Transportation convenience and the value of acquisition targets: Evidence from network analysis of Chinese M&As

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Abstract
Using the transportation centrality variables developed in the network analysis, we investigate the impact of air transportation convenience on the valuation of target companies in M&A transactions. Our findings indicate that target firms located in cities with greater transportation convenience receive high bid prices. However, direct connections between the bidder and target cities do not significantly influence the outcome once the transportation centrality of the both cities is accounted for. Despite the high bid prices, acquirers achieve better long-term stock returns when targeting firms in well-connected cities. These results underscore the importance of advanced transportation infrastructure in enhancing the value of target companies.

Keywords: Mergers and acquisitions; Transportation convenience; Network analysis; Price-to-book ratio; Premium

JEL Classifications: G34; L93

1. Introduction

The finance literature emphasizes that geographic proximity is an important factor influencing financial investments (Coval and Moskowitz, 1999; Grinblatt and Keloharju, 2001; Ivković and Weisbenner, 2005), venture capital investments (Tian, 2011), analyst forecast accuracy (Malloy, 2005; Bae et al., 2008), and real estate investments (Garmaise and Moskowitz, 2004). Distance also matters in mergers and acquisitions (M&As) because acquirers need to collect the soft information of target firms (Kang and Kim, 2008; Uysal et al., 2008). Geographic proximity also promotes the post-M&A integration and collaborative activities that are key to maximizing the synergy effects (Jaffe et al., 1993; Uysal et al., 2008; Ensign et al., 2014). Recent studies also argue that developed transportation networks mitigate costs arising from geographic distance, since shorter travel time lowers transaction costs and information asymmetry (Giroud, 2013; Bernstein et al., 2016; Charnoz et al., 2018; Ellis et al., 2020; Jin et al., 2021; Zhang et al., 2021; Li et al., 2022).

This paper investigates whether transportation convenience affects the value of target companies in M&A transactions. While previous studies emphasize direct connection between bidders and targets reduces information collection costs (information view: Jin et al., 2021; Zhang et al., 2021; Li et al., 2022), we introduce the view that the well-developed transportation network is an infrastructure that adds value for target companies (infrastructure view). The literature of spatial economics shows that good transportation improves firms' productivity and increases exports by reducing transport costs (Holl, 2016; Martincus et al., 2017; Gibbons et al., 2019; Fiorinia et al., 2021; Branco et al., 2023). In addition to the cost reduction, well-developed transportation contributes to agglomeration economies that promote knowledge spillover, labor market pooling, and input sharing (Holl, 2016). These facts raise a possibility that acquirers can achieve larger synergistic effects when the target firm has access to better transportation networks. To test this novel view, we borrow insights from network analyses (Lao et al., 2016; Trinh et al., 2022; Wu et al., 2022) to measure the transportation convenience of a single city within the whole transportation network (centrality). Centrality indicates how conveniently the given city is connected to other cities in the transportation system. This variable can be created separately for bidder and target cities, allowing us to empirically estimate the value of transportation convenience for target firms with controlling for the effect of direct connections between the bidder and target.

We hypothesize that target firms located in a high centrality place receive high bid prices. A convenient transport network reduces costs associated with the various activities of an integrated organization, such as material procurements, marketing, and corroborative activities. The agglomerated economy also provides an access to a large pool of high-quality suppliers/customers and capable human resources, helping the bidder to increase the value of target companies. As such, acquirers are willing to offer high prices.

We test the hypothesis by using acquisition announcements made by Chinese listed firms during the period 2007 to 2017. In China, the long-distance transportation network developed recently has affected regional economic growth (Lao et al., 2016; He et al., 2020; Ma and Liu, 2021; Wu et al., 2022), and a significant variation still exists in the infrastructure development among cities. Li and Li (2013) indicate that road infrastructure investments in China contribute to the reduction in firms' stock of inventory. These facts suggest Chinese M&As are appropriate for testing our hypothesis. Given that most M&A transactions in China target non-listed firms, we measure the bid price by the transaction value relative to the book value of the equity transferred to the bidder. This measure corresponds to the price-to-book ratio (PBR) evaluated by the acquirer as well as the M&A premium calculated by using the book value of equity.

Consistent with our hypothesis, both the cross-sectional regressions and propensity-score matching analyses find target firms from a high centrality city obtain significantly higher bid prices than those in a less convenient city. This result supports our view that convenient transportation in a target city allows the bidder to offer high premiums due to the large potential of synergy effects. One can criticize that the high offering price arises from the fact that acquirers can access to soft information on the target firm which significantly reduces the information asymmetry when the target resides in a good transportation city. To distinguish our infrastructure view from the information view, our estimations include the frequency of direct connections between the bidder and target. Remarkably, the direct connection is not significantly related to the bid price in most of our analyses after controlling for the centrality of the target city. The result also suggests that the transportation convenience of the acquirer does not affect the bid price. The transportation network on the target side matters in M&A transactions, since it influences the value the bidder can add to the target company. Another potential criticism against our argument is that the high bid price may arise from overpayment by hubris and overconfident managers. The literature on home bias suggests investors tend to place disproportional weight on firms with which they are familiar, and this bias may exacerbate overpayments to firms located in a convenient place (Coval and Moskowitz, 1999; Grinblatt and Keloharju, 2001; Ivković and Weisbenner, 2005). To test this idea, we investigate the short-term stock price reaction to the announcement of acquisitions. This result does not show that the stock market reacts negatively to acquisitions targeting firms residing in a high-centrality city. This finding rules out the possibility that bidders overpay for the convenient transportation of target cities.

To further examine the performance effect, we investigate long-term stock returns following the completion of M&A transactions. While Chinese acquirers generally underperform peer firms, bidders show significantly better returns when they acquire a target in a high-centrality city. This result is in line with the view that convenient transportation of a target city is an important infrastructure adding value to M&A transactions. Bidders' willingness to offer high bid prices may also increase the probability of target firms accepting the offer. Indeed, the data find that M&A transactions are more likely completed if the target resides in a high centrality city. Finally, we find a significant value impact of the target city's transportation infrastructure, regardless of the target firm's industry (manufacturing or non-manufacturing) and the type of M&A (horizontal or diversifying).

This research makes significant contributions to the literature. First, we contribute to the M&A literature by showing that the transportation network available for target firms matters in M&A transactions. A developed transportation system is a valuable infrastructure for target firms and significantly increases the value they can obtain in M&A transactions. While previous studies focus on the direct connection between bidders and targets (Jin et al., 2021; Zhang et al. 2021; Li et al., 2022), we separately examine the convenience of bidder and target cities with controlling for the direct connection and show novel evidence. We emphasize that convenient transportation creates benefits beyond the smooth communication between the bidder and target. A paper closely related to our research is that by Cai et al. (2016), showing that firms located in an urban area have a high probability of being an acquisition target. While they suggest easy transportation as a potential factor behind the urbanicity effect, we reinforce their argument by showing that the centrality measure of target cities affects the bid price in M&A transactions.

Our research is also related to the literature on spatial economics and transportation convenience. Previous studies find transportation convenience is positively related to regional GDP/income and trade (Donaldson, 2018; Jaworski and Kitchens, 2019; He et al., 2020). Recent studies also conduct micro-level analyses showing evidence that convenient transportation improves firms' productivity (Holl, 2016; Martincus et al., 2017; Gibbons et al., 2019; Fiorinia et al., 2021; Branco et al., 2023). We add to the literature by showing that convenient transportation increases the firms' market value as a target company and thereby promotes M&A transactions. Estimating the causal impact of connectivity on firm performance is challenging, as transportation infrastructure is often developed in areas with well-performing companies. To address this concern, the literature typically uses the launch of new transport infrastructure to estimate the transportation effect, which limits the focus to newly connected areas. By introducing the centrality variables that can be calculated for any city, we significantly reduce the issue and present more generalizable results. Causality concerns are mitigated by examining M&A bid prices, which are determined based on the current connectivity of the target city. Finally, the literature of network analyses has utilized centrality variables to examine the effect of transportation convenience on reginal economic activities (Lao et al., 2016; Trinh et al., 2022; Wu et al., 2022). While we borrow their methods to measure the transportation convenience, we extend the literature by relating the transportation centrality to M&A transactions.

The rest of the paper is organized as follows. Section 2 reviews previous studies and presents our hypothesis. Section 3 describes the sample selection, data, and methodology. Section 4 presents the empirical results, and additional analyses are conducted in Section 5. The final section concludes briefly.

2. Literature review and hypothesis

2.1 Geographic distance, transportation convenience, and M&As

Geographic distance increases the difficulty of effective communication (Cummings, 2007) as well as the cost of seeking and integrating knowledge (Borgatti and Cross, 2003; Ambos and Ambos, 2009). Indeed, small banks tend to lend over shorter distances because they can collect soft information about their borrowers via frequent visits (Berger et al., 2005). Previous studies have examined the effect of geographic proximity on financial investments (Coval and Moskowitz, 1999; Grinblatt and Keloharju, 2001; Ivković and Weisbenner, 2005), venture capital investments (Tian, 2011), the accuracy of analysts' forecasts (Malloy, 2005; Bae et al., 2008), and real estate investments (Garmaise and Moskowitz, 2004).

Recent studies argue that developed transportation networks mitigate communication and monitoring costs. Giroud (2013) finds that short and direct flights between headquarters and their plants lead to increased plant-level productivity and investments. The author argues that direct flights allow headquarters to monitor their plants in a cost-efficient manner. Bernstein et al. (2016) show that the introduction of new airline routes increases the interaction between venture capitalists and their portfolio companies, leading to innovation and successful exits.

Charnoz et al. (2018) find that the expansion of French High-speed Rail (HSR) has improved the performance of corporate groups by decreasing communication costs between headquarters and affiliated plants. Ellis et al. (2020) measure the geographic proximity by travel accessibility based on the launch of new direct flights to investigate its impact on the securities choices of portfolio managers. The authors find that funds invest significantly more in firms that become more proximate.

In a similar vein, geographic proximity generates informational advantages in acquisitions, because acquirers can collect the soft information of targets located nearby in a less costly way in terms of motivation, goals, expectations, ideas, opinions, and team dynamics (Uysal et al., 2008). In the due diligence process, bidders need to collect information about their targets, especially information related to competitive environments, management and personnel quality and capabilities, and organizational culture (Angwin, 2001). Shen and Reuer (2005) show that bidders tend to acquire public companies, for which much information is disclosed, rather than private targets when acquiring young firms and engaging in inter-industry transactions. Capron and Shen (2007) find that bidders tend to acquire firms in industries with which they are familiar when they target private companies. Lin and Pursiainen (2023) detect that large cultural differences between two companies significantly impair M&A transactions, as evidenced by the low likelihood of these firms being merged, and the low completion rate. Effective communication is also important after the completion of M&As to smoothly integrate the two organizations and promote mutual understanding and knowledge spillovers. Finally, geographic proximity allows acquirers to efficiently allocate their resources to target companies.

Recent studies find that better travel access, represented by the number of direct flights and introduction of high-speed rail increases M&A activity between the two places. With a direct connection, bidders can save time and costs in collecting information about potential targets and ex-post monitoring (information view: Jin et al., 2021; Zhang et al., 2021; Li et al., 2022). Zhang et al. (2021) find direct flights increase the likelihood and amounts of cross-border acquisitions between connected cities. Given that target firms are generally small private companies, direct flights provide bidders with an effective vehicle to collect relevant information on these opaque firms. Jin et al. (2021) find that local firms are more likely targeted by non-local bidders after the opening of HSR. Li et al. (2022) find that M&A transactions between two HSR-connected cities increase by 9.6 percent after the initiation of the HSR service.

While the information view is supported by several studies, we propose the infrastructure view that acquirers are likely to achieve larger synergy effects when the target firm has access to better transportation networks. Efficient transportations significantly reduce transport costs (Donaldoson, 2018) and accordingly improve firms' efficiency by reducing input and output costs as well as increase exports (Holl, 2016). Li and Li (2013) show that the value of transport infrastructure is negatively related to inventory holdings of Chinese companies. Using geo-referenced data from Peru, Martincus et al. (2017) find that improvements of road connections to the main port had a significantly positive impact on firms' exports and employment growth. Conversely, a reduction in transport convenience deteriorates firms' productivity. Branco et al. (2023) show evidence that the introduction of tolls caused a 10.2% decrease in turnover and a 4.3% decrease in labor productivity compared to firms in the non-affected, more distant, areas.

