis, this paper makes the following assumptions: the opening of producer services in a country has positive impacts on and can improve the competitiveness of manufacturing exports.

3.2. Empirical Model and Materials

Because of the different level of the producer service’s opening up in different economies, how does it affect the export competitiveness of the manufacturing industry of a country? Does the openness of producer services affect the competitiveness in a country with different levels of economic development? Based on the Diamond Model—the the five factors working as a system that contribute to the comparative advantage of each nation and its industry—this paper analyzes the impacts of producer services, as a related and supporting industry, on the export competitiveness of the manufacturing industry from the national level, as shown in Equation (1):

$$y_{it} = \alpha + \beta x_{it} + \gamma d_{cont_{it}} + \varepsilon_{it}$$

$$y_{it} = \{rca_{it}, x_{it} = \{s_{trade_{it}}, s_{fri_{it}}\},$$

$$cont_{it} = \{hitec_{it}, gdp_{it}, excha_{it}, m_{value_{it}}, gov_{it}\}$$

where subscript $i$ is for countries of different sections, $t$ is for year $t$; $y_{it}$ as the explained variable, is the manufacturing industry competitiveness of country $i$ in year $t$. $x_{it}$ is the core explaining variable. $cont_{it}$ is the control variable, $\varepsilon_{it}$ is a random disturbance, $rca_{it}$ is the manufacture industry’s Revealed Comparative Advantage index of country $i$ in year $t$. $s_{trade_{it}}$ refers to the ratio of productive service trade and gross domestic production of country $i$ in year $t$. $s_{fri_{it}}$ refers to foreign investment restriction index on producer services of country $i$ in year $t$. $gdp_{it}$ represents gross domestic production of country $i$ in year $t$. $gov_{it}$ in year $t$ represents government efficiency level of country $i$ in year $t$.

3.3. Variable Description and Data Source

Common evaluation indicators of export competitiveness include International Market Share Index (MS), Trade Competitive Index (TC), and Revealed Comparative Advantage Index (RCA). Balassa first used the RCA index to measure the international competitiveness of a certain industry in an economy [41]. Scott used the trade competitiveness index to measure the export competitiveness of industries and products [42]. Lall established the
international market share index to measure the competitiveness of an industry in an economy \[43\]. Among the three indices, the RCA index is more traditional and often used by scholars. This paper focuses on, from the aspect of industries, studying the impacts of the opening of the producer service on manufacturing export competitiveness. This article will use the RCA index to measure the export competitiveness of the manufacturing industry. An industry’s RCA is estimated as the ratio of the proportion of a particular industry’s exports of the total exports of an economy to the proportion of a particular industry’s exports to the global total. If RCA > 1, it indicates that an industry in the economy has an explicit comparative advantage. If the RCA is less than 1, it indicates that the commodities of the country have no explicit comparative advantage. Furthermore, if the RCA index is between 1.25 and 2.5, this indicates that the industry in the economy has relatively strong export competitiveness. If the index is between 0.8 and 1.25, it indicates that the export competitiveness is normal. If the index is less than 0.8, it indicates that the industry lacks export competitiveness. This paper selects the RCA index of each country’s manufacturing industry as the explained variable, and the value is calculated according to the data of the World Bank database from 2010 to 2017.

This paper takes producer services as the key factor of related and supporting industries to investigate the impact of the opening of producer services on the export competitiveness of manufacturing industries in various countries. The opening of producer services is studied from the perspective of producer services trade and foreign direct investment (FDI). There are two indicators for the core explanatory variable. One is the ratio of producer services’ import trade to GDP, indicated as $s_{\text{trade}}$. The larger the index value is, the higher the openness of producer services will be. The values of each country’s $s_{\text{trade}}$ is calculated from data from the 2010 to 2017 World Economic Development Index database. The other is the regulatory restriction index of FDI on producer services, indicated by $s_{\text{fri}}$, which measures the extent of each country’s restriction on FDI’s access to the country’s producer services. The greater the value of $s_{\text{fri}}$, the greater the restriction of producer services on foreign direct investment, and the lower the openness of producer services. The values of $s_{\text{fri}}$ are from the OECD database from 2010 to 2017. Moreover, several foreign investment restriction indices of each subsector of the producer service industry are used and are indicated as $\text{busin}$, $\text{telecom}$, $\text{finan}$, and $\text{transp}$.

This paper studies the export competitiveness of the manufacturing industry from the macro perspective of national industrial competitiveness, so the control variables refer to the diamond model about the influence factors of industrial export competitiveness based on existing research results at home and abroad, and the selected control variables are as follows: (1) gross domestic product ($\text{gdp}$), which represents the level of an economy’s aggregate demand. A country’s domestic market, compared to the international market, makes it easier to identify the domestic customer’s requirements as soon as possible, and is quick to respond to the demand of the domestic market, which is the impetus to the competitiveness of industries. The larger the domestic market scale is, the more the industries will promote competitiveness through increasing the production, expanding investment, giving full play to the advantages of scale, thus enhancing export competitiveness \[1\]. (2) The added value of the manufacturing ($m_{\text{value}}$), represents the size of a country’s manufacturing industry. The size of a country’s manufacturing industry not only represents the economy’s manufacturing production capacity but also has an impact on its industry’s competitiveness. According to the new trade theory, generally, the larger the industry scale is, the more it will be beneficial for the economy’s manufacturing industry to make full use of its advantage of economies of scale in the international market competition to obtain a more comparative advantage. The economy will have a stronger industry linkage effect and enhance its bargaining power as well as its market control with the upstream and downstream industries on the value chain. All these significantly raise a country’s manufacturing industry competitiveness and the effects of economies of scale will increase the export competitiveness of the manufacturing industry, due to the larger market capacity and stronger cost advantages \[44\]. (3) The percentage of high-tech
products to manufactured exports (hi tec), represents the level of the manufacturing industry’s technological capabilities. The technological level determines an economy’s export competitive advantage and technological development level [45]. Technological progress can promote the competitiveness of the industry, especially for the developing economies, which always only have a comparative advantage in the labor-intensive products with low cost. They will enjoy the late-mover advantage through observation, learning, imitation, and enjoying the knowledge spillover effect of the technological progress to improve the international competitiveness of industries. This is especially the case as endogenous technological progress is the source of national competitiveness. (4) The real exchange rate of an economy is measured by the market exchange rate divided by the purchasing power parity (PPP) conversion factor (excha). The exchange rate has a direct impact on the price of a country’s manufacturing exports, thus affecting international competitiveness. There is a long-term equilibrium relationship between the industry’s international competitiveness and the real exchange rate. Generally, the real exchange rate appreciation will harm the export competitiveness of the manufacturing industry, and the exchange rate depreciation will have an important impact on the improvement of export competitiveness. (5) Efficiency as the role of government (govm), measured by the World Bank’s Global Governance Index. Government can be either accelerate or retard industrial development and this is dependent on whether a country’s government can provide a good business environment for the development of the manufacturing industry and create conditions to improve its export competitiveness.

