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Location Determinants of Greenfield Foreign Investment in the United States: Evidence at the Metropolitan Statistical Area Level

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Abstract

This paper explores factors influencing greenfield foreign investment's location decisions using metropolitan statistical area data in the U.S. from 2003 to 2009. The findings suggest that greenfield foreign plants in the U.S. favor metropolitan areas with greater market demand and larger populations. In addition, high levels of existing manufacturing activities and high wages appear to be attractive to foreign firms as well. However, economic distressed areas and agglomeration in service industries fail to have significant effects on the location choice of greenfield FDI.

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1. Introduction

The U.S. continues to be the top destination of foreign direct investment (FDI), with $168 billion inflows of FDI in 2012 ranking the first in the world (UNCTAD World Investment Report 2013). Benefits of FDI include employment addition, wage increase, transfer of tangible and non-tangible assets, productivity and economic growth. Hence, local communities in the U.S. compete fiercely to attract foreign investment in order to exploit such benefits. Generous incentive packages including factor subsidies, tax breaks, infrastructure construction and employee training are offered by local governments to entice foreign firms to invest in their areas. An understanding of factors influencing location decisions of multinational corporations (MNCs) is important to local governments who wish to foster economic development within their regions. A significant number of studies have examined location determinants of FDI in the U.S. including Glickman and Woodward (1988), Coughlin et al. (1990, 1991), Friedman et al. (1992, 1996a, 1996b), Woodward (1992), Head et al. (1995, 1999), Hines (1996), Chung and Alcacer (2002) and Zhuang (2014).

All of the aforementioned studies focus on state characteristics and their effects on FDI spatial distribution. The only exceptions are Woodward (1992) using county level data in 1980 and Chung and Alcacer (2002) including a secondary analysis at a finer geographic level in the robustness check. There is rare evidence on location characteristics of foreign firms' location choice at the more disaggregated level. In addition, the above studies use data in the late 1970s to early 1990s except Zhuang (2014) using greenfield FDI data in the early 2000s. Considering that the distribution of foreign investment in a state is not random or even and local governments compete fiercely for the external resource of capital, it is crucial to understand the location determinants to foreign firms at the sub state level. The major contribution of this paper is to use updated FDI data at the metropolitan statistical area (MSA) level to explore the location determinants of newly opened foreign plants in the U.S. To my best knowledge, there is scarce evidence on location characteristics attracting greenfield foreign firms at the sub-state level after the 2000s. This paper fills in the paucity in the literature and addresses the question interested to local government on what factors intrigue potential foreign investment.

This paper focuses on greenfield FDI in the U.S. and includes greenfield FDI in all industries for two reasons. First, the attention on new foreign plants in the U.S. is because "greenfield plants clearly require an explicit location decision, while other types of investment, such as mergers, acquisition, joint ventures, and plant expansions, may not" (Guimaraes et al. 2000, p.118). Second, more and more foreign investments occur in nonmanufacturing industries in the U.S. over time. The concentration of previous studies on manufacturing foreign plants except Zhuang (2014) may be due to the lion share of manufacturing FDI in aggregate foreign investment in the U.S. in the 1980s. For example, the share of manufacturing employees in foreign affiliates was 54 percent in 1980. However, the employment share of manufacturing FDI declined to 39 percent in 2003. With service industries gradually gaining more weight in foreign investment in the U.S., just focusing on the FDI data in manufacturing industries fails to provide a full picture of how location characteristics affect foreign firms' decisions on where to invest. The data used in this study span the same period as Zhuang (2014), but are broken down to the MSA level. Zhuang (2014) use state level data but does not answer questions pertinent to local government on what metropolitan characteristics attract foreign firms. Furthermore, the random-effects Poisson model used in this study is more appropriate for the nature of count data compared to the random-effects GLS model in Zhuang (2014).

Findings of this paper suggest that foreign firms tend to locate in metropolitan areas with greater market demand, larger populations, higher wages and more existing manufacturing activities. The finding of a positive impact of wages on foreign firms' location decisions differs with the conventional wisdom and may indicate that foreign firms in the 2000s are attracted to where the productivity of workers is higher. In addition, there is considerable regional heterogeneity in foreign firms' location patterns.

