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Cross-border mergers and acquisitions and inter-urban gravity*

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Abstract

Cross-border mergers and acquisitions (M&As) have grown rapidly in recent years and are a major part of foreign direct investment (FDI). However, M&A distribution is highly skewed, with most of the activity concentrated in certain countries and even in certain cities. Only a handful of cities account for most M&As. Unlike many previous studies that have relied on a gravity model approach using the bilateral volume of FDI, this study examines the determinants of cross-border M&As by applying an FDI gravity model to inter-city investment flows in the world. The empirical results, which are based on panel data of M&A flows among 44 major cities in the world for 2010–2017, show that besides the basic attributes used in conventional gravity models such as market size and distance between origin city and destination city, urban-specific attributes such as the agglomeration of the world's top-ranked firms and the number of foreign residents have a statistically significant explanatory power for inward M&As.

Keywords: Gravity model, M&As, border effects, inter-city investment, agglomeration
*JEL Classification*s: F14, F21, F23

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1. Introduction

Cross-border mergers and acquisitions (M&As) have shown a sharp increase in activity over the past decade. According to UNCTAD (2019), the value of net cross-border M&As has reached 62% of foreign direct investment (FDI) inflows. Most of them are concentrated in developed countries, which account for 84% of the global total. The present study asserts that such flows are concentrated in only a handful of cities. Table 1 shows the proportion of the top 1%, 5%, and 10% of the target cities to the total value of inward M&As in the country. Obviously, the value of M&As is concentrated in certain cities in a country. In China, France, and Japan, the top 1% of cities account for more than half of the total, and the top 10% account for about 90% of the total. Such significant bias towards particular cities can be seen in France, Germany, Japan, the United Kingdom, and the United States as well.

[Insert Table 1 about here]

Conventionally, we have relied on a gravity equation using bilateral transactions to explain international trade and FDI. However, the occurrence of concentration in specific cities raises doubt concerning the validity of this traditional approach based on bilateral transactions. Firms may make investment decisions taking into account the attributes of the target city rather than the target country and the distance from the origin city to the target city rather than the distance between the capitals.

The factors that cause M&As to be concentrated in specific cities have not yet been elucidated. To explore the city-specific attributes that attract inward M&As, unlike many

previous studies using a gravity model for bilateral FDI,[1] this study examines the determinants of cross-border M&As by applying a gravity model to inter-city M&As in the world.

This paper contributes to the literature by empirically showing how the gravity model for bilateral FDI fits inter-city M&As in the world. The gravity model is estimated using the data collected on 44 cities in the world for city-level attributes. To the best of my knowledge, this study is the first attempt to estimate a gravity model for cross-border M&As at the city level. The present study examines as to whether a gravity model for bilateral FDI performs as well in explaining inter-city M&A volumes with plausible signs of basic gravity variables such as market size and geographical distance. Further, this study answers the question of which attractive urban attributes invite M&As. One possible explanation for why such trade is so much more concentrated in specific cities is that there are benefits from agglomeration.[2] It is likely that the agglomeration of foreign-invested firms in destination cities generate a Marshallian externality that arises from the pooling of specialized workers and the sharing of intermediate input and knowledge (Fujita and Thisse, 1996). As Duranton and Puga (2004) pointed out, the externality from agglomeration is one of the important factors for firm's location choice, and thus the agglomeration of foreign-invested firms is likely to be an attractive city attribute that

[1] See Brainard (1997), Nitsch and Maskus (2002), Portes and Rey (2005), Bénassy-Quéré et al. (2005), Bergstrand and Egger (2007), Kleinert and Toubal (2010), Blonigen and Piger (2014), Román et al. (2016), and Hoshi and Kiyota (2019). Head and Mayer (2015) provide a literature review with regard to the gravity model of FDI.

[2] For example, Head et al. (1995) provide evidence that vertical supplier-assembler relationship attracts subsequent FDI by using Japanese multinational enterprises.

triggers subsequent M&As. This study sheds light on the role of the agglomeration of foreign-invested firms in target cities in M&As among major cities. Another contribution of this study is to present evidence of border effects on M&As by dealing with both intra-national and cross-border transactions.