3.4. Data Description

Because the service trade and FDI plunged abnormally until 2010, due to the world economic crisis in 2008 and the availability of the latest FDI Regulatory Restrictiveness Index is in 2017, this paper uses panel data from 2010–2017 of the 55 countries. This paper selects 55 countries as samples from the perspective of industrial competitiveness at the national macro level, including The United States, South Korea, Slovakia, Norway, Britain, Mexico, Argentina, Chile, Slovenia, France, Ukraine, Saudi Arabia, Tunisia, the Philippines, Germany, Australia, Italy, Canada, Greece, Turkey, Ireland, the Netherlands, Luxembourg, Belgium, Indonesia, Kazakhstan, Israel, Latvia, Austria, Switzerland, Iceland, Denmark, Sweden, Spain, Portugal, Japan, Finland, New Zealand, Czech Republic, Hungary, Poland, Estonia, Lithuania, China, India, Russia, South Africa, Brazil, Colombia, Egypt, Malaysia, Morocco, Peru, Romania, Vietnam. According to the GDP and added value of manufacturing output in 2017, the total GDP of these 55 countries accounted for 91 percent of the world’s GDP, and the total value-added of the manufacturing sector accounted for 89.2 percent. Therefore, these 55 countries are representative samples of the world. Annual data for the 55 countries from 2010 to 2017 were used.

The data of the core explanatory variable s_fri and the foreign capital restriction index of each sub-industry are from the OECD database from 2010 to 2017, and the data of the core explanatory variable s_trade, the explained variables, and explanatory variable indices are from the World Development Index Database of the World Bank from 2010 to 2017. The explanatory and descriptive statistics of each variable are shown in Table 1. The mean value of the RCA index is 0.90, which is less than 1, indicating that the export competitiveness of the manufacturing industry is insufficient at the global average level, and there is still a lot of room for improvement in most countries. The minimum value of RCA is 0.15, indicating a lack of competitiveness, and the maximum value is 1.44, indicating that the manufacturing industry is competitive, which indicates that the sample countries have great differences in the export competitiveness of the manufacturing industry during the sample periods. The factors influencing the differences are worth further study, and the export competitiveness of the manufacturing industry has the potential to improve due to the low value of RCA.
Table 1. Variable descriptive statistics.

| Variable | Variable Description | Nobs | Mean   | Std. Dev. | Min.  | Max.  |
|----------|-----------------------|------|--------|-----------|-------|-------|
| rca      | the export competitiveness of the manufacturing industry. the ratio of producer services' import trade to GDP | 440  | 0.900  | 0.380     | 0.150 | 1.440 |
| s_trade  | the regulatory Restriction index of foreign direct investment (FDI) on producer services | 440  | 0.130  | 0.130     | 0.010 | 0.490 |
| s_fri    | the regulatory Restriction index of foreign direct investment (FDI) on business service | 440  | 0.120  | 0.190     | 0     | 1     |
| busi     | the regulatory Restriction index of foreign direct investment (FDI) on telecommunication service | 440  | 0.130  | 0.200     | 0     | 0.750 |
| telec    | the regulatory Restriction index of foreign direct investment (FDI) on telecommunication service | 440  | 0.0800 | 0.120     | 0     | 0.530 |
| finan    | the regulatory Restriction index of foreign direct investment (FDI) on financial service | 440  | 0.250  | 0.160     | 0.040 | 0.680 |
| transp   | the ratio of trade in producer services to GDP | 440  | 13.74  | 9.810     | 0.490 | 57.68 |
| hitec    | The percentage of high-tech products to manufactured exports | 440  | 12,391 | 26,824    | 133.1 | 190,000 |
| excha    | The real exchange rate | 440  | 0.760  | 0.320     | 0.210 | 1.620 |
| m_value  | the added value of the manufacturing | 440  | 2025   | 4879      | 16.31 | 35,910 |
| govm     | Efficiency as the role of government | 440  | 0.820  | 0.800     | −0.900| 2.200 |

4. Empirical Results

The world’s manufacturing industry has realized a global division of labor. As the supporting industry to the manufacturing industry, the openness of producer services lags that of the manufacturing industry in many countries. Has it affected the export competitiveness of the manufacturing industry in various countries? Theoretically, the least square method can obtain the best estimate and provides a more efficient test method. In this section, this paper uses baseline regression, robustness test, and heterogeneity test to analyze the impact of producer service’s opening on the export competitiveness of the manufacturing industry from the national level.