The remainder of the paper proceeds as follows. Section 2 presents the econometric model and section 3 discusses data used in the analysis. Section 4 presents the regression results and section 5 concludes the paper.

2. Econometric Model

To analyze the location decisions of greenfield foreign investment, I consider the number of greenfield foreign firms in the *i*th MSA in year *t* (FDI_{it}) conditioned on a group of location characteristics. Since the dependent variable contains count data and does not have excessive zeros, a random-effects Poisson model is utilized to estimate the effects of metropolitan area characteristics on foreign firms' location decisions.

$$\Pr(Y_{it}=FDI_{it}) = \frac{exp^{-\lambda_{it}} \times \lambda_{it}^{FDI_{it}}}{FDI_{it}!} \quad (1)$$

λ_{it} is log-linearly dependent on the explanatory variables as follows;

$$\ln\lambda_{it} = \beta_0 + \beta_1 \ln RGDPP_{it} + \beta_2 \ln POP_{it} + \beta_3 \ln WAGE_{it} + \beta_4 URATE_{it} + \beta_5 MANU\_SHARE_{it} + \beta_6 ERVICE\_SHARE_{it} + \delta_i + \gamma_t + \varepsilon_{it} \quad (2)$$

The independent variables in equation (2) are a set of location characteristics that are proposed to be attractive to foreign firms' decisions in the FDI literature. First, I include the logarithm of real gross domestic product (GDP) per capita (RGDPP) to measure local market demand. Its expected sign is positive if foreign firms plan to serve local markets. Yet this variable would be less important if foreign firms intend to serve the national market. Second, the logarithm of the population size (POP) is taken into account because the population not only reflects the market size but also implies the size of labor force both of which are factors concerned by foreign investors. Therefore, the coefficient of population is anticipated to be positive.

Third, the logarithm of the average wage (WAGE) per job is used to measure the cost of labor. The coefficient on wage rate is ambiguous. On one hand, high wage rates indicate higher labor costs and are likely to deter the inflows of foreign investment. Glickman and Woodward (1988), Coughlin et al. (1991) and Friedman et al. (1992) find negative coefficients on wages. On the other hand, higher wages might be a reflection of higher skills possessed by local workers and thus higher productivity. In this way, higher wages may be attractive to foreign firms. Chung and Alcacer (2002) find a positive and statistically significant coefficient on average weekly wage in the location study.

Fourth, the unemployment rate (URATE) is an implication of local labor availability. The unemployment rate is usually perceived to have a positive effect on location decisions of foreign firms. As the higher unemployment rate implies more potential workers available in the local labor market, it is attractive to foreign firms. However, Woodward (1992) proposes that the role of unemployment variation as a location determinant at the metropolitan level could be ambiguous. Because areas with high unemployment rates are associated with less-competitive industrial conditions and a lower quality of life, foreign firms may be discouraged by high unemployment rates.

Lastly, I include the share of manufacturing employment in total employment (MANU_SHARE) and the share of employment in service-producing industries (SERVICE_SHARE) in total employment to capture the agglomeration effects in manufacturing and service activities respectively. The two variables are expected to have positive coefficients if newly open foreign plants prefer to locate in areas with high level of existing manufacturing or service activities.

In addition, I account for MSA specific effects by employing MSA-specific constants (δ_i). This should capture a number of sources of unobserved variation between MSAs, such as, the accessibility to infrastructure, educational attainment, tax burden and land area. Furthermore, I control for time fixed effects (γ_t) to capture unobservable effects in a specific year that systematically affect all MSA, such as federal policy, aggregate economic activity.

3. Data

Data on greenfield FDI and location characteristics are compiled from different sources. First, the number of greenfield foreign projects in the U.S. cities is provided by fDi Markets, a database from the Financial Times tracking cross-border greenfield investment. The data on greenfield FDI in the top 200 U.S. cities are available over 2003 – 2009 amounting to 3071 greenfield investment projects. Overall a total of 5617 new foreign firms were established in the U.S. over the sample period. Sample data in this study cover about 55 percent of greenfield FDI projects into the U.S. Furthermore, I match the cities with the corresponding MSAs defined by the Office of Management and Budget in 2003.

