

Brakman, Steven; Garretsen, Harry; van Marrewijk, Charles

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The Location of Cross-Border Mergers & Acquisitions in the USA

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Steven Brakman
Harry Garretsen
Charles Van Marrewijk

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Abstract

The research on the location choice for Foreign Direct Investment (FDI) is traditionally restricted to a choice between countries. The within-country location choice is less prominent in the literature. If within-country location decisions are considered it is mostly limited to Greenfield investments. The vast majority of FDI, however, takes place in the form of cross-border Mergers & Acquisitions (M&As), and for this form of FDI (empirical) research on location choice within countries has been neglected. In this paper we analyze the within country location-target selection of M&As in the USA. Extending Guadalupe (2012), by introducing location choice, and applying the consequences of super-modularity of our model we analyze the within country location choice of (cross-border) M&As. Using a detailed firm level data set for all manufacturing sector M&As across the USA for the period 1985-2012, we compare location choices of cross-border M&As to that of national M&As. We find that: cross-border M&As are more spatially concentrated than national M&As, that cross-border M&As sort into larger agglomerations across the USA than national M&As, and that for both forms of M&As location specific market access in the USA as well as access to the rest of the world (through transport hubs) are key drivers for target selection.

JEL-Code: F100, F120, L130.

Keywords: cross-border mergers and acquisitions, location choice, agglomeration.

*Steven Brakman**
University of Groningen
Faculty of Economics & Business
P.O. Box 800
The Netherlands – 9700 AV Groningen
s.brakman@rug.nl

Harry Garretsen
University of Groningen
Faculty of Economics & Business
The Netherlands – 9700 AV Groningen
j.h.garretsen@rug.nl

Charles Van Marrewijk
International Business School Suzhou
Xi'an Jiaotong – Liverpool University
PR China – Suzhou, 215123
charles.vanmarrewijk@xjtlu.edu.cn

*corresponding author

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1 INTRODUCTION

The vast majority of foreign direct investment (FDI) takes place in the form of cross-border mergers and acquisitions (M&As), see Evenett (2004). Analyzing the determinants and consequences of M&As is part of a large and growing literature in both (international) economics and (international) business. In economics, the dominant industrial organization (IO) literature does, however, typically not deal with the *cross-border* aspect of M&As, but instead concentrates on national M&As (Salant et al., 1983; O'Brien and Shaffer, 2005; Davis and Wilson, 2008; Egger and Hahn, 2010). A relatively small literature explicitly tries to include the *cross-border* aspect of M&As, but neglects the role of country factors that are central in international economics and international business to explain the structure and variation of cross-border transactions (Anand and Delios, 2002; Nocke and Yeaple, 2007, 2008, Bertrand and Zitouna, 2006; Fugmagalli and Vasconcelos, 2009, Halverson, 2012). The impact of country wide differences on cross-border M&As is taken explicitly into account by Neary (2004, 2007) who focuses on differences in comparative advantage between countries in a general equilibrium model to explain the occurrence of cross-border M&As. Empirical support for this idea is found by Brakman et al (2013), see also Blonigen et al (2014). In the international business literature – ever since the introduction of Dunning's Ownership-Location-Internalization (OLI) framework – the mode of foreign entry and the choice of a foreign location have been central, but not explicitly modelled, as the OLI framework is more a taxonomy of relevant elements for location choice than a model (see for example Dunning, 2000).²

Both for the modern international business and international economics literature, however, whenever the location of cross-border M&As is taken into account, it usually refers to the host country as a whole. Where to locate the M&A *within* the host country is not analyzed. This amounts to assuming that if foreign firms have decided to engage in an M&A they choose a country but are indifferent regarding the target location within that country. This observation is the starting point for the present paper. In contrast to this observation with respect to cross-border M&As, the within country location choice with respect to greenfield FDI has been analyzed in depth. The seminal study by Head et al. (1995) was pivotal, and initiated a large and growing body of literature; see for example Fontagne and Mayer (2005); Basile et al., (2008); Defever, (2006); or Mataloni, (2011). Similar analyses for cross-border M&As are largely absent and this is striking because the bulk of FDI is in the shape of cross-border M&As. *A priori*, there is no reason to assume that the location decision of greenfield investments and M&As are similar. M&As, by definition, merge with or acquire *existing* firms at a specific location, whereas greenfield investments can, in principle, locate anywhere.

² In the international business literature, see for instance Beugelsdijk et al (2010) or Iammarino and McCann (2013) for a plea to include the within-country location choice of FDI.

In this paper we analyze the location patterns of cross-border and, as a benchmark, national M&As within the USA. We use the global mergers and acquisitions database of Thomson Financial Securities Data that includes location information on M&As. We will analyze all manufacturing cross-border and national M&As within the USA for the period 1985-2012. Our data set covers 192,000 individual M&As. Building on and extending a model by Guadalupe et al. (2012), adapted to include location choice, we provide three novel pieces of empirical evidence. First, we give new descriptive statistical evidence by comparing the location patterns of M&As with those of US firms in general using the Ellison-Glaeser index (Ellison and Glaeser, 1997, 1999). Second, we use two recent tests – an elasticity test and a pairwise comparison test – suggested by Davis and Dingel (2014) to show that cross-border M&As choose different – larger – locations than national M&As. These tests are based on the super-modularity of our model set-up. Third, we estimate the link between location patterns and location determinants for both national and cross-border M&As. We find that M&As in general are more spatially concentrated than other US firms and that cross-border M&As are indeed more spatially concentrated than national M&As. We also establish that cross-border M&As sort into larger agglomerations across the USA than national M&As, supporting the implication from Davis and Dingel (2014). And, finally, with respect to the determinants of cross-border M&As, our estimations indicate that market access in the USA as well as, through the vicinity of an international airport, access to the rest of the world are key drivers for the target selection by acquiring firms.

The structure of the paper is as follows. In Section 2 we motivate the main hypotheses of the paper. The data are illustrated in section 3, and the data appendix. Sections 4-6 present the main findings: section 4 applies the Ellison-Glaeser index to the data, section 5 provides evidence for the elasticity test, and pairwise comparison tests, and section 6 links the value of M&As to location specific variables. Section 7 concludes.

2 A MODEL of LOCATION-TARGET SELECTION

Our model assumes that the M&A decision as well as the host country decision, as a mode of entry, have already been made but that the acquiring firm still has to choose a location and thus a target within the host country. The model motivates the hypotheses and selection of variables. We do not model general equilibrium aspects of M&As related to, for example, economy wide characteristics as in Neary (2007). We also do not analyze whether an M&A is preferred over other modes of entry, as in Nocke and Yeaple (2007, 2008) who distinguish between three modes of entry: exports, greenfield FDI, and (cross-border) M&As. The key characteristic of their model is the distinction between ‘mobile’ and ‘non-mobile’ characteristics or ‘capabilities.’ The motivation for this distinction focuses on the mobility of some characteristics (like technology) and the immobility of other characteristics (like location specific knowledge of the local market; see Anand and Delios, 2002, for an

empirical analysis of a similar concept). The distribution of these capabilities over firms determines the mode of entry. Acquirers are most efficient in mobile capabilities, but least efficient in non-mobile characteristics. Target firms compensate this by possessing non-mobile capabilities that make M&As profitable; an M&A combines the two capabilities. This synergy is explicitly modelled in Nocke and Yeaple (2007, 2008). The question then becomes, what can be used to measure the local non-mobile capabilities of a target firm? A location specific answer is *agglomeration rents*, as these are non-mobile and location specific. This is the motivation for our model and links our discussion of M&As to that of Head et al. (1995, 1999) with respect to greenfield FDI. They find that industry relevant and location specific agglomeration rents are important for greenfield FDI location decisions. In general, this conclusion has been corroborated by subsequent literature (see, Kim et al., 2003, Blonigen et al. 2007, Bobonis and Shatz, 2007, Brühlhart and Mathys, 2008, Halverson, 2012, Alfaro and Chen, 2014; see Antras and Yeaple, 2014, for a survey). However, similar results for cross-border M&As have yet to be established.

Our model builds on Guadalupe et al. (2012). The difference between our model and their model is that they focus on optimal levels of innovation, whereas we focus on location choice which is absent in their model. In both models, once the M&A has taken place, the target is as efficient as the acquirer. The backbone of the model is the standard Dixit-Stiglitz monopolistic competition model extended with Melitz (2003) type productivity differences. The key assumption in the model – which is subject to our tests – is that cross-border M&As sort into larger locations than national M&As. The reason is that cross-border M&As have to overcome larger entry costs and larger locations offer larger agglomeration rents. This enables acquiring firms to cover the (larger) entry costs. However, these larger markets are also characterized by higher land and housing prices, and more intense congestion than smaller locations, which also (adversely) affects location choice (see Glaeser, 2008 for a discussion).

Empirical evidence shows that for a firm entering a *foreign* market is indeed more expensive than entering the *domestic* market (see Helpman et al., 2004, for empirical support). These costs carry over to parent firms that are engaged in M&As. Empirical research also shows that firms in larger agglomerations or cities are more productive than firms in smaller agglomerations. In general, two separate reasons can be responsible for this relation: *sorting* of more productive firms and workers into larger agglomerations and *agglomeration economies*, such as knowledge spillovers which are covered under the general term agglomeration economics. Baldwin and Okubo (2006) show, for example, that more productive firms sort into larger agglomerations or cities because firms benefit from forward and backward linkages, and only the most productive firms can cope with more intense competition in larger markets. More productive workers also tend to sort into larger agglomerations (Combes et al., 2008). In a recent study, Combes et al. (2012) try to separate sorting from agglomeration economies. They find, using a detailed dataset on French firms, that sorting is relatively unimportant compared to agglomeration economies. In a similar

vein, De la Roca and Puga (2012) find that sorting of more productive workers is not the main reason that workers in large cities are more productive than in smaller cities; learning in bigger agglomerations seems to be a relatively more important factor. For our paper it is sufficient to note that firms in larger agglomerations are more productive than in smaller locations, no matter whether this is caused by sorting, agglomeration economies, or a combination of both forces; larger markets are home to more productive firms. The existence of agglomeration economies is, however, undisputed. In a survey Melo et al. (2009) show that these agglomeration economies are in general positive.

