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Spatial proximity, localized assets, and the changing geography of domestic mergers and acquisitions in transitional China

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Abstract

Mergers and acquisitions (M&As) are the main force of spatial restructuring in the location of economic decision making. This paper analyzes the changing geography of M&As and its influencing factors in China during the period of 2002–2016. It shows a significant "core-periphery" spatial pattern or network structure, in which a core group of major metropolises and developed provinces, led by Beijing, Shanghai, Guangdong, Zhejiang and Jiangsu, dominates China's M&As market and inter-regional networks, marginalizing the other regions. The descriptive and modelling results indicate that spatial proximity and corporate preferences for localized assets can shape this geography of China's domestic M&As. The findings confirm that the "home bias" does exist in China's M&As partnering. Meanwhile, the key drivers of China's domestic acquirers are their desire to access and internalize localized assets, especially in the emerging market, new technology, and policy advantages. This study enriches the existing knowledge about the determinants of inter-regional M&As in emerging economies (e.g., China), where the influences of regional disparities in the institutional setting, industrial structure, as well as economic marketization and financialization are more significant.

1 | INTRODUCTION

Cross-border and domestic mergers and acquisitions (M&As) have been growing in an unprecedented rate since the 1990s (Chapman, 2003; Zademach, 2005). The global market value for M&As increased from USD 980.5 billion in 1990 to USD 7,214.5 billion in 2015, accounting for about 45% of the global FDI (UNCTAD, 2016). As a linchpin of corporate investment and international trade, the ever-increasing M&As have greatly promoted the corporate re-organization, technological innovation, and global economic growth (Boschma & Hartog, 2014; Weterings & Marsili, 2015). M&As have also played a critical role in the rise of corporate power, the creation of wealth, and the polarization of income inequality (Du & Boateng, 2015; Mason & Harrison, 2006). Therefore, there have been plenty of studies examining M&As in and out of the developed economies (DEs) (Green, 1987; McCarthy & Dolfsma, 2015; Warf, 2003).

With the progress of globalization, multinational corporations (MNCs) that grow up in emerging economies (EEs) have fueled the boom of the global trade and investment (e.g., M&As) markets (Buckley, Yu, Liu, Munjal, & Tao, 2016; Yeung & Liu, 2008). China, for instance, became the sixth-largest acquirer and second-largest target country in the market of cross-border M&As in 2015 (UNCTAD, 2016). The literature on why and how EEs' MNCs generate cross-border M&As has been increasing in recent years (Caiazza, Very, & Ferrara, 2017; Deng & Yang, 2015; Rabbiosi, Elia, & Bertoni, 2012). Meanwhile, the number of domestic M&As in China and other EEs has also been growing rapidly since the early 2010s (Lebedev, Peng, Xie, & Stevens, 2015; PwC, 2017). Moreover, China's central and local governments have issued a series of policies to encourage enterprises to generate or engage in domestic M&As in order to cultivate leading firms and to resolve the inefficiency and overcapacity in some key sectors. Therefore, M&As have played an increasingly important role in reshuffling the location of corporate control, which will contribute to the understanding of the dynamics of economic transition and regional development in China and other EEs. However, the spatial pattern, process, and implications of domestic M&As in EEs have not been systematically studied.

The spatial dynamics of corporate investment and industrial restructuring in the EEs has been heatedly debated due to the impacts of these economies on the globalized economy (He, Pan, & Chen, 2016; Wei, Li, & Ning, 2010). A large body of literature has examined various entry modes for corporate investment, such as greenfield investment (GI), joint venture, and spin-off, in China and other EEs (Peng, Lebedev, Vlas, Wang, & Shay, 2018; Santarelli & Tran, 2012). However, little research has been conducted on M&As, which tend to be largely affected by inter-firm and inter-regional relations (Chapman, 2003; Di Guardo, Marrocu, & Paci, 2016). Moreover, existing studies on M&As in and out of the EEs have mostly been conducted from the microeconomic perspectives (Hur, Parinduri, & Riyanto, 2011; Lebedev et al., 2015), and those from the geographical perspective are even more limited. Particularly, the influences of spatial proximity and place-specific attributes, such as local assets, on the changing geography of M&As in and out of the EEs have been partly ignored.

In order to fill the aforementioned research gaps, this paper focuses on the changing geography and underlying determinants of China's domestic M&As from 2002 to 2016 using GIS methods and the negative binomial regression model (NBRM). It examines three related research questions: (1) What are the spatial pattern and inter-regional networks of domestic M&As in different regions of China? (2) How do factors, such as spatial proximity and localized assets, influence the inter-regional M&As in China? (3) How has the relative importance of the factors changed over time? This study aims to advance the current understanding of the spatial dynamics of M&As, and to provide further insights into the processes of economic transition and industrial restructuring within China and other EEs. By elaborating on the impacts of spatial proximity and place-specific attributes, the findings also have a

series of policy implications about the strategic coupling between corporate investment and regional development.

2 | LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

2.1 | Literature review

Studies based on economics and management science have illustrated that corporates engage in M&A deals out of several motives, such as risk control, financial enticements, entrepreneurial behavior, and seeking new markets and strategic assets (Di Giovanni, 2005; Hyun & Kim, 2010; Schildt & Laamanen, 2006). In addition, studies conducted from the geographical perspective have distinguished M&A from other entry modes of corporate investment and indicated that the engagement of corporates into M&A is significantly correlated with locations and contextual factors (Chapman, 2003; Green & Meyer, 1997; Mariotti, Piscitello, & Elia, 2014). Therefore, M&As could be viewed as spatial phenomena accompanied by element reallocation and economic restructuring (Cai, Tian, & Xia, 2016; Lehto, 2006; Zademach, 2005).

The spatial attributes of M&As are partly embodied in the uneven distribution at multiple geographical scales. The cross-border M&A market has been tightly controlled by just a few developed economies and global cities (UNCTAD, 2016). Existing literature on domestic M&As has demonstrated that the acquirers and targets are highly co-agglomerated in major cities and metropolitan areas (Böckerman & Lehto, 2006; Rodríguez-Pose & Zademach, 2003). Studies on the networks of cross-border and domestic M&As have also discovered that the number of announced deals among developed regions/cities is much larger (Böckerman & Lehto, 2006; Yeo, 2013). Existing findings have also signified that the uneven distribution of M&As tends to reinforce the core-periphery pattern related to the economic landscape and urban network at multiple spatial scales (Green, 1987; Rodríguez-Pose & Zademach, 2003).

The determinants of the uneven distribution of M&As have also been a focus of the existing studies (Chapman, 2003; Ellwanger & Boschma, 2015). In addition to corporate strategies and business drivers, place-specific attributes also play a significant role (Green & Meyer, 1997; McCarthy & Dolfsma, 2015). According to the new regionalism, corporate behaviors are profoundly embedded in local economic, social and institutional contexts, and M&A is no exception (Dicken & Malmberg, 2001; Hess, 2004; Wei, 2015). The engagement of acquirers/targets into M&As is largely determined by unique contexts and place-specific attributes (Green & Meyer, 1997; Zademach, 2005). However, to what extent and in what ways these factors affect M&A deals might be different from other market entry modes such as GI. Literature has indicated that local advantages and limitations in factor endowment, market size, investment environment, and incentive policies, whether in acquirer locations or in target locations, would affect corporate decision making related to M&As (Zademach & Rodríguez-Pose, 2009). Acquirers may encounter regional challenges that limit their abilities to pursue organizational and productive expansion. By means of M&As, they can access localized assets in the target locations, such as the emerging market, human resources, and new technologies (Colombo & Turati, 2014; Mariotti et al., 2014).