The remainder of this paper is organized as follows. Section 2 elaborates on the gravity equation for inter-city M&As and the variables to be used in the estimation. Section 3 explains the data used in the estimation of the gravity model. Section 4 presents the estimation results of the gravity model. Section 5 summarizes and concludes.

2. Application of the gravity model to cross-border M&As

Head and Ries (2008) developed a gravity model for examining the determinants of FDI. They theoretically derive the gravity model for FDI, applying the model from an inspection game between the headquarters of a multinational enterprise and a subsidiary. They specify the costs and benefits of controlling a remote overseas subsidiary. The model assumes that the managers in the headquarters are required to monitor the managers at the overseas subsidiary to exert effort to maximize the value of the subsidiary, and monitoring costs are assumed to increase with the bilateral geographical distance between the headquarters and its subsidiary. In addition, the bilateral FDI is assumed to be proportional to the country's size variable. From this theoretical consideration, they derive a gravity model that includes origin- and target- country specific factors and bilateral distance. This existing framework is useful in considering the

extension to an inter-city-level analysis on cross-border M&As. As panel data is used in the estimation of this study, the gravity model for FDI is modified to include the time dimension. A gravity model for explaining inter-city M&As from origin city *i* to target city *j* in year *t* MA_{ijt} is expressed as follows:

$$MA_{ijt} = \exp\left(\mathbf{O}'_{it}\alpha + \mathbf{T}'_{jt}\beta + \mathbf{D}_{ijt}\theta\right)\varepsilon_{ijt} \qquad (1)$$

where $\mathbf{O}'_{it}$ is the vector of time-variant origin city-year specific factors; $\mathbf{T}'_{jt}$ is the vector of time-variant target city-year specific factors; $\mathbf{D}_{ijt}$ is the vector of origin-target city pair characteristics, and ε_{ijt} is the disturbance term.

With respect to the time varying origin- and target-city-year specific variables, this study uses population size (Pop_{it}, Pop_{jt}) and per capita GDP ($Pcgdp_{it}, Pcgdp_{jt}$) following Hoshi and Kiyota (2019). In addition to these size variables, some unique characteristics that would influence M&A decisions are added into the model. For example, M&A decisions may be sensitive to the level of the corporate tax rate in both the origin and target cities for the purpose of tax avoidance. If firms make investment decisions to avoid taxes, it is likely that M&As from cities with high corporate tax to low cities would be observed. The agglomeration of foreign-invested firms that is considered to generate Marshallian externality is also likely to affect inward M&As. If the knowledge-based capital required for business activities in the host city

is embodied in existing foreign-invested firms or foreign workers, it is expected that externality from the agglomeration of foreign-invested firms or workers results in a decrease of costs for firms located in the agglomerated city through shared resources and knowledge. Therefore, such benefit from agglomeration may act as a further incentive for subsequent firms to invest. In the estimation, the corporate tax rates in both the origin and target city (Tax_{it}, Tax_{jt}), and proxy variables indicate the agglomeration of foreign-invested firms in a target city (Agg_{jt}). At the national level, the institutional barrier is likely to impede inward M&As, so the level of restriction on foreign direct investment in the host country (RFI_{jt}) is also added to the model.

The $\mathbf{D}_{ijt}$ vector consists of time variant and time invariant pair characteristics as follows:

$$\mathbf{D}_{ijt} = \{Dist_{ij}, CBRD_{ij}, COMCUR_{ij}, LANG_{ij}, CLNY_{ij}, Sister_{ijt}, RTA_{ijt}\} \quad (2)$$

where $Dist_{ij}$ is the geographical distance between origin city i and target city j. As recommended by Heid et al. (2017), the gravity model of this study covers both intra-national and cross-border flows. Therefore, the dependent variable includes M&As targeting own cities (and other cities in the same country if the sampled country has multiple cities). The cross-border dummy $CBRD_{ij}$ is added to control the difference between intra-national and cross-border M&As. $COMCUR_{ij}$, $LANG_{ij}$ and $CLNY_{ij}$ indicates dummy variables that takes the