In M&A transactions, acquirers attempt to add value to the target firm's products and services by transferring their technology, production system, marketing strategy, etc. The value added can be influenced by transportation infrastructure since target firms with poor transportation networks need to incur large input/output costs. When the acquirer's efficiency is built on well-developed transportation, it will be extremely challenging to increase the target firm's value simply by transferring the bidder's business model. Furthermore, well-developed transportation attracts firms and people creating a large base of human resources, suppliers/customers, research institutions, etc. This environment allows the acquirer to add the value to the target firm through hiring of capable talents, procurement of high-quality materials, collaborative activities, etc.

When acquirers anticipate large synergy effects, they should be willing to offer high bid prices. In the context of M&As, a high premium is rationally paid to target firms that will create large synergy effects (Walkling and Edmister, 1985). Meanwhile, previous US studies have found that acquirers tend to pay excessive premiums to pursue their personal interests, bringing positive excess returns to the target's shareholders (Morck et al., 1990; Ismail, 2011). Previous studies also indicate that overpayment arises from the executive's hubris (Roll, 1986). These ideas predict that high premiums lead to value-destroying transactions (Hayward and Hambrick, 1997; Fu et al., 2013). Since this research highlights the value of transport infrastructure, however, we hold the view that high premiums are necessary costs for completing value-increasing M&As.

2.2 Hypothesis

We examine the convenience of air transportation, which clearly plays a key role in the modern transportation system. Previous studies show that air transportation increases the amounts of acquisitions between connected cities (Zhang et al., 2021). While these studies focus on the direct connection between bidders and targets, we test the view that the transportation convenience (centrality) of the city in which the target resides is important in M&A transactions. If the given target is located in a convenient city, the acquirer can increase the value of target firm's products and services to a large extent by taking advantage of the fast and low-cost procurement, marketing, and innovative activities.

We test the hypothesis by using Chinese M&A transactions. It is commonly recognized that infrastructure investments have played an important role in the Chinese economic growth (Li and Li, 1997). Indeed, recent Chinese studies show that the availability of high-speed transportation is a key driver of regional economic development (Lao et al., 2016; Ma and Liu, 2021; Wu et al., 2022). While China's coastal areas achieved tremendous economic developments in the 2000s, some western cities have also shown significant economic growth recently as the government increased investments in the infrastructure of these cities. The development in the inland area should motivate firms in coastal areas to acquire firms in the western area to expand their businesses. Since development in the western area started recently, significant heterogeneity still exists in transportation convenience both in cross-sectional and time series. These facts also suggest the transportation condition is exogenous for companies. Chinese data provide us with advantageous data.

While our data provide centrality measures both for the bidder and target cities as well as the frequency of direct connections between the two cities, we mainly investigate the effect of the target's transportation convenience, which is a new infrastructure added to the acquiring firm, on the bid price. Bid prices represent the target firm's value evaluated by the acquirer and previous US studies commonly examine the premium computed by using the pre-announcement stock price as a reference (Walkling and Edmister, 1985; Reuter et al., 2012; Jory et al., 2016). Since most M&A transactions in China target non-listed firms, however, we cannot compute the premium in the standard way due to the lack of market value data. Instead, we scale the transaction value by the book value of equity as a measure of the bid price. This variable corresponds to the price-to-book ratio (PBR), while it is evaluated by the acquiring firm, as well as the premium computed by using the book value of equity.

Specifically, we test the following hypothesis.

Hypothesis: *Bidders offer high bid prices to target firms located in a city with convenient transportation.*

3. Sample selection, data, and methodology

We collect data on domestic M&A transactions announced by Chinese listed firms during the period 2007 to 2017 from the Factset database. We pick up M&A deals that transfer the majority of control rights of the target firm to the bidders. Specifically, we obtain announcements of completed transactions classified as an Acquisition or Merger and Majority Stake in the Factset. The Factset data provide the announcement date, transaction status, company location, value of transactions, and so on. The financial and daily stock price data of these companies have been retrieved from the China Securities Market & Accounting Research (CSMAR) database. When the bidder/target's location and the acquirer's financial data were not available, we removed the deals from the sample. These procedures left 3,294 completed M&A deals as our entire sample. The Factset database also contains uncompleted deals, which include those that have been cancelled, are pending, rumored, and rumored cancelled deals. We add these transactions in the analysis of the completion likelihood.

For these M&A transactions, we measure the transportation convenience of cities in which the acquirer and target firms reside. We obtain flight frequency (frequency on to major domestic original-destination markets) of these cities from the Statistical Data on Civil Aviation of China over the period of 2007-2017. We do not use the frequency of high-speed rail, an alternative long-distance transport, due to the lack of granular data necessary to compute the centrality variables.[1] Economically developed areas are likely to have developed transportation systems. To separate the effect of transportation convenience from local economic conditions, we obtain the province's Gross Regional Domestic Product (GRDP) from the CSMAR regional economy database.

We adopt the centrality of the acquirer and target cities in the domestic air flight network. According to graph theory, the network is made up of a few "nodes" (vertices) and "links" (edges) connecting different pairs of nodes (Diestel, 1997). Centrality has been proposed as a basic concept in social network analysis to evaluate nodes' relative importance in the graph (Freeman, 1978; Borgatti, 2005). Degree centrality, Betweenness centrality, and Closeness centrality are commonly used measures of centrality in the literature of transportation networks (Bagler, 2008; Xu and Harriss, 2008; Sun et al., 2015; Du et al., 2017; Chung et al., 2020).

[1] The high-speed rail data do not include connections between various pairs of cities, although the total number of connections between any given city and all other cities is available.

Since this study focuses on the city network, we set the origin and final destination of a pair of cities connected by air flights as nodes. When a single city has multiple airports, the aggregated number of links is used to compute the city's transportation convenience. Degree centrality, Betweenness centrality, and Closeness centrality are mainly used in this study, while Eigenvector centrality generates qualitatively the same results (untabulated). Since these raw measures place equal weight on every link, despite the fact that the transportation volume differs significantly across the links, we also apply the weighted Degree centrality and Weighted Betweenness centrality by taking the number of flights between the cities as the link weight. Specifically, these measures are computed by the following equation.

1) Degree centrality

Degree centrality (DC) has been proposed to evaluate the "direct connection" of each node in a binary network, based on the relative number of neighbors in the network connected to a given node (Freeman, 1978). It is commonly used as a proxy for a city's transportation convenience in the network analysis (Xu and Harriss, 2008; Wang et al., 2011; Jiao et al., 2017). In this study, DC measures the direct flight connection between the given city and other cities. We compute the raw DC by the following equation.

$$DC(i) = \sum_{j \epsilon V}^{N} x_{ij} \tag{1}$$

where V represents the set of all cities in the air transportation network except city i, and x_{ij} is defined as 1 if there is a direct flight between cities i and j, and 0 otherwise. N is the total number of cities in the air transportation network. A city with a higher degree of centrality has direct connections with more cities.

The weighted Degree centrality of node i is computed as the sum of direct flights for the incoming and outgoing links of i (Barrat et al., 2004).

$$Weighted\ DC(i) = \sum_{j \epsilon V}^{N} w_{ij} \tag{2}$$

where w_{ij} is the air frequency between cities i and j. The higher weighted DC indicates that passengers from the given city can access more direct flights to other cities. We use the natural logarithm of the DC variables in the empirical analysis part.

2) Betweenness centrality

Betweenness centrality (BC) shows the ability of each node as a mediator in the network. It is measured by the number of times a given node lies between all other pairs of nodes on their shortest paths (Freeman, 1978). It is commonly used in air transportation network analyses to measure the intermediary role of a given airport (Wang et al., 2011; Lordan et al., 2014; Trinh et al., 2022). In this study, BC measures the degree to which a city acts as a connecting point with other cities in the air transportation network. We compute the raw BC by the following equation.

$$BC(i) = \sum_{j\epsilon V}^{N} \sum_{k\epsilon V}^{N} \frac{g_{jk}(i)}{g_{jk}}$$

where g_{jk} presents the number of the shortest path link between cities *j* and *k*. The $g_{jk}(i)$ is the number of the shortest path link between *j* and *k* flying through city *i*. The $\frac{g_{jk}(i)}{g_{jk}}$ indicates the probability of city *i* serving as a transfer airport for passengers flying from city *j* to city *k*, and vice versa. A city with higher BC acts as a more important “intermediary” in the air transportation network.

We adopt the triangle betweenness centrality proposed by Lee (2013) as a weighted version of BC.

$$Weighted\ BC(i) = \frac{2}{(N-1)(N-2)} \sum_{j\in V}^{N} \sum_{K\in V}^{N} f(i), f(i) = \begin{cases} 1, if\ w_{jk} < \min(w_{ij}, w_{ik}) \\ 0 \end{cases}$$

If the volume of indirect flow from j to k through i is greater than the direct flow from j to k, the function $f(i)$ scores 1 to node i, otherwise 0. N is the total number of cities in the air transportation network. Similarly, it is normalized by the maximum number of geodesics. In this study, a city with a higher weighted BC acts as a transfer hub that maximizes the number of air flights between the two other cities.

3) Closeness centrality

Closeness centrality is proposed to measure the average distance from a given node to all other nodes in the network (Freeman, 1978). It is usually used in air network analyses to represent an airport that is closest to the remaining airports (Trinh et al., 2022).

$$CC(i) = \frac{N-1}{\sum_{i \neq j}^{N} d_{ij}} \tag{2}$$

where d_{ij} is the length of the shortest path between city i and city j in the air transportation network. Simply described, it is the minimum number of flights that travel from city i to j. N is the total number of cities in the air transportation network. The city with a higher CC means a lower average distance (number of flights) from there to all other nodes in the air transportation network.

When a firm resides in a city without an airport, we assign the centrality measure of the nearest city with an airport, which is located less than 100 km in spherical distance from the given city. When there are no airports within 100 km, zero is assigned as the centrality.

Estimations using the natural logarithm of the spherical distance between the bidder and target cities detect a high correlation with the other variables (the variance inflation factor (VIF) is 17).[2] Therefore, the following analyses adopt four binary variables indicating the distance between the two cities: Distance1 (one for less than 100 km); Distance2 (one for 100 – 200 km); Distance3 (one for 200 – 500 km); Distance4 (one for 500 – 1000 km). Our estimations have deals by acquirers located more than 1,000 km from the target as the benchmark. The spherical

[2] When we adopt the natural logarithm of the distance, the dummy indicating a same city acquisitions (SameCity) also has high VIF (greater than 16).

distance in kilometers is calculated using the longitude and latitude of the city (Ivković and Weisbenner, 2005), mainly retrieved from the Defense Mapping Agency (1990, 1979). When the information is not available, we manually collect the data. We also adopt a dummy variable that takes on a value of one for deals involving same-city companies, and zero otherwise (SameCity). Since Zhang et al. (2021) find direct flights are associated with increased cross-border M&As, we adopt the natural logarithm of the one plus the number of direct flights between the bidder and target city (lnAirfreq). To separate the effect of transportation and economic developments, we also adopt the natural logarithm of the province's Gross Regional Domestic Product (GRDP).

Transaction values indicate the value of target firms, evaluated by the acquirer. Since most of the target companies in China are unlisted, we scale the transaction value by the book value of equity as a measure of the target firm value. Specifically, the following two variables are adopted: (a) natural logarithm of the total transaction value divided by the book value of the target firm's shares transferred to the bidder (lnPBR), (b) total transaction value minus book value of the target firm's equity transferred to the bidder and divided by the book value of transferred shares (BPremium).[3]

We control various acquirer and deal characteristics. Firm size is measured as the natural logarithm of the acquirer's assets. Previous studies find a positive relationship between acquirer size, premium, and performance (Moeller et al., 2004; Humphery-Jenner and Powell, 2014). Since leverage disgorges firms' cash flow and decreases external financing ability, we adopt the ratio of acquirer's total liabilities to total assets (Leverage). Previous studies find a positive relationship between leverage and acquisition performance (Maloney et al., 1993). We adopt Tobin's Q, which is calculated as the market value of stocks and the book value of debt divided by the book value of the acquirer's assets. We include return on assets (ROA) to measure the acquirer performance. Given that firms with excess cash may conduct value-decreasing deals

[3] The book value of the target firm's shares transferred to the bidder is computed by the book value of equity multiplied by the percentage of shares offered to the bidder.

(Jensen, 1986), we adopt the ratio of cash and its equivalents over total assets (CashHold). Previous studies find that cash-rich firms are more likely to make acquisitions, but such M&As underperform both in the short and long run (Yang et al., 2019).

