

The Impact of FDI on Local Innovations in China

—Evidence from Beijing-Tianjin-Hebei Urban Agglomeration, 2011-2018

Yunxin Ye^{1, *}

¹ School of Management and Administration, Macau University of Science and Technology, Macau, China

*Corresponding author. Email: yunxin_ye@163.com

ABSTRACT

Innovation and Foreign Direct Investment (FDI) are two major sources of economic growth. The State Council's executive meeting urged further taking forward the nationwide initiative spurring innovation to unleash social creativity. Empirical studies of FDI effects on innovation with prefectural data are rare, this paper uses prefectural data to analyze the impact of inflow FDI on domestic innovative activities in China. Using panel data of 13 cities in Beijing-Tianjin-Hebei Urban Agglomeration from 2011 to 2018, this study finds that the scale of FDI has a significantly positive effect on local innovation. Also, the result shows that the higher entry pace of FDI brings a negative effect on innovation of domestic enterprises.

Keywords: FDI, entry scale, entry pace, innovation, Beijing-Tianjin-Hebei region.

1. INTRODUCTION

Innovation promotes sustainable economic development and plays an important role in promoting social progress and enhancing national strength. Solow sees technological progress as a major driver and determinant of economic growth [1]. Schumpeter stresses innovation as a key ability of entrepreneurs [2].

According to data released by the Organization for Economic Cooperation and Development, global FDI (Foreign Direct Investment) plunged 42 percent in 2020. Meanwhile, FDI in China bucked the trend and became the world's largest recipient. FDI has played a huge role in capital accumulation and promoting economic development [3]. China put forward the "market for technology" strategy to attract FDI in the early 1990s. The purpose is to promote China's independent research and development (R&D) ability and improve the level of innovation through absorbing foreign advanced technology. Does the inflow of FDI promote the host country's innovation?

On April 30, 2015, the Political Bureau of the Central Committee of the CPC held a meeting and approved the Outline of the Coordinated Development Plan for the Beijing-Tianjin-Hebei Region. President Xi stressed it is

a major national strategy to drive the development of the hinterland in north China. The Beijing-Tianjin-Hebei region continues to open its economy, providing favorable conditions for local enterprises to attract FDI. It aims at enhancing the spillover effect of technology transfers and improving the comprehensive competitive strength of enterprises.

This study examines the impact of inward FDI on local innovations in Beijing-Tianjin-Hebei Urban Agglomerations with provincial data from the year 2011 to 2018.

1.1. Related Literatures

There are few empirical studies of the impact of FDI on innovations in China, the most related work to our study is a research conducted by Cheung and Lin [4]. They used provincial data and found positive effects of FDI on domestic innovation, especially for minor innovation. Hu and Jefferson use firm-level data to examine the growth of FDI relate to more patent applications in China's large and medium-sized industrial enterprises [5]. Based on the dynamic analysis of sources influencing innovation, Yu and his research team put up two contradictory conditions [6]. In short term, some domestic enterprises prefer to introduce foreign

technology which inhibits independent innovation. In long term, domestic innovation is promoted through increasing market competition and technology spillovers. Except for the effects from the scale of FDI, the entry pace of foreign investment exhibits a negative moderation effect on FDI spillover effects [7]. The research on the impact of inward FDI on domestic innovation in China has not reached a unified conclusion, this study uses empirical analysis to explain the relationship in a specific region during a specific time period in China.

1.2. Contribution

The imbalanced distribution of FDI has always existed within China. The academic researches on the regional imbalance of FDI mostly focus on the eastern, western, and central regions, while the research on the Beijing-Tianjin-Hebei region is relatively rare. This study focuses on two perspectives of FDI which are the entry scale and the entry speed. Based on the previous theoretical research, this paper empirically analyzes the role of inward FDI on regional innovation and finds a positive relationship between FDI inflow and local innovation. It can help to notice the importance of FDI in promoting local innovation. Moreover, the entry speed of FDI which weakened the relationship between inward FDI and innovation is insignificant. Based on these empirical results, practical policy suggestions were put forward.

