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Sister-city Ties and Chinese Outward Foreign Direct Investment: A Spatial Econometric Analysis

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Abstract

This paper employs dynamic spatial econometric methods to analyze the impact of the sister-city relationship on Chinese outward foreign direct investment (OFDI) using a linked country-level dataset from 2003 to 2016. The results show strong and robust evidence that the sister-city relationship has been a crucial OFDI location determinant in host countries and their neighbors. Specifically, the sister-city tie between China and the host country has stimulated Chinese OFDI in host countries. Moreover, Chinese OFDI in host countries would be reduced if China concluded sister-city ties with their neighbors to which we refer as the neighboring effect. Further mechanism tests show that sister cities have promoted OFDI in host countries via four channels: reducing political risk, decreasing information asymmetry, narrowing institutional distance, and mitigating cultural differences. This tendency for sister-city links to promote OFDI has varied substantially depending on OFDI entry modes (i.e., greenfield or cross-border mergers and acquisitions), motivation (i.e., resource-, market-, technology-, or efficiency-oriented OFDI), and Sino–foreign geographical relationships (i.e., Belt and Road Initiative countries or other countries).

Keywords: foreign direct investment, location choice, sister city, spatial econometrics
JEL codes: F20, F21, F23

I. Introduction

Over the past five decades, China has established more than 2,900 pairs of sister cities abroad.[1] In contrast to formal bilateral relationships, such as diplomatic ties and strategic partnerships between central governments, sister-city ties can be considered

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[1]Source: Chinese People's Association for Friendship with Foreign Countries (CPAFFC), available from: https://www.cpaffc.org.cn/index/friend_city/index/lang/1.html.

informal or semi-formal diplomatic arrangements signed by bilateral local authorities. They support friendships and cultural exchanges, and they are beneficial for the economic development of city pairs. This relationship is therefore considered a crucial complement to official diplomatic activities.

Previous literature has documented that the sister-city relationship has had positive economic impacts on intercity tourism and trade, as it has been effective in reducing institutional barriers and improving mutual economic cooperation (Brakman et al., 2016). However, few studies have focused on the influence of sister-city ties on foreign direct investment (FDI) (Zhang et al., 2020; Hu et al., 2021), and, more important, the mechanisms of the sister-city relationship's influence on FDI location choice remain unclear, which makes it difficult to apply sister-city agreements reasonably to promote FDI.

Prior studies found that some aspects of host countries, such as their economic growth (Iamsiraroj, 2016) and the quality of their institutions (Kumar et al., 2020), were important factors in FDI location choice. However, the sister-city relationship is a special FDI location factor that can be affected substantially by both the home government and host governments. This means that the authorities of the home country can guide outward foreign direct investment (OFDI) to the host country by improving the sister-city relationship. In comparison with formal and national diplomatic ties with bilateral features, the sister-city relationship as an informal and local bilateral arrangement is flexible and can be adjusted in a timely manner by local governments. It is therefore useful to understand the effect of the sister-city relationship on FDI location choice and the mechanisms of this relationship. Regrettably, the literature on this topic is inadequate.

Even fewer studies have investigated the impact of sister-city relationships on FDI in the spatial dimension. According to recent studies (Blanc-Brude et al., 2014; Regelink and Elhorst, 2015; McDonald et al., 2018; Huang et al., 2021), FDI location choice presents spatial correlation among countries. In a closely knit world, when deciding to invest in a potential host country, multinational enterprises (MNEs) may consider locating in the host country's neighboring economies. The location choice of FDI is therefore likely to depend on comprehensive comparisons among neighboring locations. In this case, the sister-city relationship may have cross-country spillover on the OFDI decisions of MNEs. A better understanding of this spillover would therefore have underlying policy implications that could help host countries to redesign FDI policies to attract FDI and succeed in competition in the business environment.

To fill this gap in the research, we explored the impact of sister-city ties on Chinese OFDI by using a dynamic spatial econometric approach. The results show strong and robust evidence that the sister-city relationship has been a crucial determinant of Chinese OFDI location choice in the host country and its neighbors. Specifically, the sister-city ties have stimulated Chinese OFDI in the host country, while the sister-city agreements between China and economies neighboring the host country have caused Chinese firms to reduce OFDI in the host country. We refer this as the neighboring effect. It implies that there is a competition for establishing sister-city relations to attract Chinese FDI. Further tests verify four specific mechanism channels and the heterogeneity of the OFDI-promoting effect.

The contributions of this study are twofold. First, as far as the authors are aware, this is the first paper to investigate the sister-city relationship as an FDI location determinant embedded into a theoretical framework of spatial location and to test the determinants of the FDI location considering both the host countries and its neighbors using a spatial econometric approach. In particular, the neighboring effect is identified as an important spatial feature of sister-city ties on FDI location choice. Second, this paper attempts to unravel how the sister-city relationship has influenced FDI location choice. The relevant mechanisms are discussed in detail, and a series of tests are conducted on multiple channels and key heterogeneous factors to verify these mechanisms.

The remainder of the paper is organized as follows: Section II summarizes the related literature. Section III discusses the theoretical framework and mechanisms and proposes several hypotheses. Section IV introduces our estimation strategy and approach. Section V describes the data and processing methods. Section VI analyzes the empirical results of the sister-city relationship as an FDI location determinant. Section VII concludes.

II. Related literature

Three groups of prior studies are relevant to our paper. The first analyzes determinants of Chinese OFDI location considering bilateral characteristics. With the surge in Chinese OFDI since the beginning of this century, location determinants have been studied continuously, and thus, a large body of literature has accumulated in this field (e.g., Buckley et al., 2007; Yao et al., 2017). The literature has explored the roles of some bilateral economic factors in stimulating Chinese OFDI, including bilateral trade (Zhang and Daly, 2011), bilateral economic agreements such as free trade agreements (Li et al., 2018), and double taxation treaties (Luo et al., 2010), which revealed that home-host economic links fostered Chinese OFDI. Furthermore, several studies found that the home country could create specific host location advantages by engaging in proactive economic cooperation. Specifically, Dong and Fan (2017) concluded that

China's aid supporting socioeconomic infrastructure in African countries was an important stimulus attracting Chinese investors. Recently, scholars have begun to pay more attention to bilateral OFDI locations in the political, diplomatic, institutional, and cultural fields (Li et al., 2018; Zhang et al., 2020), which required more involvement from the home government and relevant parties. Therefore, strong home country efforts are necessary to establish and maintain sister-city relations. This paper will explore the location factors shaped by the interactions of both home and host countries.

The second stream of related literature discusses how the bilateral relations affect FDI location choice. The creation of relationship depends on the official interactions between the home and host countries from the long- and short-run perspectives. For example, Sun and Liu (2019) found that the establishment and upgrading of a Sino–host strategic partnership promoted Chinese enterprises' OFDI to the host country. Zhang et al. (2014) confirmed that visits of state leaders between China and the host countries stimulated Chinese OFDI to the relevant countries, demonstrating the importance of bilateral national relations in FDI location choice. Home–host communications at the civilian level also played a role in enhancing cultural understanding and bridging cultural differences, thereby forming a cultural atmosphere that is beneficial to investors from both countries. The sister-city relationship appears to be an extraordinary bilateral relation dominated by local governments; such a relationship is classified as an intergovernmental relationship and supplements national diplomatic activities. As an autonomous, flexible, and decentralized friendly relationship at the subnational level, the sister-city tie has economic, social, and cultural connotations, and exhibits people-to-people relations. The sister-city relationship is therefore at an intermediate level, between official and civil bilateral relations, and may have the advantages of both but also entails more complex location effect mechanisms with regard to FDI. More recently, Zhang et al. (2020) found that the international friendship city relations established by Chinese local governments stimulated Chinese OFDI to host countries. Similar results were obtained using a sample from Japan (Hu et al., 2021). However, how sister-city ties facilitate OFDI still does not seem to be understood well.

The third group of studies seek to understand the spatial effect on FDI location. From the perspective of economic geography, the relationship between things is proportional to their distance (Tobler, 1970). Therefore, this implies that there are extensive spatial connections in making FDI location choices (McDonald et al., 2018). Specifically, the location factors in different regions could produce spillovers on FDI location choices through spatial interaction (Blanc-Brude et al., 2014). Unfortunately, although potential FDI location competitions have been highlighted in the spatial econometric literature (Regelink and Elhorst, 2015), the majority of empirical studies on

Chinese OFDI location determinants still implicitly assumed that the location influence of each country acts in isolation. Several studies analyzed the neighboring effects of Chinese OFDI location choice based on spatial econometric models; for example, Chou et al. (2011) tested the third-country effects of economic scale on FDI location by employing the spatial Durbin model, and Huang et al. (2021) investigated the cross-border spillovers of Internet security in a location on OFDI by adopting the dynamic spatial Durbin (DSD) specification. These studies provide a reference for the analysis of the neighboring effect of sister-city relations on OFDI location choice.

