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Study on the Influence of Foreign Direct Investment on the Productivity of Domestic Enterprises in Zhejiang Province

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Abstract: *This paper discusses whether the entry of foreign enterprises will affect the productivity of domestic enterprises in Zhejiang Province. Based on the regional perspective, using the micro-data of industrial enterprises in Zhejiang Province from 2002 to 2013, it is found that the entry of foreign capital in Zhejiang Province significantly improves the productivity of domestic enterprises, and this conclusion is still robust after changing the measurement method of enterprise total factor productivity, adjusting the core explanatory variable indicators, considering the dynamic trend and excluding the interference of enterprise entry and exit factors. Moreover, through the heterogeneity analysis, it is found that foreign investment has a more significant effect on the productivity improvement of private enterprises, capital-intensive enterprises and enterprises with high R&D investment. This paper affirms the role of foreign direct investment in improving the productivity of domestic enterprises, provides a reference for further promoting the opening up of foreign investment fields, and points out that China should build a good business environment to attract high-quality foreign investment, so as to boost the development of manufacturing enterprises.*

Keywords: *Foreign direct investment, Domestic enterprises, productivity*

1. Introduction

As the main body of economic development, the production efficiency of manufacturing enterprises plays an important role in promoting the speed and quality of China's economic development. With the rise of human capital and the uncertainty of the international economic environment, how to improve productivity and cost is a key factor to solve the dilemma of economic development. In the context of economic globalization, FDI has become an important channel for enterprises to optimize resource allocation and improve production efficiency on a global scale. As an important carrier of technology, capital and knowledge transfer between countries, foreign-funded enterprises are also considered as an important source of knowledge and technology spillover. As a Chinese enterprise, on the one hand, it can improve the optimal allocation of resources and promote the improvement of efficiency through the domestic market; On the other hand, as the number and scale of foreign-funded enterprises entering the domestic market continue to increase, and as China's increasingly open market system and local government economy improve the business environment, increasing the attractiveness of foreign-funded enterprises, exploring whether foreign direct investment can improve the productivity of manufacturing enterprises has become a hot topic of academic attention. For a long time, the academic circles believe that foreign-funded enterprises in the host country can obtain capital and technical support from the home country, so that the productivity of foreign-funded enterprises is higher than that of the host country enterprises, and the enterprise-level data is used to find that foreign-funded enterprises have more advantages than the host country enterprises in terms of operation and management ability, technical level and production efficiency, which is called the direct effect of FDI. The purpose of attracting multinational corporations to enter the domestic market in most countries is to obtain the advanced technology of foreign-funded enterprises. Therefore, whether foreign direct investment is conducive to the improvement of production efficiency of enterprises in host countries or regions depends on whether the economic effect of foreign direct investment exists and whether it has a positive effect on the improvement of enterprise production efficiency. As for the economic effect of foreign-funded enterprises, current scholars focus on the study of spillover effect of foreign capital. Foreign capital entering the domestic market stimulates local enterprises to increase R&D investment and improve production efficiency through technology diffusion and competition effect. Moreover, foreign capital entering the domestic market not only spreads in the industry through learning effect, but also through

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forward correlation and by providing intermediate products with high quality and low price. Expand the investment range of foreign intermediate products used by enterprises in the host country, thus improving the production efficiency of enterprises. Moreover, since foreign-funded enterprises enter the Chinese market, they will inevitably promote the localization of production, develop domestic suppliers, and indirectly promote technology spillover through upstream and downstream linkages, thus improving the production efficiency of enterprises. Therefore, scholars who support the positive spillover effect of foreign capital believe that enterprises in host countries can benefit from the spillover effect of transnational enterprises. However, scholars who hold opposing views believe that the spillover effect brought by foreign investment is not entirely positive. Using the panel data collected from the database of Chinese industrial enterprises in 2017, foreign scholars found that the large-scale entry of foreign enterprises into the same industry inhibited the productivity improvement of enterprises in the industry.[1]