Transaction characteristics are also controlled. Relative Size is the ratio of the transaction value to the acquirer's market value at the time the deal is completed. Some previous studies find that both excessively small and large deals relative to the acquirer size are associated with poor performance (Kusewitt, 1985). Relatedness is a dummy variable that takes on a value of one if the bidder and target have a same two-digit SIC (Standard Industry Classification) code, and zero otherwise. Previous studies find horizontal M&As create greater value than diversifying ones (Maquieira et al., 1998; Walker, 2000). To reduce biases driven by outliers, all variables are winsorized at the 1 percent and 99 percent values, respectively.

Table 1 shows the summary statistics for the variables used in this study. Panel A presents the transportation data for the main sample. A and T at the end of the centrality variables indicate the acquirer and target cities, respectively. The mean value of DC_A (raw) suggests that the average bidder resides in a city that is directly connected to about 2.64 cities. Panel A also suggests acquirers have slightly greater centrality values than targets. For instance, the average target firm has direct flights to 2.46 cities, which is significantly smaller than the value for acquirers.

Previous studies suggest that direct flights between the acquirer and target city matter. Panel A shows more than half of M&A transactions is made between not directly connected cities (median lnAirfreq is zero). The mean lnAirfreq is 1.58 indicating that about 4.85 direct flights are available between the average pair of bidder and targets. The mean SameCity suggests that 36 percent of the sample transactions is made by companies located in a same city.

[Insert Table 1 about here]

Panel B shows the summary statistics of the bid price (lnPBR and BPremium) separately for subsamples created by the raw Degree Centrality (DC) of acquirers and targets. The computation of the bid price needs the target firm's book equity (firms with negative values are removed) and the proportion of shares transferred to the acquirer. This requirement significantly decreases the sample size to 1,579. Nevertheless, the entire sample keeps many observations with missing bid prices to increase the sample size of stock return analyses. Acquirer and target cities are identified as having convenient transportation if the raw DC is greater than three (the median DC is 3.3 for acquirers and 3.2 for targets). Panel B shows acquirers from convenient cities pay higher prices than inconvenient ones do (1.11 versus 0.99 and 3.79 versus 3.24), and the difference is statistically significant. We highlight the transportation convenience of target companies since bidders can create more value by acquiring companies with access to good transportation. Indeed, Panel B shows a remarkable difference in lnPBR (1.24 versus 0.84) and BPremium (5.22 versus 1.59) between convenient and less convenient target.

[Insert Table 2 about here]

Table 2 shows the summary statistics for the rest of the variables (data for the entire sample are exhibited). About 26 percent of deals are paid by using stocks, suggesting that stock-financed acquisitions do not prevail in China. The median RelativeSize is 0.02, indicating that Chinese bidders target small companies relative to themselves. The mean Relatedness is 0.39. Only 39 percent of the bidders conduct horizontal M&As.

4. Empirical results

4.1 Baseline regression results

If transportation convenience adds value to M&A deals, bidders will pay a high price to target companies located in a convenient city. Table 3 implements regressions of the bid price. Panel A adopts lnPBR as a measure of the bid price. Model (1) carries a positive and significant coefficient on the raw Degree centrality of the target (DC_T). This result suggests bidders offer high prices if the target resides in a city that has direct flights to/from more cities (not only to/from the bidder's city). The degree centrality has an economically significant impact on the bid price since the estimated coefficient suggests a one standard deviation increase in DC_T leads to 12.1% increase of the target's price-to-book ratio (0.063*1.926 = 0.121). Model (2) replaces the Degree centrality with the raw Betweenness centrality and offers a positive and significant coefficient to the measure for targets (BC_T). This finding suggests acquirers are willing to pay high prices if the target is in a city that serves as a "mediator" in the air transportation network. Again, the result indicates a significant impact of target firm's efficient transportation, given that a one standard deviation increase in BC_T is associated with 12.0% increase in the price-to-book ratio (0.038*3.176 = 0.120).

[Insert Table 3 about here]

Models (1) and (2) may present biased results since these models use raw centrality measures. These variables potentially overvalue cities that have only a few direct flights to many other cities. To address this concern, Models (3) and (4) adopt the weighted centrality measures. Model (3) provides a positive and significant coefficient to the weighted Degree centrality for the target city, supporting the view that acquirers pay high prices if targets are in a city that has more flights to other cities. Model (4) adopts the weighted Betweenness centrality and provides a positive and marginally significant coefficient to the target's measure. Model (5) adopts Closeness centrality as the key independent variable, and the measure for the target has a positive and significant coefficient. The weighted centrality variables still detect a significant economic impact on the bid price. Model (4) suggests a one-standard deviation increase in the weighted DC_T brings 10.6% increase in the price-to-book ratio. The results suggest target companies receive high prices if they are in a city where passengers need fewer connecting flights to visit other cities. In marked contrast, all estimations provide no significant coefficients to the acquirer's centrality measures, suggesting that the acquisition price is more closely associated with the target's transportation convenience than with the acquirer's network connectivity.

Zhang et al. (2021) argue that direct flights are associated with increased cross-border M&As. In this study, however, no significant coefficient is provided to the direct air frequency between the bidder and target cities (lnAirfreq). This finding does not support the information view regarding the acquisition price. Untabulated results indicate that lnAirfreq has a positive and significant coefficient if the estimation does not include the centrality measures. However, Table 3 indicates that direct flights between them do not increase the value of target firms once we control for the transportation centrality of acquirer and target cities. This suggests that the lack of direct flights does not matter if the target firm is located in a transportation-convenient city.

Regressions of BPremium (Panel B of Table 3) offer the materially same results, indicating the book-value based premium is positively associated with the transportation convenience for the target while the acquirer's transportation variables do not have a significant coefficient. These results suggest that the target firm's transportation has a sizable impact on the premium. For instance, Model (1) suggests a one standard deviation increase in the DC_T is associated with 31.5% increase in BPremium (0.579*1.926/3.540). Consistent with our hypothesis, these results suggest well-developed transportation in the target side allows acquirers to achieve large synergy effects, making them willing to offer high bid prices. Transportation infrastructure adds value to target companies in the acquisition.

While Panel A of Table 3 carries a negative and significant coefficient on SameCity, the coefficient becomes insignificant in Panel B. In addition, most distance dummies have an insignificant coefficient, suggesting geographic proximity does not lead to high bid prices. All estimations provide positive and significant coefficients to RelativeSize. Firms tend to offer high prices when they acquire relatively large companies.

4.2 Propensity score matching

We show that bidders pay high prices when the target resides in a city that has convenient transportation. One can criticize that acquirers and deals may have specific characteristics associated with the bid price and target choice. To reduce such a selection bias, we perform a propensity score matching (PSM) approach (Rosenbaum and Rubin, 1983). Specifically, we first conduct the probit regression of a binary dummy variable that takes on a value of one for bidders targeting a firm in a transportation-convenient city, and zero for others. We identify cities that have a raw DC greater than three as being convenient. The estimation adopts firm and deal characteristic variables from the former regression analyses (DC_A, Firm size, Leverage, Tobin's Q, ROA, Cashhold, and Relatedness) as covariates (one-year lagged data are used) with year and industry fixed effects.

[Insert Table 4 about here]

Panel A of Table 4 shows the probit regression results. Companies with access to a good transportation network are likely to target transportation-convenient companies. This finding potentially suggests that companies valuing good transportation tend to acquire firms that operate with such an infrastructure and locate themselves in a good environment. Meanwhile, highly leveraged companies tend less to target convenient firms.

We conduct the nearest matching with the caliper of 0.01 by using the propensity score to find the matching firm. The balance test does not find a significant difference in any covariates between the two groups. Panel B of Table 4 compares the lnPBR and BPremium between the treatment and control groups. Bidders targeting a convenient firm (treatment) pay significantly higher prices than those that do not (control). This result supports our hypothesis while controlling for bidder and deal characteristics associated with the choice of targets' transportation convenience.

4.3 Stock price reaction

We argue that transportation convenience adds value in M&A transactions by showing that bidders offer high prices when they acquire firms with access to good transportation. However, the result may arise from the fact that bidders overpay to acquire these companies. To examine whether convenient transportation causes overpayments, we examine stock price reaction to the

M&A announcement using the standard event study method. Daily stock returns for 150 days ending at 21 days before the announcement (from Day -170 to Day -21) are used for market model estimation. Day 0 is the announcement date. Estimated alpha and beta are used to compute daily expected returns for the event window. We aggregate daily abnormal returns over three days (from Day -1 to Day 1) and five days (from Day -2 to Day 2) to compute cumulative abnormal returns (CARs).

One important caveat is that Chinese firms can suspend trading of their stocks when they announce major events such as M&As (Qi et al., 2024). In our sample, 1904 companies suspend stock trading, and the standard CAR computation cannot be applied to these observations.

[Insert Table 5 about here]

Panel A of Table 5 shows the results for the non-suspending sample (CARs are computed in a standard way). The mean CAR is positive and significant both for the convenient and less convenient samples, suggesting that M&A announcements generally receive favorable stock price reactions, regardless of the target's location. We do not find a significant difference in CARs between these two groups.

Panel B of Table 5 describes CARs for the suspending sample. We presume that the value of information that flows into the market by the announcement day is incorporated in the resumption day return. When the firm resumed stock trading from Day -1 to Day 1, three-day CAR is computed by using abnormal returns from the resumption day to Day 1. Similarly, five-day CAR is computed by using abnormal returns from the resumption day to Day 2, when the firm resumed stock trading from Day -2 to Day 2. The resumption day's abnormal return is adopted as the three-day (five-day) CAR when the firm resumed stock trading on Day 2 (Day 3) or onward. Again, bidders experience a positive and significant stock price reaction, regardless of the target's transportation convenience. While there is no significant difference in the mean CAR, the suspending bidders report significantly larger median stock returns when they target good transportation firms. There is no evidence that acquirers receive significantly worse stock price reactions when they target good transportation companies.

To further examine the effect of transportation convenience on the announcement return, we implement the regression of CARs separately for the suspending and non-suspending M&As. Since the results are similar for the three- and five-day CARs, Table 6 shows only the results for five-day CAR. Models (1) and (2) examine the suspension sample, and Models (3) and (4) examine the non-suspension sample. Raw centrality variables (DC and BC) are adopted, and the models carry an insignificant or marginally significant positive coefficient on these transportation variables. The results are qualitatively unchanged when we use the weighted centrality measures and Closeness Centrality (CC). While acquirers are willing to pay high bidding prices for targets with access to convenient transportation, these bidders do not receive negative stock price responses. This finding does not support the possibility that bidders overpay for targets operating with convenient transportation. We argue that well-developed transportation networks on the side of targets create value, most of which is paid to the target firm's shareholders in the form of high bid prices.

[Insert Table 6 about here]

As for control variables, all estimations carry an insignificant coefficient on lnAirfreq. Suspending bidders receive large announcement returns when they use their stocks as currency. The stock price reaction to these bidders is negatively related to Tobin's Q. These findings are consistent with the view that Chinese bidders take advantage of their overvalued stocks (Qi et al., 2024). RelativeSize has a positive and significant coefficient, suggesting relatively large targets have a sizable impact on the bidder's shareholder wealth.

4.4 Long-term performance

Some previous studies have observed significantly negative long-term abnormal returns after acquisitions due to overpayment (Rau and Vermaelen, 1998; Moeller et al., 2004; Fu et al., 2013; Edmans et al., 2022). To further examine the stock price performance of acquirers, we investigate long-term returns using Buy-and-Hold-Abnormal-Returns (BHARs) during the post-acquisition period. A monthly return of the portfolio created by the size and book-to-market ratio, to which a given bidder belongs, is adopted as an expected return to control for size and value effects (Fama and French, 1992, 1993). Specifically, we divided all listed firms at the end of June into five groups according to the market value of the firms. Then, we further divided each of the size groups into five groups based on the book-to-market ratio (BM). As a result, 25 size-BM groups are formulated every June of year *t*. This portfolio return is used as the expected return of stocks belonging to the same size-BM group during the period July of year *t* to June of year *t*+1. To avoid firms' suspension decisions affecting abnormal return, firms are removed from the portfolios during their trading suspension period. For every bidder, we compute the BHARs by deducing the buy-and-hold return (BHR) of the size-BM portfolio during a specific investment horizon (12, 24, and 36 months) from the BHR of the given acquirer.

