

LOCALIZING FOREIGN FIRMS IN VIETNAM THROUGH ANALYZING EFFECTS OF AGGLOMERATION ECONOMIES

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Abstract

This paper studies the effects of agglomeration economies on the location choices by foreign firms in Vietnam. By using a large dataset that provides detailed information about individual firms, the study examines the location choices by 737 newly created foreign firms in 2007 in about 125 different 4-digit industries. The estimates of the conditional logit model show that agglomeration benefits motivate newly-created foreign firms to locate near other foreign firms. Moreover, the results show that foreign firms in the same industries and from the same countries of origin to locate near each other.

Key words: *Agglomeration; Location choice; Foreign direct investment.*

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1. Introduction

According to traditional trade theory, location choice by a foreign firm depends on factor endowments of host countries such as natural resources, labor capital and infrastructures. The “factor endowment” theory, which was developed from Ricardo’s theory of comparative advantages by Heckscher and Ohlin (Krugman and Obstfeld, 1997), claims that firms have tendencies to locate in places where the required factors of their production are relatively abundant. However, recent theories of economic geography suggest that firms in the same industries may be drawn to a particular location in order to benefit from positive externalities or agglomeration effects. The theory of agglomeration economies was introduced by Marshall (1920) in which he provided three reasons for the clustering of



firms in the same industries: it provides a pooled market for workers with specialized skills, facilitates the development of specialized inputs and services, and enables firms to benefit from technological spillovers. Subsequent research by Krugman (1991) and Saxenian (1994) construct formal models to analyze and extend the concepts.

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To date, there have been few empirical studies on agglomeration effects, especially in transition economies. Head, Ries and Swenson (1995) examine location choices by Japanese firms in manufacturing industries in the United States, showing that Japanese firms prefer to locate near both US and Japanese firms in the same manufacturing industries. Guimaraes *et al.* (2000) and Crozet, Mayer and Mucchielli (2004) also indicate similar behavior by foreign firms in France and Portugal, respectively. However, there are also studies that do not support the existence of agglomeration effects. Shaver and Flyer (2000) examine foreign manufacturing firms in the United States and find that large firms are not likely to locate near other firms because the benefits they contribute to agglomeration economies are less than what they receive from agglomeration effects. Empirically, Baum and Mezias (1992) and Baum and Haveman (1997) also support this conclusion. For transition economies, there are fewer studies of agglomeration effects on location choices by foreign investors. Most important are the works of Boudier-Bensebaa (2005) on Hungary, Meyer and Nguyen (2005)¹ on Vietnam, and Head and Ries (1996) and Cheng and Kwan (2000) on China. However, due to the lack of detailed firm-level information, these studies can use only aggregate numbers of firms or foreign investment projects at provincial levels to estimate agglomeration effects.

This study includes investments of 737 newly created foreign firms in 2007 in about

125 different 4-digit industries. We also controls for the effects of province-specific factor endowments by using provincial characteristics in the model. The study shows that the deviation of foreign firms from these patterns indicates agglomeration effects. Different from many other studies, “country of origin” is used as a new dimension in the measurement of agglomeration effects.

We apply the conditional logit model to estimate the effects of agglomeration economies on location choices by newly created foreign firms in Vietnam in 2007. By using a large dataset and detailed information about individual firms, it is possible to measure the effects of the country of origin and the industry of a firm on its location choice. The study shows that foreign investors are not only likely to locate near other foreign firms but also prefer to locate near foreign firms in the same industries and from the same countries of origin. Similar to Head *et al.* (1995), it is argued that this pattern of location choice supports an agglomeration-externality theory rather than a theory based on the differences of endowment factors. Further, the empirical results reveal that there is competition among provinces in attracting foreign investors, and the locations of Vietnamese firms have no effect on the location decisions by foreign investors in the same industries.

This research contributes to the existing literature on agglomeration economies, location and foreign direct investment. The empirical results are particularly important for Vietnam’s provincial authorities in

¹ Meyer and Nguyen (2005) did not concentrate on agglomeration. Yet, the authors have a small data analysis and discussion about the effects of economic agglomeration on the location choices by foreign investors in Vietnam.

designing policies aimed at attracting foreign investments.