Data on real GDP per capita, population, wages and manufacturing employment are obtained from the website of the Bureau of Economic Analysis (BEA). Real GDP per capita is in 1,000 chained 2009 dollars and wages are measured as average wage per job in 1,000 dollars. The manufacturing employment share is constructed by dividing the number of manufacturing jobs by the number of non-farm employment and multiplying by 100. Population is scaled at 1,000,000 people. Data on employment in service industries and unemployment rates are from the website of the Bureau of Labor Statistics (BLS). Similar to the employment share of manufacturing industries, I divide the service employment by the total non-farm employment and multiply by 100 to generate the employment share of service industries.

Table 1 presents descriptive statistics of variables. There are 150 MSAs included the sample. From 2003 to 2009, the mean number of greenfield FDI projects in the U.S. MSA is 5.81 with zero project at the minimum and 107 projects at the maximum. The mean real GDP per capita is 47230 chained 2009 dollars and the mean average wage per job is 40170 dollars. The mean population is 1,530,000 people and the mean unemployment rate is 5.74 percent over the sample period. Table 2 shows the mean values of dependent and independent variables in the Northeast, Midwest, South and West regions[1]. The Northeast region received the most greenfield FDI with an average of 11.5 new projects per year; while the Midwest saw the fewest new FDI projects averaging at 4.24 per year. The Northeast region had the highest real GDP per capita and wages and the largest population; whereas, the South region exhibited the lowest real GDP per

[1] The northeast region includes Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. The Midwest region is comprised of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. The South region has the following states: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. The West region includes Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

capita and wages and the smallest population. The employment share in services in 2003–2009 was highest in the Northeast, yet lowest in the Midwest. On the other hand, the employment share in manufacturing was highest in the Midwest and lowest in the West over the sample period.

Table 1 Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
FDI (count)	519	5.81	10.52	0.00	107.00
RGDPP (1,000 chained 2009 dollars)	882	47.23	12.77	17.91	99.83
POP (1,000,000)	882	1.53	2.43	0.07	19.47
Wage (1,000 Dollars)	882	40.17	8.00	23.72	82.497
Urate (100%)	825	5.74	2.08	2.20	15.30
MANU_SHARE (100%)	876	9.02	4.66	1.51	29.90
SERVICE_SHARE (100%)	876	70.24	6.39	52.72	85.07

Table 2 Regional Statistics

Variable	Northeast	Midwest	South	West
FDI (count)	11.50	4.24	4.50	6.66
RGDPP (1,000 chained 2009 dollars)	54.78	48.18	44.69	47.13
POP (1,000,000)	2.66	1.32	1.20	1.83
Wage (1,000 Dollars)	46.07	39.57	38.10	41.86
Urate (100%)	5.19	6.13	5.42	6.22
MANU_SHARE (100%)	8.41	12.35	8.28	7.06
SERVICE_SHARE (100%)	73.97	69.32	69.70	70.32

4. Empirical results

4.1 Basic results

The panel Poisson estimated results of equation (1) are presented in Table 3. In regression (1), real GDP per capita and local population have positive and significant effects on attracting new foreign firms. In regression (2) where wages are included, the coefficients of population and wages are positive and significant at the 1 percent level. The impacts of population and wages remain positive and statistically significant in the rest of regressions. However, it is noticeable that the impact of real GDP per capita diminishes dramatically and becomes insignificant in the regressions including wages. The insignificant coefficient of real GDP per capita may be attributed to the high correlation with wages.[2] The metropolitan areas with higher real GDP per capita show higher level of economic development and thus pay higher wages. Hence, I estimate equation (1) excluding real GDP per capita and present the random-effects Poisson results in regression (6). The population and wages still exhibit positive and significant coefficients. In regression (7) where wages are excluded, real GDP per capita and the population have positive

[2] The correlation coefficient between the logarithm of real GDP per capita and the logarithm of wages is 0.81.

and significant effects on greenfield investment.