[Insert Table 7 about here]

Table 7 presents mean and median BHARs separately for deals targeting transportation-convenient and transportation-inconvenient firms. Since the distribution of BHAR is highly skewed, we compare the median value between the two groups. Panel A indicates that the BHARs from the completion month are negative and significant except for the BHAR12, suggesting that the average Chinese acquirer significantly underperforms peer firms in the long run. Meanwhile, bidders who acquire transportation-convenient targets report better returns than those acquiring less convenient targets. For instance, bidders show a median three-year BHAR of -19.80 percent when they target less convenient firms, while the median BHAR becomes -16.51 percent for deals acquiring firms in a convenient city. Panel B of Table 7 presents BHARs from the announcement month to examine the deals' entire effects on stock prices. Again, the result shows long-term underperformance of Chinese bidders. Importantly, acquirers targeting convenient firms report significantly better median BHARs than those acquiring targets with less convenient transportation. This result is consistent with our hypothesis that bidders can create greater value by targeting firms that have access to more convenient transportation.

To examine the effect of transportation convenience on long-term returns while controlling for firm and deal characteristics, we conduct regressions of 12-, 24-, and 36-month BHARs following completion. This estimation adopts the natural logarithm of the market value of stocks as a measure of firm size, and the book-to-market ratio is included to control for the value effect. The results, using the raw centrality measures (DC and BC), are shown in Table 8. These estimations carry a positive and significant coefficient on the target's transportation convenience measures, except Model (5). This result is consistent with our view that bidders create larger shareholder value by targeting companies with better transportation. Untabulated analyses indicate that most of the other transportation variables are positively associated with the BHARs. Meanwhile, we do not find robust evidence that the transportation convenience of the bidder city affects long-term stock performance.

[Insert Table 8 about here]

The frequency of direct flights (lnAirfreq) has no significant effects on long-term abnormal performance. While Zhang et al. (2021) suggest that direct flights increase M&A transactions, our results do not support the view that direct connections create economic benefits for acquirers once we control for the transportation centrality of the acquirer and target cities. While these estimations offer a significant coefficient on 500<=Distance<1000, no clear evidence is detected for the relation between geographic distance and long-term stock returns.

To focus on the economic effect of transportation convenience, we did not include the bid price variable in the independent variable. Untabulated analyses add the lnPBR to the independent variable and provide a positive and significant coefficient to the variable in the regression of 12-month BHAR. The longer-horizon BHARs are not significantly related to the lnPBR. All these estimations carry an insignificant coefficient on the acquirer's transportation measures. These results are in line with the view that convenient transportation in the target city creates value in M&A deals, and bidders pay more for the new infrastructure.

5. Additional analysis

5.1 Remotely versus closely-located targets

We have not supported the information view potentially because air networks reduce the information asymmetry only when the target firm is remotely located from the bidder. To test this possibility, we replicate the main analysis focusing on transactions that have the target residing more than 200 km from the acquirer (remote sample).

Panel A of Table 9 conducts the regression of bid prices for the remote sample. Models (1) to (5) are estimations for the lnPBR, while Models (6) to (10) examine the BPremium. These estimations do not provide a significant coefficient to lnAirfreq except Model (5) offering a marginally significant. The information view is not supported even for the deals in which the bidder will find it difficult to collect soft information of the target firm. The efficient transportation in the acquirer side may help information collection regarding target firms through frequent visits to target firms. This idea leads to the prediction that the transportation centrality of bidders is positively related to the bid price especially when the target is remotely located. However, Panel A does not carry significantly positive coefficients on the acquirer's centrality variables. Overall, our data do not support the information view.

[Insert Table 9 about here]

It is ambiguous whether acquirers value the transportation infrastructure in the target side especially when the target firm is remotely located. The infrastructure view considers target firms as an independent entity and highlights their connections with various cities. This view leads to the prediction that the convenient transportation in the target side adds value irrespective of the proximity to the acquirer. Meanwhile, the standalone value of target firms may become more important as they are more remotely located from the acquirer. When the target is closely located to the bidder, land transportation can connect the target firm with the acquirer's neighboring partners. (suppliers, customers, research institutions, etc.)

Most estimations in Table 9, Panel A offer a positive and significant coefficient on the centrality of target firms, suggesting that the transportation infrastructure increases the value of target firms when they are remotely located from the bidder. Panel B of table 9 replicates the analysis for transactions that have the target residing less than 200 km from the acquirer (close sample), returning relatively weak results. Although three regressions for lnPBR (Models (1), (3), and (5)) carry a positive and significant coefficient on the target's degree centrality (DC) variable, the other estimations return insignificant coefficients at the five percent level. Overall, the convenient transportation has a clear value effect on target firms especially when they are remotely located from the acquiring companies.

It is surprising that the close sample provides a positive and significant coefficient to the lnAirfreq. The information view cannot offer an explanation. Instead, a possible interpretation is that a pair of nearby cities that have many direct flights are closely related in economic activities. Such a special relationship may enable bidders to achieve large synergy gains and incentivize them to offer a high bid price. Regressions of lnPBR engender a positive and significant coefficient on SameCity, potentially suggesting that bidders value geographic expansions to relatively close cities. However, such a tendency is not detected when we use BPremium as a bid price variable.

5.2 Completion likelihood

Acquirers need to purchase a certain number of shares of target companies to successfully obtain the control rights. M&A deals can be canceled if the target firm or its shareholders are not satisfied with the bid price. High offering prices are an important instrument to make the target firm's shareholders accept the offer. This idea leads to the prediction that M&A transactions are more likely to be completed if the target resides in a more transportation-convenient city.

Factset database includes M&A transactions that have been cancelled, are pending, rumored, and rumored cancelled deals. We add 1,064 uncompleted deals, for which necessary data are available, to the entire sample to investigate the above-mentioned idea. The dataset suggests nearly 24 percent of deals are canceled, which is significantly higher than US acquisitions (6 percent in the sample of Lin and Pursiainen (2023)). This fact suggests that Chinese bidders encounter difficulties in acquisition negotiations. When the target resides in a more transportation convenient city, bidders can offer high bid prices, making the negotiation smooth, since large synergy effects are expected.

We estimate a logit model that adopts Completion as a dependent variable that takes on a value of one for completed deals, and zero otherwise. We obtain financial data of the bidders of these uncompleted deals from the CSMAR database. Table 10 shows the regression results. Most estimations provide a positive and significant coefficient on the target transportation variable, supporting the view that M&A transactions are more likely completed if targets are located in transportation-convenient cities. However, it should be noted that efficient transportation of target firms does not drastically increase the completion rate. Model (1) suggests that a one-standard deviation increase in DC_T is associated with 2.3% increase in the completion likelihood.

[Insert Table 10 about here]

These estimations carry a positive and significant coefficient on SameCity. Distance dummies are all positive and significant, and shorter distance dummies have larger coefficients. This finding suggests that bidders are more likely to reach an acquisition agreement when the target firm is more closely located. The information view suggests geographic proximity enables acquiring firms to collect soft information of the target firm and thereby reduce uncertainty about synergy effects. Frequent visits also nurture mutual trusts, making negotiations smooth. These ideas can explain the positive relationship between the completion likelihood and geographic proximity. Model (1) indicates that the completion rate increases by 12% when the target firm resides in the same city with the acquirer. The geographic proximity has a sizable impact on the competition rate of M&A transactions. Meanwhile, all the models engender an insignificant coefficient at the five percent level on the acquirers' transportation variables and lnAirfreq. This result reinforces our argument that a target's transportation matters in M&A deals.

5.3 Manufacturing versus non-manufacturing targets

It is commonly documented that efficient transportation increases firm value by reducing transportation costs (Holl, 2016; Martincus et al., 2017; Gibbons et al., 2019; Fiorini et al., 2021; Branco et al., 2023). Manufacturing firms may face higher transportation costs than non-manufacturing firms because they rely on transportation for both material procurement and product distribution. This suggests that efficient transportation is particularly beneficial for manufacturing companies. Meanwhile, well-developed transportation networks allow firms to access high-quality business partners and skilled labor through agglomeration economies (Holl, 2016). This indicates that transportation improvements can enhance firm value across all industries.

To address this issue, we separately replicate the regression of the bid price for manufacturing and non-manufacturing targets. Table 11 shows mixed evidence. Regressions of lnPBR (Models (1) – (4)) offer a positive and significant coefficient of the target centrality, indicating that efficient transportation adds value for both manufacturing and non-manufacturing companies. We do not observe a significant difference in coefficients between the two industries. Meanwhile, the regressions of BPremium detect a significant coefficient of target centrality variables only for non-manufacturing firms. While non-manufacturing firms may not incur substantial transportation costs for product distribution, they still rely on developed transportation to attract customers. Additionally, non-manufacturing firms benefit as much as manufacturing companies from agglomeration economies. Therefore, the value creation effect of efficient transportation is not limited to manufacturing industries.

[Insert Table 11 about here]

5.4 Diversifying and horizontal M&As

The effect of target firms' transportation in M&A deals may differ depending on the type of M&A. Previous studies suggest corporate diversification causes discounts (Lang and Stultz, 1994; Berger and Ofek, 1995). Inter-industry bidders should encounter more severe information asymmetry than horizontal acquirers (Shen and Reuer, 2005), and previous studies find the former receives lower stock price reactions than the latter (Bhagat et al., 2005). This section investigates whether the transportation effect differs between the two types of M&As. Bidders may be able to take advantage of developed transportation in the target city to a large extent, particularly when they are familiar with the business of target companies. This idea gives rise to a prediction that the target transportation has a strong impact on horizontal M&As. Meanwhile, the agglomerated economy facilitated by convenient transportation may compensate for the bidder's lack of experience in diversifying mergers and acquisitions.

To test these ideas, we replicate the regression of bid prices separately for diversifying and horizontal M&As. Table 12 offers positive and significant coefficients on the transportation centrality of the target, irrespective of the type of M&A. Untabulated analyses also provide a positive and significant coefficient to the weighted centrality variables. The transportation convenience of the target city matters both for diversifying and horizontal M&As.

[Insert Table 12 about here]

5.4 Alternative measures of transportation convenience

We adopted centrality measures, which are commonly used in the network analysis, to measure the transportation convenience of the acquirer and target cities. As a robustness check, this section investigates alternative measures of city transportation. Previous studies find that infrastructure investments are associated with more regional transactions (McCann and Shefer, 2004; Percoco, 2010; Wan and Zhang, 2018). Following these studies, we examine whether infrastructure investments of the acquirer and target cities influence the bid price. Specifically, municipal investments in the road and bridge (RoadBridge), newly added fixed assets (NewFixedAssets), and the number of railway operating vehicles (Vehicles) are adopted instead of the centrality measures (natural log values are used). A and T at the variable end indicate acquirer and target cities, respectively.

Table 13 shows the regression results. These regressions commonly carry a positive and significant coefficient on the infrastructure investments in the target side, while the coefficients for the acquirer side are not statistically significant in most estimations. These results support the view that bidders value developed infrastructures of the target firm.

[Insert Table 13 about here]

6. Conclusion

Previous studies focus on the direct access between bidders and targets to investigate the effect of transportation on M&A transactions (Jin et al., 2021; Zhang et al., 2021; Li et al., 2022). In this study, we measure the transportation convenience of bidder and target cities separately by introducing centrality measures to test the view that good connectivity increases the value of target companies in the M&A transactions.

We find that bidders are willing to pay high prices to targets that have access to convenient transportation. In contrast, we do not find evidence that the bid price is associated with the transportation centrality and the availability of a direct connection between the bidder and target. Despite their high premium payments, an event study does not suggest bidders receive negative stock price reactions when targeting firms with access to convenient transportation. Furthermore, those bidders realize better long-term stock performance following the execution of M&As. The results suggest that convenient transportation on the target side allows bidders to achieve large synergy effects. Good transportation increases the value of companies as a target of M&A transactions.

We contribute to the literature on M&A by showing that transportation convenience of the target city matters in M&A transactions (Jin et al., 2021; Zhang et al., 2021; Li et al., 2022). Bidders add more valuable assets by acquiring firms that have access to more convenient transportation. While previous studies emphasize the direct connection effects, we underscore convenience of the target city in the whole transportation network. We also reinforce Cai et al.'s (2016) argument by showing direct evidence that the transportation convenience of a target city affects M&A transactions. Previous US studies indicate that independent directors and anti-takeover instruments help target firms obtain large financial returns in M&A transactions (Comment and Schwert, 1995; Cotter et al., 1997). We contribute to the literature by adding a novel factor (transportation convenience) associated with the value of target firm.