Furthermore, various dimensions of proximity at regional level, which could be regarded as economic and social links between acquirer locations and target locations, are increasingly used to explain cross-border and inter-regional M&As (Di Guardo et al., 2016). With globalization and information revolution, some scholars have asserted the "death of geography" (Cairncross, 1997; Tranos & Nijkamp, 2013),

indicating that spatial distance is playing a negligible role in economic activities. However, others argued that spatial proximity is still necessary for most economic activities (McCann, 2008; Morgan, 2004), including corporate takeovers and M&As (Ragozzino, 2009). A large body of literature has documented that acquirers tend to select geographically proximate targets (Ellwanger & Boschma, 2015; Grote & Umber, 2006). Inter-regional proximities in economic development, industrial structure, and institutional setting also play a critical role in M&A partnering (Green & Meyer, 1997; Zademach & Rodríguez-Pose, 2009). Existing studies have indicated that regional integration and industrial or technological relatedness across regions tend to encourage inter-regional corporate investment and M&As (Chapman, 1999; Ellwanger & Boschma, 2015; McCarthy & Dolfsma, 2015). Researchers also found that M&A partnering seems to be motivated by inter-regional similarities in the institutional setting and cultural contexts, such as language and custom, legal system, business environment, and political contexts (Buckley et al., 2016; Du & Boateng, 2015; Hur et al., 2011).

Since the early 2000s, corporates located in EEs have not only extensively engaged in domestic M&As, but also played an increasingly important role in the growth of the global M&A market (Deng & Yang, 2015; Du & Boateng, 2015). M&As have been profoundly affecting corporate growth, industrial upgrading, economic transition, and regional inequalities in China and other EEs. From the microeconomic perspective, some studies have discussed the driving forces of EEs-related M&As, such as corporate characteristics and entrepreneurship (Lebedev et al., 2015; Rabbiosi et al., 2012). However, there has been a very small number of studies from geographical perspectives and focused on the changing geography of domestic M&As in EEs. Therefore, this study aims to fill these research gaps by providing a possible conceptual framework and empirical evidences related to transitional China.

2.2 | Conceptual framework

With economic marketization, globalization, and financialization, Chinese corporates have increasingly engaged in cross-border and domestic M&As over the past three decades (Buckley et al., 2016; Yeung & Liu, 2008). As the largest developing and transitional economy around the world, China has a more complicated and distinctive process, pattern, and implication of M&As. Meanwhile, China's M&A market is also developing with representativeness due to the increasingly globalized economy. Based on China's unique transitional contexts, this paper builds a conceptual framework from the geographical perspective for the explanation of inter-regional M&As (Figure 1), with particular attention to the impacts of spatial proximity and the access to localized assets.

Acquiring spatially close targets can help facilitate information sharing, knowledge spillover, and asset integration during the process, contributing to the maximization of M&A's benefits for engaging corporates (Chakrabarti & Mitchell, 2013). This dynamic is certainly and equally important for inter-regional M&As in China and other EEs. However, spatial proximities among different regions in China tend to be influenced by regional developmental strategies and policies (Wei, 2007). Particularly, China's central and local governments have launched a series of developmental plans to promote regional integration and urban agglomeration. With increased economic and social linkages, spatial proximity will further facilitate corporate takeovers and M&As within the same sub-region, such as the Yangtze River Delta (YRD) that includes four different provincial-level regions.

Another driving force of inter-regional M&As is corporates' desire to access and then internalize localized assets. Corporate investment and relevant decision making in EEs are not only embedded in the unique transitional contexts, but also highly associated with place-specific attributes such as localized assets (He et al., 2016). Therefore, the definition of localized assets may lay the foundation

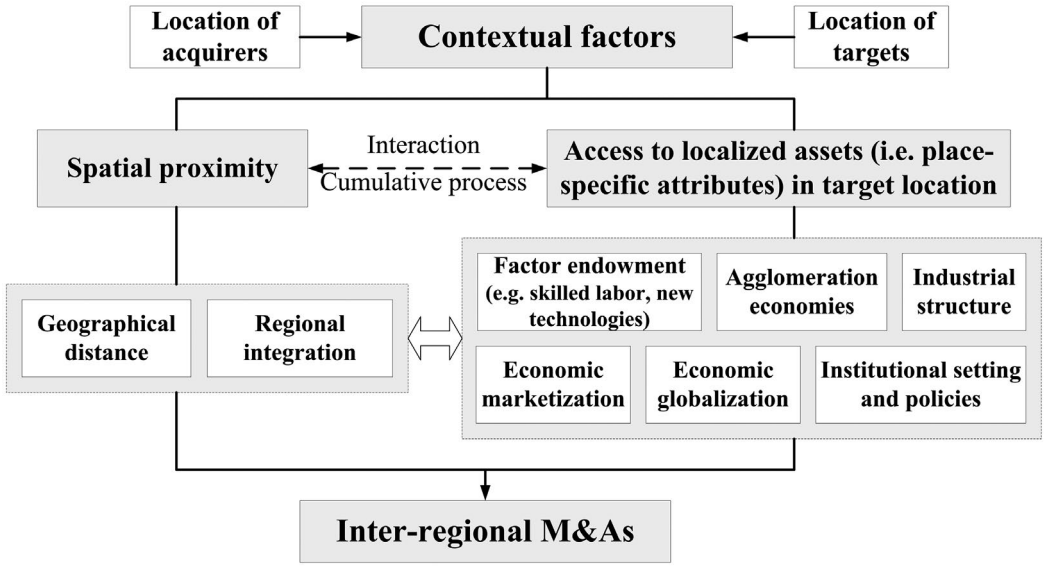

FIGURE 1 The conceptual framework of the driving forces of inter-regional M&As in transitional China

for analyzing the determinants of China's inter-regional M&As and this paper mainly focuses on the following aspects.

First, localized assets should be closely related to the factor endowment, especially in the aspects of labor pools, knowledge, and technologies (Wei & Liefner, 2012). To access and internalize the highly educated labor force, new technologies and relevant patents in the target location tend to be the main motives for China's corporates when engaging in inter-regional M&A transactions.

Second, the agglomeration of economic activities and continuous upgrading of industrial structure could be viewed as determinants of inter-regional M&As (Böckerman & Lehto, 2006). M&A deals are more likely to occur in regions with a relatively developed economy and a great number of corporates engaged in takeovers. Furthermore, the upgrading trends of industries at acquirer or target locations may have significant impacts on China's inter-regional M&As. The industrial structure dominated by traditional manufacturing industries would negatively impact the regional M&A market (Rodríguez-Pose & Zademach, 2006). Meanwhile, aggressive corporates tend to access regions with optimized industrial structure and well-developed "new economy" by engaging in M&A deals to seek business opportunities.

Third, the processes of marketization and globalization, as the main characteristics of economic transition in China and other EEs, would profoundly influence corporate investment behaviors (He et al., 2016; Wei & Liefner, 2012; Yeung & Liu, 2008). Diversified market players, as well as regional disparities in the market size and consuming ability, are viewed as the main features of the marketization process in China (He, Wei, & Xie, 2008; Wei, 2001). Engagement in inter-regional M&As could provide a way for Chinese corporates to access emerging and larger markets. Meanwhile, with the development of the financing market, China's domestic M&As tend to be largely dominated by listed corporates and occur in locations where they congregate. Furthermore, economic globalization allows Chinese corporates to acquire advanced management experiences (Liu & Zou, 2008). This will encourage individual corporates to enter the regions that are increasingly integrated into the global economy by means of M&As.

Four, localized assets could also be embodied in the institutional setting and policies, which play an increasingly important role in China's corporate investment behaviors such as M&As (Buckley

et al., 2016; Du & Boateng, 2015). Acquisition target selection favors places where local governments can provide more preferential policies such as financial supports and tax reduction. With the economic transition, inter-regional M&As may also be motivated by incentive policies for innovative milieu. Regional advantages in the business environment, such as the remission of administrative fees, might also be an important driver for corporates when seeking targets across regions.

In addition, the effects of spatial proximity and the access to localized assets are interactive. Spatial proximity can not only facilitate the interactive relationship between economic agents, but also enhance the effects of regional similarities in contextual factors (Boschma, 2005). Moreover, the increasing accessibility of distant assets would affect the positive impacts of spatial proximity on inter-regional M&As.

3 | DATA AND METHODOLOGY

3.1 | Data and study area

The data used in this study were obtained from China's M&As database, which was built by *Wind*.[1] This database has recorded announced M&A deals in which either the acquirers or targets are located in China's Mainland Since the early 1990s. For an M&A event, available information includes announced time, corporate names, transaction value, and status. Considering the relatively small number of M&As before 2002, the M&A deals that had been announced from 2002 to 2016 were selected. The total number of cross-border and domestic M&A deals is 38,295, and the number of the latter accounts for 85.7% (Table 1). This study excludes the deals that failed or were suspended in the transaction process and those with two or more acquirers. Finally, 17,746 domestic M&As events were obtained for analysis. Then, the address information of acquirers and targets was compiled using the *Qichacha* database.[2] In order to build the spatial database of domestic M&As, the locations of acquirers and targets were matched with China's administrative division at the provincial level through ArcGIS. Furthermore, socio-economic data were derived from China's statistical yearbooks and other published materials.