Based on the data of foreign investment in Zhejiang Province from China Statistical Yearbook and China Industrial Enterprise Database, this paper finds that from 2002 to 2020, foreign direct investment in Zhejiang Province shows a booming trend, with the number of foreign-invested enterprises increasing from 12,111 in 2002 to 44,024 in 2020. The total investment also increased from US $43,2016.9 million to US $589.264 billion, an increase of nearly 14 times. In addition, according to the latest Statistical Bulletin of China's Foreign Investment in 2023, the number of newly established foreign-invested enterprises in Zhejiang Province ranks fourth and the actual amount of foreign investment ranks fifth. As a whole, Zhejiang Province of China is a province with relatively developed foreign direct investment in China. Therefore, this paper chooses Zhejiang Province of China as the research object to explore the relationship between foreign direct investment and the productivity of domestic enterprises in manufacturing industry. It has significant reference significance. The research features of this paper are as follows: Existing studies have confirmed that there is a significant relationship between FDI and the productivity of enterprises in host countries, but most of them are conducted at the national level, and there is a lack of studies at the micro-enterprise level from the regional perspective. The selection of Zhejiang Province as the research object, on the one hand, makes up for the regional perspective of foreign direct investment and enterprise productivity research; On the other hand, Zhejiang Province, as a province with a more developed export-oriented economy in China, is more significantly influenced by foreign-funded enterprises. The study on the impact of foreign direct investment on enterprise productivity is of more reference to the manufacturing enterprises in Zhejiang Province to improve production efficiency and promote the development of export-oriented economy.

2. Literature review

The literature review closely related to this paper mainly focuses on two categories, the first is the spillover effect of foreign direct investment; The second category is about the influence factors of foreign capital spillover effect, including the absorptive capacity of the host country enterprises, technological distance, foreign capital entry intensity, etc. Scholars who support the positive spillover effect of foreign-funded enterprises on enterprises in the host country believe that foreign-funded enterprises entering the host country market can affect the production efficiency of local enterprises through such channels as strengthening cooperation and exchanges with local enterprises, forward and backward correlation and personnel flow. Scholars have found that enterprises in host countries can improve their own productivity by imitating the advanced technology and management experience of transnational corporations.[2] In addition, foreign-funded enterprises bring their own management experience to the host country enterprises through the way of personnel flow, which will have spillover effects on the host country enterprises and improve the production efficiency of enterprises. However, some scholars pointed out that when foreign-funded enterprises enter the host country market, they will attract local high-quality talents due to their high welfare and treatment, thus reducing the attractiveness of enterprises in the host country to talents, and on the contrary, it is difficult for foreign capital to produce positive spillover effect through personnel flow.[3] In addition, the entry of foreign enterprises into the local market intensifies the market competition in the host country, and the market share of local enterprises in the industry is squeezed by foreign enterprises. In order to maintain their market competitive advantages, enterprises will reduce costs and improve business performance by improving production efficiency. According to the research of the Japanese automobile industry into the American market. The entry of Japanese multinational automobile companies into the US market intensifies the competition in the local automobile industry. In order to maintain market competitive advantages, American domestic automobile manufacturers actively improve their production efficiency. However, the entry of foreign capital encourages American automobile companies to improve their production efficiency not because of technology spillover, but because of the competitive pressure brought by foreign investment. With the

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help of the quasi-natural experiment of China's foreign investment policy adjustment, domestic scholars found that foreign investment in general improved the production efficiency of local enterprises, but for individual enterprises, foreign investment in a negative spillover effect. [4]At the same time, scholars have found that the entry of foreign capital also has a negative competitive effect. Foreign-funded enterprises often occupy a dominant position in the market competition with enterprises in the host country by relying on their technological and capital advantages, squeezing the market share of local enterprises and making it difficult for local enterprises to have market space to improve production efficiency. The entry of foreign capital will not only have horizontal spillover effects on enterprises in the same industry, but also have spillover effects on upstream and downstream industries. On the one hand, since the entry of foreign-funded enterprises into the host country market improves the abundant intermediate products and expands the range of intermediate products input of local enterprises, local enterprises can improve their business performance by using high-quality and inexpensive intermediate products of foreign-funded enterprises, thus providing financial support for enterprises to improve their independent innovation capability. On the other hand, when foreign-funded enterprises enter the host country market, they will reduce costs through cooperation with local suppliers. In order to ensure supply quality, foreign-funded enterprises will cultivate long-term suppliers to associate with them, resulting in vertical spillovers. However, some scholars have found that because the host country government will give preferential treatment to foreign enterprises, foreign enterprises may be encouraged to develop suppliers through the international market, resulting in negative effects of backward correlation.[5]