Our research is also connected with the literature of spatial economics. The literature shows that good transportation improves firms' productivity and increases exports by reducing transport costs and enhancing agglomeration economies (Holl, 2016; Martincus et al., 2017; Gibbons et al., 2019; Fiorinia et al., 2021; Branco et al., 2023). By using the bid price in M&A transactions, we show evidence that the connectivity to other cities increases the value of companies in M&A transactions. Finally, our analysis is related to the literature on network analysis (Lao et al., 2016; Ma and Liu, 2021; Trinh et al., 2022; Wu et al., 2022). We argue that transportation centrality also matters in M&A transactions.

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Appendix
Definition of variables

This appendix shows the definition of variables used in this research.

Variable	Definition
Bid price	
lnPBR	Natural logarithm of the price-to-book ratio for the target company. The price-to-book ratio is computed as the total transaction value divided by the book value of the transferred shares (the target firm's book equity multiplied by the proportion of transferred shares).
BPremium	Book-value based premium, which is measured by the total transaction value minus book value of the transferred shares and divided by the book value of the transferred shares (the target firm's book equity multiplied by the proportion of the transferred shares).
Transportation convenience	
DC	Degree centrality, representing the availability of a direct flight connection between the given city and other cities.
BC	Betweenness centrality, representing the degree to which a city acts as a connecting point with other cities in the air transportation network.
CC	Closeness centrality, representing the minimum number of flights to travel from a given city to other cities in the air transportation network.
lnAirfreq	Natural logarithm of one plus the number of direct flights between the bidder and target city.
Distance	
SameCity	Binary variable that takes on a value of one for deals in which the bidder and target firms reside in a same city, and zero otherwise.
Distance<100	Binary variable that takes on a value of one if the distance between the bidder and target cities is less than 100 km, and zero otherwise.
100<=Distance<200	Binary variable that takes on a value of one if the distance between the bidder and target cities is between 100 and 200 km, and zero otherwise.
200<=Distance<500	Binary variable that takes on a value of one if the distance between the bidder and target cities is between 200 and 500 km, and zero otherwise.
500<=Distance<1000	Binary variable that takes on a value of one if the distance between the bidder and target cities is between 500 and 1000 km, and zero otherwise.
Firm characteristics	
FirmSize	Natural logarithm of assets.
Leverage	The ratio of firm's total liabilities to total assets.
Tobin's Q	Market value of stocks and book value of debt divided by the book value of the firm's assets.
Book-to-market ratio	Market value of the firm divided by the book value of equity.
ROA	The ratio of net profits to total assets.
CashHold	The ratio of cash and its equivalents over total assets.
Deal characteristics	
DStockPay	Binary variable that takes on a value of one if the bidder uses stocks as a payment method, and zero if the bidder pays only by cash.
RelativeSize	The ratio of the transaction value to the acquirer's market value at the time of deal completion.
Relatedness	Binary variable that takes on a value of one if the bidder and target have the same two-digit SIC (Standard Industry Classification) code, and zero otherwise.
Local economic	
LnGrdp_A	Natural logarithm of the Gross Regional Domestic Product (GRDP) of the province in which the acquirer resides.
LnGrdp_T	Natural logarithm of the Gross Regional Domestic Product (GRDP) of the province in which the target resides.

Table 1
Transportation convenience and bid price

This table presents the summary statistics for the key variables. Panel A presents the transportation variables for the entire sample, while Panel B shows variables for the bid price (lnPBR and BPremium) separately for the subsamples created by the Degree centrality (DC) of acquirers and targets. A difference test is conducted for the mean and median (Wilcoxon ranksum test) of each variable across the two groups. DC is Degree centrality, which measures the availability of direct flights between a given city and other cities. BC is Betweenness centrality, which measures the degree to which a city acts as a connecting point with other cities in the air transportation network. CC is Closeness centrality, which measures the minimum number of flights to travel from a given city to other cities. A and T at the end of transportation centrality variables indicate the acquirer and target city, respectively. lnAirfreq is measured as the natural logarithm of one plus the number of direct flights between the bidder and the target city. SameCity is a dummy variable, which takes on a value of one for deals involving same-city companies, and zero otherwise. lnPBR is the natural logarithm of the total transaction value divided by the book value of the transferred shares (the target firm's book equity multiplied by the proportion of transferred shares). BPremium is the total transaction value minus the book value of the transferred shares and divided by the book value of the transferred shares. *, **, *** denote statistical significance at the 10, 5, and 1 percent level, respectively.

Panel A: Entire sample				
	Mean	Median	SD	N
Transportation centrality of acquirers				
DC_A (raw)	2.641	3.296	1.821	3294
DC_A (weighted)	8.448	11.173	5.273	3294
BC_A (raw)	3.604	4.059	3.076	3294
BC_A (weighted)	0.103	0.021	0.149	3294
CC_A	0.292	0.289	0.202	3294
Transportation centrality of targets				
DC_T (raw)	2.464	3.178	1.926	3294
DC_T (weighted)	7.816	10.967	5.579	3294
BC_T (raw)	3.401	3.585	3.167	3294
BC_T (weighted)	0.099	0.016	0.146	3294
CC_T	0.265	0.277	0.203	3294
Air frequency between bidder and target city				
lnAirfreq	1.579	0	3.454	3294
SameCity	0.359	0	0.479	3294

Panel B: By centrality of cities in air transportation network								
Variables	Convenient (raw DC>3)			Less convenient (raw DC<3)			Difference test	
	Mean	Median	N	Mean	Median	N	Mean (T-stat.)	Median (Z-stat.)
Acquirer's city transportation								
lnPBR	1.109	0.866	870	0.988	0.729	709	2.453**	2.863***
BPremium	3.785	0.378	870	3.240	0.072	709	0.897	2.863***
Target's city transportation								
lnPBR	1.238	1.012	849	0.842	0.670	730	9.516***	9.373***
BPremium	5.217	0.751	849	1.589	-0.046	730	5.500***	9.373***

Table 2
Descriptive statistics

This table shows the descriptive statistics for firm and deal characteristics variables for the entire sample. FirmSize is measured as the natural logarithm of assets. Leverage is the ratio of the firm's total liabilities to total assets. Tobin's Q is measured as the market value of stocks and the book value of debt divided by the book value of the firm's assets. The book-to-market ratio is calculated as the market value of the firm divided by the book value of equity. ROA is the ratio of net profits to total assets. CashHold is the ratio of cash and its equivalents over total assets. DStockPay is a dummy variable that takes on a value of one if the bidder uses stocks as a payment method, and zero if the bidder pays only by cash. RelativeSize is the ratio of the transaction value to the acquirer's market value at the time of deal completion. Relatedness is a dummy variable that takes on a value of one if the bidder and target have the same two-digit SIC (Standard Industry Classification) code, and zero otherwise. LnGrdp is the natural logarithm of the province's Gross Regional Domestic Product (GRDP). A and T in the variable end indicate the acquirer and target province, respectively.

Variables	Mean	Median	SD	N
Firm characteristics				
FirmSize	21.832	21.697	1.256	3294
Leverage	0.433	0.431	0.216	3294
Tobin's Q	2.135	1.711	1.277	3294
Book-to-market ratio	2.213	1.711	2.249	3294
ROA	0.040	0.038	0.048	3294
CashHold	0.212	0.163	0.159	3294
Deal characteristics				
DStockPay	0.260	0	0.438	3294
RelativeSize	0.158	0.019	0.511	3294
Relatedness	0.386	0	0.487	3294
Local economic indcators				
LnGrdp_A	10.197	10.204	0.747	3294
LnGrdp_T	10.157	10.132	0.748	3294

Table 3
Regression of bid price

This table implements regressions of premiums. Panel A uses lnPBR as a dependent variable, which is the natural logarithm of the total transaction value divided by the book value of the transferred shares (target firm's book equity multiplied by the proportion of the transferred shares). Panel B adopts BPremium, measured as total transaction value minus the book value of the transferred shares and divided by the book value of the transferred shares. DC is Degree Centrality, which measures the availability of direct flights between a given city and other cities. BC is Betweenness Centrality, which measures the degree to which a city acts as a connecting point with other cities in the air transportation network. CC is Closeness Centrality, which measures the minimum number of flights to travel from a given city to other cities. For DC and BC, both weighted and non-weighted variables are examined. A and T at the end of the transportation centrality variables indicate the acquirer and target city, respectively. lnAirfreq is measured as the natural logarithm of one plus the number of direct flights between the bidder and the target city. SameCity is a dummy variable, which takes on a value of one for deals involving same-city companies, and zero otherwise. Four dummies regarding the geographic distance between the acquirer and target cities are included, having deals with more than 1,000 km as a benchmark (d_1<=Distance<d_2 indicates a dummy variable that takes on a value of one for deals in which the target is located between d_1 and d_2 km from the acquirer). FirmSize is measured as the natural logarithm of assets. Leverage is the ratio of the firm's total liabilities to total assets. Tobin's Q is measured as the market value of stocks and the book value of debt divided by the book value of the firm's assets. ROA is the ratio of net profits to total assets. CashHold is the ratio of cash and its equivalents over total assets. RelativeSize is the ratio of the transaction value to the acquirer's market value at the time of the deal was completed. Relatedness is a dummy variable that takes on a value of one if the bidder and target have the same two-digit SIC (Standard Industry Classification) code, and zero otherwise. LnGrdp is the natural logarithm of the province's Gross Regional Domestic Product (GRDP). A and T at the variable end indicate the acquirer and target city, respectively. T-statistics are given in parentheses, *, **, *** denote statistical significance at the 10, 5, and 1 percent level, respectively.

Table 3
(Continued)

Panel A: Regression of lnPBR					
	(1)	(2)	(3)	(4)	(5)
Centrality variable	Raw DC and BC		Weighted DC and BC		CC
DC_A	0.0003		-0.004		
	(0.03)		(-0.88)		
DC_T	0.063***		0.019***		
	(5.10)		(4.60)		
BC_A		0.003		0.130	
		(0.40)		(0.82)	
BC_T		0.038***		0.774***	
		(4.99)		(4.27)	
CC_A					-0.075
					(-0.56)
CC_T					0.340***
					(2.78)
lnAirfreq	0.005	0.005	0.009	0.008	0.015*
	(0.59)	(0.59)	(1.15)	(1.02)	(1.91)
SameCity	-0.134**	-0.125**	-0.123**	-0.106*	-0.098*
	(-2.32)	(-2.20)	(-2.10)	(-1.89)	(-1.67)
Distance<100	0.044	0.044	0.045	0.035	0.041
	(0.47)	(0.46)	(0.48)	(0.36)	(0.43)
100<=Distance<200	0.047	0.053	0.052	0.069	0.074
	(0.60)	(0.67)	(0.66)	(0.86)	(0.93)
200<=Distance<500	0.073	0.078	0.069	0.089	0.074
	(0.96)	(1.03)	(0.91)	(1.15)	(0.97)
500<=Distance<1000	0.146**	0.152**	0.137**	0.153**	0.124**
	(2.37)	(2.47)	(2.23)	(2.48)	(2.01)
FirmSize	-0.002	-0.005	0.001	-0.010	0.000
	(-0.07)	(-0.22)	(0.06)	(-0.44)	(0.02)
Leverage	-0.567***	-0.564***	-0.573***	-0.530***	-0.577***
	(-3.96)	(-3.94)	(-4.00)	(-3.70)	(-4.04)
Tobin's Q	0.030	0.029	0.033	0.031	0.035
	(1.33)	(1.27)	(1.47)	(1.34)	(1.54)
ROA	0.660	0.656	0.641	0.694	0.630
	(1.34)	(1.32)	(1.30)	(1.40)	(1.28)
CashHold	-0.006	-0.018	0.019	-0.028	0.011
	(-0.04)	(-0.11)	(0.12)	(-0.18)	(0.07)
RelativeSize	0.323***	0.324***	0.323***	0.323***	0.327***
	(6.41)	(6.49)	(6.38)	(6.50)	(6.46)
Relatedness	-0.089**	-0.091**	-0.091**	-0.091**	-0.093**
	(-1.99)	(-2.03)	(-2.03)	(-2.02)	(-2.08)
LnGrdp_A	-0.035	-0.033	-0.038	-0.032	-0.034
	(-1.05)	(-0.97)	(-1.14)	(-0.92)	(-1.01)
LnGrdp_T	0.046	0.046	0.041	0.053	0.035
	(1.43)	(1.43)	(1.28)	(1.65)	(1.08)
Constant	0.694	0.759	0.620	0.724	0.637
	(1.18)	(1.25)	(1.04)	(1.21)	(1.06)
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
N	1579	1579	1579	1579	1579
adj. R^2	0.320	0.320	0.316	0.321	0.310