2. THEORETICAL BACKGROUND

As multinational companies with relatively advanced technology enter the host country, technology transfer occurs through spillover effect. This part explains the concept of FDI spillover effect. The spillover process of

transferring technology has two main effects on the host country, namely, crowding-in effect and crowding-out effect.

2.1. Theories of FDI on innovation

FDI spillover effect refers to the foreign firms bring advanced technology to host county, these technologies are not fully absorbed by foreign enterprises and “spill over” to domestic companies. Based on the R&D production function, the equation can be represented by

$$Innov = f(L, K, FDI).$$

The equation above represents the innovation generation process. L and K in the equation represent labor and capital inputs which are utilized in producing or innovating new products or processes. FDI in the equation represents the inward FDI spillover effect and its effects on the processes of local enterprises’ innovation.

2.2. Crowding-in and crowding-out effects

There are two contradictory effects of FDI on domestic innovation. The crowding-in effect brings positive effects on domestic innovation. It spills over through three main channels, demonstration effect, labor mobility, and competition effect. The demonstration effect means domestic entrepreneurs get motivation and imitate foreign firms’ advanced technology. Local firms can improve new technology upon advanced products to come up with new ideas. Labor mobility refers to workers with past experiences in foreign firms find new jobs in local companies or start their own business. Moreover, when domestic firms devote more on improving existing products and services to overcome increasing market competition, the competition effects take effect [8].

Table 1. Descriptive Statistics of main variables

Variable	Definition	Samples	Mean	Std. Dev	Min	Max
linnov	Logarithmic of numbers of patent application	104	8.48	1.53	5.77	12.26
FDI	Flow of real FDI of per person	104	2.14	1.68	0.087	7.91
FES	Entry pace of FDI	104	0.27	0.834	-0.937	5.17
rd	R&D expenditure as a share of GDP (percent)	104	1.4	1.4	0.069	5.65
govt	Government expenditure as a share of GDP (percent)	104	17.59	5.67	7.44	39.2

On the contrary, the crowding-out effect comes up with increasing competition through raising technology standards and competing factors of production. From the perspective of human capital, foreign firms attract skilled workers with higher-paying and increasing domestic firms’ cost of production [9]. It may cause domestic firms to devote less on R&D to reduce costs. The total effect of inward FDI on domestic innovation is determined by

whether the crowd-in effect or crowd-out effect is dominated.

Moreover, the entry pace of FDI affects the relationship between FDI and innovation. On the one hand, local enterprises face the pressure of FDI entry with the increasing entry speed of FDI. In this case, domestic enterprises will try to learn faster under the pressure,

absorb advanced technology and experience brought by FDI. It will accelerate the improvement of strength of local enterprises. On the other hand, the situation of Time Compression Diseconomies may happen with the increasing entry speed of FDI [10]. It is pointed out that the final result is uneconomical when compression time violating the law or excessively speeding up the process. So, the effect of the entry speed of FDI can enhance or weaken domestic innovation.

3. THE MODEL AND DATA

3.1. Entry scale of FDI and innovation

Based on the theoretical equation presented in section 2, the empirical model is constructed as follows:

$$Innov_{it} = \beta_0 + \beta_1 FDI_{it} + \beta_2 govt_{it} + \beta_3 rd_{it} + \varepsilon_{it} \quad (1)$$

This model estimates the spillover effects of inward FDI on innovation. In this model, the i ($i=1, 2, \dots, 13$) represents each city in Beijing-Tianjin-Hebei urban agglomeration and t ($t=2011, 2012, \dots, 2018$) represents time period. Based on data availability, this research uses

the logarithm form of the number of the patent applications to evaluate domestic enterprise's innovation. The main explanatory variable in this model is the flow of total inward FDI actually utilized in each year. Based on previous studies, this research uses U.S CPI to deflate the net inflow of FDI actually utilized in each year, the year 2015 as the base year [11]. The coefficient of FDI measures the magnitude of the spillover effect β_1 . It assumes that the inflow of FDI impacts on domestic innovations in the short term.