The ratio of trade in producer services to GDP, \( s_{\text{trade}} \), and the regulatory restriction index of foreign investment in producer services, \( s_{\text{fri}} \) are two competing indicators to measure the level of the openness of producer services. Some preliminary statistical evidence is obtained through the scatter diagram and fitting curve between explanatory variables and explained variables (Figure 1). A corresponding scatter diagram and the fitting line are drawn to show some preliminary statistical evidence between the index RCA and \( s_{\text{trade}}, s_{\text{fri}} \). It can be seen from Figure 1 that the two fitting lines are inclined to the upper right and lower right respectively, and the slope is relatively easily observable. It is preliminarily determined that the RCA index of manufacturing export competitiveness
changes with the proportion of producer services trade in GDP in the same direction. RCA index changes opposite with the index of producer services foreign regulatory restrictions $s_{fri}$. Therefore, there is the possibility of $s_{trade}$ and $s_{fri}$ having some impacts on RCA, and further econometric analysis of the variables can be made.

Figure 1. Scatter diagram of the RCA of manufacturing industry and $s_{trade}$ (a), $s_{fri}$ (b).

4.1. Baseline Regression Analysis

Table 2 presents the results of the baseline regression concerning the manufacturing export competitiveness and its influencing factors according to model (1). In columns 1 and 2, the results of ordinary univariate and combinatorial regression for the two core explanatory variables are listed. The regression results show that there is a significant positive correlation between the opening of producer services and the export competitiveness of the manufacturing industry. Columns (3) and (4) analyze the combination of the two core explanatory variables in the case of OLS and dual fixed effects. In the model of column (5)–(8), control variables are gradually added to the models: hitec, gdp, excha, m_value, govm, and the regression of double fixed effect is carried out. The results show that the opening of producer services always has a significant impact on competitiveness of the manufacturing industry, and the regression results from columns (1)–(8) show that the correlation between them is stable. As for the impact of RCA on the manufacturing industry, the correlation coefficient of $s_{fri}$ is much larger than that of $s_{trade}$.

Regression results show that the two variables $s_{trade}$ and $s_{fri}$, which represent the productive service’s openness degree, under the significance level of 5%, have a positive and inverse relationship, respectively. The correlation is stable and means the higher the productive service industry openness of a country, the more the country’s manufacturing export competitiveness can be promoted. Moreover, after adding other control variables, the correlation coefficient of the two indices shows a larger influence coefficient. This may be related to the nature of producer services. As for supporting industries of manufacturing, a greater proportion of producer services provide services through the establishment of the commercial presence of foreign capital in host countries, rather than the input and support of service trade through cross-border movement. Therefore, in the regression results, Relative to the variable $s_{trade}$, the restriction index $s_{fri}$ has a larger value and a deeper influence on the export competitiveness of the manufacturing industry.
Table 2. Results of Baseline regression analysis.

|       | (1)         | (2)         | (3)         | (4)         | (5)         | (6)         | (7)         | (8)         |
|-------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|       | ols         | ols         | ols         | fe          | fe          | fe          | fe          | fe          |
| s_trade       | 0.003 **    | –           | 0.002 **    | 0.002 **    | 0.004 ***   | 0.005 ***   | 0.011 ***   | 0.010 ***   |
|       | (2.448)     | –           | (2.009)     | (2.007)     | (2.967)     | (3.916)     | (10.884)    | (10.077)    |
| s_fri        | –           | –0.420 ***  | –0.372 **   | –0.375 **   | –0.689 ***  | –1.021 ***  | –0.810 ***  | –0.790 ***  |
|       | –           | (−2.930)    | (−2.572)    | (−2.571)    | (−4.677)    | (−6.009)    | (−6.366)    | (−6.250)    |
| hitec        | –           | –           | –           | –           | 0.010 ***   | 0.012 ***   | 0.004 **    | 0.003 **    |
|       | –           | –           | –           | –           | (5.294)     | (6.200)     | (2.554)     | (2.218)     |
| gdp          | –           | –           | –           | –           | 0.043 ***   | 0.061 ***   | 0.763 ***   | 0.712 ***   |
|       | –           | –           | –           | –           | (3.445)     | (4.641)     | (16.662)    | (16.660)    |
| excha        | –           | –           | –           | –           | –           | –0.253 ***  | –0.127 **   | –0.112 **   |
|       | –           | –           | –           | –           | –           | (−3.760)    | (2.328)     | (−1.136)    |
| m_value      | –           | –           | –           | –           | –           | 0.812 ***   | 0.766 ***   | 0.766 ***   |
|       | –           | –           | –           | –           | –           | (18.442)    | (16.510)    | (16.510)    |
| govm         | –           | –           | –           | –           | –           | –           | 0.103 ***   | –           |
|       | –           | –           | –           | –           | –           | –           | –           | (2.890)     |
| _cons        | 0.873 ***   | 0.957 ***   | 0.925 ***   | 0.936 ***   | 0.478 ***   | 0.536 ***   | 1.938 ***   | 1.929 ***   |
|       | (39.519)    | (37.253)    | (30.806)    | (16.469)    | (4.121)     | (4.649)     | (16.872)    | (16.927)    |

Year effect: No, Area effect: No, N = 440, adj. R² = 0.011

Note: **, *** mean significant at the level of 5%, and 1% respectively; The values in parentheses represent the standard deviation.

According to the regression results of other control variables, the proportion of high-tech products exported is $hitec$, which represents the technology level of a country, and its influence on the competitiveness of manufacturing export is significantly positive. The impact coefficient of $gdp$ is significantly positive. $gdp$ represents the level of demand for the manufacturing industry. The larger the economic aggregate, the stronger the domestic demand is, which has a significant positive impact on the improvement of the export competitiveness of the domestic manufacturing industry. The real exchange rate $excha$ has a negative impact on the export competitiveness of the manufacturing industry. The higher the exchange rate is, the lower the export competitiveness of the manufacturing industry will be. The added value of the manufacturing industry, $m_value$, represents the industry scale of the manufacturing industry. It has a significant positive impact on the export competitiveness of the manufacturing industry. Government work efficiency, $govm$, has a significant positive correlation with manufacturing export competitiveness.