The structure of this paper is organized as follows. Section 2 reviews theories on localization. Section 3 describes the dataset. Section 4 presents methodology and empirical results. The final section is devoted to conclusions.

2. Literature review and hypotheses

Industry localization is defined as “the geographic concentration of particular industries” (Head *et al.*, 1995). One of the mechanisms motivating this concentration is the existence of agglomeration economies, which are positive externalities that stem from the geographic clustering of industries. In this context, firms contribute to the externalities and also benefit from the externalities (Shaver and Flyer, 2000).

The issue on industry localization attracted the attention of economists in the late nineteenth century. The work of Marshall (1920) is considered as an early and influential economic analysis on this phenomenon. Marshall identifies three externalities that stem from industry localization: (i) localization enables firms to benefit from technological spillovers, (ii) localization provides a pooled market for workers with specialized skills that benefits both workers and firms, and (iii) localization creates a pool of specialized intermediate inputs for an industry in greater variety and at lower cost. These positive externalities have the potential to enhance the performance by firms that agglomerate.

According to Krugman (1991), the concept of technological spillovers is quite vague and general but it is the most frequently mentioned as a source of agglomeration effects. Useful

information can flow between near firms, designers, engineers, and managers. For foreign companies, the spillovers of information can be the flows of experience-based knowledge about how to operate efficiently in the host countries (Head *et al.*, 1995). Many authors use such clusters as California’s Silicon Valley and Boston’s Route 128 to show that technological externalities are the most obvious reason for firms to agglomerate (Krugman, 1991; Saxenian, 1994). However, by contrast with the labor pooling or intermediate goods supply that are in principle measurable, technological spillovers can be invisible and difficult to measure. It can therefore be difficult to state clearly that either technological spillovers or specialized labor play a more important role in creating high-technological clusters, for instance in Silicon Valley and the high-fashion cluster in Milan.

As anticipated by Marshall (1920), localized industry allows a pooled market for workers with specialized skills to benefit both workers and firms. David and Rosenbloom (1990) argue that an increased number of firms reduce the possibility that a worker will be unemployed for a long time. Finally, this also benefits firms by increasing the supply of specialized employees and reducing the risk of high-wage requirements from labor. Popular examples of this phenomenon are microelectronic manufacture in Silicon Valley (Saxenian, 1994) and carpet manufacture in Dalton, Georgia (Krugman, 1991).

Krugman (1991) argues that the combination of scale economies and transportation costs will motivate the users and suppliers of intermediate inputs to cluster near each other. Such agglomerations reduce the total transportation costs and make large centers of

production become more efficient and have more diverse suppliers than small ones. This will encourage firms in the same industries to concentrate in one location. Krugman points out that a historical accident makes a firm locate in a particular place, and then the cumulative location choices allow such an accident to influence the long-run geographical pattern of industry.

From these observations, it seems that firms benefit from geographical localization when agglomeration economies exist. So far, there have been two types of studies that support the existence of agglomeration benefits. The first is qualitative studies of agglomerations that identify the existence of industry clusters and document the existence of agglomeration externality mechanism (Krugman, 1991; Saxenian, 1994). The second is empirical studies that try to find whether a firm has benefits when locating near other firms in the same industry or from the same country of origin. For example, the empirical research of Head *et al.* (1995), Head and Ries (1996), Head, Ries and Swenson (1999), Crozet *et al.* (2004), Guimaraes *et al.* (2000), and Coughlin and Segev (2000) find that firms in the same industries and from the same countries of origin have tendencies to locate near each other. However, the empirical study of Shaver and Flyer (2000) shows that under the existence of agglomeration economies, many firms will perform better if they do not cluster. These authors argue that firms not only capture benefits from agglomeration economies but also contribute to agglomeration economies. Therefore, large firms with the greatest capacity in technologies, human capital, training programs, suppliers, and distributors will try to locate away from their competitors

because the benefits they gain from locating near their competitors will be less than what the competitors gain from them.