In summary, it is necessary to discuss how sister-city ties affect FDI location and its mechanisms based on the view of spatial correlation.

III. Theory, mechanism, and hypotheses

1. Theoretical framework

This study proposes a combination of theoretical views given the complexity of OFDI decisions. It employs three interdisciplinary theories to model how the sister-city relationships affect the OFDI decisions of MNEs.

The first theory is the well known ownership, location, and internalization (OLI) paradigm (Dunning, 1977), also known as the eclectic theory of FDI, which provides a classic framework to explain the internationalization mode selection of enterprises. In the OLI framework, the OFDI decision is made only when firms possess ownership and internalization advantages and when the host country possesses a location advantage. Location advantage is a specific feature of a host country that is conducive to a firm's overseas operations. The sister-city relationship is a type of host location advantage that attracts FDI inflows. Dunning (2001) also emphasized the dynamic variations in three types of advantages. If the sister-city relationship is changeable, a firm with ownership and internalization advantages will react to the change by adjusting its OFDI location decisions. The second theory is the relation-fostering view (Zhang et al., 2020). Here the sister-city tie constitutes a host country location advantage that attracts FDI projects from counterpart countries. This theory is different from institution-fostering theory (Luo et al., 2010; Kumar et al., 2020) by emphasizing that OFDI can also be facilitated by good intergovernmental relations rather than purely institutional support offered by home governments. According to this view, the establishment of sister-city ties improves bilateral relations, thereby stimulating investment activities between the two countries. Recent studies have emphasized that the location choice is spatially correlated (Blanc-Brude et al., 2014; Regelink and Elhorst, 2015; McDonald et al., 2018; Huang et al., 2021) and argued that OFDI location choice can be affected by locations of neighboring regions (Blanc-Brude et al., 2014; McDonald et al., 2018). This is the third theory used in our analysis. As it emphasizes the distance and proximity between locations that impact OFDI, we refer to this as the neighboring effect, i.e., location competition among neighboring countries. Accordingly, the OLI framework can be embedded in a spatial system. In the spatial framework, a firm's OFDI location choice is determined by both host countries and their neighbors. Specifically, if a neighbor of the host country concludes sister-city agreement with a certain country (i.e., the home country of FDI), the host country may lose potential FDI from that country, and even more seriously, some foreign affiliates located in the host country might move to the neighboring country. There may thus be negative spillovers from sister-city ties.

In summary, this study uses a spatial OLI framework with consideration of bilateral relations, and it proposes the following hypotheses:

Hypothesis 1: The sister-city relationship between China and the host country stimulates Chinese OFDI in the host country.

Hypothesis 2: Sister-city relationships concluded by China with economies neighboring the host country reduce Chinese OFDI in the host country.

2. Foreign direct investment promoting mechanisms of the sister-city relationship

Although the theory explains the location effect on FDI of the sister-city relationship, the specific mechanism channel remains unclear. In our view, sister-city ties stimulate OFDI in host countries via four channels.

First, the sister-city relationship helps reduce political risk for host countries. The literature documents that good intergovernmental relations have promoted enterprise internationalization and improved the success rate of investment (Jiménez and Delgado-García, 2012). Moreover, authorities have tended to offer more institutional support, such as insurance against political risks (Luo et al., 2010) and political safeguards for MNEs in sister cities.

Second, the sister-city relationship helps relieve information asymmetry in host countries. Sister-city agreements have improved the transparency and availability of information (Blanco and Campbell, 2006), which is crucial for market-oriented OFDI, as MNEs rely on effective market information for the design and sale of products and services in overseas markets. Local governments may also provide more specific instructions to help foreign affiliates overcome investment uncertainty due to information disadvantages, which strengthens the adaptability of MNEs in unfamiliar environments and creates new investment opportunities (Zhang et al., 2020). For instance, the sister-city relationship between Jinjiang in China and Thoreau in Indonesia facilitated economic and trade docking activities between the two cities. Many Chinese enterprises have established cooperative sales relationships with large retailers and traders in Indonesia.

Third, the sister-city relationship is beneficial in narrowing the institutional distance between the two countries. Cezar and Escobar (2015) argued that institutional distance had a negative effect on FDI. In particular, Chinese investors prefer to invest in countries with small institutional gaps to prevent outsider disadvantages. Fortunately, the sister-city relationship is an effective instrument for reducing bilateral institutional barriers (Brakman et al., 2016). Through exchange activities, both countries can improve their mutual understanding of their institutions, increasing the possibility of bilateral FDI.

Fourth, sister-city relationships can mitigate cultural differences. Previous studies emphasized that cultural distance is a crucial obstacle to OFDI decisions (Denk et al., 2012). Note that sister-city ties are usually established based on a search for similarities, such as historical backgrounds, geographic locations, ideological concerns, and urban problems, in spite of cultural differences. For example, the sister-city ties of Nanjing (China) with Bandar Seri Begawan (Brunei) and between Fuzhou (China) and Semarang (Indonesia) are rooted in the history of several visits by the Chinese navigator Zheng He more than 600 years ago. The sister-city relationships between Malaysia's Sibu and several Chinese cities benefit from the presence of many Chinese people in Sibu. The amicable relationship between Myanmar's Rangoon and China's Yangzhou is based on the cities' common Buddhist culture. This demonstrates that the sister-city relationship helps "seek common ground while shelving differences," thereby enhancing mutual trust. Furthermore, frequent cultural exchanges between cities may improve local inhabitants' understanding of foreign cultures. Cultural communication is crucial for FDI locations. It is especially important for cross-border mergers and acquisitions (CM&A), which usually fail because of cross-cultural conflicts.

The discussion on the heterogeneity effect of FDI location under different conditions is also important because these heterogeneous factors can magnify or shrink the role of sister cities in FDI. In our study, owing to differences in the OFDI strategies of Chinese MNEs, overseas projects have different entry modes (i.e., greenfield and CM&A) and investment motives (i.e., resource-, market-, technology-, and efficiency-oriented OFDI), which may generate heterogeneous reflections of OFDI location choice. Moreover, the special geographical relationship between China and the host country may affect the specific role of sister-city ties. Thus, the location effect of sister-city relationships on Chinese OFDI is formed through complex interactions among these factors. Identifying possible heterogeneity is certainly valuable for a deeper understanding of the mechanisms and the design of policies and strategies. Thus, we hypothesize the following:

Hypothesis 3: The sister-city relationship stimulates Chinese OFDI in the host country, reducing political risk, decreasing information asymmetry, narrowing institutional distance, and mitigating cultural difference.

Hypothesis 4: The effect of the sister-city relationship in promoting Chinese OFDI varies with FDI entry modes, motivations, and different Sino–foreign geographical relationships.

IV. Empirical strategies

1. Econometric models

To explore the impact of the sister-city relationship on Chinese OFDI location choice in host countries, we start our analysis with a dynamic fixed-effect model and test the direct sister-city location effect on FDI:

$$OFDI_{it} = \rho OFDI_{i,t-1} + \beta SC_{it} + \boldsymbol{X}'_{it}\psi + D_t + u_i + \varepsilon_{it}, \tag{1}$$

where subscripts i and t represent the country and year, respectively. The dependent variable $OFDI_{it}$ indicates Chinese OFDI to host country i in year t, indexed by two specific measures: OFDI stocks ($OFDIS_{it}$) and flows ($OFDIF_{it}$) (in logarithms).

Given the persistence of FDI, the static specification may yield biased results owing to intertemporal correlation. A one-period lagged item $OFDI_{i,t-1}$ is therefore added as an independent variable to control for possible endogeneity due to serial correlation.

SC_{it} is the key explanatory variable, employed to investigate whether the sister-city relationship in country i directly influences Chinese OFDI location choice. In this paper, the qualitative indicator SC_D_{it} is used in the baseline specification. It is equal to 1 if China has sister-city pairs with country i, and 0 otherwise. This status variable is appropriate for revealing long-term bilateral informal friendly relationships. In the robustness tests, the other three sister-city measures are employed in the estimations. Specifically, the strength index SC_Q_{it} is used to index the extent of sister-city ties in the long-term dimension, referring to the number of sister-city pairs (in logarithms). To capture the short-run sister-city location effect, HSC_D_{it} and HSC_Q_{it} are constructed to reflect short-term changes in bilateral sister-city relations, measured by a yearly dummy to identify whether there are newly established sister-city pairs between China and foreign countries and their quantities (in logarithms), respectively.