In our set-up the problem reduces to motivating why firms in larger agglomerations or cities are relatively more attractive targets for (foreign) firms engaged in M&As than firms in smaller agglomerations or cities. In the remainder we assume that foreign firms are more productive than national firms as they have to overcome larger entry costs (and the sorting process selects more productive firms), and that larger agglomerations offer higher agglomeration rents, but are also more expensive. These assumptions are motivated by the literature discussed above and our model framework shows that as a consequence cross-border M&As should sort into larger locations than national M&As. We proceed in two steps. In the first step we analyze under what conditions the sorting process is robust. Mrázová and Neary (2013) show that if (maximum) profits are super-modular, this sorting process holds in many cases, including ours.³ In the empirical tests we will use the empirical consequences of super-modularity. In the second step we will specify the profit function in a monopolistic competition setting, which motivates our choice of variables when it comes to the location determinants of M&As.

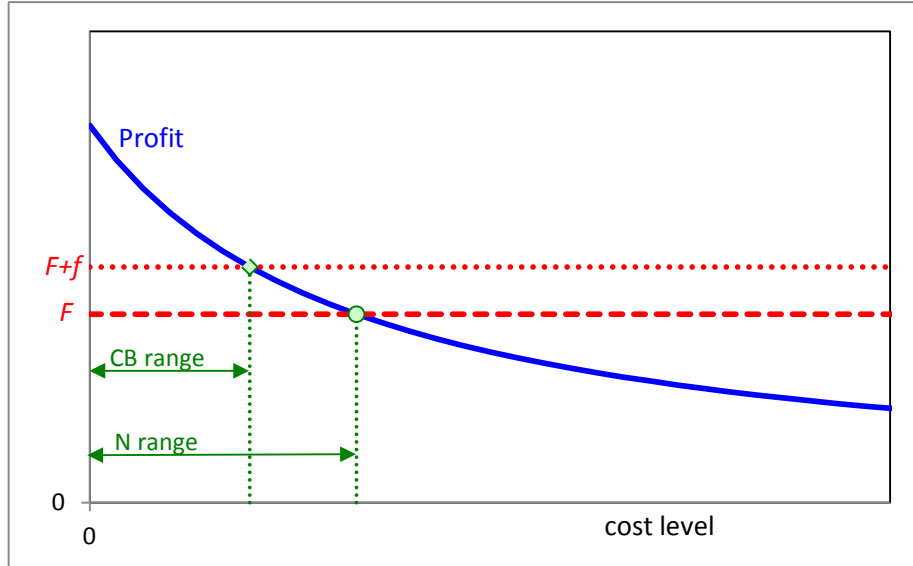
Step 1: In their paper on super-modularity Mrázová and Neary (2013) use a profit function $\pi(c)$ which is continuous and strictly decreasing in c , where c is a firm-specific cost parameter (inverse firm efficiency indicator). The firm contemplates serving a particular market at a fixed (entry) cost $F > 0$. If the entry costs are higher than the profit level of the least efficient firms but lower than the profit level of the most efficient firms there is a cut-off level at which only the most efficient firms will enter the market (this is sorting as in Melitz, 2003). We do not observe firm efficiency directly in our paper, but show that the distribution of efficiency for cross-border M&As is – on average – more efficient than national M&As at a given location. All that is needed for this selection effect to hold is that $\pi(c)$ is decreasing in c .

In our setting, we let firm efficiency interact with location choice as measured by market access or market size M at that location, such that the profit function $\pi(M, c)$ is continuous, strictly increasing in M and strictly decreasing in c . Market entry is now related to a take-over of a firm at a certain location (M&A). The costs F rise as market size increases: $F = F(M)$. Moreover, we distinguish between two types of

³ Function H is super-modular (in x and y) if: $x \geq x', y \geq y' \Rightarrow H(x, y)H(x', y') \geq H(x, y')H(x', y)$. See for some intuition the discussion below.

firms, domestic (*national* = N) firms and foreign (*cross-border* = CB) firms. In view of the discussion above, the takeover costs are higher for foreign firms because of the additional costs at a given location⁴: $F(M) + f$.

Figure 1 For a given location the CB cost range is smaller than the N cost range



N = National; CB = Cross-Border

Note that:

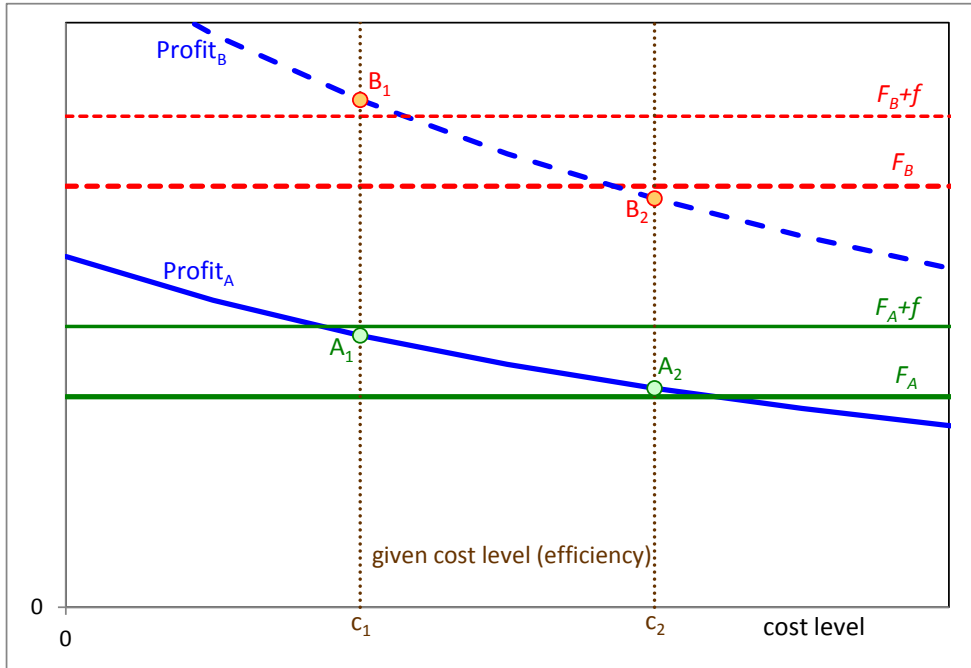
- (i) A takeover at a location is possible if the profits are larger than the takeover costs, requiring $\pi(M, c) > F(M)$ for national firms and $\pi(M, c) > F(M) + f$ for foreign firms. As Figure 1 illustrates, this implies that for a given location with market access M the range of firms for which a takeover is profitable is larger for national firms than for foreign firms. For any given location foreign firms therefore need to be on average more efficient. Note also that in Figure 1 a change in market access M does not only shift the cost line F but also the profit function π .
- (ii) Let 0 be the cost level for the most efficient firm and ∞ the cost level for the least efficient firm. If, for a given location with market access M , we have $F(M) > \pi(M, 0)$ there is no incentive even for the most efficient firm to take over another firm. Some locations (with low market access) therefore may not be profitable for takeovers. This happens in Figure 1 when the profit curve is shifted down to intersect the vertical axis *below* point F .
- (iii) Combining points (i) and (ii) above, we note that there may be locations (with low market access) where takeovers are possible for national firms but not for foreign firms, namely if $F(M) + f > \pi(M, 0) > F(M)$. This happens in Figure 1

⁴ Alternative specifications, in which f , for example, depends on market access M , are possible without affecting our main arguments and conclusions.

when the profit curve is shifted down to intersect the vertical axis between points F and $F + f$.

An acquiring firm contemplating a M&A will look at all potential target firms in different locations in conjunction with its own cost level. First of all it is necessary that a takeover at a certain location is feasible, as discussed in (i)-(iii) above. However, this is not sufficient. The tradeoff between the firm's cost (acquirer efficiency) level and the location specific profitability associated with a take-over, is crucial for efficiency sorting of firms across locations.

Figure 2 A foreign firm with higher efficiency may choose the larger market



This is illustrated in Figure 2 for two firms, namely a foreign firm 1 with higher efficiency than national firm 2 (such that: $c_1 < c_2$), confronted with two different market situations, namely situation A (using solid lines) and situation B (using dashed lines). The fixed takeover costs for foreign firms are larger by the amount f , as motivated above.

We assume that market access is higher in situation B than in situation A, hence it must be the case that $profit_B > profit_A$ in Figure 2. However, since larger locations also have higher land and housing prices or congestion costs this implies that the fixed costs for entering firms is also higher: $F_B > F_A$. The balance between profits and costs determines the attractiveness of a location. The profit level for cost levels 1 and 2 in situations A and B are given by points A_1, A_2, B_1, B_2 , in Figure 2. Note that:

- The domestic firm with cost level c_2 can take over a firm in situation A (since $A_2 > F_A$) but not in situation B (since $B_2 < F_B$).
- The foreign firm with cost level c_1 can take over a firm in situation B (since $B_1 > F_B + f$) but not in situation A (since $A_1 < F_A + f$).

The more efficient foreign firm will therefore take over a firm in the larger market (situation B), while the less efficient domestic firm will take over a firm in the smaller market (situation A). Essentially, the less efficient domestic firm cannot pay the higher fixed costs in the larger market. This depends, of course, on how rapidly fixed costs rise as market size increases and how responsive profits are to a change in market access. Mrázoá and Neary (2013) show, that an additional condition is necessary and sufficient for the sorting of more efficient firms in larger markets, as illustrated in Figure 2, to hold. Define $\tilde{\pi}(c, M) = \pi(c, M) - F(M)$. The sorting of more efficient firms is guaranteed if the function $\tilde{\pi}(c, M)$ is super-modular in c and M (for differentiable functions this holds if $\tilde{\pi}_{cM}(c, M) \geq 0$). Intuitively, super-modularity describes the complementarity between c and M ; other things equal, more efficient firms are relatively more profitable in larger locations (see Costinot, 2009, for a similar discussion in an international trade context). Interestingly, Davis and Dingel (2014) show how this complementarity can be tested using a so-called elasticity test and a pairwise comparison test between locations.