Table 3
(Continued)

Panel B: Regression of BPremium					
	(1)	(2)	(3)	(4)	(5)
Centrality variable	Raw DC and BC		Weighted DC and BC		CC
DC_A	-0.247		-0.105		
	(-1.22)		(-1.53)		
DC_T	0.579**		0.161**		
	(2.51)		(2.20)		
BC_A		-0.104		-2.990	
		(-0.86)		(-1.09)	
BC_T		0.369**		8.034**	
		(2.57)		(2.26)	
CC_A					-1.414
					(-0.64)
CC_T					1.847
					(0.84)
lnAirfreq	0.051	0.035	0.089	0.062	0.129
	(0.32)	(0.22)	(0.56)	(0.40)	(0.83)
SameCity	-0.176	-0.147	-0.069	0.017	0.153
	(-0.16)	(-0.14)	(-0.06)	(0.02)	(0.14)
Distance<100	2.451	2.483	2.438	2.362	2.334
	(1.14)	(1.15)	(1.13)	(1.09)	(1.08)
100<=Distance<200	0.589	0.598	0.668	0.725	0.855
	(0.40)	(0.40)	(0.45)	(0.50)	(0.58)
200<=Distance<500	2.067	2.104	2.051	2.175	2.159
	(1.39)	(1.41)	(1.38)	(1.46)	(1.43)
500<=Distance<1000	1.585	1.665	1.507	1.668	1.438
	(1.50)	(1.58)	(1.42)	(1.57)	(1.34)
FirmSize	0.511	0.484	0.517	0.484	0.482
	(1.27)	(1.21)	(1.28)	(1.28)	(1.19)
Leverage	-7.190**	-7.206**	-7.196**	-7.123**	-7.309**
	(-2.55)	(-2.56)	(-2.56)	(-2.56)	(-2.58)
Tobin's Q	0.178	0.163	0.199	0.179	0.197
	(0.46)	(0.42)	(0.51)	(0.46)	(0.51)
ROA	2.375	2.276	2.199	2.505	2.115
	(0.28)	(0.27)	(0.26)	(0.30)	(0.25)
CashHold	-1.287	-1.487	-1.140	-1.574	-1.455
	(-0.48)	(-0.56)	(-0.43)	(-0.58)	(-0.54)
RelativeSize	4.482***	4.497***	4.504***	4.480***	4.559***
	(3.38)	(3.39)	(3.39)	(3.40)	(3.42)
Relatedness	0.215	0.197	0.190	0.184	0.183
	(0.26)	(0.24)	(0.23)	(0.22)	(0.22)
LnGrdp_A	-1.267*	-1.239*	-1.265*	-1.287*	-1.182*
	(-1.94)	(-1.90)	(-1.95)	(-1.95)	(-1.81)
LnGrdp_T	0.507	0.520	0.455	0.613	0.407
	(0.86)	(0.89)	(0.76)	(1.07)	(0.68)
Constant	-0.295	0.209	-0.454	-0.318	-0.042
	(-0.04)	(0.03)	(-0.06)	(-0.04)	(-0.01)
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
N	1579	1579	1579	1579	1579
adj. R^2	0.121	0.121	0.120	0.122	0.117

Table 4
Propensity score matching results

This table shows the propensity score matching results for the bid price (lnPBR and BPremium). lnPBR is the natural logarithm of the total transaction value divided by the book value of the transferred shares (target firm's book equity multiplied by the proportion of the transferred shares). BPremium is the total transaction value minus the book value of the transferred shares and divided by the book value of the transferred shares. In panel A, we first conduct the probit regression of a binary dummy variable that takes on a value of one for deals targeting a firm in a transportation-convenient city, and zero for others. Cities that have a raw DC greater than three are identified as transportation-convenient cities. Then, the control group is assigned by propensity score matching. Panel B compares the bid price between the convenient and inconvenient targets. DC is Degree Centrality, which measures the availability of direct flights between a given city and other cities. FirmSize is measured as the natural logarithm of assets. Leverage is the ratio of the firm's total liabilities to total assets. Tobin's Q is measured as the market value of stocks and the book value of debt divided by the book value of the firm's assets. ROA is the ratio of net profits to total assets. CashHold is the ratio of cash and its equivalents over total assets. Relatedness is a dummy variable that takes on a value of one if the bidder and target have the same two-digit SIC (Standard Industry Classification) code, and zero otherwise. T-statistics are for the mean difference test between the convenient target (treatment group) and control group (less convenient target), *, **, *** denote statistical significance at the 10, 5, and 1 percent levels, respectively.

Panel A: Probit regression

	Dependent variable: Convenient target = 1
DC_A	0.201***
	(12.57)
FirmSize	-0.013
	(-0.47)
Leverage	-0.071
	(-0.41)
Tobin's Q	0.035
	(1.39)
ROA	0.191
	(0.30)
CashHold	0.428**
	(2.14)
Relatedness	-0.027
	(-0.47)
Constant	-1.974**
	(-2.50)
Year FE	Yes
Industry FE	Yes
N	3286
pseudo R^2	0.171

Panel B: Bid price

	Without Replacement				With Replacement			
	Convenient target (Treatment)	Less convenient target (Control)	T-stat.	Diff.	Convenient target (Treatment)	Less convenient target (Control)	T-stat.	Diff.
lnPBR	1.102	0.882	4.39***	0.220	1.244	0.951	4.90***	0.294
BPremium	3.939	1.756	2.70***	2.183	5.327	2.061	3.92***	3.266

Table 5

Cumulative abnormal returns (CARs)

This table presents the mean and median of three-day and five-day cumulative abnormal returns (CAR) of the bidder separately for those targeting a convenient and a less convenient firm. A difference test is conducted for the mean and median (Wilcoxon ranksum test) of three-day and five-day CARs across the two groups. Panel A adopts non-suspending M&As, and panel B investigates suspending M&As. Cities that have a raw DC greater than three are identified as convenient cities. Suspending M&As suspended the bidder's stock trading before the announcement, while non-suspending M&As did not suspend stock trading. For the non-suspension sample, three-day CAR is computed by aggregating daily abnormal returns from Day -1 to Day 1 while five-day CAR is computed by aggregating from Day -2 to Day 2 (Day 0 is the announcement day). For suspending M&As, when the firm resumed stock trading from Day -1 to Day 1, three-day CAR is computed using abnormal returns from the resumption day to Day 1. Five-day CAR is computed using abnormal returns from the resumption day to Day 2, when the firm resumed stock trading from Day -2 to Day 2. The resumption day's abnormal return is adopted as the three-day (five-day) CAR when the firm resumed the stock trading on Day 2 (Day 3) or onward. T-statistics and Z-statistics are given in parentheses, and *, **, *** denote statistical significance at the 10, 5, and 1 percent levels, respectively.

Mean (T-value)	Median (Z-value)	Mean (T-value)	Median (Z-value)	Mean: T-value	Median: Z-value
Convenient Target		Less convenient Target		Difference	
Panel A: Non-suspending sample					
3-day CAR					
0.485%** (2.414)	0.003% (1.138)	0.550%*** (2.893)	0.065%* (1.661)	-0.234	-0.306
5-day CAR					
0.260% (1.039)	-0.170% (0.315)	0.771%*** (3.082)	0.321%* (1.925)	-1.438	-1.090
Panel B: Suspending sample					
3-day CAR					
3.505%*** (16.687)	4.428%*** (15.034)	2.580%*** (11.553)	2.084%*** (10.493)	2.997***	3.653***
5-day CAR					
3.668%*** (15.648)	4.795%*** (14.350)	2.718%*** (10.561)	2.249%*** (9.671)	2.723***	3.400***

Table 6
Regression of CAR

This table shows regression results of the five-day cumulative abnormal return (CAR). Models (1) and (2) implement regression for the suspension sample, while models (3) and (4) execute the same estimation for the non-suspension sample. Suspending M&As suspended the bidder's stock trading before the announcement, while non-suspending M&As did not suspend stock trading. Raw centrality variables (DC and BC) are adopted. DC is Degree Centrality, which measures the availability of direct flights between a given city and other cities. BC is Betweenness Centrality, which measures the degree to which the city acts as a connecting point with other cities in the air transportation network. A and T at the variable end indicate the acquirer and target city, respectively. lnAirfreq is measured as the natural logarithm of one plus the number of direct flights between the bidder and the target city. SameCity is a dummy variable, which takes on a value of one for deals involving same-city companies, and zero otherwise. Four dummies regarding the geographic distance between the acquirer and target cities are included, as they have deals with more than 1,000 km as the benchmark (d_1<=Distance<d_2 indicates a dummy variable that takes on a value of one for deals in which the target is located between d_1 and d_2 km from the acquirer). FirmSize is measured as the natural logarithm of assets. Leverage is the ratio of the firm's total liabilities to total assets. Tobin's Q is measured as the market value of stocks and the book value of debt divided by the book value of the firm's assets. ROA is the ratio of net profits to total assets. CashHold is the ratio of cash and its equivalents over total assets. DStockPay is a dummy variable that takes on a value of one if the bidder uses stocks as a payment method, and zero if the bidder pays only by cash. RelativeSize is the ratio of the transaction value to the acquirer's market value at the time the deal was completed. Relatedness is a dummy variable that takes on a value of one if the bidder and target have the same two-digit SIC (Standard Industry Classification) code, and zero otherwise. LnGrdp is the natural logarithm of the province's Gross Regional Domestic Product (GRDP). A and T at the end of the variable indicate the acquirer and target city, respectively. T-statistics are given in parentheses, *, **, *** denote statistical significance at the 10, 5, 1 percent level, respectively.

Table 6
(Continued)

Sample	(1)	(2)	(3)	(4)
	Suspending M&As		Non-suspending M&As	
	Centrality variable: Raw DC and BC			
	Dependent variable: 5-day CAR			
DC_A	0.0004		0.001	
	(0.37)		(0.61)	
DC_T	0.001		0.00004	
	(0.73)		(0.03)	
BC_A		0.0002		0.001
		(0.34)		(0.90)
BC_T		0.001		-0.0001
		(1.13)		(-0.07)
lnAirfreq	-0.0004	-0.0004	-0.001	-0.001
	(-0.57)	(-0.67)	(-0.76)	(-0.83)
SameCity	-0.006	-0.006	-0.001	-0.001
	(-1.04)	(-1.10)	(-0.24)	(-0.25)
Distance<100	0.011	0.011	0.0002	-0.0001
	(1.15)	(1.15)	(0.02)	(-0.01)
100<=Distance<200	-0.005	-0.005	-0.010	-0.010
	(-0.60)	(-0.59)	(-1.16)	(-1.16)
200<=Distance<500	-0.010*	-0.010*	0.011	0.011
	(-1.67)	(-1.66)	(1.40)	(1.40)
500<=Distance<1000	-0.005	-0.004	0.003	0.003
	(-0.84)	(-0.81)	(0.52)	(0.50)
FirmSize	-0.007***	-0.007***	0.001	0.001
	(-3.60)	(-3.64)	(0.58)	(0.51)
Leverage	0.010	0.011	-0.007	-0.006
	(0.85)	(0.87)	(-0.49)	(-0.45)
Tobin's Q	-0.005***	-0.005***	-0.003	-0.003
	(-2.91)	(-2.94)	(-1.25)	(-1.30)
ROA	-0.052	-0.053	0.001	0.002
	(-1.22)	(-1.23)	(0.01)	(0.03)
CashHold	0.022*	0.022	0.010	0.010
	(1.65)	(1.63)	(0.62)	(0.61)
DStockPay	0.021***	0.020***	0.006	0.006
	(4.84)	(4.75)	(0.56)	(0.57)
RelativeSize	0.013***	0.013***	0.014*	0.014*
	(5.09)	(5.10)	(1.65)	(1.66)
Relatedness	0.005	0.005	-0.002	-0.002
	(1.26)	(1.27)	(-0.37)	(-0.37)
LnGrdp_A	0.0001	0.0001	0.003	0.004
	(0.04)	(0.02)	(1.09)	(1.12)
LnGrdp_T	0.003	0.003	0.002	0.002
	(0.93)	(0.98)	(0.56)	(0.56)
Constant	0.122**	0.123**	-0.158***	-0.155**
	(2.05)	(2.08)	(-2.61)	(-2.57)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
N	1953	1953	1335	1335
R^2	0.162	0.162	0.121	0.121
adj. R^2	0.120	0.120	0.057	0.058

Table 7
Buy-and-hold abnormal returns (BHARs)

This table presents the mean and median of the buy-and-hold-abnormal-returns (BHARs) from the completion month (Panel A) and from the announcement month (Panel B) separately for deals targeting transportation-convenient and less transport-convenient firms. A difference test is conducted for the mean and median (Wilcoxon ranksum test) of BHARs across the two groups. Cities that have a raw DC greater than three are identified as convenient cities. BHARs are computed by deducing the buy-and-hold return (BHR) of the same size-BM portfolio return during a specific investment horizon (12, 24, and 36 months) from the BHR of the given acquirer. T-statistics and Z-statistics are given in parentheses, *, **, *** denote statistical significance at the 10, 5, 1 percent level, respectively.