As overseas affiliations invest with various motives (Buckley et al., 2007), different motivations lead to discrepancies in location choice. Specifically, resource-acquiring and technology-sourcing OFDIs focus on natural minerals and technological endowments respectively. Market-oriented OFDI tends to flow to host countries with high demand for products and services, whereas for efficiency-oriented OFDI, the optimal location is related to the configuration of the production chains with low costs. Moreover, MNEs' OFDI location choices are affected by some specific country characteristics irrespective of their motivations, such as geographical distance, society, and bilateral political relationships, which influence foreign entry costs and thresholds. Hence, identifying these FDI locations is crucial. The omission of controls for important location characteristics may bias our results when aggregate-level Chinese OFDI is used. The vector $\boldsymbol{X'_{it}}$ on the features of host economies is therefore incorporated to capture these effects. Specifically, four types of country-specific FDI location determinants constitute the vector. Macroeconomic circumstances are indexed by economic size ($size_{it}$), development level ($develop_{it}$), growth potential ($growth_{it}$), change in exchange rates ($exchange_{it}$), and openness ($open_{it}$) as the main determinants of market- and efficiency-oriented OFDI. The intensity of technology ($tech_{it}$) and the abundance of energy ($energy_{it}$) and ore (ore_{it}) represent the resource endowments of the host countries. These locations are strong attractions for overseas subsidiaries with technology-sourcing and resource-acquiring motivations. Furthermore, the distance aspect contains two dimensions, geographical distance ($distance_i$) and institutional distance ($institution_{it}$), which increase the entry and operating costs of OFDI. The final characteristic involves formal and national-level bilateral political relationships. The sister-city relationship (SC_{it}) of interest in our study is known to be an informal and local-level relationship between two countries; it is thus necessary to isolate formal and national political relations. In this paper, strategic partnerships ($partner_{it}$) and the frequency of state leader's exchange visits ($visit_{it}$) are employed to capture formal and national bilateral political relations in the long- and short-run dimensions. Details of the control variables are provided in the Appendix (Table A1).

Chinese OFDI activities may be stimulated by government polices such as the "Going-out" national strategy and the Belt and Road Initiative. The OFDI decisions of MNEs may also be influenced by the global business cycle.[2] To capture these time effects, the year dummies D_t are added to the model. Time-invariant dummies u_i are employed to address the unobservable location characteristics of host country i, which weakens the econometric endogeneity associated with omitted variable bias. ε_{it} is the error term.

To capture the neighboring effect of OFDI location choice, a DSD model is employed, as in Equation (2). This is a good solution for exploring nonisolated locations and has been widely used in recent studies on FDI spatial analysis (Regelink and

[2]For instance, undervalued overseas assets stimulated CM&A deals during the period of global recession.

Elhorst, 2015; Lin and Kwan, 2017; Huang et al., 2021).[3] Specifically, as our focus, the spatially lagged independent term $\Sigma_{j=1,j\neq i}^{J}\boldsymbol{w}_{ij}SC_{jt}$ is used to identify cross-country spillovers of sister-city ties from neighboring countries. It reflects the weighted average of sister-city relations from neighboring economies. The spatial autoregressive term $\Sigma_{j=1,j\neq i}^{J}\boldsymbol{w}_{ij}OFDI_{jt}$ is incorporated to capture the effect of OFDI spatial agglomeration. Given the similarities among neighboring countries in natural endowment, economy, and society, MNEs with specific OFDI motives usually tend to agglomerate in those nearby countries, leading to FDI flows and stocks in several regions of the world. In particular, Chinese OFDI is mainly concentrated in neighboring areas such as the Southeast Asia and developed regions such as Western Europe and North America. Thus, our estimations are likely to be biased without considering FDI spatial correlations.

$$OFDI_{it} = \rho OFDI_{i,t-1} + \omega\sum_{j=1,j\neq i}^{J}\boldsymbol{w}_{ij}OFDI_{jt} + \beta SC_{it} + \varphi\sum_{j=1,j\neq i}^{J}\boldsymbol{w}_{ij}SC_{jt} + \boldsymbol{X}'_{it}\psi + D_t + u_i + \varepsilon_{it}, \quad (2)$$

where i and j refer to countries i and j, respectively. Coefficients β and φ reflect sister-city location effects on OFDI from host country i and its neighboring economies, that is, the host and neighboring effects. Following the literature on FDI (Lin and Kwan, 2017), we set the spatial weight matrix $\boldsymbol{w}_{ij}$ in two forms for the baseline and robustness tests, including the inverse-geographical distance matrices and spatial contiguity matrices.

For the inverse distance matrices, the nontruncated and truncated forms are defined and used for analyses in the global and regional dimensions, respectively. Specifically, the nontruncated form is calculated using Equation (3):

$$\boldsymbol{w}_{ij}^{global} = \begin{cases} (GeoDis_{ij})^{-1}, & \text{if } i \neq j \\ 0, & \text{else} \end{cases}, \quad (3)$$

where $GeoDis_{ij}$ stands for the Earth's spherical distance between countries i and j in km. $\boldsymbol{w}_{ij}^{global}$ assumes spillovers of sister-city locations worldwide, containing global spatially dependent relations in terms of geographical distance.

By contrast, a battery of truncated distance matrices is structured to explore the actual geographic range of the location effect by limiting the distance parameter z,

[3]The DSD model includes the time lag item and spatial X and Y lag terms. As the model is not a standard spatial Durbin specification, there is some controversy regarding its estimation technique (Jocobs et al., 2009; Lee and Yu, 2010). To obtain reliable estimation results, we employ the setting approach of the DSD model used in relevant FDI studies (Regelink and Elhorst, 2015; Lin and Kwan, 2017; Huang et al., 2021), that is, the spatial lag items of the core independent variable and FDI are embedded in the DSD model, but the spatial lags of other controls are not incorporated. This specification has two advantages. First, few spatial lag terms are introduced in the model, which makes estimation easy. Second, the potential spillovers of various controls can be captured by the spatial lagged OFDI item because OFDI location choice in neighboring economies reflects the influences of third-country locations. The DSD does not, therefore, yield the omitted variable bias due to third country effects from other location factors.

within which the spatial dependence of sister-city ties is incorporated. Equation (4) shows this cut form:

$$\boldsymbol{w}_{ij}^{region} = \begin{cases} (GeoDis_{ij})^{-1}, \text{ if } i \neq j \text{ and } GeoDis_{ij} \leqslant z \\ 0, \quad \text{else,} \end{cases} \tag{4}$$

where a series of regional spatial weight matrices is obtained by cutting the distance at z km. Through this treatment, the spatial variables with these truncated matrices can be understood as regional spillover measures but not spillovers over the entire world. That is, the scope of the zone depends on the setting of parameter z.

Furthermore, the contiguity matrix is computed as a substitute for the inverse distance form, which takes 1 as the spatial weight if countries i and j are contiguous; otherwise, it is 0. Spatial models with these matrices can be regarded as small-scale spatial specifications because only neighboring countries are embedded in the estimation.

2. Estimation methodology

Two dynamic econometric models are involved in our analysis. For Equation (1), considering a dynamic panel model without the spatial item, we can perform the estimation by using the system-generalized method of moments (S-GMM) approach to treat endogeneity owing to the time-lagged term $OFDI_{i,\,t-1}$, whereas for the dynamic panel spatial model in Equation (2) (i.e., the DSD model), estimation methods are not unique (Lee and Yu, 2010). The S-GMM approach has been advocated as useful for estimating dynamic spatial panel models in several theoretical econometric studies (Jocobs et al., 2009). To unify the estimated techniques for comparison, we employ the S-GMM estimator to run the DSD model. In our estimation, dynamic items and key variables are regarded as endogenous variables. We also employ Hansen J-statistics and second-order serial correlation tests for each dynamic specification to check the validity of the instruments and serial correlation.

V. Data and processing

Our country-level panel dataset is constructed based on several authoritative data sources. The data are processed and computed manually. Specifically, Chinese OFDI stocks and flows in each host country are originated from the Statistical Bulletin of China’s Outward Foreign Direct Investment, which has offered reliable country-level information on Chinese OFDI amounts since 2003 and is published by the Ministry of Commerce of the People’s Republic of China.