Step 2: next we will specify the profit function $\pi(c, M)$ for a specific, monopolistic competition setting in order to link our model to the location determinants of M&As in our empirical analysis. Assume, like Guadalupe et al. (2012), that the target firm in location j will become as productive as the parent firm after an M&A, the value of the firm after a takeover equals $V_j^N(c, M_j) = \tilde{\pi}(c, M_j)$ for national firms and $V_j^{cb}(c, M_j) = \tilde{\pi}(c, M_j) - f$ for foreign firms. In a CES monopolistic competition context we typically have:

$$\tilde{\pi} = \frac{(\sigma-1)^{(\sigma-1)}}{\sigma^\sigma} E_j P_j^{(\sigma-1)} (\tau c)^{(1-\sigma)} - F_j, \quad (1)$$

where $\tau \geq 1$ is the standard iceberg transportation cost, σ the elasticity of demand, E_j is total expenditure on all varieties produced in j , and P_j the (exact) aggregate price index associated with CES utility. The term $E_j P_j^{(\sigma-1)}$ is called (real) market access (Brakman et al, 2009, ch. 8). As discussed in Mrázoá and Neary (2013), cross-section comparisons instead of time-series comparisons allows us to treat the real market access as given for individual firms.⁵

Hypotheses

On the basis of the above model set-up, for the value of a firm after a M&A we see that firms have to be (i) productive enough and (ii) select locations that offer sufficient market access or, more generally, agglomeration rents, to cover the location costs; it is the combination of these two elements that will make an M&A viable. Because of the additional fixed costs f , for a given efficiency level, foreign firms are

⁵ So the condition $\tilde{\pi}_{cM}(c, M) \geq 0$ holds.

on average more efficient and tend to opt for larger locations.⁶ We can now formulate the following hypotheses:

Hypothesis 1:

M&A activity is not distributed randomly across space and we expect cross-border M&As to be more spatially concentrated than national M&As, as larger agglomerations are more scarce than smaller agglomerations.

Hypothesis 2a:

Higher entry costs for cross-border M&As imply that they are, on average, to be found in larger locations compared to national M&As.

Hypothesis 2b:

Higher entry costs for cross-border M&As imply that they are, on average, to be found in locations that are nearby or give better access to larger locations compared to national M&As.

The main difference between hypothesis 1 and hypotheses 2a and 2b is that the former is concerned with the question regarding the degree of spatial concentration of M&As but not with the locational features of M&As as such, whereas the latter deals explicitly with these locational features. We will address these hypotheses by looking at three types of evidence by investigating the overall spatial concentration of M&As in the USA (test of hypothesis 1), inspecting the location characteristics of M&As (test of hypothesis 2a), and linking M&A patterns to location determinants (test of hypothesis 2b).

3 DATA SET

The best and most extensive data source for M&As is the ‘Global Mergers and Acquisitions’ database of Thomson Financial Securities Data (Thomson, hereafter). Our sample from the Thomson dataset starts in 1985 and runs until July 2012 (see also the Appendix for a detailed data description). We focus on all countries and selected those firms that merged with or took over a firm in the USA. Table 1 provides an overview of the resulting 192,281 M&As that make up our sample. National M&As refer to an American-based firm merging or acquiring another American-based firm, whereas cross-border M&As refer to firms from outside the US that take over a US based firm (not necessarily US-owned). Most M&As are national rather than cross-border (86 per cent versus 14 per cent).⁷ We have information on the value of the transaction only in 45 per cent of the cases. In general, the larger the deal the more

⁶ We do not observe c , and concentrate on location choice.

⁷ Note, that our M&A coverage is much larger than that of for instance Anand and Delios (2002) who have 2175 entries for the UK, Germany and Japan into the US.

likely it is that there is information regarding the value of the transaction. Since cross-border M&As are on average larger than national M&As, this explains why the value of the transaction is available for 51 per cent of the cross-border M&As compared to 44 per cent of the national M&As. For both types of M&As employment information is only provided for 10 per cent of the cases, while information on both value and employment is available for only 8 per cent of the M&As.

Table 1 Overview of American M&A data, 1985-2011

	National	%	Cross-border	%
Total number of M&As	165,401	100	26,880	100
With value of transaction	72,561	44	13,688	51
With employment data	17,102	10	2,789	10
Both value and employment data	13,847	8	2,231	8

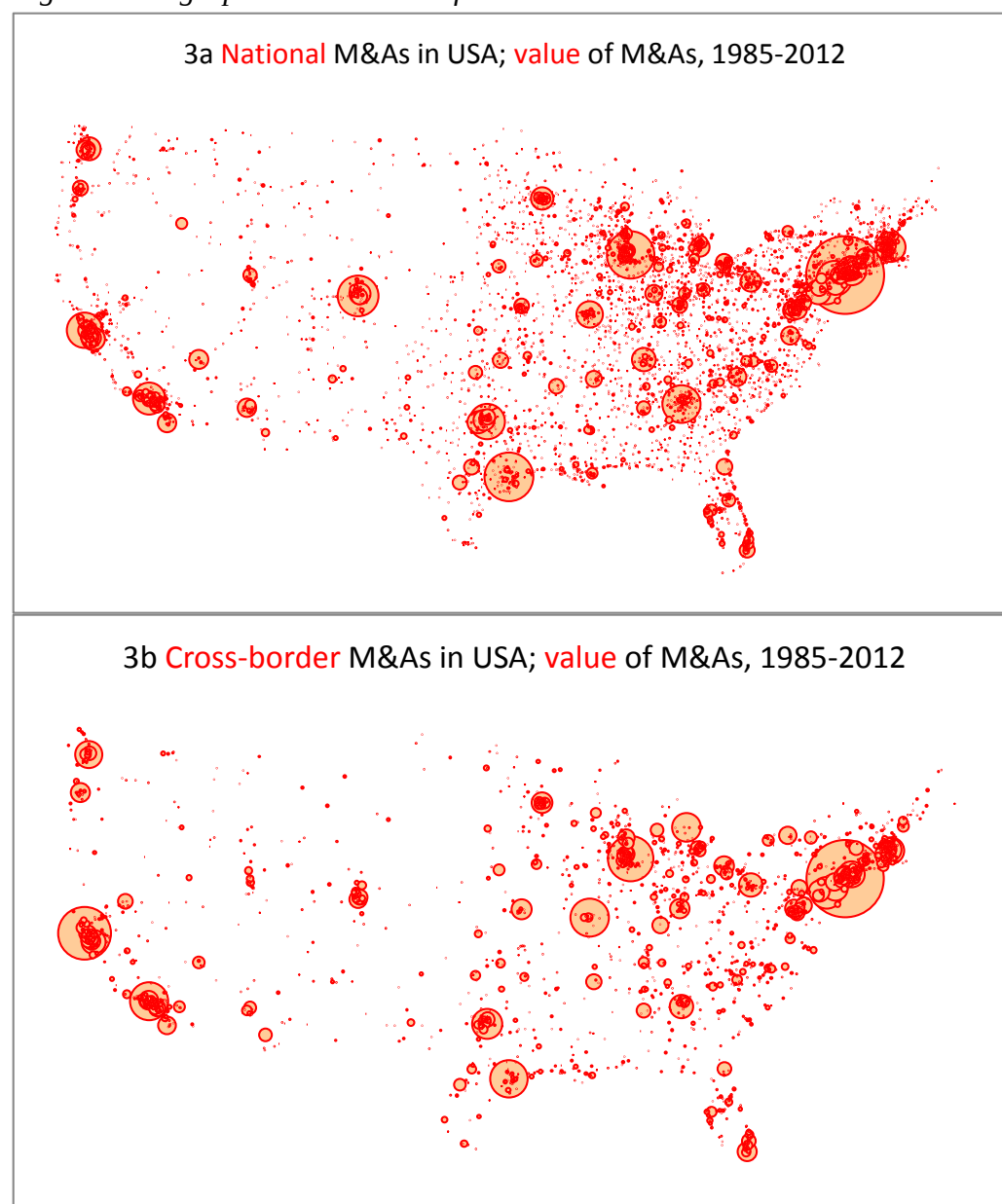
Total number of M&As is 192,281 of which 14% is cross-border

Given the limited number of observations for which we have employment data available and the peculiarities of the employment data we will focus our attention on the M&As for which the value of the transaction is available, which is also consistent with the definition of $V_j^{cb}(c, M_j)$. Figure 3 illustrates the geographic distribution of the national and cross-border M&As. See the Appendix and section 5 for details of the geographical assignments. The size of the bubbles is proportional to the total value of M&As in that location in the period 1985-2012. The contours and main locations of the United States are clearly visible from this geographical distribution. New York is the main location for M&A targets, attracting 10.34 per cent of the value of national M&As and 11.48 per cent of cross-border M&As, see Table 2. For national M&As New York is followed by Houston (4.01 per cent) and Chicago (3.85 per cent). For cross-border M&As it is followed by San Francisco (5.36 per cent) and Chicago (3.99 per cent).

Comparing panels *a* and *b* in Figure 3 shows that there are both similarities and differences between national and cross-border M&As, see also Table 2. Regarding the differences we note that there are many more locations visible for national M&As than for cross-border M&As (more dots: 5153 compared to 2046 locations, or 2.5 times as many). This is a consequence of the fact that there are many more national than cross-border M&As (namely about 5.5 times as many), but also that cross-border M&As might be more concentrated.

Table 2 provides the geographical distribution of the various types of M&As across the 50 states and the District of Columbia, in number, value, and per cent of the respective total. The number of observations is reduced by about two per cent since we exclude the states “Guam”, “Virgin Islands”, and “Unknown” from the analysis. The total value of the national M&As (in constant 2010 dollars) is \$19.1 trillion, compared to \$3.9 trillion for cross-border M&As. The average value for the national M&As is therefore \$269 million, compared to \$291 million for cross-border M&As. The largest target state for national M&As is California, which attracts 16.2 per cent of the number of deals and 13.3 per cent of the total value. It is followed by Texas in terms of the number of deals and by New York in terms of total value.

Figure 3 Geographic distribution of American national and cross-border M&As



We can already see at this aggregate level that the distribution of cross-border M&As deviates from that of national M&As. California is more popular among foreign firms,

attracting 2.9 percentage points more deals than for national M&As and 3.7 percentage points higher value. New York is also more popular among foreigners, with 1.9 percentage points more deals and 2.0 percentage point higher value. Texas, in contrast, is less popular among foreigners, with 1.4 percentage points fewer deals and 3.0 percentage points lower value. Taken over all states, the average absolute deviation in the percentile distribution for the number of deals is 0.38 percentage points and for the total value is 0.56 percentage points.