As shown in Figure 2, this study area is China's Mainland, including 31 province-level units.[3] Based on the traditionally tripartite classification (i.e., eastern, central, and western), these units were grouped into seven sub-regions according to their geographical locations, multidimensional proximities, and economic performances (Figure 2).

TABLE 1 The data about M&A deals in China, 2002–2016

Definition		Number of M&As	Proportion (%)
All M&A deals that are announced or completed during this period		38,295	100
Cross-border M&As, acquirers or targets located outside China's Mainland		5,473	14.3
Domestic M&A deals are failed or aborted		1,798	4.7
Acquirers or targets cannot be identified or localized		11,679	30.5
Acquirers and targets share the same address, and other problems		1,599	4.2
Valid domestic M&As used in this study	M&A deals occurred in the same provincial-level unit	9,104	23.8
	Inter-provincial M&A deals	8,642	22.5

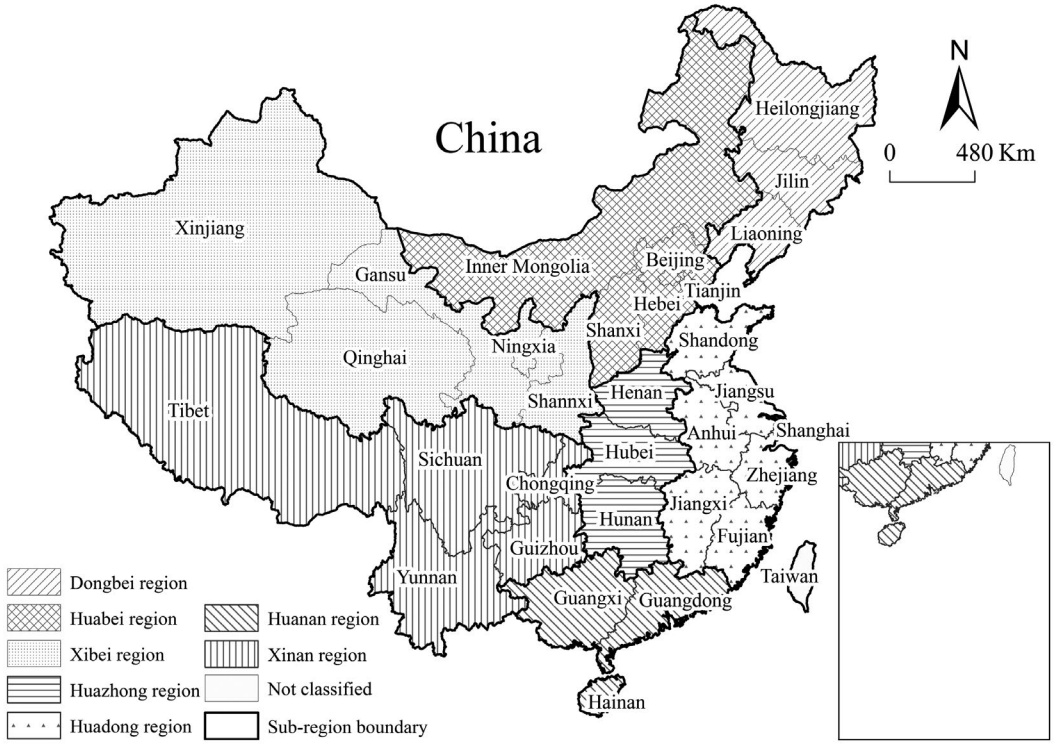

FIGURE 2 The location of the study area

3.2 | Methodology

3.2.1 | Quantitative indexes and spatial analysis methods

First, the concentration ratio (CR_{top5}) and Gini coefficient (G) were introduced to depict the geographical concentration and dispersion of China's domestic M&As. CR_{top5} can be calculated according to the following equation:

$$CR_{top5} = \sum_{i=1}^{5} MA_i / \sum_{i=1}^{n} MA_i \tag{2}$$

where $\sum_{i=1}^{5} MA_i$ represents the number of acquirers or targets located in the top five province-level units. And the Gini coefficient is calculated as follows:

$$G = \frac{1}{2N^2\mu} \sum_i \sum_j \left| \frac{MA_i}{MA_{PRC}} - \frac{MA_j}{MA_{PRC}} \right| \tag{3}$$

where MA_i, MA_j and MA_{PRC} stand for the numbers of M&A deals in place i, place j and China's Mainland, respectively, N is the number of units and μ represents the average provincial share of acquirers or targets engaged in domestic M&A deals.

Second, a spatial matrix (31 provinces × 31 provinces) was built based on the inter-provincial M&A flow, which was defined as the announced deal between an acquirer (target) located in province A and a target (acquirer) located in province B. The main nodes of the M&A networks in China were measured using Degree Centrality ($C_D\left(N_i\right)$), which indicates the intensity of the connection between node i and the others.

$$C_D\left(N_i\right) = \sum_{j=1}^{g} MA\_F_{ij}\,(i \neq j) \tag{4}$$

where g is the number of related nodes, and MA_F_{ij} stands for the number of M&A flows between node i and j. The UCINET, an effective tool of social network analysis, was used to process the data, in order to draw the spatial matrix and networks.

Third, this study applied the Chord Diagram, a visualization method, to map the topological networks of China's inter-provincial M&As. In chord diagrams, a segment of the circular arc equals a node, and a longer (shorter) circular arc stands for a node with a higher (lower) value of the index of Degree Centrality, indicating that the node is more (less) powerful in the networks. The lines among circular arcs signify the number of inter-provincial M&As, with a wider (narrower) line indicating more (less) M&A deals between related nodes.

3.2.2 | Variables specifications and models

This paper aims to examine how spatial proximity and localized assets influence the uneven distribution of China's inter-provincial M&As. The dependent variable was defined as the number of M&As (MA_F_{ij}) between province i and province j. The geographical distance (DIST), which was calculated using the physical distance between the pair of provincial capitals (Böckerman & Lehto, 2006; Chakrabarti & Mitchell, 2013), was employed to measure the effect of spatial proximity. This study also introduced a dummy variable (REG), which signifies whether the acquirer and target are located in the same sub-region. Moreover, several independent variables were introduced to measure the impacts of the access to localized assets in the target location.

With the economic transition, corporates tend to engage in M&As for productive factors such as skilled labor, as well as new knowledge and technologies. This study used two proxies, the average annual wage of employed workers (WAGE) and the provincial share of the annual granted patents (PATE), to measure the factor endowment in target locations. Per capita GDP, which is widely used in the literature, was employed to gauge the effects of agglomeration economies in target locations. The regional inequalities in industrial structure and upgrading milieu may drive corporate outward investment. The shares of manufacturing and service industries in GDP (IND and SER) were used to examine the impacts of the changing industrial structure in target locations on inter-provincial M&As.

Corporate investment strategies have been increasingly influenced by market-related forces, such as the access to emerging and larger markets. Considering the impacts of the financial market on China's inter-provincial M&As, this paper introduced three variables, namely the provincial share of the total retail sales of consumer goods (RSCG), the share of financial industries in GDP (FIN) and the number of listed corporates (LIST), to measure the effects of economic marketization in target locations. Moreover, this study used average annual ratios of foreign direct investment (FDI) and outward direct investment (OFDI) to GDP as proxies to measure the effects of economic globalization in target locations.

In addition, the ratio of R&D expenditure to GDP (R&D), and the ratio of fixed-asset investment to GDP (INV) were, respectively, adopted as proxies for the target location's innovative milieu and developmental mode. The weighted sum strength of national-level developmental zones (DZs) established in different regions was utilized to represent the general industrial policies in target locations (IndPOL). This paper also introduced a dummy variable (IncPOL), which indicates whether the provincial-level government has implemented incentive policies toward corporates engaging in M&As. The location quotient index related to administrative charges was used as the proxy of the quality of the business environment in target locations. In order to explain the interaction between spatial proximity and place-specific attributes, a cross-term related to DIST and PGDP was introduced in the regression analysis.