4.2. The Regression Analysis of One-Period Lagged Core Explanatory Variables

The manufacturing industry is also supportive to producer services and plays a driving role in its development. Therefore, if factors other than producer services promote the improvement of the export competitiveness of the manufacturing industry, they will promote the productivity of producer services. Consequently, this will bring about the increase of service trade and the expansion of FDI. In this way, the reverse causal relationship between explained variables and explanatory variables will be generated, and the model may produce endogenous problems. Therefore, this paper regressions the one-stage lag of the core explanatory variables. Since the export competitiveness of the manufacturing industry cannot affect the past trade in productive services or opening, the one-stage lag regression can avoid the endogeneity problem. In columns (1) and (2) of Table 3, OLS regression of the two core variables is carried out with one lag. The results show that $s\_trade$ and $s\_fri$ still respectively maintain a significant positive and negative correlation on the export competitiveness of the manufacturing industry after a lag of one period, indicating that the improved openness of producer services in the last year will promote the export competitiveness of the manufacturing industry in this year. In columns (3) and (4), the
regression of non-fixed effect and fixed year and region effect for s_trade and s_fri, the two core explanatory variables with one lag period, can still obtain the consistent correlation with the above. The model of columns (5)–(8) is based on the lag of s_trade and s_fri, and other control variables continue to be added. The correlation between each control variable and rca of manufacturing export competitiveness is stable.

Table 3. Results of regression analysis on one-period lagged core explanatory variables.

|       | (1)  | (2)  | (3)  | (4)  | (5)  | (6)  | (7)  | (8)  |
|-------|------|------|------|------|------|------|------|------|
| ols   | 0.003** | 0.003* | 0.003* | 0.004*** | 0.005*** | 0.011*** | 0.010*** | 0.010*** |
| L.s_trade | (2.234) | (1.868) | (1.866) | (2.753) | (3.711) | (10.229) | (9.421) | 0.327 ** |
| L.s_fri | -0.373** | -0.327** | -0.329** | -0.651*** | -0.998*** | -0.784*** | -0.757*** | -0.651*** |
| hitec | -2.467 | -2.139 | -2.141 | -4.180 | -5.578 | -5.862 | -5.694 | -5.578*** |
| gdp | -5.092 | 6.033 | 2.857 | 2.524 | 2.524 | 2.524 | 2.524 | 2.524 |
| excha | -0.042*** | 0.061*** | 0.757*** | 0.705*** | 0.705*** | 0.705*** | 0.705*** | 0.705*** |
| hitec | -3.119 | 4.327 | 15.683 | 13.733 | 13.733 | 13.733 | 13.733 | 13.733 |
| lnm_value | -3.747 | -1.944 | -1.195 | -1.195 | -1.195 | -1.195 | -1.195 | -1.195 |
| govm | -0.271*** | -0.113* | -0.125 | -0.125 | -0.125 | -0.125 | -0.125 | -0.125 |
| _cons | 0.872*** | 0.951*** | 0.925*** | 0.472*** | 0.545*** | 1.917*** | 1.919*** | 1.919*** |
| adj. $R^2$ | 0.010 | 0.013 | 0.019 | 0.005 | 0.094 | 0.125 | 0.515 | 0.524 |

Note: *, **, *** mean significant at the level of 10%, 5%, and 1% respectively; The values in parentheses represent the standard deviation.

4.3. Heterogeneity Test and Result Analysis of s_fri Based on Different Subdivisions of Producer Service Industries

According to the above analysis results, the FDI restriction index of the producer service industry has a larger impact coefficient on the dependent variable negatively, and a greater impact on the export competitiveness of manufacturing industry than that of the input in service trade. Therefore, this paper will further conduct an empirical analysis of the impact of FDI restrictions on the export competitiveness of the manufacturing industry in each subsector of the producer service industries’ FDI regulatory restriction Index, with the data from the OECD database.

In Table 4, regression results of the impact of the industry heterogeneity of producer services’ opening on the export competitiveness of the manufacturing industry are given. This is achieved through dividing industries by the producer services’ foreign capital restriction index, then performing a heterogeneity analysis of the index on the foreign capital restriction busin, telecom, fina, and transp indices. In Table 4, columns (1)–(4) are the current regression of each explanatory variable. The results show that the FDI restriction index of producer services in four sub-industries has a significant negative impact on the export competitiveness of the manufacturing industry. This result is significant at the 1% level. This indicates that the larger the limits on foreign capital’s access in each industry, the more these industries, as direct manufacturing input industries, are difficult to enter the host country through service trade due to the particularity of the industries, and most of them can only enter the host country market through commercial presence. That is, foreign capital can provide inputs to the manufacturing industry. Therefore, the higher the restrictions on foreign investment in subdivisions of producer service industries, the more the export competitiveness of the manufacturing industry will be inhibited. As for the results in columns (5)–(8), to solve the possible endogeneity problems, regression of
the core explanatory variables with one lag was adopted. The regression results were consistent with the above results, and the regression results of all variables were also significant, indicating that the correlation between dependent variables and independent variables was stable, as shown in Table 4.

Table 4. Regression results of the industry heterogeneity of $s_{fri}$.