Table 2 Distribution of M&As with value of transaction across US states, 1985-2012

state	total value and total number (#) of M&As				percentile distribution of M&As			
	cross-border M&As		national M&As		cross-border M&As		national M&As	
	#	value	#	value	#	value	#	value
AK	36	2	91	17	0.3	0.1	0.1	0.1
AL	91	22	614	107	0.7	0.6	0.9	0.6
AR	31	12	297	110	0.2	0.3	0.4	0.6
AZ	199	31	1,083	185	1.5	0.8	1.5	1.0
CA	2,520	653	11,478	2,534	19.0	16.9	16.2	13.3
CO	350	77	1,818	813	2.6	2.0	2.6	4.3
CT	286	103	1,443	595	2.2	2.7	2.0	3.1
DC	59	15	314	117	0.4	0.4	0.4	0.6
DE	270	47	885	316	2.0	1.2	1.2	1.7
FL	590	98	3,875	507	4.5	2.5	5.5	2.7
GA	284	61	2,051	614	2.1	1.6	2.9	3.2
HI	42	7	168	23	0.3	0.2	0.2	0.1
IA	50	12	454	92	0.4	0.3	0.6	0.5
ID	39	2	180	42	0.3	0.0	0.3	0.2
IL	560	285	3,189	1,318	4.2	7.4	4.5	6.9
IN	104	13	1,022	199	0.8	0.3	1.4	1.0
KS	68	11	505	81	0.5	0.3	0.7	0.4
KY	71	23	601	98	0.5	0.6	0.8	0.5
LA	106	12	853	97	0.8	0.3	1.2	0.5
MA	691	215	2,898	686	5.2	5.6	4.1	3.6
MD	205	69	1,267	232	1.5	1.8	1.8	1.2
ME	48	17	172	21	0.4	0.4	0.2	0.1
MI	288	117	1,434	393	2.2	3.0	2.0	2.1
MN	230	61	1,404	291	1.7	1.6	2.0	1.5
MO	153	136	1,011	332	1.2	3.5	1.4	1.7
MS	23	1	298	56	0.2	0.0	0.4	0.3
MT	35	2	160	14	0.3	0.0	0.2	0.1
NC	215	31	1,384	291	1.6	0.8	2.0	1.5
ND	9	2	106	16	0.1	0.1	0.1	0.1
NE	38	9	246	63	0.3	0.2	0.3	0.3
NH	93	12	368	66	0.7	0.3	0.5	0.3
NJ	572	211	2,602	1,103	4.3	5.5	3.7	5.8
NM	43	3	298	39	0.3	0.1	0.4	0.2
NV	236	27	696	130	1.8	0.7	1.0	0.7
NY	1,323	573	5,768	2,462	10.0	14.8	8.1	12.9
OH	343	99	2,217	482	2.6	2.6	3.1	2.5
OK	90	21	822	168	0.7	0.5	1.2	0.9
OR	103	28	600	108	0.8	0.7	0.8	0.6
PA	509	182	2,808	673	3.8	4.7	4.0	3.5
RI	47	19	199	26	0.4	0.5	0.3	0.1
SC	78	12	538	76	0.6	0.3	0.8	0.4
SD	10	3	86	8	0.1	0.1	0.1	0.0
TN	140	36	1,004	335	1.1	0.9	1.4	1.8
TX	1,072	272	6,758	1,923	8.1	7.0	9.5	10.1
UT	135	11	598	81	1.0	0.3	0.8	0.4
VA	267	49	1,713	534	2.0	1.3	2.4	2.8
VT	15	2	114	10	0.1	0.0	0.2	0.1
WA	277	91	1,245	435	2.1	2.4	1.8	2.3
WI	123	52	830	143	0.9	1.3	1.2	0.7
WV	28	3	243	32	0.2	0.1	0.3	0.2
WY	43	2	165	12	0.3	0.1	0.2	0.1
total	13,238	3,857	70,973	19,107	100	100	100	100

value of transaction in billion 2010 dollars

4 SPATIAL CONCENTRATION OF M&As

Method: Ellison-Glaeser index

In order to study concentration patterns a first step is to look at spatial concentration measures. This should reveal itself, see hypothesis 1, in a ranking of concentration; cross-border M&As are expected to be more spatially concentrated than national M&As, and M&As in general are expected to be more concentrated than the overall location pattern of firms. We will measure the concentration of M&As via the index introduced by Ellison and Glaeser (1997). The advantage of the EG index is that it corrects for industry or sector differences (see also Combes et al. (2008)). Some industries are highly specialized (the sector consists of a limited number of firms), while others consists of many firms. If an industry consists, for example, of 2 firms at most two regions account for all production, which could create the illusion of concentration; one should not mix specialization with concentration.⁸ We chose the EG-index as our starting point for the analysis, as it is one of the better indices (see also Holmes and Stevens, 2004).

$$\gamma = \frac{\sum_i (s_i - x_i)^2 - (1 - \sum_i x_i^2) H}{(1 - \sum_i x_i^2) (1 - H)}, \quad \text{where} \quad H = \sum_j z_j^2$$

s_i share of sector employment / value in geographic area i

x_i share of total employment / value in geographic area i

H Herfindahl index of employment / value size distribution for sector

In the absence of agglomeration effects some areas provide natural advantages that are better for some firms than for other firms. In this case, on average, the location of firms should resemble that of the overall distribution of employment; implying $\sum_i (s_i - x_i)^2$ is close to zero. Subtracting $(1 - \sum_i x_i^2) H$ corrects for the fact that some industries consist of a limited number of (large) firms, while others consist of a large number of firms.⁹

⁸ Although the EG-index is a step forward it still is sensitive for administrative definitions of spatial units. Duranton and Overman (2005, 2008) correct for this, by abstracting from pre-defined spatial units by treating space as a continuum. A closely related measure to the EG index is the one developed by Maurel and Sedillot (1999).

⁹ Dividing the expression by $(1 - \sum_i x_i^2) (1 - H)$ gives an unbiased estimator of γ (see Ellison and Glaeser, 1997). Furthermore, they show that $\gamma = \gamma^{na} + \gamma^S - \gamma^{na} \gamma^S$, where γ^{na} is a parameter capturing natural advantages, and γ^S a parameter capturing the probability that a firm locates in the same location as its predecessor, indicating agglomeration advantages.

Concentration results

We focus on the value of M&As, measured in constant 2010 dollars. Like Ellison-Glaeser (1997) we analyze SIC sectors, restricting attention for the moment to the 3-digit level. We have sector data available at the 4-digit SIC level. However, the number of transactions within the 4-digit classification is too limited. We thus restrict attention to 3-digit sectors or higher levels of aggregation. The underlying Herfindahl index per sector is based on the distribution of national M&As in that sector. There are still very few observations (one or two) for certain 3-digit sectors, causing outliers in the EG index. We therefore apply the concomitant 2-digit sector Herfindahl index throughout our analysis.¹⁰ The Herfindahl index for the number of transactions is, of course, simply $1/n$, where n is the number of transactions in that sector. We use the number of M&As as a robustness check.

Table 3 Summary of Ellison-Glaeser concentration index; USA, 3-digit

	Ellison-Glaeser	Holmes-Stevens	National M&As	Cross-border M&As
Minimum	-0.013	-0.203	-0.278	-0.022
Maximum	0.630	0.909	1.157	1.311
Mean	0.051	0.034	0.219	0.421
Median	0.026	0.017	0.142	0.325
# Sectors	459	1086	341	341

Source: Ellison and Glaeser (1997) data for establishment size, 4-digit SIC sectors; Holmes and Stevens (2004) data for establishment size, 6 digit NAICS sectors, mean and median are weighted averages by number of sectors; own calculations for M&As based on 3 digit SIC sectors, 1985-2012

Table 3 summarizes our findings, both for national M&As and cross-border M&As. The minimum EG index for national M&As is similar to that found by Holmes-Stevens and for cross-border M&As to that found by Ellison-Glaeser. The maximum EG index for M&As is somewhat higher in both cases.¹¹ More importantly, however, the mean and median EG index for *national* M&As (0.219 and 0.142, respectively) are significantly *higher* than for Ellison-Glaeser and Holmes-Stevens establishments, suggesting that national M&As are more geographically concentrated than the distribution of establishments. As discussed above, we attribute this finding to the selection effect: only sufficiently successful and viable establishments are M&A

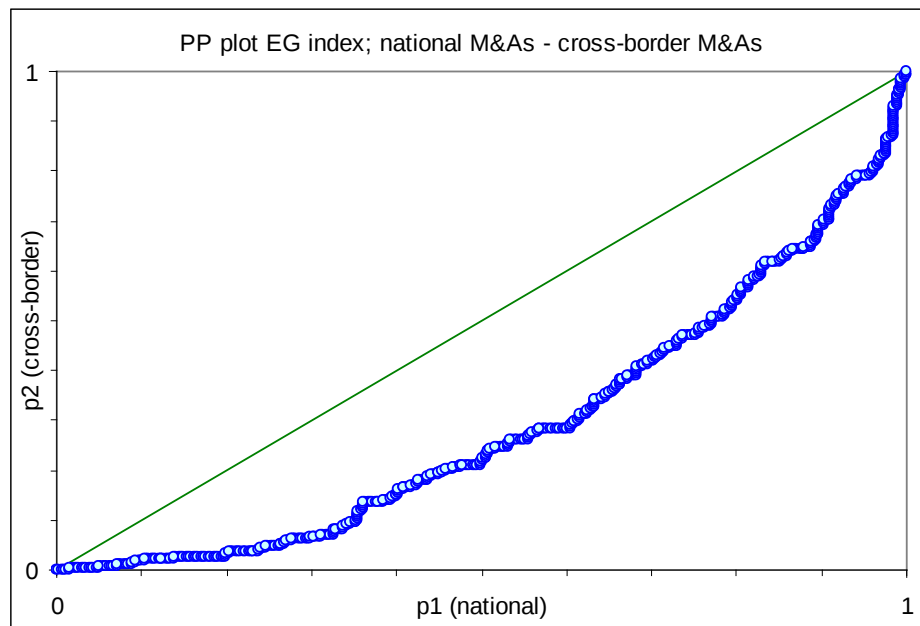
¹⁰ The correlation of the EG index using 2-digit and 3-digit Herfindahl indices is high (0.82 for cross-border M&As, for example). Alternatively, we could impose a minimum number of observations before a sector is included in the analysis, reducing the number of included sectors.

¹¹ For comparison purposes, the table restricts attention to sectors for which the EG index is available for both national and cross-border M&As.

targets. Similarly, the mean and median EG index for *cross-border* M&As (0.421 and 0.325, respectively) is significantly *higher* than for national M&As. This indicates that the selection of establishments for cross-border M&As is more stringent to overcome the higher costs to counteract the liability of foreign-ness (see equation 2).