Definitions of the variables are presented in Table 2. Based on the conceptual framework, the estimation model and its equation can be listed as follows:

$$MA\_F_{ij} = \beta_0 + \beta_1 \ln DIST_{ij} + \beta_2 REG_{ij} + \sum_{3k} \beta_{3k} X_j + \varepsilon \tag{5}$$

where X represents the independent variables related to localized assets in the target location, β and k denote the coefficient and the number of variables, and ε is the stochastic error term. This mode is usually estimated using the Poisson regression model (PRM) (Zademach & Rodríguez-Pose, 2009), because the number of inter-regional M&As is a non-negative integer. MA_F_{ij} is assumed to follow a Poisson distribution:

$$Pr\left(MA\_F_{ij}\right) = \frac{exp\left(-\mu_{ij}\right)\mu_{ij}^{MA\_F_{ij}}}{MA\_F_{ij}!}, \left(MA\_F_{ij} = 0,1 \ldots\right) \tag{6}$$

where μ_{ij} indicates the conditional mean, which can be identified through a function of independent variables:

$$\mu_{ij} = exp\left(\beta_0 + \beta_1 \ln DIST_{ij} + \beta_2 REG_{ij} + \sum_{3k} \beta_{3k} X_j\right) \tag{7}$$

However, the application of PRM is based on the restriction of equidispersion, an assumption stating that the conditional variance should be equal to its conditional mean value. The PRM is insufficient for the data characterized by over-dispersion. The variance of MA_F_{ij} is much greater than its mean[4] in the authors' database. Therefore, the observations are over-dispersion, indicating that the NBRM is more appropriate for this study. The conditional mean in the NBRM can be calculated in the same way as μ_{ij} in Equation (7), while the conditional variance should be defined by a combination of the μ_{ij} and a dispersion parameter α,

$$Var\left(MA\_F_{ij}\right) = \mu_{ij} + \alpha\mu_{ij}^2 \tag{8}$$

In addition, MA_F_{ij} can be assumed to follow a gamma distribution:

$$Pr\left(MA\_F_{ij}\right) = \frac{\Gamma\left(MA\_F_{ij} + \alpha^{-1}\right)}{MA\_F_{ij}!\Gamma\left(\alpha^{-1}\right)}\left(\frac{\alpha^{-1}}{\alpha^{-1} + \mu_{ij}}\right)^{\alpha^{-1}}\left(\frac{\mu_{ij}}{\alpha^{-1} + \mu_{ij}}\right)^{MA\_F_{ij}} \tag{9}$$

where Γ represents the standard gamma function. This paper adopted the maximum likelihood techniques to estimate the coefficients for variables, and the likelihood ratio test of over-dispersion was used to check the fitting degree of models. The potential problems of heteroscedasticity and data fluctuation were addressed by taking the logarithm of all independent variables except the CHA and dummy variables.

4 | PATTERNS OF DOMESTIC M&As IN TRANSITIONAL CHINA

4.1 | The changing distribution of corporates engaged in M&As

Figure 3 shows the changing patterns of acquirers and targets in China's Mainland during 2002–2008 and 2009–2016. Specifically, the number of M&A deals China's corporates were involved in grew from 3,212 during 2002–2008 to 14,534 during 2009–2016. In addition, acquirers and targets were increasingly co-agglomerated in coastal regions and major metropolises, particularly Beijing, Shanghai, Guangdong, Jiangsu and Zhejiang. Moreover, the spatial pattern of acquirers was slightly different from that of targets. It was found that more acquirers gathered in developed regions such as Beijing, Guangdong and Zhejiang. In contrast, there were relatively more acquisition targets located in Shanghai, Jiangsu and most developing regions. Furthermore, the uneven distribution of corporates engaged in China's domestic M&As tends to be stable or unconvertible over time.

However, Figure 4 indicates that the trends of the geographical concentration and dispersion of corporates involved in China's domestic M&As have changed over time. During 2002–2008, the CR5 indexes and Gini coefficients for acquirers and targets showed a decline in fluctuation, which suggests a significant tendency of geographical dispersion. In contrast, these indicators presented a fluctuating growth during 2009–2016, which suggests that the distribution of China's domestic M&As tends to increasingly agglomerate in certain regions (e.g., Beijing, Shanghai, Guangdong, Jiangsu and Zhejiang). Moreover, the CR5 and Gini of acquirers were higher than those of targets, indicating that acquirers are more spatially concentrated than targets. This finding indicates an increasing concentration of corporate control and economic decision making in a few developed regions in transitional China.

4.2 | Inter-regional M&As and the changing networks

Table 3 reports the shares of the volume of intra- and inter-regional M&As in each provincial-level region of China's Mainland, and the results can be concluded as follows. First, the average share of intra-provincial M&As exceeded 50%, which was higher than that of inter-provincial M&As. This may signify that acquisition target selection is highly influenced by "home bias" in China at the regional scale. Second, a significant growth in the share of inter-provincial M&As can be found in most provincial-level regionses during 2009–2016, implying that corporate takeovers across these regions have been increasingly active. This may restructure the location of economic decision making in different regions of China. Third, inter-provincial M&As were mostly associated with TOP5[5] and neighboring provinces, which account for 26.1% and 9.5%, respectively, during 2009–2016. This may not only confirm the effects of "home bias" on M&As partnering, but also indicate that economic decision making is dominated by the few developed regions in China. In addition, the composition of M&As varied across regions. Some regions, such as Beijing and Tibet, possessed a relatively smaller share of intra-provincial M&As, implying more external linkages related to corporate outward investment. Other regions are the opposite.

TABLE 2 The definitions of dependent and independent variables

Category	Variables	Description (Abbreviation)
Dependent variable		
Inter-provincial M&As		Number of inter-regional M&As between province i and j during the study period[1] (MA_F_{ij})
Independent variables		
Spatial proximity	Geographical distance	Geographical distance between the capital of province i and that of province j ($DIST_{ij}$)
	Regional location	Dummy variable, 1 for province i and j are located in the same sub-region (REG_{ij})
Factor endowment	Labor market	Average annual wage of employed workers during the study period in target location j ($WAGE_j$)
	Technological resources	Share of the annual granted patents during the study period in target location j ($PATE_j$)
Agglomeration economies	Economic scale	Average annual per capital GDP during the study period in target location j ($PGDP_j$)
Industrial structure	Manufacturing industries	Average annual share of the output of manufacturing industries in GDP during the study period in target location j (IND_j)
	Service industries	Average annual share of the output of service industries in GDP during the study period in target location j (SER_j)
Economic marketization	Market demands	Share of the total retail sales of consumer goods during the study period at target location j ($RSCG_j$)
	Financial market	Average annual share of the output of financial industries in GDP during the study period in target location j (FIN_j)
	Stock market	Share of the number of listed corporates during the study period in target location j ($LIST_j$)
Economic globalization	Inward and outward FDI	Average annual ratio of inward/outward foreign direct investment to GDP during the study period in target location j ($IFDI_j$/ $OFDI_{i,j}$)
Institutional setting	Developmental mode	Ratio of fixed-asset investment to GDP during the study period in target location j (INV_j)
	Innovative milieu	Share of R&D expenditure to GDP during the study period in target location j ($R\&D_j$)
	General industrial policies	Weighted sum strength of established national-level developmental zones (DZs) during the study period in target location j ($IndPOL_j$)[2]
	Business environment	Location quotient index for administrative charges in target location j (CHA_j)[3]
	M&A-related incentive policies	Dummy variable, 1 for the provincial-level government in target location j that has issued M&A-oriented incentive policies for corporates during the study period ($IncPOL_j$)[4]

Note: 1. The study period in this paper indicates the time period of 2002–2008 and 2009–2016 (year). 2. The national-level DZs established before 2000 are more likely to have more advantages in preferential policies and institutional innovation, so that, we give them more weight for measuring the variable of IndPOL. 3. $CHA_j = (AC_j / \sum_{j=1}^{n} AC_j) / (REV_j / \sum_{j=1}^{n} REV_j)$, where, AC_j is the number of administrative charges at target location j, REV_j stands for the amount of fiscal revenue at target location j, and n means the total number of target locations. 4. The variable IncPOL was only taken into the models related to the period of 2009–2016 because most local governments did not issue and implemented M&A-oriented policies until the 2010s.