The above studies have not reached a consistent conclusion on the relationship between foreign capital entry and enterprise productivity in the host country. Some scholars believe that the main reason is that all the existing studies analyze the relationship between foreign capital entry and enterprise performance from a static perspective, but foreign capital entry shows a dynamic development process. Domestic scholars use the data of large and medium-sized industrial enterprises at the industry level to re-measure the technology spillover and market competition effect of foreign capital entry, and find that in the short term, the negative competition effect of domestic enterprises receiving large-scale foreign capital entry is very significant. But in the long run, with the entry of foreign capital, inefficient enterprises are forced to actively introduce new technologies, thus improving their production efficiency. This paper discusses the effect of foreign capital competition from a dynamic perspective. Zhang et al. (2014) found that foreign-funded enterprises with long-term operations in the host country play a more obvious role in promoting the productivity improvement of the host country enterprises, because foreign-funded enterprises with long-term operations in the host country have a higher possibility of technology spillover when they strengthen cooperation and exchange with the host country enterprises.[6] It is worth noting that the above studies on foreign capital spillover effect from a dynamic perspective assume that the spillover effect is linear, while Girma (2005) found that the effect of foreign direct investment on the productivity improvement of domestic enterprises may be non-linear, and summarized the cause of the non-linear trend as the size of enterprises' technology absorption capacity. [7]It is believed that there is a "threshold effect" of foreign capital spillover. Only when the enterprise's attracting ability reaches a certain level, the effect of foreign capital inflow on the improvement of enterprise productivity is significant. Domestic scholars have also verified the fact that there is a threshold effect of foreign capital spillover from the perspectives of regional economic development level and market competition degree, which has enriched the theoretical research on foreign capital spillover effect.

Therefore, domestic scholars further introduce the speed of foreign investment to regulate the effect. On the one hand, when foreign investment enters slowly, domestic enterprises are less impacted by foreign investment, but the learning effect is also not obvious. [8]Domestic enterprises can expand the ways of learning and communication with domestic enterprises, and with less impact from market competition, they can achieve greater productivity improvement. However, if a large number of foreign capital enters the domestic market in the short term, it may cause domestic enterprises to receive excessive foreign capital impact, and easily aggravate the technical barriers of foreign capital spillover. Therefore, it can be concluded that the speed of foreign capital entry has a regulating effect on technology spillover.

3. Data sources and indicators

3.1. Data source

The data used in this paper are obtained from the combination of China Industrial Enterprise Database and China Statistical Yearbook from 2002 to 2013, and the enterprise-level data of Zhejiang Province is

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selected, including the data of all state-owned enterprises and non-state-owned industrial enterprises above designated size in Zhejiang Province. This paper focuses on manufacturing enterprises in Zhejiang Province, so non-manufacturing data such as mining industry are excluded. Brandt et al. (2012) was adopted to clean the database of industrial enterprises.[9]In accordance with general accounting principles, the observation values of negative or zero sample values for indicators such as gross industrial output value, fixed assets, number of employees and input of intermediate products were removed, and enterprises with fewer than 8 employees were excluded to avoid selection bias and finally sample data were obtained.