The regressions also reveal that the share of manufacturing employment is an important determinant attracting greenfield investment. The coefficient of the share of manufacturing employment is positive and significant in regressions (4) – (7). It indicates that newly opened foreign plants are still attracted by dense existing manufacturing activities even though the share of FDI in manufacturing industries declines over time. However, the unemployment rate and the share of service employment fail to present significant effects throughout the regressions.

Overall, the basic Poisson estimated results indicate that greenfield foreign investment in the U.S. are attracted to the metropolitan areas with higher real GDP per capita, greater population sizes, higher local wages and more manufacturing activities. Nevertheless, the sample data show that newly opened foreign affiliates have not preferences for areas with higher unemployment rates or higher share of service industries.

Table 3 Basic Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log RGDPP	0.75608***	-0.13328	-0.47037	-0.49754	-0.47595		0.63141**
	[0.268]	[0.419]	[0.468]	[0.466]	[0.473]		[0.316]
Log POP	0.60274***	0.53337***	0.48449***	0.56237***	0.57130***	0.57720***	0.68574***
	[0.056]	[0.062]	[0.065]	[0.075]	[0.083]	[0.083]	[0.076]
Log WAGE		1.72547***	2.32308***	2.15339***	2.12929***	1.60355***	
		[0.641]	[0.679]	[0.687]	[0.693]	[0.457]	
URATE			-0.03577	-0.04354	-0.04276	-0.02967	-0.02359
			[0.029]	[0.029]	[0.030]	[0.026]	[0.029]
MANU_SHARE				0.03247**	0.03115*	0.03010*	0.03734**
				[0.016]	[0.017]	[0.017]	[0.017]
SERVICE_SHARE					-0.00298	-0.00510	-0.00747
					[0.012]	[0.012]	[0.012]
Constant	-2.17438**	-	-	-	-	-4.78459**	-1.37560
		4.98041***	5.59775***	5.14711***	4.92789***		
	[1.033]	[1.489]	[1.650]	[1.662]	[1.871]	[1.862]	[1.459]
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Area Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	519	519	495	489	489	489	489

Notes: Standard errors are reported in brackets, *** p<0.01, ** p<0.05, * p<0.1.

In addition, the exploration of MSA dummy coefficients reveals that using Albany-Schenectady-Troy, NY as the benchmark, 35 MSAs receive significantly fewer FDI projects; 26 MSAs are not significantly different from the benchmark; and 32 MSAs receive significantly more FDI projects after controlling for the location characteristics.[3] The summary results are displayed in Table 4. In addition, I categorize the MSAs into their respective states. Comparison of the summary statistics in Table 4 and Table 2 shows that more MSAs in the Midwest and South receive greenfield FDI projects, but MSAs in the Northeast and West receive more numbers of greenfield foreign investment over the sample period.

Table 4 Regional Distributions of MSA Dummy Coefficients

Regions	Significantly fewer	Insignificantly Different	Significantly higher

[3] To obtain the MSA dummy coefficients, I estimate equation (1) using the Poisson estimator controlling for the MSAs. 94 MSAs are included in the regressions. However, it is worthwhile to note that the estimated coefficients of explanatory variables are quite different from the random effects Poisson estimated results. For the brevity of the paper, the estimated results are available upon request.

Northeast	5	1	2
Midwest	10	6	6
South	13	14	16
West	7	5	8
Total	35	26	32

4.2 Regional Hetetrogeneity

To explore the heterogeneity of location decisions of greenfield FDI, I estimate equation (1) for the Northeast, Midwest, South and West respectively. The random-effects Poisson estimated results are reported in Table 5. The positive pull-in effect of population is significant in the Northeast, South and West. Wages are significant factors influencing the investment decisions of foreign firms in the Northeast, Midwest and West. However, new foreign firms are discouraged by high real GDP per capita and unemployment rates in the Midwest. The share of service employment shows a negative and significant coefficient only in the Northeast, but insignificant in other regions. The positive effect of the share of manufacturing employment seems to be sensitive that the employment share in manufacturing fails to present significant effects across the regions.