value 1 when origin city *i* and target city *j* share a common currency, a common language and the pair has a colonial relationship respectively. These two variables are likely to be appropriate proxies for factors that facilitate monitoring as addressed by Head and Ries (2008). As a time-variant pair specific factor, it is expected that impediments to an M&A between the two cities are mitigated by the strengthening of the friendship and cooperation between the two cities. To uncover this factor, this study investigates the existence of sister cities and friendship cooperation agreements among the 44 cities, and constructs a dummy variable $Sister_{ijt}$, which takes the value 1 when an agreement is in force. In order to take account of regional trade agreements (RTAs) at the national level, a dummy variable RTA_{ijt} takes the value 1 if a city pair belongs to the same RTA. As a result, the empirical specification is described as follows:

$$MA_{ijt} = \exp\big(\alpha_1 Pop_{it} + \alpha_2 Pcgdp_{it} + \alpha_3 Tax_{it} + \beta_1 Pop_{jt} + \beta_2 Pcgdp_{jt} + \beta_3 Tax_{jt} + \beta_4 Agg_{jt} + \beta_5 RFI_{jt} + \theta_1 \ln Dist_{ij} + \theta_2 CBRD_{ij} + \theta_3 Sister_{ijt} + \theta_4 COMCUR_{ij} + \theta_5 LANG_{ij} + \theta_6 CLNY_{ij} + \theta_7 RTA_{ijt}\big)\varepsilon_{ijt} \quad (3)$$

The gravity model is estimated by the pseudo-Poisson maximum likelihood (PPML) estimation proposed by Santos Silva and Tenreyro (2006). The advantage of the PPML estimator is to account for heteroskedasticity, and to allow zero M&A observations. Since there remains a concern about omitted variable bias, the model that includes the origin city-year fixed

effects and target city-year fixed effects instead of these explicit time-varying city characteristics is also estimated. This specification is expressed as follows:

$$MA_{ijt} = \exp\left(\boldsymbol{\lambda}'_{it} + \boldsymbol{\pi}'_{it} + \theta_1 \ln Dist_{ij} + \theta_2 CBRD_{ij} + \theta_3 COMCUR + \theta_4 LANG_{ij} + \theta_5 CLNY_{ij} + \theta_6 Sister_{ijt} + \theta_7 RTA_{ijt} + \gamma_1 CBRD_{ij} \times Agg_{jt}\right)\varepsilon_{ijt} \quad (4)$$

where $\boldsymbol{\lambda}'_{it}$ denotes the set of time-varying origin city-year fixed effects and $\boldsymbol{\pi}'_{it}$ indicates the set of time-varying target city-year fixed effects. As pointed out by Heid et al. (2017), the interaction term of cross-border dummy and city characteristics enable us to identify the effects of city attributes on M&As, even when the model includes both origin city-year and target city-year fixed effects. In this study, cross terms for variables of interest are introduced and examine the effects of urban attributes.

3. Data

The present study uses data of inter-city M&A volumes among 44 cities of 32 countries/regions retrieved from *Zephyr*, the database of M&A transactions provided by Bureau van Dijk (BvD). M&A volume data is available for the years 2010–2017 including own-city M&As as well as those targeting other domestic cities. City selection depends on the availability of data on the attributes of the city such as population size, per capita GDP, and proxies for the agglomeration of foreign-invested firms. The characteristics at the city level are collected from the Global