Panel A: BHARs from the completion month						
	Convenient Target		Less convenient Target		Difference	
	Mean (T-value)	Median (Z-value)	Mean (T-value)	Median (Z-value)	Mean: T-value	Median: Z-value
12-month BHAR	1.208% (1.369)	-4.847%*** (-3.512)	0.267% (0.303)	-6.036%*** (-4.461)	0.753	0.656
24-month BHAR	-3.182%** (-2.433)	-10.676%*** (-7.310)	-6.979%*** (-5.330)	-12.597%*** (-9.265)	2.048**	1.831*
36-month BHAR	-6.744%*** (-3.895)	-16.505%*** (-9.542)	-13.400%*** (-7.242)	-19.799%** (-11.869)	2.629***	2.403**
Panel B: BHARs from the announcement month						
	Convenient Target		Less convenient Target		Difference	
	Mean (T-value)	Median (Z-value)	Mean (T-value)	Median (Z-value)	Mean: T-value	Median: Z-value
12-month BHAR	7.926%*** (7.264)	-2.404%** (1.960)	2.467%** (2.508)	-4.623%** (-2.529)	3.694***	2.840***
24-month BHAR	1.310% (0.845)	-7.466%*** (-4.077)	-7.538%*** (-5.266)	-12.299%*** (-9.125)	4.170***	3.913***
36-month BHAR	-7.027%*** (-3.567)	-14.921%*** (-7.899)	-17.583%*** (-8.723)	-20.515%*** (-12.886)	3.741***	4.188***

Table 8
Regression of buy-and-hold abnormal returns

This table shows the regressions results of BHARs from the completion month. The raw centrality variables (DC and BC) are adopted. DC is Degree Centrality, measuring the availability of direct flights between a given city and other cities. BC is Betweenness Centrality, which measures the degree to which a city acts as a connecting point with other cities in the air transportation network. A and T at the variable end indicate the acquirer and target city, respectively. lnAirfreq is measured as the natural logarithm of one plus the number of direct flights between the bidder and the target city. SameCity is a dummy variable, which takes on a value of one for deals involving same-city companies, and zero otherwise. Four dummies regarding the geographic distance between the acquirer and target cities are included, having deals with more than 1,000 km as benchmark (d_1<=Distance<d_2 indicates a dummy variable that takes on a value of one for deals in which the target is located between d_1 and d_2 km from the acquirer). FirmSize is measured as the natural logarithm of market value of equity. Leverage is the ratio of the firm's total liabilities to total assets. Book-to-market ratio is calculated as the market value of the firm divided by the book value of equity. ROA is the ratio of net profits to total assets. CashHold is the ratio of cash and its equivalents over total assets. DStockPay is a dummy variable that takes on a value of one if the bidder uses stocks as a payment method, and zero if the bidder pays only by cash. RelativeSize is the ratio of the transaction value to the acquirer's market value at the time of deal completion. Relatedness is a dummy variable that takes on a value of one if the bidder and target have the same two-digit SIC (Standard Industry Classification) code, and zero otherwise. LnGrdp is the natural logarithm of the province's Gross Regional Domestic Product (GRDP). A and T at the end of the variable indicate the acquirer and target city, respectively. T-statistics are given in parentheses, *, **, *** denote statistical significance at the 10, 5, and 1 percent level, respectively.

Table 8
(Continued)

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
	Centrality variable: Raw DC and BC					
	12-month BHAR		24-month BHAR		36-month BHAR	
DC_A	-0.001		0.007		0.003	
	(-0.28)		(1.01)		(0.34)	
DC_T	0.008*		0.015**		0.021**	
	(1.92)		(2.22)		(2.11)	
BC_A		0.001		0.005		0.002
		(0.32)		(1.20)		(0.34)
BC_T		0.004*		0.008**		0.014**
		(1.72)		(1.96)		(2.30)
lnAirfreq	0.0005	0.0002	-0.002	-0.002	0.001	0.001
	(0.20)	(0.08)	(-0.53)	(-0.44)	(0.14)	(0.14)
SameCity	-0.016	-0.018	-0.007	-0.005	-0.006	-0.006
	(-0.79)	(-0.88)	(-0.22)	(-0.17)	(-0.15)	(-0.14)
Distance<100	-0.020	-0.019	0.018	0.017	0.005	0.003
	(-0.59)	(-0.59)	(0.32)	(0.30)	(0.06)	(0.04)
100<=Distance<200	0.015	0.015	-0.065	-0.063	-0.092*	-0.089*
	(0.51)	(0.52)	(-1.53)	(-1.47)	(-1.72)	(-1.66)
200<=Distance<500	-0.013	-0.013	0.001	0.002	-0.060	-0.058
	(-0.52)	(-0.53)	(0.04)	(0.04)	(-1.17)	(-1.15)
500<=Distance<1000	0.030	0.031	0.008	0.010	-0.015	-0.014
	(1.32)	(1.35)	(0.26)	(0.30)	(-0.38)	(-0.35)
FirmSize	-0.014	-0.014*	0.016	0.015	0.072***	0.070***
	(-1.61)	(-1.65)	(1.17)	(1.12)	(3.67)	(3.56)
Leverage	0.084*	0.087*	0.009	0.015	-0.101	-0.094
	(1.68)	(1.74)	(0.11)	(0.19)	(-0.97)	(-0.90)
Book-to-market ratio	0.005	0.005	0.004	0.004	0.005	0.005
	(1.59)	(1.61)	(0.73)	(0.75)	(0.61)	(0.62)
ROA	0.253	0.255	0.299	0.302	0.506	0.510
	(1.35)	(1.36)	(1.10)	(1.11)	(1.45)	(1.46)
CashHold	0.093*	0.094*	0.226**	0.231**	0.380***	0.379***
	(1.67)	(1.69)	(2.40)	(2.45)	(2.96)	(2.97)
DStockPay	0.033*	0.032*	0.030	0.027	0.031	0.029
	(1.77)	(1.69)	(1.14)	(1.05)	(0.91)	(0.83)
RelativeSize	-0.042***	-0.042***	-0.064***	-0.065***	-0.036	-0.036
	(-2.68)	(-2.70)	(-2.80)	(-2.82)	(-1.31)	(-1.31)
Relatedness	0.026	0.026	0.023	0.023	0.039	0.038
	(1.61)	(1.61)	(0.95)	(0.95)	(1.18)	(1.17)
LnGrdp_A	0.016	0.016	0.039**	0.038**	0.036	0.037
	(1.20)	(1.17)	(2.00)	(1.96)	(1.30)	(1.35)
LnGrdp_T	0.018	0.018	0.036**	0.037**	0.042*	0.042*
	(1.45)	(1.50)	(2.00)	(2.03)	(1.67)	(1.65)
Constant	-0.073	-0.063	-1.025***	-1.007***	-2.236***	-2.196***
	(-0.32)	(-0.28)	(-2.87)	(-2.81)	(-3.87)	(-3.79)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
N	3239	3239	3239	3239	3239	3239
R^2	0.041	0.041	0.051	0.051	0.064	0.064
adj. R^2	0.012	0.012	0.022	0.022	0.035	0.036

Table 9

Remotely versus closely located targets

This table implements regressions of lnPBR (Models (1)-(5)) and BPremium (Models (6)-(10)) separately for the remote (Panel A) and close (Panel B) samples. The remote sample consists of deals in which the target is located more than 200 km from the bidder, while the close sample targets a firm located less than 200 km from the acquirer. lnPBR is the total transaction value divided by the book value of the transferred shares (target firm's book equity multiplied by the proportion of transferred shares). BPremium is the total transaction value minus the book value of the transferred shares. DC is Degree Centrality, measuring the availability of direct flights between the given city and other cities. BC is Betweenness Centrality, which measures the degree to which the city acts as a connecting point with other cities in the air transportation network. CC is Closeness Centrality, which measures the minimum number of flights to travel from a given city to other cities. For DC and BC, both weighted and non-weighted variables are examined. A and T at the variable end indicate the acquirer and target city, respectively. lnAirfreq is measured as the natural logarithm of one plus the number of direct flights between the bidder and the target city. SameCity is a dummy variable, which takes on a value of one for deals involving same-city companies, and zero otherwise. Four dummies regarding the geographic distance between the acquirer and target cities are included, having deals with more than 1,000km as a benchmark (d_1<=Distance<d_2 indicates the dummy variable that takes on a value of one for deals in which the target is located between d_1 and d_2 km from the acquirer). FirmSize is measured as the natural logarithm of assets. Leverage is the ratio of the firm's total liabilities to total assets. Tobin's Q is measured as the market value of stocks and the book value of debt divided by the book value of the firm's assets. ROA is the ratio of net profits to total assets. CashHold is the ratio of cash and its equivalents over total assets. Relatedness is the dummy variable that takes on a value of one if the bidder and target have the same two-digit SIC (Standard Industry Classification) code, and zero otherwise. Book-to-market ratio is calculated as the market value of the firm divided by the book value of equity. DStockPay is a dummy variable that takes on a value of one if the bidder uses stocks as a payment method, and zero if the bidder pays only by cash. RelativeSize is the ratio of the transaction value to the acquirer's market value at the time of deal completion. LnGrdp is the natural logarithm of the province's Gross Regional Domestic Product (GRDP). A and T at the end of this variable indicate the acquirer and target city, respectively. T-statistics are given in parentheses, *, **, *** denote statistical significance at the 10, 5, and 1 percent level, respectively.

Table 9
(Continued)