Our key explanatory variable, the sister-city relationship, is measured by using information on amicable agreements between local governments of China and foreign countries collected from the Chinese People's Association for Friendship with Foreign Countries. This dataset documents all regional Sino–foreign friendship agreements since the first agreement between China's Tianjin and Japan's Kobe in 1973. According to the data, by 2018, the number of local pairs reached 2,470.[4] The collected dataset includes the date and bilateral regional governments of each agreement, which can be used to identify Sino–foreign sister-city ties. As the information on amicable agreements is at the case level, we transformed the data and reconstructed four country-level key variables (SC_D_{it}, SC_Q_{it}, HSC_D_{it}, and HSC_Q_{it}) to index sister-city relations.

The data for controls are obtained from several sources. As a global database with abundant information on country features, the World Development Indicators (WDI) are the main source of our controls. We use the data from the WDI to capture the FDI location effects from macroeconomic circumstances and resource endowments. To address inflation and exclude the price effect, all amount data are measured at 2010 price. Data on formal and national bilateral political relations, including strategic partnerships and leader exchange visits, are collected manually from the Ministry of Foreign Affairs of China. To construct variables for bilateral distances, we extract geographical distance using Google Earth software and calculated institutional distance using the Worldwide Governance Indicators (WGI).

Other indicators used in the mechanism channel tests and heterogeneity analyses, such as political risk, information asymmetry, regime, cultural differences, and Chinese OFDI features in host countries, are derived mainly from a series of well known official databases of international organizations. Further details can be found in the related section. Finally, given the availability of data for most variables, the study period is limited from 2003 to 2016.

VI. Empirical results

1. Summary statistics

Table 1 reports the summary statistics of the variables used in the baseline specifications. The regression sample contains 153 economies across all continents; thus it provides a good representation. Specifically, Chinese OFDI stocks ($OFDIS_{it}$) and flows ($OFDIF_{it}$)

[4]These agreements are classified at the levels of province (721 pairs), prefecture (1,418 pairs), and county (331 pairs), respectively.

are displayed in Panel A. The large standard deviations (4.175 and 4.170) and 0 minimum values indicate that Chinese OFDI is unevenly distributed overseas, and some economies do not receive investment from Chinese enterprises. Panel B shows the four sister-city indicators. Notably, the status dummy SC_D_{it} indicates that more than half of the countries had concluded sister-city agreements with China, with a median of 1, and the 0 values reflect that there are countries without Sino–foreign local friendship agreements. The spatial lags of the sister-city ties and OFDI in nontruncated forms are summarized in Panels C and D, where nonzero medians suggest widespread spatial dependence. It may thus be reasonable to incorporate spatial indices into sister-city relations and Chinese OFDI when estimating our regressions. Furthermore, all country-level controls are listed in Panel E. From the distinct differences in most country features, we consider it essential to include these controls to decrease omitted variable bias.

Table 1. Summary statistics

Variable	Mean	Standard deviation	Min.	Med.	Max.	Observations
Panel A: Dependent variables: Chinese OFDI						
$OFDIS_{it}$	7.448	4.175	0.000	8.475	18.173	1,921
$OFDIF_{it}$	5.036	4.170	0.000	5.889	16.251	1,921
Panel B: Key independent variables: Sister-city relationships						
SC_D_{it}	0.670	0.470	0.000	1.000	1.000	1,921
SC_Q_{it}	1.174	1.257	0.000	0.693	5.572	1,921
HSC_D_{it}	0.229	0.420	0.000	0.000	1.000	1,921
HSC_Q_{it}	0.245	0.506	0.000	0.000	2.773	1,921
Panel C: Key independent variables: Spatial lag of sister-city relationships						
$\Sigma^J_{j=1, j \neq i} \boldsymbol{w}_{ij} SC\_D_{jt}$	0.091	0.041	0.028	0.082	0.245	1,921
$\Sigma^J_{j=1, j \neq i} \boldsymbol{w}_{ij} SC\_Q_{jt}$	0.156	0.079	0.045	0.133	0.503	1,921
$\Sigma^J_{j=1, j \neq i} \boldsymbol{w}_{ij} HSC\_D_{jt}$	0.029	0.016	0.007	0.024	0.113	1,921
$\Sigma^J_{j=1, j \neq i} \boldsymbol{w}_{ij} HSC\_Q_{jt}$	0.030	0.016	0.007	0.024	0.115	1,921
Panel D: Control variables: Spatial lag of Chinese OFDI						
$\Sigma^J_{j=1, j \neq i} \boldsymbol{w}_{ij} OFDIS_{jt}$	1.868	1.688	0.000	1.751	8.988	1,921
$\Sigma^J_{j=1, j \neq i} \boldsymbol{w}_{ij} OFDIF_{jt}$	1.278	1.210	0.000	1.101	6.650	1,921

(Continued on the next page)

(Table 1 continued)

Variable	Mean	Standard deviation	Min.	Med.	Max.	Observations
Panel E: Control variables: Country features						
$size_{it}$	24.052	2.273	18.826	23.886	30.460	1,921
$develop_{it}$	8.378	1.430	5.386	8.342	11.425	1,921
$growth_{it}$	0.041	0.056	−0.621	0.041	1.231	1,921
$exchange_{it}$	0.035	0.357	−0.322	0.000	13.450	1,921
$open_{it}$	0.409	0.272	0.000	0.355	2.312	1,921
$tech_{it}$	0.071	0.111	0.000	0.027	0.987	1,921
$energy_{it}$	0.161	0.274	0.000	0.027	1.000	1,921
ore_{it}	0.077	0.144	0.000	0.020	0.864	1,921
$distance_{i}$	14.748	1.192	9.440	14.841	16.117	1,921
$institution_{it}$	3.509	2.301	0.001	3.112	12.072	1,921
$partner_{it}$	0.813	0.535	0.000	0.693	1.792	1,921
$visit_{it}$	0.224	0.444	0.000	0.000	2.079	1,921

Notes: Nontruncated spatial weight matrices are employed in Panels C and D. For the detailed definitions of variables, see Section IV and Appendix Table A1. OFDI, outward foreign direct investment.

2. Baseline results

The baseline analysis employs two models to estimate the impacts of sister-city relationships from the host country and the host country's neighboring economies on the location choice of Chinese OFDI. Specifically, OFDI stocks ($OFDIS_{it}$) and flows ($OFDIF_{it}$) are used as dependent variables. The former is an indicator reflecting the going-concern status of overseas subsidiaries. Changes in $OFDIS_{it}$ can indicate newly increased foreign investment or the exit of overseas affiliates from host countries. In contrast, the latter is an index to proxy for MNEs' location decisions because flows can be adjusted timeously in the short term. Intuitively, in comparison with flows, FDI stocks are insensitive to locations because of the sunk cost and time required to adjust foreign operations. Both measures are employed to examine the extent to which OFDI location choices are affected by the status dummy for whether China has concluded a sister-city agreement with host country *i*.

As mentioned in the empirical strategies, we began our analysis by running a dynamic model without spatial consideration as in Equation (1) to explore the Sino–foreign sister-city relations of host countries as a determinant of Chinese OFDI locations. The results of A-1 and B-1 in Table 2 show positive coefficients of sister-city ties (SC_D_{it}),[5]

[5]All estimations are examined by the Hansen-*J* and the second-order serial correlation tests. The results are presented in the last four rows of Table 2, and they indicate that these two tests do not reject the null hypotheses on the validity of instruments and absence of second-order serial correlation, at least at the 5 percent level. From these results, we confirm that the settings of the estimated dynamic models are applicable.

and A-1 is even statistically significant at the 1 percent level, which initially indicates the positive nexus between sister-city relations and FDI. Note that the time-lagged OFDI items ($OFDI_{i,\,t-1}$) in both A-1 and B-1 are positive and statistically significant at the 1 percent level, indicating a time-series correlation with FDI activities, regardless of stocks or flows. These results imply that our estimation should be a dynamic specification. Failure to consider time-lagged OFDI is likely to lead to endogeneity bias.