Figure 5 shows the changing geographical and topological networks of inter-provincial M&As in China's Mainland. The number of inter-provincial M&As grew from 1,301 during 2002–2008 to 7,265 during 2009–2016, implying a growing number of corporates and their locations in China's M&A networks. Meanwhile, the network centralization of inter-provincial M&As decreased from 24.4% during 2002–2008 to 16.7% during 2009–2016, which indicates that China's domestic M&A network has been a flattening-structure since the early 2010s. However, inter-provincial M&A flows were still uneven and asymmetric. A core group of developed regions, led by the TOP5, dominated China's domestic M&As market. Although less-developed provinces were increasingly involved in domestic M&A networks, the number of M&A flows among developed regions was relatively larger, with a higher growth rate. During 2009–2016, M&A flows among Beijing, Shanghai and Guangdong reached about 300, while those among less-developed provinces were still under 10. Moreover, with the rapid growth of inter-provincial M&As, Jiangsu and Zhejiang have evolved into the important nodes in China's inter-provincial M&A networks. These results may indicate that developed regions have been acquiring corporate control, and directly affecting economic and industrial landscapes in transitional China.

5 | DETERMINANTS OF INTER-REGIONAL M&As IN TRANSITIONAL CHINA

Tables 4 and 5 present the estimation results of NBRMs. It should be noted that a few independent variables are highly correlated with each other based on the analysis of Pearson correlation. The result of the collinearity diagnostics test shows that variables, such as WAGE, PATE, PGDP, SER, RSCG, and LIST, have higher VIF (variance inflation factor) values, indicating significant effects of multicollinearity. In order to control the potential problem of multicollinearity, the related variables were put into five sets of NBRMs (see model 1–5). As is shown in Tables 4 and 5, the significant "Wald chi2" values indicate that these models are statistically significant. And, the "chibar2" statistics strongly suggest that the NBRM is more appropriate than the PRM. Therefore, the results from NBRMs could indicate how and to what extent relevant variables can affect China's inter-provincial M&As during 2002–2008 and 2009–2016.

First, spatial proximity plays a significantly positive role in China's inter-provincial M&As, which is in line with the existing literature on developed economies (Ellwanger & Boschma, 2015). The coefficients for DIST are all significantly negative, indicating that geographical distance is the main deterrent to inter-provincial M&A deals in China. Chinese acquiring corporates tend to search for targets located in the same or neighboring regions, which is known as the effect of "home bias." However, the coefficients for REG are negative and insignificant, suggesting that there is no significant relationship between inter-provincial M&As and either the acquirer or the target located in the same sub-region. There are few exceptions (e.g., East China), nevertheless, probably because of the relatively few inter-provincial M&As occurring among nonadjacent provincial-level units located in the same sub-region.

Second, the search for localized assets about factor endowment, especially in terms of skilled labor, knowledge, and new technologies, can largely drive firms to engage in inter-provincial M&As in China. High wages could indicate the spatial agglomeration of highly educated and skilled labor. The coefficient for WAGE is negative and insignificant during 2002–2008, while that during 2009–2016 is significantly positive. This may suggest that access to talents and skilled workers has been positively associated with inter-provincial M&As in transitional China since the early 2010s. The coefficients for PATE are all positive and significant, signifying that the pursuit of technological resources plays an important role in M&As partnering across China's regions. Serviceable patents are mostly related to the high-tech industry, which has also become a hot investment field for acquirers in China's M&A

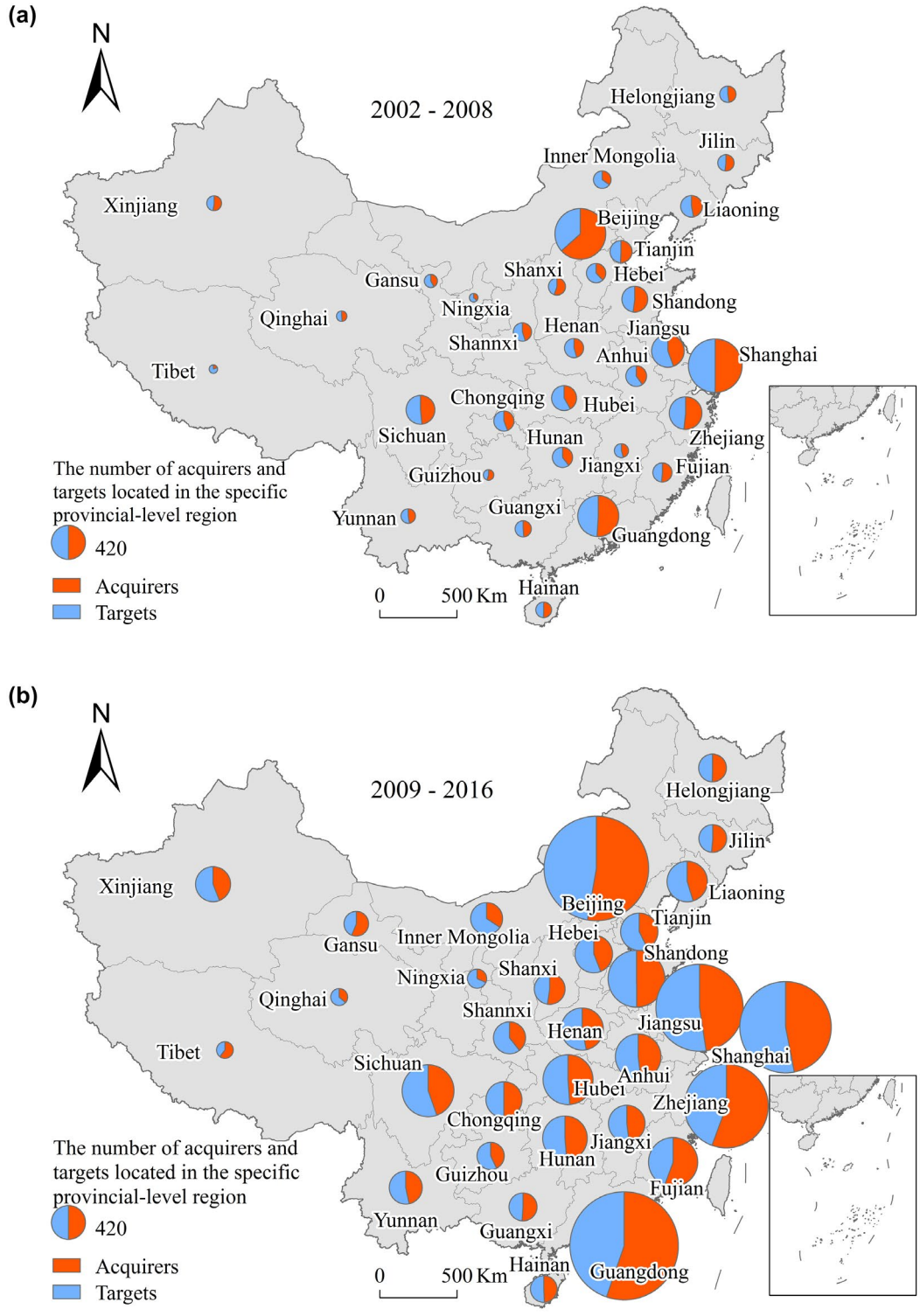

FIGURE 3 (a) The changing distribution of the acquirers and targets engaged in China's intra- and inter-provincial M&As, 2002–2008, (b) The changing distribution of the acquirers and targets engaged in China's intra- and inter-provincial M&As, 2009–2016