Power City Index (GPCI) Yearbook published by the Institute of Urban Strategies, The Mori Memorial Foundation for the period 2010–2017. The GPCI Yearbook collects a variety of statistics for the 44 cities in the world in order to evaluate and rank them.[3] In addition to the basic gravity variables such as population size (Pop_{it}, Pop_{jt}) and per capital GDP ($Pcgdp_{it}, Pcgdp_{jt}$), the level of corporate tax rates (Tax_{it}, Tax_{jt}), the number of the world's top 300 companies (Agg_Firms_{jt}) and the number of foreign residents ($Agg\_Foreigners_{jt}$) as proxy variables of agglomeration were collected from the dataset. The list of 44 cities is displayed in Table 2 with the average volume of inward and outward M&As flows per year over the period covered in this study. The number of sample cities increased over time, from 35 cities during 2010–2011 to 40 cities during 2012–2015. Two more cities were added in 2016 and 2017 respectively, and 44 cities are covered in 2017. Hence, the sample size of inter-city M&As for the 8 years is (35×35×2) + (40×40×4) + (42×42) + (44×44) = 12,550 at the maximum. The annual volume of M&As can be divided into intra-national and cross-border. In most of the sample cities, intra-national inward M&As is more dominant than cross-border inward M&As, suggesting the existence of border effects.

[Insert Table 2 about here]

[3] The criteria for city selection consist of the following three (Institute of Urban Strategies, The Mori Memorial Foundation, 2018) 1. Top-ten cities in existing influential city rankings; 2. Major cities of countries found in the top ten of existing influential international competitiveness rankings; 3. Cities which do not meet the above criteria but were deemed appropriate for inclusion by the GPCI Executive Committee. However, some cities match one or more of the above criteria but are not evaluated in the GPCI as necessary data are not available.

The geographical distance between origin city i and target city j ($Dist_{ij}$) is retrieved from the *world distance calculator* website. The city-pair dummy variable indicating sister city or friendship cooperation agreements ($Sister_{ijt}$) is constructed by surveying the homepages of each city on the Internet one by one. Regarding country-pair characteristics, following Head and Ries (2008), this study employs directional dummy variables for colonial relationships to indicate M&As to a former colony from its colonizer ($ToCLNY_{ij}$) and M&As from a colony to its colonizer ($FromCLNY_{ij}$). These are retrieved from the Centre d'Etudes Prospectives et d'Informations Internationales as well as other country-pair characteristics including the common currency dummy ($COMCUR_{ij}$), common language dummy ($LANG_{ij}$), and RTA dummy (RTA_{ijt}). To consider the impact of country-level FDI regulation in the target city (RFI_{jt}), the total FDI regulatory restrictiveness index (RRI), which measures statutory restrictions on FDI, is additionally collected from the OECD. Table 3 shows the descriptive statistics of variables.

[Insert Table 3 about here]

4. Estimation results

Table 4 displays the basic results from the pooling estimation for Eq. (3). The results show the estimated coefficients from PPML and robust standard errors clustered at the city pair in brackets to account for the correlation within a city pair. All estimations include year fixed effects, although the results are suppressed. Column (1) reports the result from the model

including the market sizes of both origin city and target city and its distance. As shown in the results from empirical studies on the bilateral gravity model, the economic sizes of both cities have a positive impact on M&As between cities, while the geographical distance between the two cities is, as expected, significantly and negatively associated with inter-city M&As. This result is always consistent, even considering other covariates.

[Insert Table 4 about here]

Column (2) shows the results of the model with the border dummy variable which takes the value of one when the target city is located in a foreign country. The coefficient of border dummy is significantly negative, indicating the cross-border M&As would be approximately one-third of intra-national M&As ($\exp[-1.159]=0.314$), holding other factors constant. This result is consistent with Table 1, which shows the average volume of intra-national M&As is significantly larger than cross-border M&As in most cities. As demonstrated by the gravity model of trade, border effects are still noticeable even if the effects of distance are controlled.

The result in column (3) shows that time-varying city and city pair characteristics are associated with inter-city M&As. Specifically, regarding corporate tax rates, the tax rate in the origin city is positively related with inter-city M&As while that in the target city has no significant impact. Since this study only covers major cities in the world, cities and regions that are considered tax evasion sites are not included in the analysis. The insignificant sign of tax

rate in target city may be due to the lack of variation in the sample. Therefore, although the effect of corporation tax cannot be determined from this result, it is suggested that at least a high tax rate triggers outward M&As.