To capture the neighboring effect of OFDI location choice, we introduce the spatially lagged independent ($\Sigma^{J}_{j=1,\,j\neq i}\boldsymbol{w}_{ij}SC\_D_{jt}$) and dependent items ($\Sigma^{J}_{j=1,\,j\neq i}\boldsymbol{w}_{ij}OFDI_{jt}$) with the nontruncated distance matrix $\boldsymbol{w}_{ij}$ to construct the DSD model, as shown in Equation (2). The results in A-2 and B-2 show positive (0.479 and 0.341) and statistically significant sister-city location effects from host countries at the 1 percent level. In contrast, significantly negative neighboring effects (−1.701 and −17.524) on $\Sigma^{J}_{j=1,\,j\neq i}\boldsymbol{w}_{ij}SC\_D_{jt}$ are observed in A-2 and B-2, respectively, implying that sister-city agreements concluded by neighboring countries *j* decrease the motivation of Chinese MNEs to invest in host country *i*. Hypotheses 1 and 2 are therefore supported by using a spatial econometric specification. The significantly positive spatial OFDI terms ($\Sigma^{J}_{j=1,\,j\neq i}\boldsymbol{w}_{ij}OFDI_{jt}$) in both specifications reflect Chinese OFDI agglomeration. It is therefore necessary to capture this tendency to prevent bias of the results. Statistically significant country-level controls are also found in most specifications of Table 2, which implies multiple motives for Chinese OFDI, and suggests the need to identify these location characteristics to reduce omitted variable bias.

These findings indicate that the sister-city relationship is a spatially interacting FDI location factor. It is valuable to understand this phenomenon as it illustrates country competition in the business environment to attract FDI. As a crucial informal bilateral location characteristic, the establishment of more sister-city ties increases competitiveness for a country acquiring FDI in comparison with other national rivals. We can therefore call the spillovers of sister-city ties on OFDI location choice a type of neighboring effect.

Interestingly, two features of the country competition regarding sister-city agreements should be noted in our results. First, according to the coefficients of $\Sigma^{J}_{j=1,\,j\neq i}\boldsymbol{w}_{ij}SC\_D_{jt}$ and SC_D_{it} (φ and β), the magnitudes of negative spatial spillovers relative to the positive host country effect reach 3.55 (−1.701/0.479 in A-2) and 51.39 (−17.524/0.341 in B-2) times in terms of stocks and flows, respectively, reflecting the asymmetry between the host and neighboring effects of sister-city ties. This means that Chinese MNEs may turn to investing in neighboring economies if the host countries make less efforts to improve sister-city relations than their neighbors. Second, the negative spatial spillover in terms of FDI stocks (A-2) is only 0.10 times relative to that in the specification based on flows (B-2), implying that FDI stocks are insensitive to sister-city spatial location changes.

This phenomenon can be explained by the sunk costs and adjustment time of FDI stocks. Instead of relocating already established overseas affiliates, MNEs may choose to postpone or halt plans to move affiliates to neighboring economies.

Table 2. Baseline results

Variable	Dependent variable: $OFDI_{it}$			
	Panel A: OFDI stocks ($OFDIS_{it}$)		Panel B: OFDI flows ($OFDIF_{it}$)	
	A-1	A-2	B-1	B-2
	S-GMM	DSD	S-GMM	DSD
$OFDI_{i,t-1}$	0.918***	0.913***	0.365***	0.335***
	(0.002)	(0.003)	(0.005)	(0.004)
$\Sigma^{J}_{j=1,j\neq i}\boldsymbol{w}_{ij}OFDI_{jt}$		0.017**		0.155***
		(0.007)		(0.043)
SC_D_{it}	0.446***	0.479***	0.039	0.341***
	(0.021)	(0.017)	(0.131)	(0.114)
$\Sigma^{J}_{j=1,j\neq i}\boldsymbol{w}_{ij}SC\_D_{jt}$		−1.701***		−17.524***
		(0.185)		(1.197)
$size_{it}$	0.059***	0.061***	0.613***	0.637***
	(0.005)	(0.006)	(0.024)	(0.038)
$develop_{it}$	−0.045***	−0.042***	−0.424***	−0.424***
	(0.008)	(0.009)	(0.042)	(0.042)
$growth_{it}$	0.214***	0.221***	−1.949***	−1.839***
	(0.058)	(0.060)	(0.222)	(0.214)
$exchange_{it}$	−0.030***	−0.034***	−0.209***	−0.317***
	(0.006)	(0.006)	(0.063)	(0.049)
$open_{it}$	0.340***	0.410***	1.820***	2.468***
	(0.036)	(0.038)	(0.253)	(0.247)
$tech_{it}$	−0.290***	−0.374***	0.200	−0.587**
	(0.052)	(0.059)	(0.208)	(0.292)
$energy_{it}$	0.316***	0.290***	0.809***	0.642***
	(0.016)	(0.017)	(0.088)	(0.083)
ore_{it}	0.120**	0.096*	1.596***	1.240***
	(0.049)	(0.054)	(0.328)	(0.266)
$distance_{i}$	−0.049***	−0.035***	−0.182***	−0.055
	(0.005)	(0.005)	(0.035)	(0.035)
$institution_{it}$	0.006	0.005	−0.026	−0.036*
	(0.004)	(0.004)	(0.019)	(0.020)
$partner_{it}$	0.074***	0.095***	0.762***	0.894***
	(0.014)	(0.017)	(0.102)	(0.101)
$visit_{it}$	−0.054***	−0.063***	0.290***	0.094*
	(0.011)	(0.012)	(0.059)	(0.050)
Year fixed effects	Yes	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes	Yes
Observations	1,921	1,921	1,921	1,921
Number of countries	153	153	153	153
Number of instruments	197	199	197	199
Hansen-*J* test (statistics)	143.73	144.10	139.94	139.87
Hansen-*J* test (*p*)	0.913	0.909	0.944	0.944
2nd-order serial test (statistics)	0.200	0.187	1.901	1.631
2nd-order serial test (*p*)	0.841	0.851	0.057	0.103

Notes: ***, **, and * represent significance at the 1, 5, and 10 percent levels, respectively. Robust standard errors are in parentheses. Nontruncated distance matrices are used in all specifications. DSD, dynamic spatial Durbin. S-GMM, system-generalized method of moments. OFDI, outward foreign direct investment.

3. Robustness tests

Four robustness tests are conducted using the DSD model to confirm the robustness of the baseline results and to explore specific features of interest. The tests involve geographical scopes of spillover, alternative key measures, spatial weight matrices, and reaction time.

The spillovers of sister-city relations on OFDI location choice may change in different geographical scopes. In the baseline specifications, spatial matrices are constructed based on a nontruncated form, which identifies spillovers of sister-city relationship on OFDI location choice on a global scale. We therefore test the robustness of Equation (2) with a series of truncated distance specifications. It is also interesting to understand the features of spatial spillovers of sister-city relationship. Table 3 shows spillovers on OFDI location choice from neighboring countries estimated by using spatial matrices with distance limits reducing from 10,000 to 2,000 km and 1,000 to 200 km, with 1,000 and 100 km as intervals. All specifications present significantly negative spatial spillovers of the sister cities, regardless of FDI stocks (Panel A) or flows (Panel B), implying that spatial location effects are robust to different geographical distances. More important, we observe a strengthened tendency for negative spatial spillovers with a narrowing of distance. Specifically, the spillover changes from −1.510 to −6.680 and from −14.986 to −44.082 in terms of OFDI stocks and flows, respectively. In particular, sharp changes are observed within 1,000 km, implying that fiercer sister-city competition was mainly generated in a nearby areas. Thus, the spillover of sister-city location was regional rather than worldwide.

Table 3. Robustness test: Results with different truncated matrices

Panel A: OFDI stock ($OFDIS_{it}$)						
	(1) 10,000 km	(2) 9,000 km	(3) 8,000 km	(4) 7,000 km	(5) 6,000 km	(6) 5,000 km
$\Sigma^{J}_{j=1, j\neq i}\boldsymbol{w}_{ij}SC\_D_{jt}$	−1.510***	−1.385***	−1.362***	−1.350***	−1.326***	−1.507***
	(7) 4,000 km	(8) 3,000 km	(9) 2,000 km	(10) 1,000 km	(11) 900 km	(12) 800 km
$\Sigma^{J}_{j=1, j\neq i}\boldsymbol{w}_{ij}SC\_D_{jt}$	−1.694***	−1.858***	−2.123***	−2.553***	−2.507***	−2.522***
	(13) 700 km	(14) 600 km	(15) 500 km	(16) 400 km	(17) 300 km	(18) 200 km
$\Sigma^{J}_{j=1, j\neq i}\boldsymbol{w}_{ij}SC\_D_{jt}$	−2.586***	−2.906***	−2.785***	−3.489***	−4.277***	−6.680***
Panel B: OFDI flow ($OFDIF_{it}$)						
	(1) 10,000 km	(2) 9,000 km	(3) 8,000 km	(4) 7,000 km	(5) 6,000 km	(6) 5,000 km
$\Sigma^{J}_{j=1, j\neq i}\boldsymbol{w}_{ij}SC\_D_{jt}$	−14.986***	−14.655***	−14.539***	−14.708***	−14.563***	−15.518***
	(7) 4,000 km	(8) 3,000 km	(9) 2,000 km	(10) 1,000 km	(11) 900 km	(12) 800 km
$\Sigma^{J}_{j=1, j\neq i}\boldsymbol{w}_{ij}SC\_D_{jt}$	−17.145***	−17.548***	−18.826***	−21.058***	−21.240***	−21.235***
	(13) 700 km	(14) 600 km	(15) 500 km	(16) 400 km	(17) 300 km	(18) 200 km
$\Sigma^{J}_{j=1, j\neq i}\boldsymbol{w}_{ij}SC\_D_{jt}$	−22.117***	−25.141***	−24.844***	−30.817***	−42.195***	−44.082***

Notes: *** represents significance at the 1 percent level. All specifications are based on Equation (2). Truncated matrices with distances from 10,000 to 200 km are employed in each specification. $\Sigma^{J}_{j=1, j\neq i}\boldsymbol{w}_{ij}$ SC_D_{jt} is the spatially lagged qualitative indicator used to identify spillovers of sister-city ties on OFDI location choice.