3.2. Index construction

Business Productivity (avep). The explained variables are measured by enterprise total factor productivity (TFP). Common measurement methods include least square method (OLS), fixed effect method, OP, and DEA (data enveloping analysis). In order to eliminate the possible endogeny problems of existing measurement methods, this paper combined the LP method proposed by Levisohn and Petrin to estimate the total factor productivity of enterprises,[10] and referred to the semi-parameter estimation method proposed by Lian Yujun et al. (2012). The specific calculation model is shown as follows:

$$lnY_{it} = \alpha_0 + \alpha_1 lnK_{it} + \alpha_2 lnL_{it} + \alpha_3 lnM_{it} + \varepsilon_{it}$$

Where, i and t represent the enterprise and the year respectively; lnY represents the main business income of the enterprise respectively; lnK, lnL and lnM represent the logarithm of the net fixed assets of the enterprise, the logarithm of the number of employees employed by the enterprise, and the logarithm of the labor and raw material expenses payable by the enterprise respectively; year and lnd are the year controlled by the model and the fixed effect of the industry. ε is the error term. Moreover, a special index is needed because intermediate input data in some years are difficult to obtain. In order to ensure the accuracy of data, this paper further measures enterprise productivity through output per capita (avep) as the core explanatory variable. Foreign Direct Investment (FDI). This paper mainly investigates the influence mechanism of the scale of foreign investment in Zhejiang Province on the productivity of manufacturing enterprises. In this paper, the foreign direct investment index is constructed to measure the intensity of foreign investment (FDI) in Zhejiang Province by the ratio of foreign capital to the paid-in capital of Hong Kong, Macao and Taiwan. Using the proportion of the total output value of foreign investors in Zhejiang Province and Hong Kong, Macao and Taiwan regions in the total output value of industrial enterprises above designated size to measure the degree of foreign investment openness (FDI_adj), as a substitute index to carry out the robustness test.

Control variables. In order to accurately investigate whether the entry of foreign-funded enterprises into Zhejiang Province promotes the productivity improvement of manufacturing enterprises, this paper further controls the factors that may affect the productivity of enterprises. The details include: enterprise size (size), expressed by the total output value of the enterprise, the larger the enterprise size may be more able to improve production efficiency; The age of the enterprise is measured by the year of the enterprise minus the year of its establishment. In this paper, the enterprise interest expenditure is used to measure the financing ability of the enterprise, and the amount of assets and liabilities and the export scale of the enterprise are added as control variables. In addition, in order to exclude the impact of time and industry factors on enterprise productivity and control the fixed effects of time and industry, the main variables are shown in Figure 1:

3.3. Model construction

To investigate whether foreign direct investment has an impact on the productivity of domestic enterprises, this paper constructs the panel regression model as follows:

$$\mathrm{TFP_{ijt}} = \beta_0 + \beta_1 \mathrm{FDI_t} + \sum \beta_k \mathrm{X_{ijt}} + \gamma_i + \varepsilon_{ijt}$$

The left side of the equation is the total factor productivity of the firm, and the right side of the equation is the explained variable selected by the model, where the subscripts i, j and k represent the firm, the industry and the year respectively,γ_i represents the fixed effect variable at the non-observed firm level, and ε_{ijk} the random disturbance term.

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4. Empirical analysis

4.1. Baseline regression results

Table 1 reports the basic estimation results of the productivity of FDI and domestic enterprises. In column (1), Lp method is used to measure the productivity of enterprises as the explained variable, and in column (2) and (3), op method and per capita output of enterprises are used to measure the total factor productivity of enterprises as the explained variable. According to the regression results, the estimated coefficient of FDI, the core explanatory variable, is significantly positive at the level of 1% when the fixed effects of industry, year and firm level are controlled, indicating that FDI has a positive spillover effect on the productivity of domestic enterprises and significantly promotes the productivity improvement of domestic enterprises. Moreover, according to the regression results of FDI in columns (2) and (3), the estimated coefficient of FDI is still significantly positive under the replacement of the measurement method of the productivity of domestic enterprises, indicating that the conclusion will not change due to different measurement methods of enterprise productivity, and has a certain robustness.