The number of the world's top 300 companies introduced into the model as a proxy for the agglomeration of foreign-invested firms in the target city has a statistically significant positive impact on inter-city M&As, which is greater than market size variables such as population and GDP per capita, while another measurement for agglomeration, namely that of foreign residents, is not statistically significant. As a city-pair attribute, this study examines the possible positive effect of twin/sister city or cooperation agreements on the inter-city M&A volume. However, contrary to expectation, the sign of the sister city dummy variable is negative and statistically significant. The coefficient of the sister-city dummy indicates that M&As between sister cities would be approximately two-thirds of that for cities lacking a sister cities agreement ($\exp[-0.464]=0.629$), all other things being equal. Originally, the conclusion of sister cities agreements may have been intended for cultural exchange rather than strengthening economic ties, but in some cases, they mutually exchange investment promotion delegates. The results of this study show that investment in two cities does not necessarily accelerate even if the official connection between cities is strengthened, but rather that investment is increased in cities without such bureaucratic connections.

Columns (4)–(6) show the results from the model where country pair-level variables are added as well as city-level variables. Although the signs of the common currency dummy and common language dummy are not statistically significant, those of the colonial relationship (only from the colony) dummy and RTA dummy variable are statistically significant and positive, which are intuitively plausible results. Even if country-pair level variables are introduced into the model, they do not change the significance of city-level variables.

This study also estimates the equation in which dummy variables for origin city-year and target city-year are introduced instead of using explicit variables. Table 5 displays the results from the model with time-varying city fixed effects. It is remarkable that the coefficient of border dummy variable is still significant at the 1% level even after the time-varying city fixed effects are introduced into the model. As presented in Eq. (4), introducing interacted terms of time-varying city attributes and the border dummy leads to the alternative specification that identifies the effect of city characteristics even when the origin- and target city-year fixed effects are controlled (Heid et al., 2017; Beverelli et al., 2018). Columns (2) and (3) in Table 5 report the results from the model in Eq. (4). The result of the interacted term of border dummy and the number of world's top 300 firms ($CBRD_{ij} \times Agg\_Firms_{jt}$) is compatible with the results in Table 4, showing a statistically significant positive effect. As an alternative measurement, the model with the interacted term of border dummy and the number of foreign residents ($CBRD_{ij} \times Agg\_Foreigners_{jt}$) is also estimated, and the its coefficient turns to be

statistically significant and positive as reported in column (4). These results support the assertion that the concentration of foreign-invested companies has the effect of further promoting subsequent inward M&As. In addition to the variables of interest, the effects of other factors such as tax rates and regulations were also examined. With respect to the tax impacts ($CBRD_{ij} \times \ln Tax_{it}, CBRD_{ij} \times \ln Tax_{jt}$) displayed in columns (5) and (6), no statistically significant impact is detected for both origin and target city. On the other hand, as shown in column (7), country-level investment regulation ($CBRD_{ij} \times RFI_{jt}$) which is measured by total FDI RRI is found to be negatively associated with inter-city M&As. A higher RRI reflecting foreign capital regulation at the country level is likely to inhibit inward M&As at the city level. As a robustness check, time-invariant city-pair fixed effects are introduced to the gravity equation. The endogeneity can be eliminated by the fixed-effect model under the assumption that unobserved city-pair specific effects are time-invariant. The results indicate that the main results still hold, even after unobserved origin-target city-pair effects are controlled.

[Insert Table 5 about here]

5. Conclusion

With regard to the determinants of FDI, many previous studies relied on bilateral data to utilize gravity models. Unlike the literature on this topic, this study examines whether the gravity model can explain inter-city M&As in the world using disaggregated M&A data at the city level for the years 2010–2017. The empirical strategy builds on the framework of gravity model for

bilateral FDI and empirically examines the effect of city-level attributes. This study focuses on the role of the border effect and agglomeration of foreign-invested firms.

The estimation results from PPML reveal that the gravity model fits well even in the inter-city data. Although the range of cities covered in this paper is very limited, the evidence that the gravity model is applicable even between cities suggests the further potential of gravity models. This study also examines the border effect that differentiates intra-national and cross-border M&As. The value of cross-border M&As has nearly quadrupled in the last ten years (UNCTAD, 2019), but the results of this study show that border effects are still substantial.