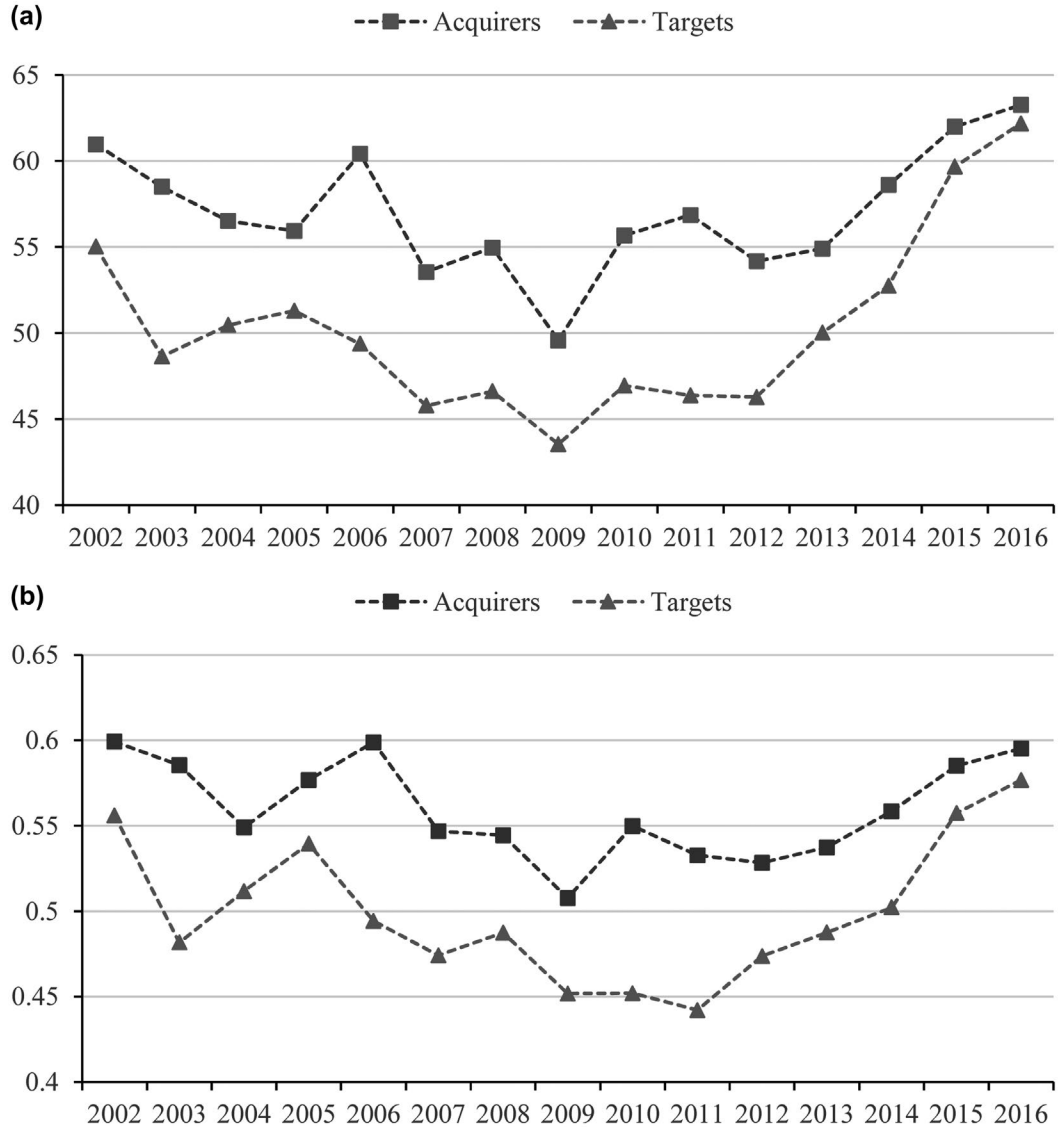

FIGURE 4 (a) The changes of CR index of China's intra- and inter-provincial M&As, 2002–2016 (Percentage), (b) The changes of Gini coefficient of China's intra- and inter-provincial M&As, 2002–2016

markets. This finding is consistent with the view of Zademach and Rodríguez-Pose (2009), who argued that the technological level of targets' location could drive the cross-border M&As in Europe.

Third, the industrial structure in the target location can critically affect the amount of inter-provincial M&As in transitional China. The coefficients for IND are negative and significant in most models, indicating that acquirers are less likely to seek targets in distant regions dominated by industrial economies. This may also imply that traditional manufacturers are unlikely to reshape their established location patterns when promoting restructuring through M&As. Moreover, existing studies have illustrated that M&A markets for service industries, such as banking, real estate, and producer services, are increasingly active in China (PwC, 2017). However, the coefficients for SER are insignificant, indicating an unclear relationship between inter-provincial M&As and the share of service

TABLE 3 The share of intra- and inter-provincial M&As in China during 2002–2008 and 2009–2016

		2002–2008			2009–2016		
			Inter-provincial (%)			Inter-provincial (%)	
Sub-regions	**Province-level units**	**Intra-provincial (%)**	**With neighbors**	**With TOP 5**	**Intra-provincial (%)**	**With neighbors**	**With TOP 5**
North China	Beijing	208 (35.7)	33 (5.7)	114 (19.6)	838 (40.0)	98 (4.7)	501 (23.9)
	Tianjin	53 (60.2)	5 (5.7)	18 (20.5)	104 (48.1)	40 (18.5)	68 (31.5)
	Hebei	38 (74.5)	1 (2.0)	2 (3.9)	121 (53.3)	49 (21.6)	52 (22.9)
	Shanxi	36 (63.2)	2 (3.5)	10 (17.5)	93 (51.7)	10 (5.6)	45 (25.0)
	Inner Mongolia	31 (79.5)	0 (0.0)	5 (12.8)	88 (68.8)	6 (4.7)	21 (16.4)
East China	Shanghai	381 (73.8)	40 (7.8)	72 (14.0)	784 (55.1)	170 (11.9)	350 (24.6)
	Jiangsu	126 (74.6)	12 (7.1)	18 (10.7)	736 (56.2)	209 (16.0)	313 (23.9)
	Zhejiang	102 (54.8)	32 (17.2)	29 (15.6)	709 (50.0)	297 (20.9)	437 (30.8)
	Shandong	74 (59.2)	10 (8.0)	18 (14.4)	299 (51.3)	21 (3.6)	158 (27.1)
	Fujian	39 (60.0)	5 (7.7)	16 (24.6)	224 (45.7)	83 (16.9)	168 (34.3)
	Anhui	49 (79.0)	5 (8.1)	7 (11.3)	184 (50.7)	42 (11.6)	100 (27.5)
	Jiangxi	20 (60.6)	3 (9.1)	5 (15.2)	111 (47.6)	39 (16.7)	78 (33.5)
South China	Guangdong	169 (55.5)	17 (5.5)	56 (18.2)	1,164 (49.4)	161 (6.8)	571 (24.3)
	Guangxi	25 (55.6)	6 (13.3)	8 (17.8)	76 (52.1)	13 (8.9)	46 (31.5)
	Hainan	17 (37.8)	4 (8.9)	13 (28.9)	48 (37.5)	12 (9.4)	45 (35.2)
Northeast China	Liaoning	41 (53.9)	5 (6.6)	20 (26.3)	138 (51.3)	12 (4.5)	69 (25.7)
	Jilin	28 (56.0)	2 (4.0)	14 (28.0)	55 (38.7)	11 (7.7)	31 (21.8)
	Heilongjiang	27 (58.7)	1 (2.2)	7 (15.2)	61 (43.3)	7 (5.0)	43 (30.5)
Central China	Henan	46 (76.7)	2 (3.3)	9 (15.0)	170 (55.9)	25 (8.2)	77 (25.3)
	Hubei	63 (68.5)	4 (4.3)	22 (23.9)	212 (47.7)	57 (12.8)	125 (28.2)
	Hunan	36 (61.0)	0 (0.0)	12 (20.3)	179 (50.9)	27 (7.7)	90 (25.6)

(Continues)

TABLE 3 (Continued)

		2002–2008			2009–2016		
			Inter-provincial (%)			Inter-provincial (%)	
Sub-regions	**Province-level units**	**Intra-provincial (%)**	**With neighbors**	**With TOP 5**	**Intra-provincial (%)**	**With neighbors**	**With TOP 5**
Northwest China	Shannxi	40 (74.1)	5 (9.3)	7 (13.0)	78 (53.1)	12 (8.2)	35 (23.8)
	Gansu	12 (46.2)	1 (3.8)	6 (23.1)	48 (39.3)	8 (6.6)	42 (34.4)
	Ningxia	5 (50.0)	1 (10.0)	4 (40.0)	27 (64.3)	5 (11.9)	8 (19.0)
	Qinghai	8 (42.1)	4 (21.1)	4 (21.1)	18 (47.4)	0 (0.0)	12 (31.6)
	Xinjiang	19 (47.2)	1 (2.5)	11 (27.5)	124 (62.9)	4 (2.0)	33 (16.8)
Southwest China	Chongqing	36 (61.0)	9 (15.3)	9 (15.3)	124 (52.3)	37 (15.6)	36 (15.2)
	Sichuan	95 (65.5)	11 (7.6)	20 (13.8)	245 (56.3)	34 (7.8)	89 (20.5)
	Guizhou	7 (31.8)	4 (18.2)	5 (22.7)	73 (62.9)	5 (4.3)	31 (26.7)
	Yunnan	21 (61.8)	0 (0.0)	4 (11.8)	123 (66.5)	8 (4.3)	31 (16.8)
	Tibet	2 (40.0)	0 (0.0)	0 (0.0)	5 (8.2)	7 (11.5)	22 (36.1)

Note: TOP 5 includes Beijing, Shanghai, Guangdong, Jiangsu and Zhejiang.