Analyzing the more stringent selection effect for cross-border M&As compared to national M&As for the 341 sectors in more detail, we find that the cross-border EG index is higher than the national EG index for 267 sectors, or for 78.3 per cent of the cases. The average increase in the EG index is 0.202, almost a doubling of the value.

Figure 4 PP-plot of EG indices; national M&As – cross-border M&As



Test Statistics: Mean difference test: 9.48***, Distribution difference test: 2.749***
Where *** indicates the 1% significance level.

These differences are highly significant. To illustrate this we can compare the difference in the *distributions* of the EG indices, rather than focusing on a simple summary statistic such as the mean or variance. Figure 4 shows the percentile-percentile (PP) plot. This is the scatter plot of the percentiles of the two distributions, which focuses attention on the majority of the observations rather than possible outliers. If the two samples would have been drawn from the same underlying distribution the PP-plot would tend to coincide with the diagonal. Clearly, this is not the case. A formal test of the extent of the deviation of the PP-plot from the diagonal, provided by the HWM index (Hinloopen, et al., 2012), soundly rejects that the underlying distribution is the same (see Figure 4). Based on the above information, we may therefore conclude that the EG index for cross-border M&As is significantly higher than for national M&As.

5 LOCATION OF M&As WITHIN USA

Method

We have established that cross-border M&As are more concentrated than national M&As (and that M&As are more concentrated than US firms in general), but we do not know the locational features of the acquired firms. For all we know at this stage, they could be concentrated somewhere in a US desert. Our model in section 2 and in particular hypothesis 2a indicate that, compared to national M&As, one expects cross-border M&As to be found more often in larger locations across the USA because larger locations are associated with stronger market access or more general agglomeration rents and for cross-border M&As to be profitable in a certain location, recall Figures 1 and 2, they require *ceteris paribus* larger agglomeration benefits to off-set the larger entry or location costs that they face.

The problem to be analyzed here is similar to the problem analyzed by Davis and Dingel (2014), building on the work of Costinot (2009). They analyze the sorting of skilled workers over a discrete number of cities with heterogeneous locations within the cities, which determines their productivity in different sectors. Davis and Dingel (2014) show that larger cities have relatively more skilled populations and produce relatively more in skill-intensive sectors. Instead of the sorting of workers with certain skills, we analyze the sorting of firms with certain (productivity/skill) characteristics regarding M&As over a discrete number of locations within the cities determining their productivity in different sectors. Davis and Dingel (2014) provide two tests, an elasticity test, and a pairwise comparison test, which are both based on super modularity. A function H is super modular (in our case in location size, L , and efficiency of firms engaged in M&As: that is cross-border (CB) or national (N)) if:

$$L > L', CB > N \Rightarrow H(L, CB)H(L', N) > H(L, N)H(L', CB).$$

We assume that the efficiency of cross-border M&As is larger than of national M&As. If correct, the larger locations host relatively more of the (more productive) cross-border M&As. Building on Davis and Dingel (2014) this can be tested in two ways via an elasticity test and a pairwise comparison test. The *elasticity test* compares the elasticities in the following simple regression:

$$\ln(cb, nat) = \beta_0 + \beta_{i1} \ln(L) + \epsilon, \quad (2)$$

where, $i=cb, n$; the test checks whether $\beta_{cb,1} \geq \beta_{n,1}$.¹²

¹² As shown in footnote 24 in Davis and Dingel (2014), this regression can be understood as a first-order Taylor approximation where β_{i1} is increasing in i , due to the assumption of super modularity.

The *pairwise comparison* test is directly related to super modularity.

We can compare any two arbitrary locations with the two M&A types to see whether or not inequality for super modularity holds. If so, we verify that the larger location in this pairwise comparison has relatively more of the cross-border M&A type. We call the comparison a ‘success’ if the condition holds (value = 1) and a ‘failure’ if not (value = 0). We can thus compare for example 40 locations in $(40 \times 39)/2 = 780$ different pairs, and each location pair has 2 M&A types. This gives a total of $780 \times 2 = 1560$ pairwise comparisons. The extent to which the average success rate exceeds the random distribution benchmark of 0.5 can then be taken as an indication regarding the sorting-predictive power of the model. We can create different bins of locations. For instance a bin of 2, consisting of just of a group of large versus a group of small locations (consisting, for example, of a group of all locations larger than the median size, and a group smaller than the median size). In the analysis below we divide the locations into 2 up to 360 bins in discrete steps.

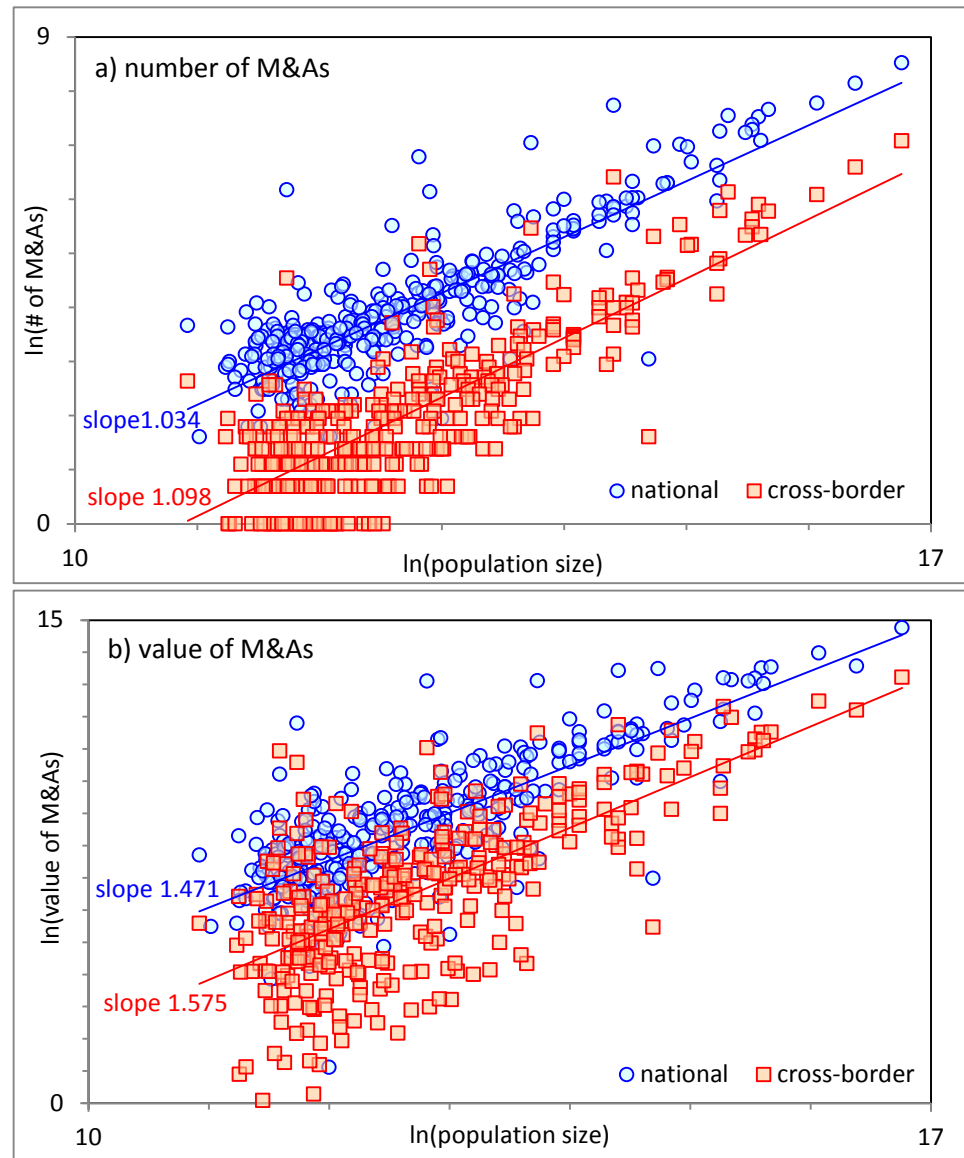
Test results

Before we can perform such tests we have to assign M&As to a specific location for which the relevant data are available, in this case by allocating all M&As in our database to the nearest metropolitan statistical area (MSA). The Appendix describes the procedure in detail, and provides additional location characteristics.¹³

The elasticity test is illustrated in Figure 5 for both the number of M&As (panel a) and the value of M&As (panel b). The graphs illustrate the size of national and cross-border M&As relative to the size of the population of the metropolitan areas, both in logs. The slope of the regression lines (which are also depicted) provide the elasticity of the size of M&As (either in number or value) with respect to population size. In all cases M&As tend to rise with population, but according to the elasticity test this rise should be faster for cross-border M&As than for national M&As. The slope of the cross-border regression line is indeed steeper for both the number of M&As and the value of M&As (in both panels of the figure). The cross-border estimates are also outside the 90 per cent confidence intervals of the national M&A elasticity estimates, as summarized in Table 4.

¹³ The maximum distance of an M&A location to the nearest MSA is 360 km. We experimented with different maximum distances between M&A and MSA for inclusion in the analysis, but this does not materially affect our results. We identify 361 MSAs with positive M&A activity for the 48 contiguous states plus Washington DC.

Figure 5 Elasticity test for cross-border M&As versus national M&As



Based on M&As within a 100 km radius of an MSA

Our findings do not change if we only allocate M&As within a certain range to a specific metropolitan statistical area rather than including all M&As without such a limit. This is illustrated for M&As within a 100 km range in Table 4 and Figure 5.