The problems firms will experience when participating in an industrial cluster can be the spillover of technology, employee defection to competitors, and the sharing of distributors and suppliers with neighboring firms. Yoffie (1993) shows that semiconductor managers decide to locate far from their competitors due to their concern that their technology might spill over to the near firms. Baum and Mezias (1992) indicate that locating closer to other hotels in Manhattan increases the survival chance of a hotel, but this benefit of agglomeration diminishes when hotel districts become crowded, pushing up prices and exacerbating competition.

In this study, based on the FDI patterns in Vietnam, three hypotheses aimed at verifying the existence of agglomeration economies are tested. The empirical research on different countries – see the studies of Boudier-Bensabaa (2005) on Hungary, Meyer and Nguyen (2005) on Vietnam, Head and Ries (1996) and Cheng and Kwan (2000) on China, Crozet *et al.* (2004) on France, and Guimaraes *et al.* (2000) on Portugal – show that new foreign firms are likely to locate near other foreign investors. By doing that, they may use the experience and performance by earlier investors as indicators of the underlying business climate at the location. Hence, it is possible to expect an empirical relationship between the location choice by a new foreign firm and the prior number of foreign firms in a particular province. Following the work of previous authors (Boudier-Bensabaa, 2005; Meyer and Nguyen, 2005; Cheng and Kwan, 2000), the stock number of foreign investors

at provincial level in the previous year in Vietnam is used as a proxy for foreign-specific agglomeration.

Hypothesis 1: *The greater the number of foreign firms already established in a province, the more likely new foreign investors are to invest in that province.*

When studying the behavior by Japanese firms in the United States, Head *et al.* (1995; 1999) find that new Japanese firms prefer to locate near both Japanese and US firms in the same industries. Moreover, Japanese firms are likely to locate near Japanese firms in the same manufacturer-led *keiretsu*². Crozet *et al.* (2004) also find similar evidence about the industrial concentrations of foreign firms in France. It seems that the benefits from technological spillovers, specialized labor markets, and the availability of input suppliers to the industry motivate firms in the same industries to cluster. Based on the empirical results of previous studies, the following hypothesis is advanced. The lagged stock number of foreign firms in the same industries by province in Vietnam are used as proxies for industry-specific agglomeration.

Hypothesis 2: *The greater the number of foreign firms in a specific industry already located in a province, the more likely new foreign investors in that industry are to locate in that province.*

Besides finding that foreign firms are likely to locate near firms in the same industries, Head *et al.* (1995; 1999) and Crozet *et al.* (2004) also show that foreign firms prefer to locate near firms from the same countries of origin. Head

et al. (1999) argue that agglomeration effects between Japanese firms may arise due to their different characteristics from the firms of other countries. For example, the preference for higher skilled workers because of a stronger desire for quality control or greater use of complex machinery might motivate a new Japanese firm to locate near earlier arrivals to be able to hire away employees trained in Japanese methods. Thus, it is possible to expect an empirical relationship between location choice by a new foreign firm and the prior number of foreign firms from the same countries of origin in a particular province. Following the work of Crozet *et al.* (2004), the lagged stock number of foreign firms in Vietnam from the same countries of origin by province is used as a proxy for country-specific agglomeration.

Hypothesis 3: *The greater the number of foreign firms from a specific country already located in a province, the more likely new foreign investors from that country are to locate in that province.*

3. Description of the Data

The dataset that is used in this study is obtained from the yearly surveys of the enterprises operating in Vietnam conducted by the General Statistics Office of Vietnam since 2000. These are comprehensive surveys covering all state enterprises, non-state enterprises that have equal or greater than 10 employees, 20% of sampled non-state enterprises with fewer than 10 employees, and all foreign enterprises across 64 provinces and cities in Vietnam.

² Keiretsu can be considered as industrial or vertical groups, i.e. those headed by large manufacturing companies whose members consist largely of component suppliers.

The contents of the surveys cover indicators to identify enterprises including their name, address, type, and economic activities of the enterprises, and indicators to reflect production situations of the enterprises such as their employees, income of employees, asset and capital source, turnover, profit, contributions to the state budget, investment capital, taxes and other obligations to the government, job training, and evaluations on the investment environment, etc.