3.2. Entry pace of FDI and innovation

Based on previous studies, the entry pace of FDI is defined as $FES_{it} = (FDI_{it} - FDI_{i,t-1})/FDI_{i,t-1}$. In the equation, $FDI_{i,t-1}$ is the inflow of FDI with lag of one period.

$$Innov_{it} = \beta_0 + \beta_1 FDI_{it} + \beta_2 FES_{it} + \beta_3 govt_{it} + \beta_4 rd_{it} + \varepsilon_{it} \quad (2)$$

The coefficient of FES reflects the effects of FDI entry pace and innovation. Other variables in this model include the logarithm of expenditure on research and

Table 2 Model estimation results

Independent Variables	Model (1) linnov	Model (2) linnov	Model (3) lpatentgrant
lrfdi	0.442*** (5.76)	0.467*** (6.03)	0.329** (2.69)
govt	0.0619*** (5.86)	0.0611*** (5.86)	-0.0518** (-2.90)
rd	0.502*** (6.59)	0.469*** (6.15)	0.595*** (5.56)
fes		-0.0954* (-2.04)	0.130 (1.38)
_cons	7.859*** (20.42)	8.010*** (20.39)	8.950*** (15.25)
Observations	104	104	104

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

development. The government expenditure represents the size of government. Moreover, the model includes the birth rate to control regional characteristics.

The data are collected from the statistical yearbooks in each province and the China City Statistical Yearbook. With the data availability, the sample in this research consists of a total 13 cities in the Beijing-Tianjin-Hebei region during the year 2011 to 2019. Definitions and descriptive statistics of main variables are summarized in Table 1.

4. EMPIRICAL RESULTS AND ANALYSIS

This research uses STATA to make empirical research with prefectural-level data. To determine whether to use fixed-effect models or random effect models, the Hausman test is required. The P-value of the Hausman test is -8.16. So, it is better to use random-effect regression methods.

In order to check whether the multicollinearity among

the variables happens, this study uses the value of variance inflation factor (VIF) of each variable to test multicollinearity. The results of VIF of all variables are less than 10 to exclude the multicollinearity among variables.

The regression results are shown in Table 2. According to the result of Model (1), the coefficient of FDI_{it} shows the flow of inward FDI has a significant positive effect on the number of the patent applications of domestic enterprises. We can infer that the crowding-in effect of FDI on innovation dominates in Beijing-Tianjin-Hebei Urban Agglomeration. Also, the government expenditure and R&D expenditure positively affects domestic innovation.

After considering the pace of FDI inflow, the coefficient of FES is negative. With the t-value of FES equals to 0.041, it is significant at 5% or marginally significant. Instead of enhancing the absorption of advanced knowledge and innovative ideas, domestic enterprises are more likely to survive from Time Compression Diseconomies. Moreover, the coefficient of FDI still be positive in the result of Model (2). More government expenditure and R&D expenditure will promote innovative activities.

To test the robustness of the result, the dependent variable changes to the logarithm of the number of the patents granted instead of the patent application to evaluate innovation. The positive relationship between FDI inflow and domestic innovation is not changed. The coefficient of government expenditure and R&D expenditure are significant. However, the pace of FDI entry becomes an insignificant variable in Model (3).

5. CONCLUSION

This paper empirically analyzes the relationship between the inflow of FDI and innovation of domestic enterprises based on the panel data of 13 cities in Beijing-Tianjin-Hebei Urban Agglomeration from the year of 2011 to 2018. Through the results of the regression models, this study finds the increasing scale of inflow of FDI promotes innovation of domestic enterprises which reflects the crowd-in effect of FDI. Considering the entry pace of FDI, faster speed brings negative effects on innovative activities. Previous studies explain this situation as the Time Compression Diseconomies. Moreover, the higher levels of investments in research and development and larger size of government were proved to be positively relate to domestic innovation.

Based on this study, several policy suggestions were made for Beijing-Tianjin-Hebei Urban Agglomeration. The government should continue to attract foreign investment and formulate reasonable policies to attract FDI. At the same time, the government should reasonably control the speed of entering FDI to achieve effectiveness.

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