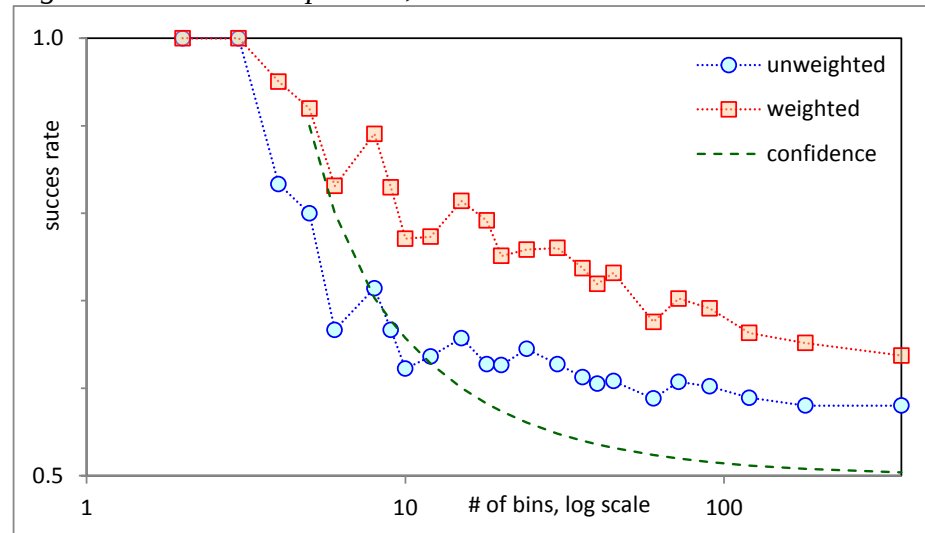
Table 4 Metropolitan area elasticity test for M&As, USA

	All M&As included		Only M&As within 100 km	
	coefficient	st error	coefficient	st error
Number M&As, national	0.971	0.0357	1.034	0.0343
Number M&As, cross-border	1.057	0.0437	1.098	0.0420
Value M&As, national	1.388	0.0614	1.471	0.0610
Value M&As, cross-border	1.520	0.0950	1.575	0.0882

The number of observations is 361 for national M&As and 345 for cross-border if all M&As are included; it is 360 and 338, respectively, if only M&As within 100 km are included.

The pairwise comparison test can best be illustrated by Figure 6, which shows the success rate of the pairwise comparison. The figure shows the un-weighted and the (population) weighted success rate. We expect that the successful comparison between a very large and a much smaller location is more revealing for the test than a comparison between two almost similar-sized locations for which the test outcome might just be a random result. We therefore include ‘weighted’ success rates, where we use the difference in log population for a location pair as weight.

Figure 6 Pairwise comparison; National and Cross-border M&As



The confidence line indicates the upper limit of a 95% confidence interval for tossing a fair coin; based on the central limit theorem above 27 pairs (8 bins) and exact below; not shown below 10 pairs (5 bins).

The benchmark is the horizontal axis at 0.5, which would indicate a purely random result. The confidence line in the figure indicates the upper limit of a 95% confidence interval for tossing a fair coin. The success rate for 2 and 3 bins is 100%, both for the weighted and unweighted comparisons. The success rate decreases to a (weighted) success rate of 64% for 360 bins. For more than 10 bins both the weighted and unweighted bilateral comparisons are above the 95% confidence line.¹⁴ For all comparisons the success rate is better than the random outcome.

Based on the two tests in this section we can conclude that in line with our model and hypothesis 2a, cross-border M&As are more often found in relatively large locations than national M&As. This suggests that agglomeration economies are more important for cross-border M&As. In the next section we address this question directly and also allow geography to play a role.

¹⁴ Below that level there are essentially too few possibilities to construct a confidence interval; for 2 bins there is only 1 pair and for 3 bins there are only 2 pairs since we only have two categories (national and cross-border).

6 LOCATION DETERMINANTS OF CROSS-BORDER M&As

Estimation method and model

We identify 5504 different locations receiving either national or cross-border M&As in the observation period. We complement these locations with 1076 urban locations (urban areas of at least 2500 people in 2010) that did not receive any M&As for a total of 6580 locations. We then link the location choices of M&As to location characteristics of the 381 US Metropolitan Statistical Areas (MSA).¹⁵ In doing so we will not only take the features of the M&A location as such into account but also, in line with hypothesis 2b, the economic geography of the location *vis a vis* the rest of the USA (or the world). As we showed in our model set up, see Figure 2, some locations may not be viable for M&A activity as they offer too little agglomeration benefits to overcome location costs. This is more stringent for cross-border M&As; some locations that are viable for national M&As might not be suitable for cross-border M&As. In the estimations we should therefore explicitly deal with the issue of ‘zero’ observations. The percentage of observations with host MSA locations in the USA with zero M&A activity in our sample period 1985-2012 is quite high, in particular for cross-border M&As: 4534 out of 6580 for cross-border M&As and 1427 out of 6580 for national M&As. A proper handling of these zero observations is therefore important (see Santos-Silva and Tenreyro, 2006; Helpman et al. 2008; Razin and Sadka, 2007; Head and Mayer, 2014).

The zero observations problem can be dealt with by using Lambert’s (1992) zero-inflated approach. This approach is similar to the Heckman et al (2008) selection model but does not rely on the associated normality assumptions, and is therefore less restrictive (Heckman, 1974; see Razin and Sadka, 2007, for an application to FDI).¹⁶ The zero-inflated Poisson model assumes that there are two latent groups of observations; an observation in the always 0 Group, which has an outcome of 0 with a probability of 1. We will label this the Passive Group. Observations in the other group which might have a zero outcome, but there is a positive probability that there is a non-zero outcome. We will label this the Active Group. This process is developed in two stages:

- (i) Allocate membership into the latent groups (Passive Group and Active Group)
- (ii) Model the value/number of (cross-border/national) M&As for observations in the Active Group.

Based on the discussion in Head and Mayer (2014, section 5.2) we opt for the (zero inflated) Poisson model (ZIP). This approach can also be used for our non-integer data (the value of M&As; see the discussion in Santos-Silva and Tenreyro (2006) for

¹⁵ See the Appendix for further information on M&As and the matching with MSAs. In general variables that involve distances are specific for M&A locations (such as Market access), other variables link M&As to the closest MSA.

¹⁶ This avoids the difficulty of trying to find an appropriate exclusion restriction (Helpman *et al*, 2007).

trade flows). Based on the definition of $V_j^{cb}(c, M_j)$ from our model, the dependent variable is the value of M&As, the independent variables are related to (real) market access, $E_j P_j^{(\sigma-1)}$. The location specific costs, F_j , are measured in terms of density (see step 2 in our model set up where we defined the profit function in a monopolistic competition setting). We capture real market access by a simple market access variable, as specific location dependent price indices are not available. Density related variables capture agglomeration economies of location j , but might also be related to congestion or, in our model terms, location costs of location j (Glaeser, 2008). The additional fixed costs, f , for cross-border M&As are implicitly captured by distinguishing between the zero and non-zero latent groups. Furthermore, we include several control variables, as well as (US federal state) fixed effects. Our approach is a natural complement to Head et al. (1995) who focus on greenfield FDI (see also Head and Mayer, 2004).

Estimation results

As a first step we differentiate between locations where M&As takes place, that is cross-border and national M&As combined versus locations where no M&A activity takes place. The base-line estimation results are presented in Table 5.¹⁷ In general, we expect the coefficients of the variables in the passive group to be of opposite sign compared to the active group. We use clustered standard errors to allow for possible intra (target) State dependence. State fixed effects capture non-observed state relevant variables which might affect target selection. The number of zeros is listed for each regression. Vuong tests (not presented, but available upon request) indicate that the ZIP model is preferred over the Poisson model; we only present the results from the ZIP model.

Table 5 presents the results for the Passive group and the Active group. The columns with heading ‘passive’ describe the results of the equation that determines whether the observation is in the Passive Group (zero with probability 1) or not, the columns with headings *MAtotal* describe the Poisson regression to explain the total value of all M&As. Four basic model specifications are presented: columns (1)-(2) show results for (real) market access; in columns (3)-(4) a dummy variable is added that indicates whether an international airport is available within 70 miles of the M&A and captures *international* market access; columns (5)-(6) add population density as a measure of density related cost factors; and finally columns (7) and (8) includes all variables. Market access is measured as a simple Harris market potential for each of the M&A locations, that is, a distance-weighted total income of all MSAs.¹⁸

¹⁷ All estimates are carried out with STATA, version 13.1. The do-files, and data files are available upon request.

¹⁸ Implicitly the distance decay has a coefficient of ‘1’, experimenting with lower distance decay parameters does not affect the results in a qualitative sense (results available upon request).

Table 5 M&A locations versus No M&A locations (the extensive margin)

Variable	(1) MAtotval	(2) passive	(3) MAtotval	(4) passive	(5) MAtotval	(6) passive	(7) MAtotval	(8) passive
Market potential	0.202*** (5.58e-05)	-0.490*** (0)	0.168*** (0.00327)	-0.438*** (0)	0.253*** (2.67e-08)	-0.455*** (0)	0.227*** (1.34e-05)	-0.415*** (0)
Airport 70			1.464*** (7.05e-05)	-0.675*** (0.00641)			1.621*** (2.21e-07)	-0.615** (0.0102)
Population density					-0.000118*** (0.00369)	-8.65e-05 (0.176)	-0.000137*** (7.35e-07)	-6.95e-05 (0.217)
Constant	5.428*** (0)	1.761*** (4.54e-06)	5.690*** (0)	1.373*** (0.00142)	5.162*** (0)	1.604*** (1.83e-05)	5.380*** (0)	1.280*** (0.00211)
Observations	6,580	6,580	6,580	6,580	6,580	6,580	6,580	6,580
State fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Number of zeroes	1076	1076	1076	1076	1076	1076	1076	1076

Robust pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1; all estimates converged in one step; totval = total value; MA = Mergers & Acquisitions

A few results stand out. First, and foremost, market access is an important determinant for both the extensive margin of M&As (active versus passive) as well as for the intensive margin. In all models, market access contributes positively to the probability of M&As. The negative and highly significant coefficients in columns (2), (4), (6) and (8) indicate that a high market access makes it less likely for a location to be in the Passive Group of M&As. High market access thus crucially affects whether a cross-border M&A takes place at all, which is in line with hypothesis 2b. Once in the active group high market access positively contributes to higher values of M&As in a particular location, as indicated by columns (1), (3), (5), and (7).

Second, location choice might be affected by nearby transportation possibilities, indicating international trade options or international market access from a USA location j to the rest of the world. We experimented with distances to international oriented US seaports and airports. Table 5 shows the results for airports. The results for seaports were not significant and are not presented. The results in columns (3)-(4) and (7)-(8) show the positive contribution of a nearby international airport on the probability of M&As. This indicates that the presence within a 70 mile radius of an internationally oriented airport is important.¹⁹ It matters for both the intensive and extensive margin. Results on population density seem only important for the intensive margin, as indicated by columns (5)-(6), and (7)-(8), and are less relevant for the extensive margin. We also experimented with controls, like unemployment, commuting time, international seaports, differentiating between coastal locations (east coast or west coast) or sunbelt locations and income per capita. Including these controls does not affect the baseline results described above.