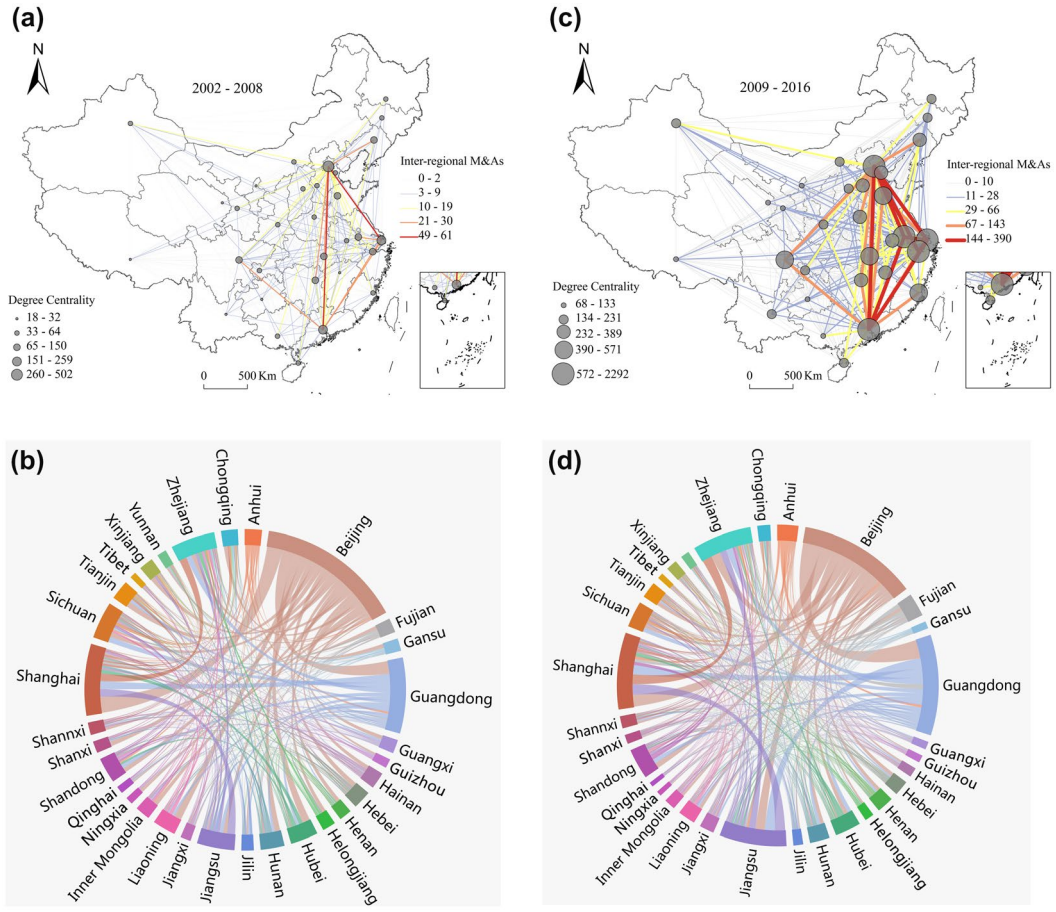

FIGURE 5 (a) The geographical networks of China's inter-provincial M&As, 2002–2008, (b) The topological networks of China's inter-provincial M&As, 2002–2008, (c) The geographical networks of China's inter-provincial M&As, 2009–2016, (d). The topological networks of China's inter-provincial M&As, 2009–2016

industries. This is partly because service enterprises tend to develop a market where there appears a short supply through distant M&As.

Fourth, the results imply that the growth of China's inter-provincial M&As may be promoted by the marketization process, particularly the increasing market demands and capital control power in target locations. Significantly positive coefficients for RSCG can be found in all models, indicating that acquirers are more likely to search for targets in regions with emerging and bigger markets. This finding is also similar to existing literature that highlights the important role market expansion plays in driving M&As. The coefficients for LIST are positive and significant, suggesting that the increase of China's inter-provincial M&As is highly related to the development of the stock market, as well as the spatial agglomeration of listed corporates. This is partly because M&A markets are more active in regions where listed corporates congregate. Meanwhile, listed corporates largely stand for higher capital control power and better production networks, which are attractive to less-developed regions and relevant corporates.

In addition, long-distance M&A partnering in China is profoundly affected by place-specific institutional setting and policies, and such influences might be reinforced since 2008 when regional competition in China was further intensified. With few exceptions, the coefficients for IndPOL are

TABLE 4 Negative binomial regression model results for the determinants of China's inter-provincial M&As, during 2002–2008

Variables	Model 1	Model 2	Model 2A	Model 3	Model 4	Model 5
ln $DIST_{ij}$	−0.677***	−0.652***	−1.542***	−0.664***	−0.639***	−0.612***
REG_{ij}	−0.319	−0.341	−0.359	−0.336	−0.285	−0.262
ln $WAGE_j$	−0.213					
ln $PATE_j$	0.077***					
ln $PGDP_j$		0.277	−0.114			
ln $DIST_{ij}$_$PGDP_j$			0.862			
ln IND_j	−1.046**	−1.288***	−1.518***	−0.955	−1.177**	−0.789
ln SER_j				0.460		
ln $RSCG_j$					0.139***	
ln FIN_j	−0.005				0.020	−0.053
ln $LIST_j$						0.170***
ln $IFDI_j$	0.007	−0.098	−0.127*	−0.044	−0.020	−0.026
ln $OFDI_j$	3.474	0.185	0.399	1.683	2.962	2.024
ln INV_j	−0.047	−0.679	−0.738	−0.593	−0.038	−0.053
ln $R\&D_j$	0.135			0.066	0.049	0.134
ln $IndPOL_j$	0.393	0.881***	0.848***	0.863***	0.381	0.254
CHA_j	0.227	0.093	0.105	0.054	0.136	0.278
_cons	7.862**	10.29***	12.08***	7.285***	7.677***	6.282**
Observations	930	930	930	930	930	930
Wald Chi2	114.7***	106.4***	108.8***	105.5***	116.7***	121.6***
−log likelihood	1,311.2	1,315.4	1,314.1	1,315.8	1,310.2	1,307.8
Overdispersion	1.057	1.080	1.074	1.081	1.051	1.036
chibar2	1541.2***	1563.7***	1561.6***	1566.4***	1536.3***	1503.4***

Note: ***, **, * indicate statistical significance at 1%, 5%, and 10% level, respectively. Based on model 2, the cross term DIST_PGDP was added into model 2A.

significantly positive, implying that benefiting from favorable industrial policies is the main motive for corporates undertaking inter-provincial M&As in transitional China. However, the coefficients for IncPOL are insignificant and negative, suggesting that M&A-oriented incentive policies implemented in the target location have not directly facilitated the growth of inter-provincial M&As. This is partly because such policies aim to support local firms other than external acquirers. Despite the insignificant coefficients of CHA, a positive-to-negative change can still be observed. This result may indicate the increasing importance of the business environment in the location choice of corporate investment such as M&As. Moreover, the coefficients for INVT and R&D, respectively, show significantly negative and positive signs during 2009–2016. This result may suggest that acquirers tend to seek targets in regions with better innovation milieu, rather than those investment-driven ones.