The sample includes 737 foreign investors that started their activities in 2007. The previous investors that are used to form the agglomerations are the cumulative number of foreign or Vietnamese firms up to 2006. In this study, firms from all industrial sectors in 4-digit industries and in all forms of ownership such as 100% foreign-owned and joint venture firms are included in the regression models. Most of the new foreign firms concentrated in Ho Chi Minh City and its two neighboring provinces, Binh Duong and Dong Nai that belong to the Southeast region, and Hanoi that belongs to the Red River Delta region. While just these four provinces and cities accounted for 72.5% of the 737 new foreign firms in 2007, 24 out of the 64 provinces in Vietnam had no new foreign investors in 2007. Most of these provinces are in the North Central Coast, the Northwest and the Mekong River Delta regions.

4. Methodology and empirical results

Various modeling approaches and levels of aggregation have been used for analyzing industrial location such as ordinary least squares (Boudier-Bensabaa, 2005), conditional logit model (Head *et al.*, 1995; Crozet *et al.*, 2004; Guimares and Figueiredo,

2000), negative binomial regression model (Meyer and Nguyen, 2005; Coughlin and Segev, 2000), and Generalized Method of Moments (Cheng and Kwan, 2000). These procedures have been applied to foreign direct investment aggregated to the country level or the provincial level and, more frequently in recent years, to the firm level. By virtue of possessing a large and detailed dataset, this study can use the conditional logit model to examine the three hypotheses at the firm level

4.1. The model and variables

4.1.1. The model

The conditional logit model is widely used in previous empirical works on agglomeration effects (Head *et al.*, 1995; Crozet *et al.*, 2004; Shaver and Flyer, 2000; Guimaraes *et al.*, 2000). This model is derived from the result of McFadden (1974) with the assumption that each investor chooses a location that will yield the highest profit. Profit depends on the available inputs that go into firms' production function including agglomeration effects stemming from economic activities of near similar firms. In this model, the information about the location choice that an investor made and attributes for the chosen location and other locations in the choice set are exploited.

Following Head *et al.* (1995), the study considers that the investor i , if it locates in province j , will derive an expected profit of Π_{ij} . This investor chooses the location with the greatest expected profitability that can be represented as followed:

$$\Pi_{ij} = \alpha_j + \beta'X_{ij} + \varepsilon_{ij}$$

where α_j includes the characteristics of province j . α_j is considered as province-specific endowment effects that determine the attractiveness of provinces to investors². X_{ij} is agglomeration variables measured as the count number of firms cumulated up to 2006. Each measure varies across investors i , because investors differ by industry and country of origin. ε_{ij} is an investment location specific random disturbance that is attributable to errors associated with imperfect perception and optimization by decision makers and unobservable location characteristics that affect the profitability of locating in a given site.

The investor i prefers the location j among the choice set M if it yields higher profits than any other possible choices:

$$\Pi_{ij} > \Pi_{ik} \quad \forall k, k \neq j, \text{ and } j, k \in M.$$

The probability of choosing the location j is thus:

$$\text{Prob}(\Pi_{ij} > \Pi_{ik}) \quad \forall k, k \neq j.$$

McFadden (1974) shows that if, and only if, ε_{ij} is distributed as a Type I Extreme Value independent random variable, then the probability that a location j yields the highest profitability for investor i among all the alternative locations in the choice set M is presented by the logit model:

$$\text{Pr}(ij) = \frac{\exp(\alpha_j + \beta' X_j)}{\sum_M \exp(\alpha_m + \beta' X_{im})} \quad j, m \in M$$

The maximum likelihood techniques are used to estimate endowment effects and agglomeration effects.

4.1.2. Dependent variables

The dependent variable is the province chosen by each foreign firm that was newly created in 2007. In total, there were 737 new foreign firms that distribute in 40 provinces among 64 provinces in Vietnam. Conditional logit model requires that all choices be selected at least once. So, 24 provinces that are not selected any time from the choice set are removed. Most of these provinces are from the Northeast, the Northwest, the North Central Coast, and the Mekong River Delta regions. The other 40 provinces create a set of unordered choice for each foreign firm, say, $M = 1, 2, \dots, 40$. Let y_{ij} ($j \in M$) be a dependent variable for the choice actually chosen by the i^{th} foreign firm. That is, $y_{ij} = 1$ if foreign firm i chooses the location j , and $y_{ij} = 0$ for $j' \neq j; j, j' \in M$. Totally, we have 29480 observations that is the product of 737 observation and 40 provinces.