As for city attributes, the present study sheds light on the role of the agglomeration of foreign-invested firms in target cities in M&As among the major cities. The sharing of resources and knowledge through pools of foreign-invested firms and foreign workers agglomerated in the target city will benefit subsequent investors. From the results, it is concluded that the agglomeration of foreign firms or workers has a positive impact on inward M&As. In policy debates, it has been highlighted that it is important to promote inward investment to spur economic growth (Hoshi and Kiyota, 2019). The results of this study show that the agglomeration of foreign-invested companies has a cyclical effect that leads to subsequent inward investment, suggesting that agglomeration promotes investment concentration in specific cities. The present study argues that country-level deregulation and strengthening economic ties through RTAs are still crucial factors to increase cross-border M&As.

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Table 1. Share of M&A volumes for top recipient cities in 2017

Country	Top 1%	Top 5%	Top 10%
China	66.5%	82.5%	88.8%
France	55.6%	77.1%	88.6%
Germany	25.4%	57.8%	72.6%
Japan	60.8%	86.5%	92.9%
UK	46.7%	68.1%	81.8%
US	38.6%	75.0%	85.6%

Source: Author's computation based on the *Zephyr* database by BvD.

Table 2. Sampled cities and the annual average volume of M&As (USD million)

		Inward M&A		Outward M&A	
City	Availability	Intra-national	Cross-border	Intra-national	Cross-border
Amsterdam	2010-2017	5125	21294	5510	32555
Bangkok	2010-2017	3438	1066	3738	1666
Barcelona	2012-2017	3742	1500	924	839
Beijing	2010-2017	51631	15505	68244	17546
Berlin	2010-2017	1583	2932	1406	1300
Boston	2010-2017	6816	1348	23830	10654
Brussels	2010-2017	2523	3925	2532	18574
Buenos Aires	2017	2475	1381	2473	566
Cairo	2010-2017	230	1452	356	197
Chicago	2010-2017	20942	6605	40123	7009
Copenhagen	2010-2017	717	294	534	317
Dubai	2017	1025	1125	791	1982
Frankfurt	2010-2017	1435	1719	2451	2535
Fukuoka	2010-2017	549	78	310	34
Geneva	2010-2017	312	702	197	1052
Hong Kong	2010-2017	5443	2276	811	7154
Istanbul	2012-2017	1416	2521	1247	382
Jakarta	2016-2017	4233	3959	4504	688
Johannesburg	2016-2017	1856	447	879	1234
Kuala Lumpur	2010-2017	3585	2044	3830	1004
London	2010-2017	27957	46343	47081	66447
Los Angeles	2010-2017	5024	1758	8764	8788
Madrid	2010-2017	14155	17537	19999	9622
Mexico City	2012-2017	5648	1813	5130	1946
Milan	2010-2017	6489	13091	8567	2075
Moscow	2010-2017	34619	21172	41436	10506
Mumbai	2010-2017	12500	5907	14475	761
New York	2010-2017	92644	16201	120077	63677
Osaka	2010-2017	8970	2004	5621	3869
Paris	2010-2017	16548	16165	21326	35728
San Francisco	2010-2017	23773	2368	19044	6603
Sao Paulo	2010-2017	16213	5090	17454	1405
Seoul	2010-2017	25452	5287	27738	3422
Shanghai	2010-2017	31503	7652	33884	3542
Singapore	2010-2017	7849	7193	7828	28896
Stockholm	2012-2017	3237	5024	4923	4931
Sydney	2010-2017	14210	8354	15584	7570
Taipei	2010-2017	5327	818	6865	3005
Tokyo	2010-2017	64618	8052	74541	42758
Toronto	2010-2017	10546	4404	11974	19909
Vancouver	2010-2017	4171	4433	3704	1842
Vienna	2010-2017	963	2173	1525	1087
Washington, D.C.	2012-2017	2246	1235	11700	4519
Zurich	2010-2017	1814	3532	2432	12312