The coefficients of other variables have insignificant or unexpected signs in the results. This indicates that the proxies of agglomeration economies, the financial market, economic globalization, and cultural proximity in this study seem to be less important to the changing geography of China's inter-provincial M&As. Moreover, this result is inconsistent with the authors' expectations and conceptual framework, which calls for more scholarly investigations. With regard to the cross term, the

TABLE 5 Negative binomial regression model results for the determinants of China's inter-provincial M&As, during 2009–2016

Variables	Model 1	Model 2	Model 2A	Model 3	Model 4	Model 5
ln $DIST_{ij}$	−0.576***	−0.579***	−2.172***	−0.562***	−0.561***	−0.591***
REG_{ij}	−0.050	−0.058	−0.049	−0.033	−0.004	−0.022
ln $WAGE_j$	0.120*					
ln $PATE_j$	0.036**					
ln $PGDP_j$		0.023	−0.355**			
ln $DIST_{ij}$_$PGDP_j$			1.581**			
ln IND_j	−0.797*	−1.006*	−1.207**	−1.247**	−0.724	−0.734
ln SER_j				−1.068		
ln $RSCG_j$					0.117***	
ln FIN_j	−0.024	0.009	0.036		0.076	0.032
ln $LIST_j$						0.075***
ln $IFDI_j$	−0.009	0.013	0.043	0.042	0.018	0.020
ln $OFDI_j$	−0.236	−0.457	−0.540*	−0.440	−0.181	−0.236
ln INV_j	−0.908***	−1.232***	−1.189***	−1.561***	−0.415	−0.367
ln $R\&D_j$	0.151	0.116	0.122	0.192**	0.118	0.153*
ln $IndPOL_j$	0.420***	0.507***	0.468***	0.381***	0.323**	0.394***
CHA_j	−0.009	−0.118	−0.174	−0.174	−0.114	−0.071
$IncPOL_j$	−0.143	−0.063	−0.048	−0.065	−0.200*	−0.184
_cons	11.05***	13.57***	13.65***	20.09***	8.643***	8.794***
Observations	930	930	930	930	930	930
Wald Chi2	363.3***	356.7***	362.1***	358.4	367.1***	368.7***
−log likelihood	2,533.2	2,536.5	2,533.8	2,535.7	2,531.3	2,530.6
Overdispersion	0.432	0.441	0.434	0.438	0.427	0.425
chibar2	8,017.7***	8,083.1***	8,070.9***	8,070.4***	8,028.5***	8,013.4***

Note: ***, **, * indicate statistical significance at 1%, 5%, and 10% level, respectively. Based on model 2, the cross term DIST_PGDP was added into model 2A.

coefficient of DIST_PGDP is significantly positive during 2009–2016, which is in contrast to that of DIST and PGDP. The results suggest that China's inter-provincial M&A partnering might be blocked by the increase in spatial distance. However, this relationship could be weakened in the target location with a higher level of economic and social development. For individual corporates, access to localized assets within developed regions could offset some losses and risks incurred by long-distance M&As. In other words, place-specific attributes could alter the impacts of spatial proximity on inter-provinciall M&As.

6 | CONCLUSION

This study examines the changing geography and influential factors of inter-provincial M&As in transitional China by applying spatial database, GIS methods, and NBRMs. It demonstrates that China's domestic M&A market, the inter-provincial market especially, has been increasingly active since the early 2010s. Meanwhile, acquirers and targets engaged in domestic M&As tend to unevenly and

increasingly co-agglomerate in the developed provinces and major metropolises, especially Beijing, Shanghai, Guangdong, Jiangsu and Zhejiang (i.e., the TOP5). These results can uncover the differences between the patterns of acquirers and targets over time, with targets becoming geographically more dispersed to less-developed regions. This also supports the finding that China's inter-provincial M&A networks first spatially expanded across the country and then tended to present a flattening-structure. However, China's M&A networks are still controlled by a core group of developed regions, which has also largely dominated the spatial restructuring of corporate control and economic decision making in transitional China.

The modeling results have proved that China's inter-provincial M&As are largely driven by forces, such as spatial proximity and access to localized assets, especially since the early 2010s. Spatial proximity is positively associated with the growth of M&As between any two provincial-level regions, confirming the significant effects of "home bias" on M&As partnering in transitional China. To acquire high-quality productive factors, such as skilled labor and new technologies, in target locations is the main driving force for Chinese corporates when engaging in inter-provincial M&As. The access to emerging market demands and the active stock market (or listed corporates) are also the main determinants of corporates' engagement in M&A activities. Motives, such as the access to industrial policies, as well as better innovation milieu and business environment in target locations, also act as important determinants in Chinese corporates' consideration when engaging in M&As. In addition, China's inter-provincial M&As are highly related to the industrial structure in the target location, which implies that M&A markets tend to be more active in regions where "new economy," such as producer services and high-tech industries, congregate.

This study focuses on the spatial dynamics of inter-regional M&A, one of the market entry modes of corporate investment, and the findings will contribute to the literature in the following aspects. First, a conceptual framework has been developed from the geographical perspective and based on existing studies, to analyze how spatial proximity and place-specific attributes affect the domestic M&As in China and other EEs. Second, this study can help to demonstrate the differences in the spatial dynamics between M&As and other market entry modes, such as GI, making M&A-related issues a research focus. Third, this empirical investigation can advance the understanding of the changing geography of domestic M&As in China, one of the largest emerging and transitional economies around the world. Furthermore, this study will be conducive to comparing the spatial dynamics of inter-regional M&As among different economies, thus testing the applicability of M&A-related theories established based on a few developed economies to the others in the world. The findings indicate that China's domestic M&As shows a "core-periphery" pattern similar to that found in developed economies (Green, 1987; Zademach & Rodríguez-Pose, 2009). The findings have confirmed the roles of old-fashioned factors, such as spatial proximity and the access to the market or skilled labor pools, in China's inter-regional M&As. However, the effects of the institutional contexts and economic marketization and financialization on M&As are more significant in China, signifying the differences in the institutional setting and corporate governance practices between DEs and EEs.

It needs to be emphasized that the domestic M&A markets have become increasingly active in China and other EEs, which should be regarded as a new perspective to understand the process of economic transition and regional development (Caiazza et al., 2017; Peng et al., 2018). In particular, the uneven distribution and asymmetric network of inter-regional M&As largely embody the regional disparities in corporate control and economic decision making within EEs. Meanwhile, M&As could provide new channels for individual corporates to capture high-quality but distant assets, thus promoting regional development by coupling exterior resources. For China and other EEs, it is of critical significance to formulate and implement more effective M&A-related policies in the aforementioned process.

This study also has some policy implications. Specifically, the implementation of M&A-oriented policies can help break through local protection. The service system for M&A-related corporates, including financing, human resource, innovation, and entrepreneurship service, should be established by local governments. Moreover, less-developed regions should give full play to their unique advantages to proactively engage in cross-border and domestic M&A markets, in order to keep local assets in suit, exert external corporate control and facilitate economic decision making.

This study is an initial effort to uncover the changing geography of domestic M&As and its determinants in EEs (e.g., China). Further studies should pay more attention to the spatial pattern, process, and consequence of M&As in and out of China and other EEs. In particular, the geography of M&As at finer geographical scales, such as the inter- and intra-urban level, may call for more scholarly investigations. It is also advisable to expand relevant research by examining how corporate characteristics and industrial heterogeneities affect the geography of M&As in and out of EEs. Furthermore, dynamic variations of M&As across different industries, the relationship between the transitional context and M&A markets, and the impacts of M&As on economic growth and industrial landscape within EEs could also be focused on in future studies.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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ENDNOTES

[1] Wind is the market leader of the financial information service industry in China.

[2] http://www.qichacha.com/

[3] With the exceptions of 22 provinces, there are 4 centrally administered municipalities (i.e. Beijing, Shanghai, Tianjin and Chongqing), and 5 autonomous regions (i.e. Xinjiang, Tibet, Inner Mongolia, Ningxia and Guangxi) in China's Mainland.

[4] During the period 2002–2008, the mean of the dependent variable was 1.41 while its variance was 12.65. During the period 2009–2016, the mean of the dependent variable was 7.81 while its variance was 345.15.

[5] The TOP5 provincial-level units include Beijing, Guangdong, Shanghai, Jiangsu and Zhejiang.

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