Table 1: Results of baseline regression

	(1) tfp_lp_output	(3) $avep$
FDI	0.837***	0.664***
	(20.07)	(41.67)
$size$	0.386***	0.517***
	(122.77)	(234.41)
age	-0.001	-0.088***
	(-0.31)	(-35.23)
$loan$	-0.002***	-0.018***
	(-3.11)	(-29.74)
lev	-0.001	-0.154***
	(-0.06)	(-27.82)
$export$	-0.000	-0.009***
	(-0.04)	(-21.40)
N	160598	236232
R^2	0.947	0.866

According to the regression results of control variables in column (2), the estimated coefficient of firm size is significantly positive at the 1% level, indicating that the larger the scale of domestic enterprises, the more capable the enterprises are to reduce production costs and improve business performance and other channels to improve productivity. The estimated coefficient of enterprise age is significantly negative, indicating that young enterprises are more aggressive than those with longer operating years. To improve enterprise productivity by increasing productivity, enterprises with longer operating years will have "slack". The estimated coefficient of corporate liquidity factor is also significantly negative, which indicates that stronger financing ability of enterprises may inhibit the improvement of corporate productivity. The reason may be that stronger financing ability of enterprises may give enterprises competitive advantages to some extent, and reduce the enthusiasm of enterprises to improve competitive advantages through improving productivity. The estimated coefficient of asset-liability ratio is significantly negative, indicating that the increase of debt will reduce the productivity of enterprises. The reason is that too high debt ratio will squeeze the funds invested in R & D of enterprises, resulting in enterprises falling into the "trap" of low productivity. However, the estimated coefficient of export scale of enterprises is significantly not negative, which is in line with the research conclusion of Zhang Jie et al. (2010) to a certain extent. The productivity of exporting enterprises is lower than that of non-exporting enterprises, which may be explained by the increase of domestic trade cost caused by the segmentation of China's domestic market, which encourages inefficient enterprises to seek export.

4.2. Robustness test

Substitute core explanatory variables：In order to ensure the robustness of the regression results, the core index is replaced to estimate, and the ratio of foreign capital to the paid-in capital is used to replace the index of the openness of the basic regression to China. The results are shown in column (1) of Table 2. After replacing the core index, the estimated coefficient is still significantly positive, and the conclusion does not change. Consider dynamic trends：Since the influence of foreign direct investment

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and other factors on the productivity of enterprises may take time to play, this paper estimates again by adding the lag period of enterprise productivity, and the results are shown in column (2) of Table 2. After the lag period of enterprise productivity, the estimated coefficient of foreign direct investment is significantly not positive, and the conclusion does not change.

Table 2: Estimated results of robustness test

	(1) $avep$	(2) $L.avep$	(3) $avep$	(4) $avep$
FDI_adj	0.392***			
	(18.94)			
FDI		0.830***	0.388***	0.528***
		(42.19)	(9.60)	(38.49)
$controls$	YES	YES	YES	YES
N	382060	197465	32218	291702
R^2	0.852	0.822	0.813	0.866

Adjust the sample range：Since there may be newly established enterprises and bankrupt enterprises that have withdrawn from the market in the original sample, which may affect the accuracy of the estimated results, enterprises with long-term existence during the sample period are selected as new research objects to further exclude the impact of enterprise entry and exit on the estimated results. The results are shown in column (3) of Table 2, and it is found that the conclusion has not changed. It has certain robustness. Control industry and year fixed effect：In order to prevent industry and year from possibly affecting the estimated results, this paper further controlled the fixed effects of industry and year to exclude non-observed influencing factors. After controlling the fixed effects of industry and year, as shown in Table 2 (4), although the estimated coefficient decreased compared with the baseline regression result, it was still significantly positive at 1% level, and the conclusion was robust.

4.3. Heterogeneity analysis

According to the enterprise ownership division：Since this paper investigates the impact of foreign direct investment on the productivity of domestic enterprises, considering the differences in the operation modes of state-owned enterprises and private enterprises, we conducted regression for enterprises divided into state-owned enterprises and private enterprises respectively. The results are shown in column (1) and (2) of Table 3, and (1) is listed as the sample of state-owned enterprises. The estimated coefficient of foreign direct investment did not pass the significance test, indicating that the influence of foreign investment on state-owned enterprises is not significant; In column (2), the estimated coefficient of foreign direct investment on private enterprises is significantly positive, indicating that the entry of foreign enterprises has a significant effect on the productivity of private enterprises. The possible explanation is that state-owned enterprises have a strong ability to resist risks. On the one hand, private enterprises are greatly affected by the competition of foreign investment, so they must improve their competitiveness by improving productivity. On the other hand, private enterprises operate flexibly and can easily improve their productivity by introducing foreign technologies.