Table 3. Descriptive statistics

Variable	Description	Obs	Mean	Std. Dev.	Min	Max
MA_{ijt}	M&A flow (Ten thousand USD)	12,550	34580	312830	0	12900000
$\ln Pop_{it}$	Origin city's population (log, 1000)	12,550	7.98	1.18	5.25	10.10
$\ln Pcgdp_{it}$	Origin city's per capita GDP (log, USD)	12,550	10.62	0.91	7.41	12.13
$\ln Pop_{jt}$	Target city's population (log, 1000)	12,550	7.98	1.18	5.25	10.10
$\ln Pcgdp_{jt}$	Target city's per capita GDP (log, USD)	12,550	10.62	0.91	7.41	12.13
$\ln Dist_{ij}$	Distance btw origin and target city (log, km)	12,550	8.39	1.66	0	9.89
$CBRD_{ij}$	Cross-border dummy	12,550	0.95	0.22	0	1
$Sister_{ijt}$	Sister city pair dummy	12,550	0.13	0.33	0	1
$\ln Tax_{it}$	Tax rate in origin city (log, %)	12,550	3.29	0.66	-6.91	3.82
$\ln Tax_{jt}$	Tax rate in target city (log, %)	12,550	3.29	0.66	-6.91	3.82
Agg_Firms_{jt}	The N of top 300 firms in target city	12,550	1.11	0.91	0	4.08
$Agg\_Foreigners_{jt}$	The N of foreign residents in target city	11,158	12.25	1.06	10.07	14.72
$COMCUR_{ij}$	Common currency dummy	12,550	0.09	0.29	0	1
$LANG_{ij}$	Common language dummy	12,550	0.19	0.39	0	1
$ToCLNY_{ij}$	To colony dummy	12,550	0.03	0.16	0	1
$FromCLNY_{ij}$	From colony dummy	12,550	0.03	0.16	0	1
RTA_{ijt}	RTA dummy	12,550	0.29	0.45	0	1
RFI_{jt}	Total FDI Regulatory Restrictiveness Index	11,242	0.11	0.09	0.02	0.43

Table 4. Base results from the gravity model for inter-city M&As

	(1)	(2)	(3)	(4)	(5)	(6)
City-level variables						
$\ln Pop_{it}$	0.610***	0.605***	0.571***	0.591***	0.604***	0.610***
	[0.125]	[0.121]	[0.116]	[0.117]	[0.127]	[0.117]
$\ln Pcgdp_{it}$	0.762***	0.762***	0.649***	0.703***	0.764***	0.678***
	[0.0937]	[0.0922]	[0.115]	[0.116]	[0.140]	[0.156]
$\ln Pop_{jt}$	0.703***	0.696***	0.292**	0.297**	0.627***	0.328**
	[0.121]	[0.119]	[0.130]	[0.133]	[0.113]	[0.145]
$\ln Pcgdp_{jt}$	0.421***	0.397***	0.0153	-0.0531	0.316**	0.0177
	[0.113]	[0.119]	[0.132]	[0.133]	[0.145]	[0.196]
$\ln Dist_{ij}$	-0.493***	-0.368***	-0.376***	-0.355***	-0.373***	-0.347***
	[0.0115]	[0.0410]	[0.0433]	[0.0356]	[0.0387]	[0.0305]
$CBRD_{ij}$		-1.159***	-1.008**	-1.413***	-1.355***	-1.370***
		[0.428]	[0.465]	[0.389]	[0.454]	[0.406]
$Sister_{ijt}$			-0.464**	-0.406**	-0.367*	-0.451**
			[0.200]	[0.204]	[0.220]	[0.223]
$\ln Tax_{it}$			0.549*	0.567*	0.826**	0.923
			[0.301]	[0.328]	[0.359]	[0.657]
$\ln Tax_{jt}$			-0.102	-0.112	0.00123	-0.717
			[0.128]	[0.170]	[0.207]	[0.709]
Agg_Firms_{jt}			0.453***	0.447***		0.427***
			[0.0540]	[0.0537]		[0.0558]
$Agg\_Foreigners_{jt}$					0.0382	
					[0.0623]	
Country-level variables						
$COMCUR_{ij}$				-0.0713	-0.0474	-0.0902
				[0.395]	[0.418]	[0.390]
$LANG_{ij}$				0.379	0.0963	0.453*
				[0.283]	[0.325]	[0.264]
$ToCLNY_{ij}$				0.326	0.395	0.431
				[0.290]	[0.298]	[0.343]
$FromCLNY_{ij}$				1.413***	1.527***	1.188***
				[0.225]	[0.219]	[0.275]
RTA_{ijt}				0.805**	0.749**	0.778**
				[0.327]	[0.351]	[0.333]
RFI_{jt}						-0.127
						[0.587]
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-9.822***	-9.460***	-2.829*	-3.227**	-11.58***	-3.266*
	[1.302]	[1.330]	[1.494]	[1.394]	[1.536]	[1.783]
Observations	12,550	12,550	12,550	12,550	11,158	11242
R-squared	0.586	0.587	0.635	0.639	0.609	0.641
Log Likelihood	-4.78E+08	-4.70E+08	-4.41E+08	-4.24E+08	-3.89E+08	-394000000