In Table 6 we repeat the exercise but differentiate between the value of cross-border M&As and national M&As. The columns with heading ‘Passive’ again describe the results of the equation that determines whether the observation is in the Passive Group (zero with probability 1) or not, the columns with headings *cbtotval* and *nattotval* describe the Poisson regression to explain the value of the observations for cross-border and national M&As respectively.

To a large extent the results mimic those of Table 5 for all M&As. Again, market access for the extensive margin as well for the intensive margin of M&As is important for both types of M&As. The negative and highly significant coefficient in the Passive columns indicate that a high market access makes it less likely for the location to be in the Passive Group of M&As. Second, for both cross-border and national M&As international market access is important for both the intensive and extensive margin: better international market access means significantly more M&A activity for the Active Group. Third, population density has a negative effect on the intensive margin but is not significant for the extensive margin.

¹⁹ The international airports in our sample are: Atlanta, Dallas, McCarran, Phoenix, Los Angeles, San Francisco, Denver, John F. Kennedy, LaGuardia, Newark, Logan, Philadelphia, Orlando, Atlanta, Miami, Charlotte, Minneapolis, O’Hare, Detroit, George Bush, Newark, Seattle.

Table 6 National M&A locations versus Cross-Border M&A locations

Variable	(1) nattotval	(2) passive	(3) cbtotval	(4) passive	(5) nattotval	(6) passive	(7) cbtotval	(8) passive
Market potential	0.195*** (0.000208)	-0.251*** (6.25e-05)	0.175*** (9.45e-09)	-0.134*** (0.000736)	0.161*** (0.00758)	-0.195*** (0.00164)	0.159*** (7.09e-06)	-0.0856*** (0.00824)
Airport 70					1.507*** (5.59e-05)	-0.751*** (6.69e-05)	0.759** (0.0277)	-0.827*** (1.16e-08)
Constant	5.359*** (0)	0.423 (0.372)	5.196*** (0)	2.306*** (0)	5.625*** (0)	-0.00221 (0.996)	5.327*** (0)	1.930*** (0)
Observations	6,580	6,580	6,580	6,580	6,580	6,580	6,580	6,580
State fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Number of zeroes	1427	1427	4534	4534	1427	1427	4534	4534
Variables	(9) nattotval	(10) passive	(11) cbtotval	(12) passive	(13) nattotval	(14) passive	(15) cbtotval	(16) passive
Market potential	0.247*** (2.13e-07)	-0.257*** (2.42e-06)	0.224*** (5.06e-11)	-0.137*** (0.00379)	0.222*** (5.42e-05)	-0.205*** (0.000322)	0.213*** (1.10e-08)	-0.0968*** (0.00861)
Airport 70					1.662*** (1.96e-07)	-0.760*** (3.77e-05)	0.957*** (0.00219)	-0.846*** (1.40e-09)
Population density	-0.000118*** (0.00293)	9.32e-06 (0.735)	-0.000115*** (0.00480)	3.22e-06 (0.912)	-0.000137*** (1.92e-06)	1.71e-05 (0.467)	-0.000130*** (1.36e-06)	1.63e-05 (0.398)
Constant	5.086*** (0)	0.457 (0.278)	4.927*** (0)	2.321*** (0)	5.307*** (0)	0.0573 (0.895)	5.037*** (0)	1.998*** (0)
Observations	6,580	6,580	6,580	6,580	6,580	6,580	6,580	6,580
State fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Number of zeroes	1427	1427	4534	4534	1427	1427	4534	4534

Robust pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1; all estimates converged in one step; totval = total value; nat = national; cb = cross-border

No clear difference is found between the results for cross-border versus national M&As, which indicates that once a target location has been chosen – for cross-border M&As relatively larger locations compared to national M&As – market access, distance to an international airport, or population density are roughly equally important. Additional sensitivity analyses with controls, like unemployment, commuting time, differentiating between coastal locations or sunbelt locations, and income per capita, did not change the conclusions. We also experimented with our choice of location, see Table A.4 in the Appendix, by taking the so-called Urban locations as our spatial unit of analysis where we allocated all M&As in a certain M&A location to the Urban location with which it is linked, this gives us 3535 locations to be analyzed (2459 locations with M&As and 1076 locations without M&As) but this alternative specification of the spatial units also does not affect our conclusions.

7 CONCLUSIONS

The bulk of FDI consists of cross-border M&As. What has received scarce attention so far, in both the international economics and the international business literature, is the location of these M&As within the host country. By explicitly adding the location pattern of M&As, we can add to our understanding of M&As because location patterns not only reveal where a merger or acquisition takes place, but also whether the location pattern of cross-border M&As differs from national M&As or from location patterns in general. Location selection is not random and we hypothesize, based on the work of Guadalupe et al. (2012), that cross-border acquirers are more selective than national acquirers, as they have to overcome larger market entry costs or, put differently, as they have to overcome the liability of foreignness.

To test our hypotheses, we analyze all manufacturing cross-border M&As into the United States as well as all manufacturing national M&As between 1985 and 2012. We provide three sets of empirical evidence. Using the Ellison-Glaeser index, we first find that M&As are indeed more concentrated than firms in general, and that cross-border M&As are even more concentrated, suggesting indeed that non-mobile location characteristics as suggested by Anand and Delios (2002) are important for the sorting mechanism determining target firm selection. Based on a novel test introduced by Davis and Dingel (2014), we then establish that cross-border M&As are concentrated in larger agglomerations than national M&As. These larger M&As might offer higher agglomeration rents or provide better market access. Finally, we offer Zero Inflated Poisson estimates of the value of M&As in particular locations, which in the first stage distinguishes between a group where no M&As take place (but do have targets) and locations that are attractive for M&As. In the second stage the intensive margin of M&As is determined. We show that the distinction between locations for cross-border M&As and national M&As is particularly important for the first stage: locations need a good market access and access to a nearby international

airport in order to be eligible for cross-border M&A activity, also after controlling for location specific variables.

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APPENDIX DATA DESCRIPTION

Data

The best and most extensive data source for M&As is the ‘Global Mergers and Acquisitions’ database of Thomson Financial Securities Data (Thomson, hereafter). Our sample from the Thomson dataset starts in 1985 and runs until July 2012. We focus on all countries and selected those firms that merged with or took over a firm in the USA. National M&As refer to an American-based firm merging or acquiring another American-based firm, whereas cross-border M&As refer to firms from outside the US that take over a US based firm (not necessarily US-owned). We have information on the value of the transaction only in 45 per cent of the cases. In general, the larger the deal the more likely it is that there is information regarding the value of the transaction. Since cross-border M&As are on average larger than national M&As, this explains why the value of the transaction is available for 51 per cent of the cross-border M&As compared to 44 per cent of the national M&As. For both types of M&As employment information is only provided for 10 per cent of the cases, while information on both value and employment is available for only 8 per cent of the M&As. We focus our attention on the M&As for which the value of the transaction is available.

M&A location matching

To provide more detailed information on the location of M&As we matched the Thomson data with geographic information (longitude and latitude). As a starting point, we took the 86,249 M&As for which the value of the transaction is known, see Table A1 for details. Of these M&As Thomson provides the “city” as well as the state for about 83 per cent of the observations. Restricting attention to the 48 contiguous states and Washington DC reduces the number of M&As to 71,038 observations (82 per cent of the total).

Table A1 Geographic matching of M&As

	National	%	Cross-border	%	Total	%
With value	72,561	100	13,688	100	86,249	100
With value and city	60,266	83	11,034	81	71,300	83
48 contiguous states + DC	60,055	83	10,983	80	71,038	82
Geographically matched	59,961	83	10,963	80	70,924	82

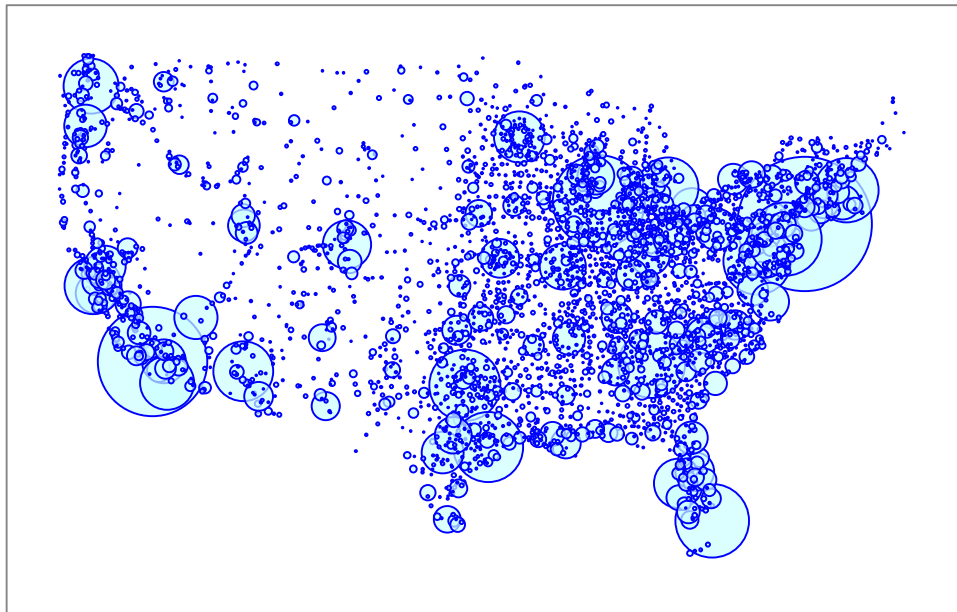
We used location information on about 43,500 locations provided to us by University of Groningen (available upon request), to connect the state and city in the Thomson data to longitude and latitude coordinates. We manually corrected the information where needed and possible in about 9000 cases (10 per cent of the total). In most cases this involved correction of spelling errors, such as “Birmingham” instead of “Bermingham” in Alabama or “Phoenix” instead of “Phoeniz” in Arizona. In other cases we needed to delete a comma or excess information, such as the “N” in “N Hollywood” California. When the location could not be matched directly, we used

Google earth, and allocated it to a nearby big(ger) city. The location “Newbury Park” in California, for example, is thus allocated to “Thousand Oaks.” In case the “city” refers to a wider area, such as the “Piceance basin” in Colorado or the “Gulf of Mexico” in Texas we looked up this area on Google or used common knowledge to allocate it to a central location within the area, in casu “Meeker” and “Corpus Christi,” respectively. In some exceptional cases (114 times, 0.1 per cent of the total) we were not able to allocate the M&A to any location in particular. This happened, for example, for “California” and “Lakeview Terrace” in the state of California and for “Suite 630” in Minnesota. These cases are excluded from our further analysis. As Table A1 indicates, there is little difference in the success rate of matching to specific locations between national M&As and cross-border M&As.