Table 3: Results of heterogeneity analysis 1

	(1) State-owned	(2) Private enterprise	(3) Low R&D	(4) High R&D
FDI	-0.004	0.668***	0.109***	0.144***
	(-0.02)	(41.72)	(6.52)	(3.50)
$controls$	YES	YES	YES	YES
N	3205	233027	140790	95442
R^2	0.941	0.864	0.930	0.881

According to enterprise research and development division：In addition to the size of the spillover effect of foreign-funded enterprises, the R&D investment of domestic enterprises will also have a significant impact. In this paper, enterprises are divided into high R&D investment enterprises and low R&D investment enterprises according to the amount of R&D investment. The regression results are shown in column (3) and (4) of Table 3, and the sample regression results of low R&D investment are listed in (3). It is found that its estimated coefficient is lower than that of the sample with high R&D input in column (4), indicating that the positive spillover effect of FDI on enterprises with high R&D input is stronger. The reason is that enterprises with high R&D input have a closer technological distance to foreign-funded enterprises, and their absorption capacity is stronger, so FDI has a stronger effect on their

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productivity improvement.

According to the type of industry: Due to the different characteristics of enterprises in different industry types, this paper divides enterprises into labor intensive, capital intensive and technology intensive by industry for regression. Columns (1) - (3) of Table 4 respectively show the regression results of labor-intensive, capital intensive and technology intensive enterprises. It is found that compared with technology-intensive enterprises, The higher estimated coefficient of labor-intensive and capital-intensive enterprises may be due to the fact that technology-based foreign-invested enterprises may take measures to limit the outflow of core technologies in order to maintain their competitive advantage, so that the positive spillover effect of technological FDI is relatively smaller than that of labor-intensive FDI.

Table 4: Results of heterogeneity analysis 2

	(1) labor-intensive	(2) Capital-intensive	(3) technology-intensive
FDI	0.626***	0.735***	0.554***
	(23.85)	(24.70)	(20.11)
$controls$	YES	YES	YES
N	87823	67536	80873
R^2	0.866	0.892	0.845

5. Conclusions

Based on the enterprise-level data of Zhejiang Province from 2002 to 2013, this paper studies the impact of foreign direct investment on the productivity of domestic enterprises. Based on the previous question on whether FDI can promote the productivity growth of enterprises, it is found that there are differences in the conclusions. Supporters and opponents believe that foreign investment is conducive to the productivity improvement of domestic enterprises, while opponents believe that by squeezing the living space of domestic enterprises, the crowding out effect is greater than the positive spillover effect, which hinders the productivity improvement of enterprises. The reason why the research conclusions have not been unified may be the problem of sample selection, and the difference of samples leads to the inconsistency of conclusions. This paper selects the enterprise-level data of Zhejiang Province as the research object. On the one hand, Zhejiang Province, as a province with a high degree of openness to foreign investment in China, is more in line with the research theme of this paper; On the other hand, as a province attracting more foreign direct investment, the productivity performance of domestic enterprises can more accurately reflect the impact of foreign direct investment on enterprise productivity.

Based on the research results, this paper puts forward corresponding suggestions. First, since FDI can improve the productivity of domestic enterprises, China should continue to open wider to the outside world. The Chinese government should guide foreign enterprises to serve the transformation of the manufacturing industry. Second, while opening up more to foreign investment, we need to create a good business environment and help domestic enterprises learn from foreign enterprises. Third, domestic enterprises are encouraged to increase investment in research and development, the absorption capacity of enterprises has a regulating effect on foreign capital spillover, and the improvement of their own technical level is conducive to the better use of foreign capital to promote the transformation and upgrading of manufacturing industry.

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