| Core Explanatory Variable | One-Phase Lag Core Explanatory Variable |
|---------------------------|----------------------------------------|
|                           | (1)         | (2)         | (3)         | (4)         | (5)         | (6)         | (7)         | (8)         |
|                           | ols         | ols         | ols         | fe          | fe          | fe          | fe          | fe          |
| $s_{trade}$               | 0.010 ***   | 0.010 ***   | 0.010 ***   | 0.010 ***   | 0.010 ***   | 0.010 ***   | 0.010 ***   | 0.010 ***   |
|                          | (9.754)     | (9.548)     | (10.437)    | (9.397)     | (9.294)     | (9.093)     | (9.889)     | (8.936)     |
| $busin$                   | -0.243 ***  | -           | -           | -0.257 ***  | -           | -           | -           | -           |
|                          | (-3.192)    | -           | -           | (-3.170)    | -           | -           | -           | -           |
| $telecom$                 | -           | -0.269 ***  | -           | -0.284 ***  | -           | -           | -           | -           |
|                          | - (-3.416)  | -           | -           | (-3.390)    | -           | -           | -           | -           |
| $fnan$                    | -           | -           | -0.926 ***  | -           | -0.912 ***  | -           | -           | -           |
|                          | - (-7.280)  | -           | -           | (-6.735)    | -           | -           | -           | -           |
| $transp$                  | -           | -           | -           | -0.417 ***  | -           | -           | -           | -0.419 ***  |
|                          | - (-4.374)  | -           | -           | (-4.405)    | -           | -           | -           | -0.419 ***  |
| $hitec$                   | 0.001       | 0.002       | 0.003 **    | 0.002       | 0.001       | 0.003 *    | 0.004 **    | 0.002       |
|                          | (0.767)     | (1.510)     | (2.364)     | (1.197)     | (0.931)     | (1.674)     | (2.488)     | (1.307)     |
| $gdp$                     | 0.729 ***   | 0.730 ***   | 0.694 ***   | 0.726 ***   | 0.727 ***   | 0.730 ***   | 0.694 ***   | 0.729 ***   |
|                          | (14.805)    | (14.597)    | (14.410)    | (14.693)    | (13.991)    | (13.776)    | (13.576)    | (13.880)    |
| $excha$                   | -0.009      | -0.027      | -0.098      | -0.000      | -0.021      | -0.039      | -0.098      | -0.005      |
|                          | (-0.087)    | (-0.272)    | (-1.017)    | (-0.004)    | (-0.196)    | (-0.360)    | (-0.959)    | (-0.048)    |
| $m_value$                 | 0.778 ***   | 0.775 ***   | 0.750 ***   | 0.776 ***   | 0.779 ***   | 0.775 ***   | 0.750 ***   | 0.779 ***   |
|                          | (16.256)    | (16.194)    | (16.345)    | (16.421)    | (15.378)    | (15.309)    | (15.402)    | (15.524)    |
| $govm$                    | 0.110 ***   | 0.120 ***   | 0.093 ***   | 0.095 **    | 0.114 ***   | 0.123 ***   | 0.093 **    | 0.096 **    |
|                          | (2.997)     | (3.255)     | (2.641)     | (2.585)     | (2.903)     | (3.141)     | (2.471)     | (2.453)     |
| $cons$                    | 1.937 ***   | 1.888 ***   | 1.844 ***   | 1.927 ***   | 1.945 ***   | 1.891 ***   | 1.848 ***   | 1.930 ***   |
|                          | (16.462)    | (15.996)    | (16.338)    | (16.548)    | (15.634)    | (15.156)    | (15.438)    | (15.652)    |

Year effect: No, Yes; Regional effect: No, Yes; Num.: 440, 385; adj. $R^2$: 0.488, 0.498.

Note: *, **, *** mean significant at the level of 10%, 5%, and 1% respectively; The values in parentheses represent the standard deviation.

4.4. Heterogeneity Analysis by Economic Development Level

Today, the developed countries, whose service industry account for more than 70% of their GDP, have first transitioned to service-led economies. For the producer services in developed countries, in terms of the structure of the more advanced producer services, openness is much more advanced compared to that of the developing countries, while because of the limitation of developing countries’ development level, the openness of producer services is very limited. From another perspective, the service industry in developing countries has more room to open, and therefore, will their impact of promoting opening on the export competitiveness of the manufacturing industry have greater elasticity? In this part, this paper classifies 55 sample countries, according to their levels of economic development and conducts a heterogeneity analysis according to national development levels.

This paper classifies 55 sample countries according to the income standards published by the World Bank. The World Bank defined per capita national income of $12,056 or more in 2017 as a high-income economy, which is also referred to here as a “first world” or “developed country”, and the rest are classified as developing countries. According to this criterion, the sample countries are classified in Table 5.
Table 5. Developed countries and developing countries divided by the income standards published by the World Bank (2018).

| Developed Countries (36) | Developing Countries (19) |
|--------------------------|---------------------------|
| Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Monaco, the Netherlands, Norway, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Israel, Japan, South Korea, New Zealand, Australia, Canada, the United States, Libya, Argentina, Uruguay, Saudi Arabia |

Tables 6 and 7 are the OLS analysis results of samples of the developed and developing countries, respectively. In Table 6, from 1 to 8, the adjusted \( R^2 \) value grows larger and the regression results of the core explanatory variables are significant, which means the regression results are stable and the interpretation of the model effect is stronger and stronger. Among the explanatory variables, the coefficient of \( s_{fri} \) is the largest. Therefore, this means that a higher-level opening of the producer services in developed countries is conducive to enhance the export competitiveness of the country’s manufacturing industry while restricting the access of foreign investment in the service industry will have a greater negative impact on the competitiveness of manufacturing export.

Table 6. Regression results of heterogeneity analysis on developed countries.

|     | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| \( S_{trade} \)  | 0.001 | -0.001 | -0.001 | 0.001 | 0.004 *** | 0.008 *** | 0.009 *** |
|     | (0.997) | (-0.855) | (-0.810) | (0.594) | (3.409) | (10.488) | (10.789) |
| \( S_{fri} \)  | - | -2.581 *** | -2.648 *** | -2.648 *** | -2.816 *** | -1.984 *** | -1.706 *** | -1.699 *** |
|     | (8.095) | (-8.059) | (-7.963) | (-8.749) | (-6.380) | (-7.828) | (-7.854) |
| \( hitec \)  | - | - | - | -0.003 | 0.009 *** | -0.001 | -0.001 |
|     | (1.062) | (3.078) | (-0.531) | (-0.403) |
| \( gdp \)  | - | - | - | -0.052 *** | 0.083 *** | 0.543 *** | 0.567 *** |
|     | (4.176) | (6.965) | (13.777) | (13.963) |
| \( excha \)  | - | - | - | -0.614 *** | -0.156 ** | -0.009 |
|     | (7.565) | (-2.461) | (-0.098) |
| \( Lnm\_value \)  | - | - | - | - | - | 0.625 *** | 0.648 *** |
|     | | | | (16.261) | (16.373) |
| \(.govm \)  | - | - | - | - | - | - | 0.092 ** |
|     | | | | (2.183) |
| \( _cons \)  | 0.991 *** | 1.190 *** | 1.206 *** | 1.225 *** | 0.746 *** | 0.934 *** | 1.810 *** | 1.828 *** |
|     | (38.824) | (40.358) | (34.297) | (20.010) | (6.432) | (8.662) | (19.548) | (19.810) |