Urban location matching

The 2010 US Census identifies 3592 Urban locations, consisting of 497 ‘Urban Areas’ (population $\geq 50,000$) and 3095 ‘Urban Clusters’ (population from 2,500 to 50,000). Together the Urban locations account for about 253 million people or about 82 percent of the total American population. From now on we ignore the 57 Urban locations in Alaska, Hawaii, and Puerto Rico and concentrate on the 3535 remaining Urban locations. The largest Urban Area is New York – Newark (18.35 million), followed by Los Angeles – Long Beach – Anaheim (12.15 million) and Chicago (8.61 million), see Figure A.1 for an overview of the distribution of population size for the Urban locations.

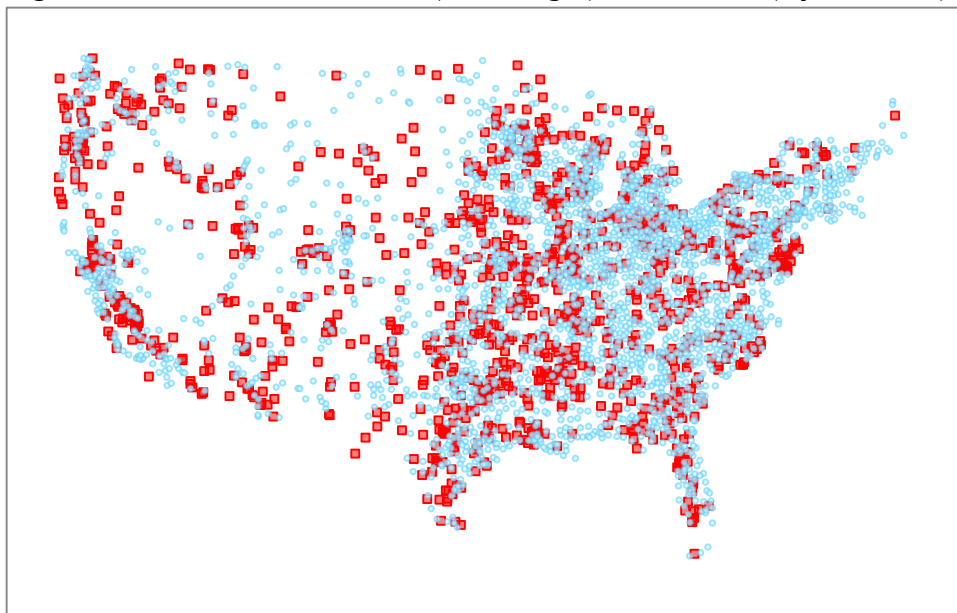
Figure A.1 Population size of Urban locations



We link M&A locations to Urban locations in two steps. First, for all M&A locations we check if there is an Urban location with the same name. If so, we link the M&A location to this Urban location and impose a distance of zero between the two

locations.²⁰ Second, for the remaining M&A locations we calculate the minimum distance from this location to all Urban locations using latitude and longitude. We link the M&A location to the nearest Urban location while recording the distance between the two locations. Using this procedure the 5504 M&A locations are linked to 2459 different Urban locations. This implies that the remaining 1076 Urban locations do not have any M&A location linked to them. They can be found throughout the country, as illustrated in Figure A.3.

Figure A.2 Urban locations with (circle, light) and without (square, dark) M&As



Our estimation procedure can now, in principle, proceed in two different ways.

- First, we can take the 5504 M&A locations as a point of departure and identify the location-specific characteristics that make them attractive for M&As. We then add the 1076 Urban locations without any M&A links and their location-specific characteristics. The total number of locations is thus $5504 + 1076 = 6580$.
- Second, we can take the Urban locations as our point of departure. We then allocate all M&As in a certain M&A location to the Urban location with which it is linked. This gives us 3535 locations to be analyzed, namely 2459 locations with M&As and 1076 locations without M&As.

The main paper evaluates the results of the first approach, while providing the results of the second approach as a robustness check.

Table A.3 provides a description of the variables used and the relevant sources.

²⁰ This happens for 1799 M&A locations.

Table A.3 Variable definitions and sources

Variable	Description	Source
nat tot #	The number of M&A targets with value information available at a given location taken over by national (American) firms in the period 1985 – July 2012	Thomson Financial Securities matched with University of Groningen location data
cb tot #	The number of M&A targets with with value information available at a given location taken over by foreign firms in the period 1985 – July 2012	Thomson Financial Securities matched with University of Groningen location data
nat tot val	The real value in 2010 \$ million (using GDP deflator) of the nat tot # variable M&A targets at a given location taken over by national (American) firms in the period 1985 – July 2012	Thomson Financial Securities matched with University of Groningen location data
cb tot val	The real value in 2010 \$ million (using GDP deflator) of the cb tot # variable M&A targets at a given location taken over by foreign firms in the period 1985 – July 2012	Thomson Financial Securities matched with University of Groningen location data
MSA dist	Distance from M&A location (or urban location) to nearest MSA location in km; connection with relevant MSA variables	Calculated based on coordinates, US Census Bureau and Proximityone.com
airp dist	Distance in km from M&A location (or urban location) to nearest main airport, list of 20 busiest airports by total passenger boardings in 2010 for 48 states + DC	Calculated based on coordinates, IATA (www.iata.org/)
seap dist	Distance in km from M&A location (or urban location) to nearest main seaport, list of 20 busiest seaports in 2010 for 48 states + DC ²¹	Calculated based on coordinates, American Association of Port Authorities (http://www.aapa-ports.org/)
MP Harris	Market potential of M&A location (or urban location) based on distance to all MSAs; sum of all MSA income in US \$ billion in 2010 with distance decay = -1; internal distance ($(\frac{2}{3})\sqrt{(area/\pi)}$) is used if bigger than distance based on coordinates	Calculated based on coordinates, US Census Bureau and Proximityone.com
MP 0.9 Urban location	Same as above with distance decay = -0.9 List of 3592 urban locations (urban areas and urban clusters) in USA with at least 2500 inhabitants in 2010; variables: Longitude in decimals Latitude in decimals Population size in 2010 Land area in square km	US Census Bureau

²¹ We used the ports of: Mobile, Lake Charles, Baton Rouge, Long Beach, Los Angeles, Twin Ports, Houston, New York, Baltimore, Tampa, Huntington, Beaumont, Louisiana, New Orleans, Hampton, Pittsburg, Philadelphia, Corpus Christi, Tampa, Texas Citi. The ranking is relatively robust over the years, although at the bottom end of the ranking some changes can occur.

Table A.3 continued

MSA	List of 374 Metropolitan Statistical Areas in Proximityone.com USA, 2011; variables: Longitude in decimals Latitude in decimals Population size in 2010 Population size in 2000 Land area in square mile Population weighted density in 2010 E002, EMPLOYMENT STATUS - In labor force E003, EMPLOYMENT STATUS - In labor force - Civilian labor force E005, EMPLOYMENT STATUS - In labor force - Civilian labor force – Unemployed E025, COMMUTING TO WORK - Mean travel time to work (minutes) E032, INDUSTRY - Civilian employed population 16 years and over E033, INDUSTRY - Agriculture, forestry, fishing and hunting, and mining E034, INDUSTRY - Construction E035, INDUSTRY - Manufacturing E036, INDUSTRY - Wholesale trade E037, INDUSTRY - Retail trade E038, INDUSTRY - Transportation and warehousing, and utilities E039, INDUSTRY - Information E040, INDUSTRY - Finance and insurance, and real estate and rental and leasing E041, INDUSTRY - Professional, scientific, and management, and administrative and waste management services E042, INDUSTRY - Educational services, and health care and social assistance E043, INDUSTRY - Arts, entertainment, and recreation, and accommodation and food services E044, INDUSTRY - Other services, except public administration E045, INDUSTRY - Public administration E048, CLASS OF WORKER - Government workers E051, INCOME AND BENEFITS - Total households E062, INCOME AND BENEFITS - Median household income (dollars) E063, INCOME AND BENEFITS - Mean household income (dollars) E068, INCOME AND BENEFITS - With retirement income E088, INCOME AND BENEFITS - Per capita income (dollars) E092, INCOME AND BENEFITS - Median earnings for workers (dollars) E093, INCOME AND BENEFITS - Median earnings for male full-time, year-round workers (dollars) E094, INCOME AND BENEFITS - Median earnings for female full-time, year-round workers (dollars) E119, PERCENT OF FAMILIES/PEOPLE WHOSE INCOME IN PAST 12 MONTHS IS BELOW POVERTY LEVEL - All families
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Table A.4 Urban Location sensitivity: M&A locations versus No M&A locations (the extensive margin)

Variables	(1) MAtotval	(2) passive	(3) nattotval	(4) passive	(5) cbtotval	(6) passive
Market potential	0.300*** (0.00267)	-0.254*** (4.21e-09)	0.308*** (0.00247)	-0.255*** (5.98e-10)	0.219*** (0.00541)	-0.429*** (0.000149)
Airport 70	2.143*** (4.78e-06)	-0.359** (0.0433)	2.128*** (1.99e-05)	-0.372** (0.0146)	1.715*** (6.19e-07)	-0.484** (0.0200)
Population density	-6.52e-05 (0.264)	-2.62e-05 (0.257)	-7.32e-05 (0.216)	-3.17e-05 (0.187)	-1.24e-05 (0.873)	1.66e-06 (0.966)
Constant	5.523*** (0)	0.667** (0.0441)	5.371*** (0)	0.995*** (0.00164)	5.144*** (0)	4.175*** (9.76e-07)
Observations	3,535	3,535	3,535	3,535	3,535	3,535
State fixed effects	YES	YES	YES	YES	YES	YES
Number of zeroes	1076	1076	1173	1173	2570	2570

Robust pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1; all estimates converged in one step; totval = total value; MA = Mergers & Acquisitions; nat = national; cb = cross-border