Next, to test whether the baseline results are sensitive to different sister-city measures, we re-estimate Equation (2) using the three other substituted indicators. The results in A-1 (B-1) of Table 4 show the strength index SC_Q_{it} on the accumulative quantity of sister-city pairs based on nontruncated spatial matrices. Similar to the prior results in A-2 (B-2) of Table 2, there are sister-city promoting effects from the host country but asymmetric adverse impacts from the neighboring economies in each specification. Following A-1 (B-1), A-2 (B-2) and A-3 (B-3) display the yearly sister-city location effect using the dummy (HSC_D_{it}) and quantity (HSC_Q_{it}). In comparison with cumulative indicators on sister cities, there seems to be a weakened host-country effect but strengthened spillovers in the short term, implying that the OFDI decisions of MNEs are more sensitive to yearly sister-city changes in the surrounding regions.

Subsequently, the contiguity matrix is employed as an alternative spatial weight to conduct estimations with the sister-city measure used in the baseline estimation (i.e., SC_D_{it}). As shown in A-4 (B-4), all specifications present coefficients of our focus that are qualitatively the same as those estimated in previous tables, suggesting that significantly negative sister-city spillovers exist even if only the neighboring countries are considered.

Given the reaction time of the OFDI decisions of MNEs regarding location changes, the one-period lagged sister-city indicators for host ($SC\_D_{i,t-1}$) and neighboring effects ($\Sigma^{J}_{j=1,j\neq i}\boldsymbol{w}_{ij}SC\_D_{j,t-1}$) are used in the estimations in the last robustness test. The results of A-5 (B-5) in Table 4 are similar to those of the baseline regression, implying that our analyses still hold after considering the time-lag issue.

Table 4. Robustness test: Results based on different sister-city measures, contiguity matrices, and lagged key variables

Variable	Dependent variable: $OFDI_{it}$									
	Panel A: OFDI stock ($OFDIS_{it}$)					Panel B: OFDI flow ($OFDIF_{it}$)				
	A-1	A-2	A-3	A-4	A-5	B-1	B-2	B-3	B-4	B-5
	SC_Q_{it}	HSC_D_{it}	HSC_Q_{it}	Contiguity	$SC\_D_{i,t-1}$	SC_Q_{it}	HSC_D_{it}	HSC_Q_{it}	Contiguity	$SC\_D_{i,t-1}$
SC_{it}	0.156***	0.002	0.028***	0.438***	0.526***	0.771***	0.073**	0.197***	0.170	0.343**
	(0.017)	(0.011)	(0.009)	(0.018)	(0.019)	(0.088)	(0.036)	(0.041)	(0.131)	(0.143)
$\Sigma^{J}_{j=1,j\neq i}\boldsymbol{w}_{ij}SC_{jt}$	−0.400***	−2.628***	−2.943***	−0.138*	−1.783***	−7.912***	−36.141***	−35.766***	−3.109***	−17.060***
	(0.134)	(0.814)	(0.528)	(0.076)	(0.265)	(0.648)	(2.615)	(2.512)	(0.350)	(1.116)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,921	1,921	1,921	1,921	1,921	1,921	1,921	1,921	1,921	1,921
Number of countries	153	153	153	153	153	153	153	153	153	153

Notes: ***, **, and * represent significance at the 1, 5, and 10 percent levels, respectively. Robust standard errors are in parentheses. All specifications are based on Equation (2). Nontruncated distance and contiguity matrices are used in the specifications. SC_Q_{it} (A-1 and B-1) refers to the accumulative quantity of sister-city pairs. HSC_D_{it} (A-2 and B-2) refers to a yearly dummy to identify whether there are newly established sister-city pairs. HSC_Q_{it} (A-3 and B-3) refers to the yearly quantity of sister-city pairs. Contiguity (A-4 and B-4) refers to the contiguity matrix employed to conduct the baseline estimation. $SC\_D_{i,t-1}$ (A-5 and B-5) refers to the one-period lagged sister-city indicators used in the estimation.

4. Mechanism channel tests

To verify the mechanism channels of the sister-city relationship on OFDI location choice in Hypothesis 3, we explore each channel using Equation (5) with the interaction term

$$OFDI_{it} = \rho OFDI_{i,t-1} + \omega \sum_{j=1, j \neq i}^{J} \boldsymbol{w}_{ij} OFDI_{jt} + \beta SC_{it} + \xi SC_{it} \times Channel_{it} + \gamma Channel_{it} + \varphi \sum_{j=1, j \neq i}^{J} \boldsymbol{w}_{ij} SC_{jt} + \boldsymbol{X}_{it}' \psi + D_t + u_i + \varepsilon_{it}, \quad (5)$$

where $Channel_{it}$ refers to the proxy indicator for the channel. As mentioned above, four possible channels are investigated using a series of indices. According to Equation (5), the host-country effect of the sister city is given by $\beta + \xi Channel_{it}$ and depended on $Channel_{it}$. Thus, the parameter ξ can be used to identify the existence of the specific channel.

We begin our mechanism analysis by examining the channel of political risk reduction. Due to the complexity of the channel, three types of proxies from different sources are employed to prevent biased results from the selection of only one indicator. Specifically, we use two subindices, including government stability and socioeconomic conditions, from the International Country Risk Guide (ICRG) as our first type of indicator, published by the PRS Group. In the second type, the strategic partnership ($partner_{it}$) and frequency of state leader's exchange visits ($visit_{it}$) employed in the control variables are used to construct the interaction terms to index bilateral political risks in the long- and short-runs, respectively. As the last proxy, the ratio of favorability of China among the public is derived from a survey of international views on China conducted by the Pew Research Center in 2019. These indicators reflect low political risks with high values in various dimensions. Table 5 presents the results based on the three types of indicators. The coefficients of $SC_{it} \times Channel_{it}$ in all three panels are negative, and the

Table 5. Mechanism analysis: Political risk reduction

Variable	Dependent variable: $OFDIS_{it}$				
	Panel A: Risk index		Panel B: Official		Panel C: Civil
	A-1	A-2	B-1	B-2	C-1
	Government	Society	Long run	Short run	Public opinion
$SC\_D_{it} \times Channel_{it}$	−0.024 (0.022)	−0.057*** (0.017)	−0.739*** (0.055)	−0.076** (0.036)	−27.310* (15.213)
Other controls	Yes	Yes	Yes	Yes	Yes
Observations	1,418	1,418	1,921	1,921	341
Number of countries	114	114	153	153	27

Notes: ***, **, and * represent significance at the 1, 5, and 10 percent levels, respectively. Robust standard errors are in parentheses. All specifications are based on Equation (5) with OFDI stocks ($OFDIS_{it}$) as the dependent variable. Nontruncated distance matrices are used in all specifications. $SC\_D_{it} \times Channel_{it}$ refers to the interaction term consisting of the sister-city indicator and the proxy indicator for the channel. Other controls refer to the other independent variables in Equation (5) that exclude the interaction term $SC\_D_{it} \times Channel_{it.}$

overwhelming majority are significant, implying that the sister-city relationship yielded a larger OFDI-promoting effect in countries with higher political risk. These results indicate that sister-city ties decreased the political risk of the host country. The stimulating effect was especially remarkable for long-term official relations and civil opinion.