Year effect: No Yes Yes Yes Yes Yes Yes Yes
Regional effect: No No No Yes Yes Yes Yes Yes
Num. 288 288 288 288 288 288 288 288
adj. \( R^2 \) -0.000 0.197 0.196 0.177 0.240 0.379 0.697 0.701

Note: *, **, *** mean significant at the level of 10%, 5%, and 1% respectively; The values in parentheses represent the standard deviation.
Table 7. Regression results of heterogeneity analysis on developing countries.

|       | (1)  | (2)  | (3)  | (4)  | (5)  | (6)  | (7)  | (8)  |
|-------|------|------|------|------|------|------|------|------|
|       | ols  | ols  | ols  | fe   | fe   | fe   | fe   | fe   |
| s_trade | 0.005 | −0.004 | −0.005 | −0.005 | −0.022 *** | 0.004 | 0.004 |
|        | (0.620) | (−0.526) | (−0.597) | (−0.654) | (−2.652) | (0.523) | (0.486) |
| s_fri  | 0.796 *** | 0.824 *** | 0.841 *** | 0.670 *** | −0.084 | −0.158 | −0.156 |
|        | (4.263) | (4.231) | (4.207) | (2.674) | (−0.301) | (−0.696) | (−0.659) |
| hitec  | 0.005 ** | 0.008 *** | 0.001 | 0.001 |
|        | (1.978) | (3.413) | (0.544) | (0.541) |
| lngdp  | −0.011 | 0.063 ** | −0.961 *** | −0.963 *** |
|        | (−0.385) | (2.130) | (−8.446) | (−7.787) |
| excha  | −1.639 *** | −0.428 | −0.418 |
|        | (−4.923) | (−1.423) | (−1.087) |
| Lnm_value | 0.955 *** | 0.957 *** |
|        | (9.212) | (8.585) |
| ef     | −0.003 | (−0.044) |
|       | -cons | 0.706 *** | 0.582 *** | 0.601 *** | 0.573 *** | 0.641 *** | 1.068 *** | 2.757 *** | 2.756 *** |
|        | (7.208) | (12.005) | (9.893) | (5.807) | (2.628) | (4.373) | (10.205) | (10.155) |
| Year effect | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Regional effect | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Num. | 152 | 152 | 152 | 152 | 152 | 152 | 152 | 152 |
| adj. $R^2$ | −0.044 | 0.089 | 0.086 | 0.051 | 0.065 | 0.181 | 0.459 | 0.456 |

Note: *, **, *** mean significant at the level of 10%, 5%, and 1% respectively; The values in parentheses represent the standard deviation.

Most control variables, such as the regression results of $excha$, $m_value$ after logarithm, $govm$, and $gdp$, have a significant correlation with the export competitiveness of the manufacturing industry as the results analyzed above. In addition, in Columns 5, 7, and 8, it can be observed that the regression results of the control variable $hitec$ are inconsistent with the previous analysis. The possible reason is that the technology level of developed countries is more advanced than that of others. Developed countries are the leaders in the world’s advanced technology while developing countries are followers in many technological fields. Brezis et al. [46], Brezis and Krugman [47] think that it is easier for developing countries to catch up with technological leaders by imitating new technologies. To prevent developing countries from exploiting the late-mover advantage to study, imitate, and weaken their leadership of technology and the world economy, and to guarantee its advantages and benefits, developed countries often exert restrictions on high-tech exports to achieve the technology blockade of developing countries or extend their leading technology life cycle. Therefore, when the proportion of high-tech products exported by developed countries increases, their technological leadership is easy to be imitated and learned by other countries, which is not conducive to their technological leadership and thus harms the export competitiveness of manufacturing industries in developed countries. Therefore, the proportion of high-tech products exported by developed countries is negatively correlated with the export competitiveness of the manufacturing industry. However, due to the long process of technology imitation and catch-up, the negative impact is not significant during the model period.

The analysis results of samples from developing countries are shown in Table 7. After adding all control variables, the variables of $s_{trade}$ and $s_{fri}$ are positively and negatively respectively correlated to the export competitiveness of producer services to manufacturing, but the results are not significant. On the one hand, from the perspective of statistical techniques, this may be related to the small number of samples from developing countries in the group. On the other hand, the manufacturing industry of developing countries is mainly low-end labor-intensive, and processing trade accounts for a high proportion of trade. Most developing countries have weak absorptive capacity and learning capacity of new technologies, which limits their achievement of the technology spillover effect.
during short periods. Theoretically speaking, the opening-up economy mainly improves the productivity of domestic enterprises through the self-selection and learning effect of host country enterprises. Opening to the outside world can improve the efficiency of allocation of production factors and the efficiency of division of labor, to improve international competitiveness. At the same time, it can intensify competition, stimulate the spillovers of technology, and reduce the cost and price of products, to improve competitiveness. However, developing countries are mainly engaged in intermediate product processing trade with less technology intensity, so it is difficult to obtain technology spillovers. Meanwhile, they need good human capital and an institutional environment to enjoy the learning effect. Therefore, due to developing countries always lacking high-end human capital and an appropriate institutional environment, their opening of producer services has no significant impact on the competitiveness of developing countries’ manufacturing exports.