Notes: The PPML coefficients are shown. The dependent variable is the M&A volume from origin city *i* to target city *j* in year *t*. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Robust standard errors clustered within city pairs are in brackets.

Table 5. Results from the model with time-varying origin and target city fixed effects

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
City-level variables							
$\ln Dist_{ij}$	-0.347***	-0.355***	-0.334***	-0.364***	-0.325***	-0.324***	-0.320***
	[0.0193]	[0.0206]	[0.0184]	[0.0235]	[0.0174]	[0.0174]	[0.0167]
$CBRD_{ij}$	-1.495***	-2.133***	-2.796***	-13.56***	-2.917*	-3.191*	-1.359***
	[0.175]	[0.213]	[0.377]	[1.333]	[1.525]	[1.726]	[0.364]
$Sister_{ijt}$	-0.490***	-0.686***	-0.554***	-0.406***	-0.383***	-0.387***	-0.307**
	[0.151]	[0.154]	[0.147]	[0.147]	[0.146]	[0.146]	[0.150]
$CBRD_{ij} \times Agg\_Firms_{jt}$		0.414***	0.442***				
		[0.0830]	[0.0850]				
$CBRD_{ij} \times Agg\_Foreigners_{jt}$				0.929***			
				[0.105]			
$CBRD_{ij} \times \ln Tax_{jt}$					0.196		
					[0.416]		
$CBRD_{ij} \times \ln Tax_{it}$						0.276	
						[0.474]	
$CBRD_{ij} \times RFI_{jt}$							-10.65***
							[1.832]
Country-level variables							
$COMCUR_{ij}$			-0.316	0.0649	-0.365	-0.366	-0.732***
			[0.255]	[0.250]	[0.254]	[0.254]	[0.265]
$LANG_{ij}$			0.358**	-0.176	0.249	0.249	0.447***
			[0.164]	[0.148]	[0.163]	[0.163]	[0.155]
$ToCLNY_{ij}$			0.697**	0.439	0.791***	0.787***	0.601*
			[0.305]	[0.304]	[0.302]	[0.302]	[0.314]
$FromCLNY_{ij}$			0.983***	0.715***	1.069***	1.066***	0.658***
			[0.233]	[0.230]	[0.235]	[0.235]	[0.233]
RTA_{ijt}			0.850***	0.470***	0.878***	0.880***	0.734***
			[0.142]	[0.142]	[0.148]	[0.149]	[0.134]
Observations	12,481	12,481	12,481	10,809	12,481	12,481	11,141
R-squared	0.924	0.926	0.932	0.943	0.93	0.93	0.939
Log Likelihood	-2.10E+08	-2.08E+08	-1.97E+08	-1.58E+08	-2.00E+08	-2.00E+08	-1.74E+08

Notes: The PPML coefficients are shown. The dependent variable is the M&A volume from origin city *i* to target city *j* in year *t*. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Robust standard errors clustered within city pairs are in brackets.