As in the case of the first mechanism test, we use three types of indicators to explore the channels of the decrease in information asymmetry. Specifically, the well-known index of economic freedom (IEF) and three important subindicators – trade, investment, and finance – are selected as proxies for national information asymmetry. This is because high levels of economic freedom are conducive to the sharing and diffusion of information. As telecommunications infrastructure is a crucial medium for information transmission, we employ four indices from the WDI as the second type to measure country-level infrastructure on mobile telecommunications, Internet, broadband, and cyber security. The third group of indicators is based on dummies for country types, as high economic development usually indicates a good environment for acquiring information. We therefore identify developed countries and the G20 country group. The results in Table 6 show that the interaction terms are negative and significant in all specifications (from A-1 to C-2), indicating that sister-city ties yielded a stronger effect of attracting FDI in countries with information asymmetry. Thus, the sister-city relationship compensated for the local information barrier, decreasing the information asymmetry of the host country.

Table 6. Mechanism analysis: Decrease in information asymmetry

Variable	Dependent variable: $OFDIS_{it}$									
	Panel A: Index of economic freedom				Panel B: Telecommunciations infrastructure				Panel C: Country type	
	A-1	A-2	A-3	A-4	B-1	B-2	B-3	B-4	C-1	C-2
	IEF	Trade	Investment	Finance	Cell	Internet	Broadband	Net-security	Developed	G20
SC_D_{it} × $Channel_{it}$	−0.024*** (0.005)	−0.011*** (0.002)	−0.021*** (0.001)	−0.005** (0.002)	−0.218*** (0.016)	−0.892*** (0.063)	−0.079*** (0.018)	−0.116*** (0.020)	−0.458*** (0.071)	−0.294*** (0.038)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,715	1,720	1,727	1,718	1,911	1,892	1,773	1,014	1,921	1,921
Number of countries	143	144	145	143	153	152	152	148	153	153

Notes: *** and ** represent significance at the 1 and 5 percent levels, respectively. Robust standard errors are in parentheses. All specifications are based on Equation (5) with OFDI stocks ($OFDIS_{it}$) as the dependent variable. Nontruncated distance matrices are used in all specifications. SC_D_{it} × $Channel_{it}$ refers to the interaction term consisting of the sister-city indicator and the proxy indicator for the channel. Other controls refer to the other independent variables in Equation (5) that exclude the interaction term SC_D_{it} × $Channel_{it}$. IEF, index of economic freedom.

To examine sister-city location via the channel of the narrowing of institutional distance, we index the institutional gap between China and other countries by using the control variable $institution_{it}$ from the WGI. Following the dimensions used to construct $institution_{it}$, a new indicator of the institutional gap is also computed using the ICRG.

The results for these two specifications are presented in Panel A of Table 7. Given that it is difficult to measure institutions by using quantitative indices, we employ three types of qualitative indexes to identify the Sino–foreign gap. Specifically, the state system (i.e., republic versus monarchy) and the relation between central and local governments (i.e., unitary system versus federal system) are used to index basic state institutions. In the dimension of social system, a dummy is employed to identify whether a country is socialist. The legal system dummy labels one country as having a civil law system. If one country has an institution similar to that of China, the corresponding index is assigned a value of 1; otherwise 0. Relevant information is collected manually from the Ministry of Foreign Affairs of China and the classic literature of Porta et al. (2008). Panel A shows the positive coefficients for the interaction terms, indicating a stronger host sister-city location effect with a larger institutional gap. Furthermore, the results in Panels B to D based on specific regimes show that there were smaller sister-city promoting effects when similar institutions were present in China and the host country, and all these specifications are significant at the 1 percent level. We therefore confirm that sister-city agreements boosted OFDI by narrowing institutional distance.

Table 7. Mechanism analysis: Narrowing of institutional distance

Variable	Dependent variable: $OFDIS_{it}$					
	Panel A: Index		Panel B: Country system		Panel C: Social system	Panel D: Legal system
	A-1	A-2	B-1	B-2	C-1	D-1
	WGI	ICRG	Republic	Unitary system	Socialist	Civil law
$SC\_D_{it} \times Channel_{it}$	0.016* (0.009)	0.032 (0.082)	−0.543*** (0.055)	−0.546*** (0.078)	−0.413*** (0.061)	−0.439*** (0.059)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,921	1,431	1,921	1,921	1,921	1,921
Number of countries	153	115	153	153	153	153

Notes: *** and * represent significance at the 1 and 10 percent levels, respectively. Robust standard errors are in parentheses. All specifications are based on Equation (5) with OFDI stocks ($OFDIS_{it}$) as the dependent variable. Nontruncated distance matrices are used in all specifications. $SC\_D_{it} \times Channel_{it}$ refers to the interaction term consisting of the sister-city indicator and the proxy indicator for the channel. Other controls refer to the other independent variables in Equation (5) that exclude the interaction term $SC\_D_{it} \times Channel_{it}$. ICRG, International Country Risk Guide; WGI, Worldwide Governance Indicators.

In the final mechanism test, we use the well-known Hofstede cultural index and several indicators reflecting other cultural phenomena to examine the channels of cultural distance mitigation. Specifically, two important dimensions, power distance and long-run orientation, are selected from the Hofstede indicators. As overseas ethnic groups can construct immigrant networks in host countries that attract FDI from specific countries, we use the ratio of overseas Chinese people to the total population as our measure. Chinese linguistics and characters have had a profound influence on neighboring countries throughout history, forming a Chinese cultural sphere (Matisoff, 1991; Heinrich, 2021). Given the historical effect, a country-level dummy with this scope are used to define the reach of influence. Relevant data are collected from Overseas Chinese Affairs Office of the State Council. As an in-depth cultural phenomenon, religion persistently influences residents. In recent times, the nonreligious population has represented a high proportion in China, but Buddhism has had an effect on Chinese culture throughout its long history. We therefore employ two dummies to identify nonreligious and non-Buddhist countries based on the information collected manually from the Ministry of Foreign Affairs of China. Panel A in Table 8 shows the positive but nonsignificant parameters of the interaction terms on Hofstede's cultural differences, and reveals that the sister-city effect was larger in host countries with a larger cultural gap. Further tests shown in Panels B to D provide strong evidence that Chinese OFDI was more affected by the sister-city location in countries with small overseas Chinese populations, outside the Chinese-character cultural sphere, with religious populations, and without a strong Buddhist influence. Thus, the sister-city relationship attracted FDI through the channel of cultural distance mitigation. Thus, Hypothesis 3 is fully supported by a series of tests on the mechanistic channels.

Table 8. Mechanism analysis: Cultural distance mitigation

Variable	Dependent variable: $OFDIS_{it}$					
	Panel A: Hofstede index		Panel B: Nationality	Panel C: Linguistics and characters	Panel D: Religion	
	A-1	A-2	B-1	C-1	D-1	D-2
	Power	*Orientation*	*Ethnic Chinese*	*Chinese-character cultural sphere*	*Non-Religious*	*Non-Buddhist*
$SC\_D_{it} \times Channel_{it}$	0.110 (0.122)	0.592 (0.417)	−6.785*** (0.351)	−0.763** (0.313)	−1.507*** (0.168)	0.005*** (0.000)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,048	840	1,921	1,921	1,869	1,882
Number of countries	84	68	153	153	149	150

Notes: *** and ** represent significance at the 1 and 5 percent levels, respectively. All specifications are based on Equation (5) with OFDI stocks ($OFDIS_{it}$) as the dependent variable. Nontruncated distance matrices are used in all specifications. Chinese-character cultural sphere includes China, Japan, the Democratic People's Republic of Korea, the Republic of Korea, and Vietnam. $SC\_D_{it} \times Channel_{it}$ refers to the interaction term consisting of the sister-city indicator and the proxy indicator for the channel. *Other controls* refer to the other independent variables in Equation (5) that exclude the interaction term $SC\_D_{it} \times Channel_{it}$.

5. Heterogeneity analysis

To test Hypothesis 4, we explore whether the FDI location effects of the sister-city relationship vary according to some crucial factors. The model for the heterogeneity test is constructed using Equation (6):

$$OFDI_{it} = \rho OFDI_{i,t-1} + \omega \sum_{j=1, j \neq i}^{J} \boldsymbol{w}_{ij} OFDI_{jt} + \beta SC_{it} + \xi SC_{it} \times Type_{it} + \gamma Type_{it} + \varphi \sum_{j=1, j \neq i}^{J} \boldsymbol{w}_{ij} SC_{jt} + \boldsymbol{X}'_{it} \psi + D_t + u_i + \varepsilon_{it}, \quad (6)$$

where $Type_{it}$ stands for the heterogeneity factor and the heterogeneity of the sister-city location effect is tested by the interaction term $\xi SC_{it} \times Type_{it}$.