5. Conclusions
From the perspective of national industrial competitiveness, this paper empirically analyzed the impact of the opening of producer services on a given country’s manufacturing industry export competitiveness. Using transnational data, a total of 55 countries which represent more than 90% of the world economy were studied. Benchmark OLS and heterogeneity analysis was performed on sample data ranging from 2010–2017. Results show that productive service’s opening-up significantly promotes the manufacturing’s export competitiveness. Additionally, it was identified that the negative effects of restricting FDI access to the service industry were greater than the positive effects of the service trade on manufacturing industry export competitiveness. Through heterogeneity analysis, regression results suggested that the key explanatory variables are more important in developed countries than in developing countries. It is suggested that this is the case due to a greater lack of high-level human capital and poorer institutional systems in developing, rather than developed countries. According to the heterogeneity analysis service industry subdivisions, the restriction on the FDI’s access to the financial service and transportation service has greater negative effects on the manufacturing’s export competitiveness than that of other service industry divisions.

Based on the above analysis results, it is recommended that countries should accelerate the opening of their service industries so that their domestic manufacturing industries can improve world market competitiveness. Countries should also relax present FDI access to domestic service restrictions and this is especially required for finance and transportation services. Moreover, developing countries should continue to improve their institutional systems and enhance human capital to encourage the advantages bestowed by the level of service industry openness on manufacturing industry international competitiveness.

Author Contributions: Conceptualization, C.Y.; methodology, C.Y.; software, C.Y.; formal analysis, C.Y.; investigation, C.Y.; resources, C.Y.; data curation, C.Y.; writing—original draft preparation, C.Y.; writing—review and editing, D.T., A.P.T., B.J.B.; visualization, A.P.T., B.J.B.; supervision, D.T.; project administration, D.T.; funding acquisition, C.Y. All authors have read and agreed to the published version of the manuscript.

Funding: This research was founded by the Social Science Foundation of Jiangsu Province under Grant 19EYB019 and China Social Science Foundation under Grant 21BJY085.

Institutional Review Board Statement: Not Applicable.

Informed Consent Statement: Not Applicable.

Data Availability Statement: All the data are supported by the OECD database, https://data.oecd.org/ (accessed on 1 July 2021).

Acknowledgments: We gratefully acknowledge the anonymous reviewers for their insightful comments to this manuscript.

Conflicts of Interest: The authors declare no conflict of interest.
References

1. Porter, M.E. The Competitive Advantage of Nations. *Harvard Bus. Rev.* 1990, 1, 73–91. [CrossRef]

2. Namiki, N. Comparision of the Industry between Japan and American. *Inf. Econ. Rev.* 1985, 2, 56–62.

3. Mckee, K.; Sessionsrobinson, C. Manufacturing Productivity and Competitiveness. *J. Manuf.* 1989, 1, 35–39.

4. Krugman, P. Competitiveness: A Dangerous Obsession. *Foreign Aff.* 1994, 73, 28. [CrossRef]

5. Liu, Z. Producer Services and Their Agglomeration: Key Elements and Implementation Mechanisms for Climbing Global Value Chains. *China Econ. Stud.* 2008, 1, 3–12. [CrossRef]

6. Markussen, J.R. Trade in Producer Services and in Other Specialized Intermediate Inputs. *Am. Econ. Rev.* 1989, 79, 85–95. [CrossRef]

7. Houghton, J.; Pappas, N.; Sheehan, P. *New Manufacturing* One Approach to the Knowledge Economy; Victoria University: Melbourne City, Australia, 1999.

8. Eswaran, M.; Kotwal, A. The Role of the Service Sector in the Process of Industrialization. *J. Dev. Econ.* 2002, 68, 401–420. [CrossRef]

9. Robinson, S.; Wang, Z.-J.; Martin, W. Capturing the Implications of Services Trade Liberalization. *Econ. Syst. Res.* 2002, 14, 3–33. [CrossRef]

10. OECD. The Linkages between Open Services Markets and Technology Transfer.; OECD Publishing: Paris, France, 2006.

11. Hoekman, B. Trade in Services, Trade Agreements and Economic Development: A Survey of the Literature. 2006. Available online: https://ideas.repec.org/p/cpr/ceprdp/5760.html (accessed on 1 July 2021).

12. Markussen, J.R.; Venables, A.J. The Theory of Endowment, Intra-industry and Multi-national Trade. *J. Int. Econ.* 2000, 52, 209–234. [CrossRef]

13. Ethier, W.; Horn, H. Services in International Trade. In *International Trade and Trade Policy*; Elhanan, H., Razin, A., Eds.; Tel Aviv University: Tel Aviv, Israel, 1991; pp. 223–244.

14. Francois, J.F. Producer Services, Scale, and the Division-of-labor. *Oxf. Econ. Pap. New Ser.* 1990, 42, 715–729. [CrossRef]

15. Francois, J.; Woerz, J. Producer Services, Manufacturing Linkages, and Trade. *J. Ind. Compet. Trade* 2008, 8, 199–229. [CrossRef]

16. Amiti, M.; Konings, J. Trade Liberalization, Intermediate Inputs, and Productivity: Evidence from Indonesia. *Am. Econ. Rev.* 2007, 97, 1611–1638. [CrossRef]

17. MacPherson, A. The Role of Producer Service Outsourcing in the Innovation Performance of New York State Manufacturing Firms. *Ann. Assoc. Am. Geogr.* 1997, 87, 52–71. [CrossRef]

18. van Marrewijk, C.; Stibora, J.; de Vaa, A.; Vlaen, J.-M. Producer Services, Comparative Advantage, and International Trade Patterns. *J. Int. Econ.* 1997, 42, 195–220. [CrossRef]