4.1.3. Agglomeration variables

The study estimates the effects of three types of agglomerations on the location choices by foreign investors in Vietnam. In each case, the agglomeration is measured as cumulative counts of firms up to 2006. It is noted that cumulated up to 2006, there were 4200 foreign firms. Following the work of Guimaraes *et al.* (2000), Head *et al.* (1995) and Crozet *et al.* (2004), there are three types of agglomeration effects as follows:

- Foreign-specific agglomeration: the cumulative number of foreign firms by province up to 2006 is used as a proxy.
- Industry-specific agglomeration: the cumulative number of foreign firms in

² Head *et al.* (1995) show that in both theories of localization, endowment-driven localization and agglomeration model of industry localization, firms in the same industry cluster geographically. However, only in the presence of agglomeration externalities does the clustering add to the attractiveness of the location.

the same 4-digit industries by province up to 2006 are used as proxies.

- Country-specific agglomeration: the cumulative number of foreign firms from the same countries of origin by province up to 2006 is used as a proxy.

4.1.4. Control variables

It is expected that provincial endowment factors can influence a firm's desire to invest in a particular province, such as the size of the provincial economy, the size of the provincial market, infrastructure, human resources, and geographical location.

For the above reason, following the work of Meyer and Nguyen (2005), the control variables that are included in the regression model are the size of local consumer market measured by the population of province, GDP growth rate by province, human capital development measured by the number of undergraduate students by province, and infrastructure conditions proxied by the distance to the nearest big harbor. These data are cumulated up to 2006 and taken from the Statistical Yearbooks of Vietnam, the GSO. Table 2 and Table 3 present the descriptive statistics and the correlations

Table 2: Descriptive statistics

Variables	Description	Mean	S.D.	Min	Max
1. Choice	Dummy variable which equals 1 if firm i chooses location j and equals 0 for other location j' , $j \neq j'$ and j, j' belong to the location choice set	0.02	0.15	0	1
2. Foreign firm	The cumulative number of foreign firms by province up to 2006	123.27	317.54	1	
3. Same industry	The cumulative number of foreign firms in the same 4-digit industries by province up to 2006	3.58	16.67	0	216
4. Same country	The cumulative number of foreign firms from the same countries of origin by province up to 2006	21.70	74.54	0	422
5. Population	Average population in thousands by province in 2006	1,574.61	1236.99	401.50	6,611.60
6. Student	Number of undergraduate students by province in 2006	32,810.84	98,226.38	558	529,211
7. GDP	GDP by province in 2006	12.44	2.62	6.90	18.90
8. Distance to harbor	The distance in km to the nearest big harbors by province	53.64	78.12	0	303

of variables used in this study. There are quite high correlations between independent variables, suggesting that the model can have multi-correlation problem that can make the

estimated results inefficient. However, the observations of the model are quite large, therefore we can ignore the effect of multicollinearity problem (Wooldridge, 2003).

Table 3: Correlations in the dataset

Variable	1	2	3	4	5	6	7	8
1. Choice	1							
2. Foreign firms	0,41	1						
3. Same industry	0,34	0,53	1					
4. Same country	0,32	0,68	0,42	1				
5. Population	0,33	0,78	0,44	0,48	1			
6. Student	0,26	0,62	0,32	0,34	0,73	1		
7. GDP	0,30	0,74	0,41	0,45	0,77	0,65	1	
8. Habor distance	-0,13	-0,34	-0,18	-0,24	-0,34	-0,17	-0,30	1

4.2. Empirical results

Table 4 presents the agglomeration coefficients generated by maximum likelihood estimation. The highly statistically significant coefficients of the variables *foreign firm* proxied by the cumulative number of foreign firms by province up to 2006 reveal that new foreign firms are likely to locate in provinces where already existed a relatively large number of foreign firms.