Table 5 Regional Results

	(1) Northeast	(2) Midwest	(3) South	(4) West
Log RGDPP	-2.51681	-3.28841**	-0.45567	0.52991
	[1.553]	[1.455]	[0.744]	[0.588]
Log POP	0.84393***	0.39873	0.72342***	0.31926***
	[0.134]	[0.317]	[0.138]	[0.108]
Log WAGE	6.21746***	6.86970**	0.52555	2.39880***
	[1.741]	[2.679]	[1.284]	[0.816]
URATE	0.26787	-0.19954**	-0.02214	-0.01392
	[0.225]	[0.082]	[0.045]	[0.057]
MANU_SHARE	-0.09754	0.02892	0.03792	-0.01569
	[0.075]	[0.038]	[0.025]	[0.031]
SERVICE_SHARE	-0.09614***	-0.00662	-0.00475	0.01773
	[0.032]	[0.043]	[0.015]	[0.020]
Constant	-6.40710	-10.25786	0.81885	-11.28728***
	[5.097]	[10.648]	[3.337]	[1.820]
Year fixed effects	Yes	Yes	Yes	Yes
Area fixed effects	Yes	Yes	Yes	Yes
Observations	49	108	226	106

Notes: Standard errors are reported in brackets, *** p<0.01, ** p<0.05, * p<0.1.

5. Conclusion

Using greenfield FDI data at the MSA level over the period 2003 – 2009 in the U.S., this study explores location determinants of greenfield foreign establishments at a finer geographic level compared to prior studies. This paper investigates the impact of market demand, cost of labor, labor availability and industry agglomeration on the location choice of greenfield foreign investment.

The findings suggest that foreign firms favor areas exhibiting greater market demand and providing more labor force. The results are consistent with prior studies including Coughlin et al. (1991), Friedman et al. (1992), Woodward (1992), Head et al. (1999) and Chung and Alcacer

(2002). This study also finds that new foreign investments are attracted to locations with more existing manufacturing activities. The finding of agglomeration effects in manufacturing industries corroborates Coughlin et al. (1991), Woodward (1992), Head et al. (1995, 1999), Chung and Alcacer (2002) and Zhuang (2014). Furthermore, this study shows that higher wages do not deter the inflows of foreign firms; instead foreign firms respond positively to higher wages in the area. This result contradicts earlier findings on manufacturing foreign firms in the 1970s and 1980s such as Glickman and Woodward (1988), Coughlin et al. (1991), Friedman et al. (1992), Woodward (1992) and Friedman et al. (1996) where higher wages implies higher labor costs that discouraged new foreign establishments. As higher wages may be an indicator of higher skills and productivity of the work force, the positive and significant coefficients of wages suggest the pull-in effects of more productive labor force on foreign firms, similar to other recent studies on FDI location choice for Portugal by Guimaraes et al. (2000), for the U.S. by Chung and Alcacer (2002) and Zhuang (2014) and for the United Kingdom by Devereux et al. (2007). In the explorations of location determinants by regions, considerable regional heterogeneity is observed that traditional variables, population and wages appear to be the most significant pull-in factors for new foreign firms with significant coefficients in three out of four regions.

This study suggests some changes in foreign firms' location preferences compared to earlier studies using FDI data in the 1970s and 1980s. Higher wages do not discourage new foreign plants in the 2000s whereas higher wages are found to hinder foreign investment in the 1970s and 1980s. Higher wages can be associated with higher educational attainment or stronger unionization. Further studies controlling for these two factors would be helpful to understand whether the positive effect of wages is attributed to better educational workers. Second, the unemployment rate has no significant effects or even shows a negative impact in a subsample regression for the Midwest. This is quite contrary to prior findings of positive effects of the unemployment rate. A high unemployment rate not only indicates economic distress and more available workers that were appealing to foreign investment in the 1970s and 1980s, but also a lower quality of life that may discourage foreign investment. Hence, the inclusion of a measure of life quality in the metropolitan area in future studies would be helpful to deepen the understanding of foreign firms' location decisions.

With local government being part of efforts to attract FDI, the information on location determinants of FDI at the MSA level is crucial for local authority to formulate better promotion policies. Large local population and more active existing manufacturing are advantageous for MSAs to promote to foreign firms. In addition, higher local wages if accompanied with statistics on higher educational attainment are attractive to foreign firms. By understanding their advantages to foreign investors, local government may have better bargaining power and pay less to successfully attract foreign investment.

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