19. Hansen, N. Do Producer Services Induce Regional Economic Development? *J. Reg. Sci.* 1990, 30, 465–476. [CrossRef]

20. Wolfmayer, Y. Producer Services and Competitiveness of Manufacturing Exports; FIW: Wien, Austria, 2008.

21. Marshall, J.N.; Damesick, P.; Wood, P. Understanding the Location and Role of Producer Services in the United Kingdom. *Environ. Plan. A Econ. Space* 1987, 19, 575–595. [CrossRef]

22. Feng, T.-W. The Relationship between Producer Service and Manufacturing Efficiency. *J. Quant. Tech. Econ.* 2009, 3, 56–65. [CrossRef]

23. Ming-rong, W.; Ming-xi, W. The Impact of Producer Services on Manufacturing Exports—Evidence from China’s Industrial Panel. *J. Tech. Econ. Manag.* 2012, 4, 117–120. [CrossRef]

24. Deardorff, A.V. International Provision of Trade Services, Trade, and Fragmentation. *Rev. Int. Econ.* 2001, 9, 233–248. [CrossRef]

25. Yu, M.-C. Developing Producer Services to Promote International Competitiveness of China’s Manufacturing. *Commer. Res.* 2011, 2, 100–106.

26. Arnold, J.M.; Javorcik, B.S.; Mattoo, A. Does Services Liberalization Benefit Manufacturing Firms? Evidence from the Czech Republic. *J. Int. Econ.* 2011, 85, 136–146. [CrossRef]

27. Matthias, A.J.; A Narciso, G. Services Inputs And Firm Productivity In Sub-Saharan Africa: Evidence From Firm-Level Data. *J. Afr. Econ.* 2008, 17, 578–599. [CrossRef]

28. Konan, D.E.; Maskus, K.E. Quantifying the Impact of Services Liberalization in A Developing Country. *J. Dev. Econ.* 2006, 81, 142–162. [CrossRef]

29. Javorcik, B.S.; Li, Y. Do the Biggest Aisles Serve A Brighter Future? Global Retail Chains and Their Implications for Romania. *J. Int. Econ.* 2013, 90, 348–363. [CrossRef]

30. Coucke, K.; Sleuwaegen, L. Offshoring as A Survival Strategy: Evidence from Manufacturing Firms in Belgium. *J. Int. Bus. Stud.* 2008, 39, 1261–1277. [CrossRef]

31. Banga, R.; Golder, B. Contribution of Services to Output Growth and Productivity in Indian Manufacturing: Pre- and Post-Reforms. *Environ. Polit. Wkly.* 2007, 42, 2769–2777. [CrossRef]

32. Tarr, D. *Impact of Services Liberalization on Industry Productivity, Exports and Development: Six Empirical Studies in the Transition Countries*; World Bank: Washington, DC, USA, 2012. [CrossRef]

33. Fernandes, A.M.; Paunov, C. Foreign Direct Investment in Services and Manufacturing Productivity: Evidence for Chile. *J. Dev. Econ.* 2012, 97, 305–321. [CrossRef]

34. Bourles, R.; Cette, G.; Lopez, J.; Mairesse, J.; Nicoletti, G. Do Product Market Regulations in Upstream Sectors Curb Productivity Growth? Panel Data Evidence fro OECD Countries. *Rev. Econ. Stat.* 2013, 95, 1750–1768. [CrossRef]
35. Forlani, E. Competition in the Service Sector and the Performances of Manufacturing Firms: Does Liberalization Matter? *CESifo Work. Pap.* **2010**, *1*, 1–36. [CrossRef]

36. Bas, M.; Strauss-Kahn, V. Does Importing More Inputs Raise Exports? Firm-level Evidence from France. *Rev. World Econ.* **2014**, *150*, 241–275. [CrossRef]

37. Papaioannou, S.K.; Dimelis, S.P. Does Upstream Regulation Matter When Measuring the Efficiency Impact of Information Technology? Evidence across EU and US Industries. *Inf. Econ. Policy* **2017**, *41*, 67–80. [CrossRef]

38. Yang, F.F.; Yeh, A.G.O.; Wang, J. Regional Effects of Producer Services on Manufacturing Productivity in China. *Appl. Geogr.* **2018**, *97*, 263–274. [CrossRef]

39. Su, X.; Anwar, S.; Zhou, Y.; Tang, X. Services Trade Restrictiveness and Manufacturing Export Sophistication. *N. Am. J. Econ. Financ.* **2020**, *51*, 101058. [CrossRef]

40. Liu, M.-y.; Rui, M.-j.; Yao, K. Co-evolution between Producer Service Embedded in Value Chain and Industrial Upgrade of Manufacturing. *China Ind. Econ.* **2010**, *8*, 66–75. [CrossRef]

41. Balassa, B. Trade Liberalisation and “Revealed” Comparative Advantage. *Manch. Sch.* **1965**, *33*, 99–123. [CrossRef]

42. Scott, M.F.G. Intra-industry Trade: The Theory and Measurement of International Trade in Differentiated Products. *Econ. J.* **1975**, *85*, 646–648. [CrossRef]

43. Lall, S. Exports of Manufactures by Developing Countries: Emerging Patterns of Trade and Location. *Oxf. Rev. Econ. Policy* **1998**, *14*, 54–73. [CrossRef]

44. Yeaple, S.R. A Simple Model of Firm Heterogeneity, International Trade, and Wages. *J. Int. Econ.* **2005**, *65*, 1–20. [CrossRef]

45. Grossman, G.; Helpman, E. The Politics of Free Trade Agreements. *Am. Econ. Rev.* **1995**, *85*, 667–690. [CrossRef]

46. Brezis, E.S.; Krugman, P.R. Technology and the Life Cycle of Cities. *J. Econ. Growth* **1997**, *2*, 369–383. [CrossRef]

47. Brezis, E.S.; Krugman, P.R.; Tsiddon, D. Leapfrogging in International Competition: A Theory of Cycles in National Technological Leadership. *Am. Econ. Rev.* **1993**, *83*, 1211–1219. [CrossRef]