From the perspective of MNEs, it is interesting to determine whether there are heterogeneous sister-city location effects across various types of FDI activities, especially regarding entry modes and investment motivations. To clarify this, we use the China Global Investment Tracker (CGIT) database published by the American Enterprise Institute, which offers information about 1,488 Chinese OFDI projects worth over US$100 million over the period 2005–2018. From the CGIT, we obtain information on the entry modes of overseas affiliates investing in greenfield or CM&A. Each project's OFDI motive is identified manually. We categorize all OFDI projects into four types: resource-, market-, technology-, and efficiency-oriented OFDI. In practice, we calculate the ratio of each OFDI activity pattern to the total as a proxy for specific OFDI tendency in each host country. Table 9 shows the proportions of entry modes and motivations, as measured by the number of projects (Panel A) and amounts (Panel B). Both specifications (A-1 and B-1) present significantly negative interaction items on the greenfield ratio, implying that the sister-city relationship had a stronger location

Table 9. Heterogeneity analysis based on OFDI modes and motivations

Variable	Dependent variable: $OFDIS_{it}$									
	Panel A: Number of projects					Panel A: Amount of projects				
	A-1	A-2	A-3	A-4	A-5	B-1	B-2	B-3	B-4	B-5
	Green	Resource	Market	Tech.	Efficiency	Green	Resource	Market	Tech.	Efficiency
$SC\_D_{it} \times Type_{it}$	−0.444***	−0.368***	−0.418***	1.944***	0.564***	−0.366***	−0.297***	−0.499***	0.822*	0.445***
	(0.085)	(0.062)	(0.098)	(0.677)	(0.135)	(0.078)	(0.063)	(0.098)	(0.459)	(0.166)
Other controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165	1,165
Number of countries	100	100	100	100	100	100	100	100	100	100

Notes: *** and * represent significance at the 1 and 10 percent levels, respectively. Robust standard errors are in parentheses. All specifications are based on Equation (6) with OFDI stocks ($OFDIS_{it}$) as the dependent variable. Nontruncated distance matrices are used in all specifications. $SC\_D_{it} \times Type_{it}$ refers to the interaction term consisting of the sister-city indicator and the proxy indicator for the heterogeneity factor. Other controls refer to the other independent variables in Equation (6) that exclude the interaction term $SC\_D_{it} \times Type_{it}$.

effect on CM&A than on the entry mode of greenfield. One possible explanation is that greenfield investment, as fresh capital, usually provides new employment opportunities and taxes for host countries and thus the resistance is low. For OFDI motives, larger sister-city effects were found in foreign subsidiaries seeking technology and efficiency, while adverse effects were displayed in those with motivations regarding resources and markets. These results indicate that sister-city ties helped to overcome OFDI obstructions on technology and operating limits. However, resource-acquiring and market-oriented OFDI were mainly affected by the central government and the objective demands of the host countries, rather than by local informal relationships.

We also seek to determine whether there is heterogeneity among countries that are geographically close to China. Two groups of countries are therefore included in the analysis. One group is within the scope of the international collaboration framework advocated by China, including the Belt and Road Initiative (BRI) countries and the member states of the Asian Infrastructure Investment Bank (AIIB).[6] The other group includes China's neighboring countries. In addition to using a dummy to identify whether a country is China's neighbor, we further classify neighboring countries into two types: land and maritime neighbors.[7] The results in Table 10 show that all interaction terms $SC\_D_{it} \times Type_{it}$ have negative coefficients and most of them are significant at the 1 percent level, indicating that the sister-city location effect was weakened for countries within Chinese collaboration frameworks and for neighboring countries. This is mainly because cooperative frameworks and neighbors entail mechanisms similar to those of

Table 10. Heterogeneity analysis based on Sino−foreign geographical relationship

Variable	Dependent variable: $OFDIS_{it}$				
	Panel A: Cooperation framework		Panel B: Neighboring country		
	A-1	A-2	B-1	B-2	B-3
	BRI	AIIB	Neighbor	Land	Marine
$SC\_D_{it} \times Type_{it}$	−0.407*** (0.059)	−0.420*** (0.031)	−0.248*** (0.080)	−0.119 (0.077)	−0.738*** (0.233)
Other controls	Yes	Yes	Yes	Yes	Yes
Observations	1,921	1,921	1,921	1,921	1,921
Number of countries	153	153	153	153	153

Notes: *** represents significance at the 1 level. Robust standard errors are in parentheses. All specifications are based on Equation (6) with OFDI stocks ($OFDIS_{it}$) as the dependent variable. Nontruncated distance matrices are used in all specifications. $SC\_D_{it} \times Type_{it}$ refers to the interaction term consisting of the sister-city indicator and the proxy indicator for the heterogeneity factor. Other controls refer to the other independent variables in Equation (6) that exclude the interaction term $SC\_D_{it} \times Type_{it}$. AIIB, Asian Infrastructure Investment Bank; BRI, Belt and Road Initiative.

[6]There are 65 BRI countries and 59 AIIB members.

[7]China has 20 neighboring countries, including 14 land neighbors and six maritime neighbors.

sister-city ties and are substitutes for the sister-city location advantage to some extent. Notably, in Panel B, the sister-city location characteristic is important to land neighbors but not to marine neighbors, which may reflect that bilateral amicable relationships between China and its land neighbors were weaker than those with its marine neighbors. Hypothesis 4 is therefore supported by multiple heterogeneity tests.

VII. Conclusions

In this paper, we examined the host and neighboring effects of sister-city ties on Chinese OFDI location choice from 2003–2016 by using spatial econometric approaches.

The results provide strong evidence that the sister-city relationship has been an important OFDI location determinant in the host countries and their neighbors. Specifically, sister-city ties between China and host countries have stimulated Chinese OFDI to those countries, and the sister-city ties concluded by China with neighboring countries reduced Chinese OFDI in the host country – a phenomenon to which we refer as the neighboring effect – implying that there has been competition among sister cities to attract FDI. Further tests showed that the sister-city relationship promoted OFDI to host countries via four channels: reduction in political risk, decrease in information asymmetry, narrowing of institutional distance, and mitigation of cultural difference. The heterogeneity tests also showed that the OFDI-promoting effect varied substantially with FDI entry modes, motivations, and different Sino-foreign geographical relations. Specifically, there was a stronger facilitating effect for overseas projects adopting the entry mode of CM&A, seeking technology and efficiency, and entering host countries with weak ties to China.

Several policy implications can be obtained from this paper. For the host country, authorities should attach importance to sister-city agreements regarding preferred FDI sources. Sister-city promoting channels should be consolidated and broadened to reduce negative neighboring effects from neighboring countries. For China, sister-city ties are an important guiding tool for OFDI. Given the strong flexibility of local informal friendly relations and their substitutive role for national diplomatic relationships, China should strengthen sister-city ties in "politically cold and economically hot" countries to offset their adverse impacts on OFDI. Due to the negative spillovers from neighbors, it is necessary for central and local governments to implement overall planning and coordination of sister-city development to prevent the "crowding-out" effect of OFDI caused by the disorderly establishment of sister cities. Chinese MNEs should also actively utilize sister-city mechanisms and driving forces of CM&A and technology- and efficiency-oriented OFDI to reduce resistance from host countries and improve their overseas opportunities.

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Appendix

Table A1. Measurement of control variables

Feature	Control variable	Symbol	Measurement
Macroeconomic environments	Economic size	*size*	Constant GDP in logarithms
	Development level	*develop*	Constant GDP per capita in logarithms
	Growth potential	*growth*	Constant GDP growth
	Change in exchange rates	*exchange*	Yearly average of host country's currency against USD
	Openness	*open*	Imports and exports relative to GDP
Resource endowments	Technical intensity	*tech.*	Exports of high-technology product relative to manufactured products
	Energy intensity	*energy*	Fuel exports relative to total exports
	Ore intensity	*ore*	Ore exports relative to total exports
Distance	Geographical distance	*distance*	Geographical distance between capitals of China and host country in logarithms
	Institutional distance	*institution*	Yearly average of absolute differences of six institutional indicators between China and host country
Formal and national bilateral political relations	Strategic partnerships	*partner*	The indicator is manually constructed by six grades from weak (0) to strong (5) in logarithms
	Frequency of state leader's exchange visits	*visit*	The yearly number of exchange visits by bilateral state leaders in logarithms

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