In addition, the variable *same industry* proxied by the cumulative number of foreign firms in the same 4-digit industries up to 2006 has highly statistical significance. This result shows that the locations of new foreign investments are influenced by the previous location choices by other foreign firms in the same industries. Head *et al.* (1995) consider this phenomenon as the “follow the leader” pattern of foreign firms; that is difficult to interpret as anything other than agglomeration effects.

The positive and statistically significant coefficient of the variable *same country*, the cumulative number of foreign firms from the same countries of origin up to 2006, indicates that new foreign firms benefit from locating near firms from the same countries of origin. The larger coefficient of the variable *same industry* than that of the variable *same country* suggests that the benefits foreign firms gain from industry-specific agglomerations are higher than from country-specific agglomerations.

Regarding the control variables, all variables are statistically significant except. These results indicate that the characteristics of the provinces are important determinants in attracting foreign investors. Foreign firms tend to locate in locations that have high GDP, large market measured by numbers of population and advanced human resource proxied by number of students. Additionally, the negative

sign of the variable *distance to harbor* means that the nearer a province is to a big harbor, the more attractive it is to foreign investors. This evidence suggests that foreign investors prefer to locate in a place with upgraded infrastructure to reduce transportation costs.

Table 4: Agglomeration effects in the conditional logit model

Variables	Results
Foreign firm	0.007** (0.025)
Same industry	0.017*** (0.000)
Same country	0.0075*** (0.000)
GDP	-5.74e-09* (0.088)
Population	-0.0004** (0.001)
Student	4.56e-06*** (0.000)
Distance to harbor	-0.009*** (0.000)
Pseudo R2	0.31
No. of choosers	737
No. of choices	40

Note: *p*-value in parentheses with significance at the *** 1%, ** 5%, and * 10% levels.

5. Conclusions

This study argues that agglomeration externalities influence the location decisions by foreign firms. The empirical results show that the location choices by new foreign firms in Vietnam are affected by the locations of the prior foreign investments in general and by those of firms in the same industries and from

the same countries of origin in particular. These findings hold even when province-specific endowment effects are controlled by using the variables indicating the characteristics of each province.

These findings are consistent with the empirical results that are estimated for foreign investments in developed countries such as the United States, France, and Portugal (Head *et al.*, 1995; Crozet *et al.*, 2004; Guimaraes *et al.*, 2000). It indicates that the behavior by foreign investors in both developed and developing countries are probably similar. Their same motivations are to obtain the highest benefits when investing abroad. Apparently, the positive externalities such as technological spillovers will induce foreign firms to cluster in a particular region. Moreover, locating near each other creates a network of foreign firms that allows a foreign firm to access suppliers and to exchange information more easily. This network may consist of foreign firms in the same industries that are considered as industrial or vertical groups. These groups might be headed by large manufacturing companies whose members are component suppliers. Vertical linkages can create a pool of specialized intermediate inputs to an industry in greater variety and at lower cost as suggested by Marshall (1920). So, for example, a firm that produces plastic auto parts might be attracted to a province that has considerable auto production even if there is no concentration of plastic parts producers in that province (Head *et al.*, 1995).

This research contributes to the literature on agglomeration economies, location and foreign direct investment in some aspects. To the best of our knowledge, this is one of a very few studies of agglomeration effects on location choices by foreign investors in developing and

transition economies. The empirical findings on agglomeration economies may be useful for provincial authorities in designing policies to attract more foreign direct investment. Benefits of agglomeration externalities suggest that authorities should create policies to draw *initial* investments into concentrated production regions such as industrial zones. Then the cumulative number of foreign firms will create positive agglomeration externalities and make that region more attractive.

This study remains two limitations. The first is that the empirical results refer to only 2007.

In order to see whether the results apply to other time periods, future research will have to work with larger dataset covering more years, so as to increase the cross time variance in the set of agglomeration variables. The second limitation is that we have studied the location decisions by foreign firms only at the provincial level. The conditional logit model may work better with a smaller choice set. Therefore, future research should extend to macro areas by looking at the location choices by foreign firms at the regional level. □

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