Panel A: Remote sample										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sample	lnPBR					BPremium				
Centrality variable	Raw DC and BC		Weighted DC and BC		CC	Raw DC and BC		Weighted DC and BC		CC
DC_A	0.007		-0.005			-0.005		-0.021		
	(0.38)		(-0.82)			(-0.02)		(-0.23)		
DC_T	0.064***		0.016***			0.855***		0.246***		
	(3.43)		(2.74)			(2.75)		(2.65)		
BC_A		0.007		0.032			-0.050		-5.473*	
		(0.63)		(0.16)			(-0.32)		(-1.71)	
BC_T		0.041***		0.660**			0.489**		6.759	
		(3.46)		(2.55)			(2.29)		(1.20)	
CC_A					-0.159					0.419
					(-0.80)					(0.14)
CC_T					0.137					2.131
					(0.82)					(0.86)
lnAirfreq	0.0003	-0.001	0.009	0.007	0.017*	-0.165	-0.133	-0.111	0.006	0.005
	(0.02)	(-0.05)	(0.92)	(0.78)	(1.83)	(-0.82)	(-0.61)	(-0.57)	(0.03)	(0.03)
200<=Distance<500	0.070	0.078	0.066	0.085	0.076	2.061	2.129	2.007	2.156	2.125
	(0.90)	(0.99)	(0.85)	(1.08)	(0.97)	(1.37)	(1.41)	(1.34)	(1.43)	(1.39)
500<=Distance<1000	0.131**	0.139**	0.117*	0.132**	0.105*	1.785*	1.819*	1.663	1.615	1.464
	(2.08)	(2.20)	(1.86)	(2.09)	(1.68)	(1.71)	(1.76)	(1.58)	(1.57)	(1.38)
FirmSize	-0.050	-0.051	-0.048	-0.053*	-0.052*	-0.311	-0.286	-0.318	-0.208	-0.392
	(-1.61)	(-1.62)	(-1.54)	(-1.72)	(-1.65)	(-0.59)	(-0.54)	(-0.60)	(-0.42)	(-0.74)
Leverage	-0.248	-0.261	-0.241	-0.228	-0.249	-4.349	-4.449	-4.379	-4.279	-4.386
	(-1.24)	(-1.30)	(-1.20)	(-1.14)	(-1.23)	(-1.13)	(-1.14)	(-1.14)	(-1.12)	(-1.12)
Tobin's Q	0.026	0.025	0.027	0.027	0.027	-0.232	-0.218	-0.235	-0.165	-0.234
	(0.86)	(0.84)	(0.90)	(0.89)	(0.89)	(-0.46)	(-0.43)	(-0.46)	(-0.32)	(-0.46)
ROA	0.408	0.402	0.383	0.479	0.377	-4.065	-4.277	-4.235	-3.959	-4.051
	(0.60)	(0.59)	(0.56)	(0.69)	(0.55)	(-0.38)	(-0.40)	(-0.39)	(-0.37)	(-0.37)
CashHold	-0.003	-0.018	0.018	-0.027	-0.022	-0.894	-0.904	-0.955	-0.831	-1.610
	(-0.01)	(-0.08)	(0.09)	(-0.13)	(-0.10)	(-0.27)	(-0.28)	(-0.29)	(-0.25)	(-0.47)
RelativeSize	0.257***	0.259***	0.256***	0.258***	0.259***	2.586**	2.603**	2.608**	2.585**	2.673**
	(3.73)	(3.77)	(3.75)	(3.79)	(3.80)	(2.00)	(2.03)	(2.01)	(2.02)	(2.06)
Relatedness	-0.081	-0.085	-0.088	-0.089	-0.091	0.178	0.127	0.108	0.033	0.038
	(-1.21)	(-1.25)	(-1.31)	(-1.30)	(-1.34)	(0.14)	(0.10)	(0.09)	(0.03)	(0.03)
LnGrdp_A	-0.022	-0.022	-0.028	-0.027	-0.025	-1.360	-1.404	-1.359	-1.537*	-1.333
	(-0.47)	(-0.47)	(-0.60)	(-0.58)	(-0.53)	(-1.53)	(-1.55)	(-1.57)	(-1.68)	(-1.50)
LnGrdp_T	0.091**	0.089**	0.086**	0.094**	0.082**	0.938	0.915	0.894	1.000*	0.830
	(2.43)	(2.38)	(2.26)	(2.52)	(2.16)	(1.52)	(1.50)	(1.42)	(1.69)	(1.33)
Constant	1.183	1.327	1.166	1.284	1.249	13.815	15.081	13.513	13.300	15.380
	(1.24)	(1.35)	(1.20)	(1.32)	(1.27)	(1.19)	(1.29)	(1.18)	(1.16)	(1.31)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	851	851	851	851	851	851	851	851	851	851
adj. R^2	0.302	0.303	0.300	0.300	0.293	0.091	0.091	0.090	0.091	0.084

Table 9
(Continued)

Panel B: Close sample										
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sample	lnPBR					BPremium				
Centrality variable	Raw DC and BC		Weighted DC and BC		CC	Raw DC and BC		Weighted DC and BC		CC
DC_A	0.007		-0.0004			-0.126		-0.088		
	(0.32)		(-0.06)			(-0.28)		(-0.57)		
DC_T	0.053**		0.017**			0.312		0.103		
	(2.50)		(2.39)			(0.75)		(0.72)		
BC_A		0.011		0.567			0.063		7.845	
		(0.77)		(1.28)			(0.24)		(1.28)	
BC_T		0.027*		0.416			0.131		-1.385	
		(1.90)		(0.92)			(0.54)		(-0.22)	
CC_A					-0.167					-4.062
					(-0.76)					(-0.87)
CC_T					0.535**					4.137
					(2.45)					(0.91)
lnAirfreq	0.223***	0.220***	0.224***	0.234***	0.224***	10.926***	10.930***	10.943***	11.215***	10.945***
	(6.84)	(6.90)	(6.87)	(6.53)	(6.90)	(13.64)	(13.90)	(13.87)	(13.65)	(13.95)
SameCity	-0.214***	-0.212***	-0.208***	-0.207***	-0.214***	-0.693	-0.734	-0.655	-0.733	-0.752
	(-2.90)	(-2.87)	(-2.82)	(-2.84)	(-2.90)	(-0.79)	(-0.83)	(-0.75)	(-0.88)	(-0.88)
Distance<100	-0.060	-0.075	-0.054	-0.084	-0.055	1.472	1.373	1.470	1.299	1.504
	(-0.51)	(-0.62)	(-0.46)	(-0.72)	(-0.47)	(0.55)	(0.51)	(0.55)	(0.51)	(0.57)
FirmSize	0.059*	0.054	0.064*	0.049	0.069**	1.432**	1.383**	1.452**	1.322**	1.474**
	(1.75)	(1.58)	(1.89)	(1.49)	(2.03)	(2.14)	(2.11)	(2.15)	(2.08)	(2.18)
Leverage	-0.866***	-0.847***	-0.888***	-0.803***	-0.903***	-10.400***	-10.310***	-10.415***	-9.857***	-10.544***
	(-4.29)	(-4.21)	(-4.36)	(-4.08)	(-4.45)	(-2.80)	(-2.78)	(-2.81)	(-2.71)	(-2.84)
Tobin's Q	0.046	0.044	0.052	0.049	0.057	0.671	0.637	0.707	0.680	0.721
	(1.29)	(1.23)	(1.46)	(1.42)	(1.60)	(1.26)	(1.22)	(1.33)	(1.34)	(1.37)
ROA	1.395*	1.392*	1.389*	1.301*	1.368*	16.415	16.311	16.465	15.772	16.154
	(1.95)	(1.94)	(1.95)	(1.85)	(1.92)	(1.31)	(1.29)	(1.32)	(1.26)	(1.29)
CashHold	0.013	0.009	0.033	0.003	0.052	-1.699	-1.986	-1.432	-2.185	-1.401
	(0.05)	(0.04)	(0.13)	(0.01)	(0.21)	(-0.40)	(-0.46)	(-0.33)	(-0.51)	(-0.31)
RelativeSize	0.375***	0.375***	0.375***	0.369***	0.377***	5.277***	5.275***	5.284***	5.218***	5.300***
	(5.61)	(5.70)	(5.55)	(5.64)	(5.56)	(2.89)	(2.90)	(2.88)	(2.87)	(2.88)
Relatedness	-0.038	-0.039	-0.035	-0.040	-0.038	1.385	1.352	1.407	1.347	1.398
	(-0.61)	(-0.62)	(-0.56)	(-0.65)	(-0.61)	(1.18)	(1.16)	(1.21)	(1.17)	(1.23)
LnGrdp_A	0.083	0.102	0.078	0.136*	0.075	0.487	0.799	0.439	1.403	0.468
	(1.07)	(1.31)	(1.05)	(1.65)	(1.01)	(0.43)	(0.74)	(0.42)	(1.42)	(0.51)
LnGrdp_T	-0.137	-0.151*	-0.140*	-0.171*	-0.144*	-1.865	-2.113	-1.860	-2.559**	-1.902
	(-1.63)	(-1.79)	(-1.71)	(-1.92)	(-1.77)	(-1.40)	(-1.63)	(-1.47)	(-2.03)	(-1.62)
Constant	-0.023	0.009	-0.116	-0.090	-0.126	-14.849	-14.580	-15.013	-15.354	-15.139
	(-0.03)	(0.01)	(-0.16)	(-0.13)	(-0.17)	(-1.35)	(-1.35)	(-1.35)	(-1.40)	(-1.36)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	728	728	728	728	728	728	728	728	728	728
adj. R^2	0.342	0.344	0.338	0.352	0.336	0.261	0.262	0.261	0.265	0.262

Table 10
Logit regression of deal completion

This table implements logit regressions of the completion dummy (Completion) by adding 1,064 uncompleted deals to the entire sample. Completion takes on a value of one for completed deals, and zero otherwise. DC is Degree Centrality, measuring the availability of direct flights between the given city and other cities. BC is Betweenness Centrality, which measures the degree to which the city acts as a connecting point with other cities in the air transportation network. CC is Closeness Centrality, which measures the minimum number of flights to travel from a given city to other cities. For DC and BC, both weighted and non-weighted variables are examined. A and T at the variable end indicate the acquirer and target city, respectively. lnAirfreq is measured as the natural logarithm of one plus the number of direct flights between the bidder and the target city. SameCity is a dummy variable, which takes on a value of one for deals involving same-city companies, and zero otherwise. Four dummies regarding the geographic distance between the acquirer and target cities are included, having deals with more than 1,000km as a benchmark (d_1<=Distance<d_2 indicates the dummy variable that takes on a value of one for deals in which the target is located between d_1 and d_2 km from the acquirer). FirmSize is measured as the natural logarithm of assets. Leverage is the ratio of the firm's total liabilities to total assets. Tobin's Q is measured as the market value of stocks and the book value of debt divided by the book value of the firm's assets. ROA is the ratio of net profits to total assets. CashHold is the ratio of cash and its equivalents over total assets. Relatedness is the dummy variable that takes on a value of one if the bidder and target have the same two-digit SIC (Standard Industry Classification) code, and zero otherwise. LnGrdp is the natural logarithm of the province's Gross Regional Domestic Product (GRDP). A and T at the end of this variable indicate the acquirer and target city, respectively. T-statistics are given in parentheses, *, **, *** denote statistical significance at the 10, 5, and 1 percent level, respectively.

Table 10
(Continued)

Centrality variable	(1)	(2)	(3)	(4)	(5)
	Raw DC and BC		Weighted DC and BC		CC
	Dependent variable: Completion				
DC_A	-0.019		-0.008		
	(-0.68)		(-0.83)		
DC _T	0.078***		0.030***		
	(2.99)		(3.35)		
BC_A		-0.006		0.174	
		(-0.41)		(0.50)	
BC _T		0.036**		0.440	
		(2.20)		(1.18)	
CC_A					-0.196
					(-0.60)
CC_T					1.077***
					(3.69)
lnAirfreq	0.014	0.019	0.013	0.024*	0.012
	(0.94)	(1.27)	(0.90)	(1.65)	(0.88)
SameCity	0.784***	0.821***	0.770***	0.858***	0.758***
	(6.31)	(6.72)	(6.19)	(7.22)	(6.19)
Distance<100	0.930***	0.929***	0.934***	0.925***	0.951***
	(3.77)	(3.77)	(3.78)	(3.76)	(3.83)
100<=Distance<200	0.740***	0.762***	0.726***	0.791***	0.731***
	(3.62)	(3.73)	(3.57)	(3.89)	(3.61)
200<=Distance<500	0.587***	0.606***	0.576***	0.638***	0.574***
	(3.63)	(3.75)	(3.56)	(3.97)	(3.57)
500<=Distance<1000	0.365***	0.376***	0.354***	0.389***	0.345***
	(2.91)	(2.99)	(2.82)	(3.10)	(2.75)
FirmSize	0.042	0.040	0.041	0.034	0.039
	(0.82)	(0.78)	(0.80)	(0.65)	(0.76)
Leverage	-0.230	-0.238	-0.228	-0.234	-0.234
	(-0.99)	(-1.03)	(-0.99)	(-1.01)	(-1.02)
Tobin’s Q	-0.074**	-0.074**	-0.074**	-0.077**	-0.074**
	(-2.33)	(-2.34)	(-2.34)	(-2.41)	(-2.31)
ROA	3.281***	3.255***	3.277***	3.254***	3.296***
	(3.38)	(3.39)	(3.38)	(3.41)	(3.38)
CashHold	0.471	0.460	0.476	0.434	0.437
	(1.21)	(1.19)	(1.22)	(1.13)	(1.12)
Relatedness	0.132	0.128	0.133	0.124	0.127
	(1.24)	(1.20)	(1.25)	(1.16)	(1.19)
LnGrdp_A	-0.0003	0.004	0.0004	0.014	0.008
	(-0.00)	(0.06)	(0.01)	(0.19)	(0.11)
LnGrdp_T	0.002	-0.0005	-0.001	-0.006	-0.010
	(0.03)	(-0.01)	(-0.01)	(-0.09)	(-0.15)
Constant	-0.147	-0.102	-0.152	-0.031	-0.151
	(-0.09)	(-0.06)	(-0.10)	(-0.02)	(-0.09)
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
N	4336	4336	4336	4336	4336
pseudo R^2	0.144	0.143	0.145	0.142	0.146

Table 11
Regression of bid price: Manufacturing and non-manufacturing targets

This table implements regressions of lnPBR (Models (1) to (4)) and BPremium (Models (5) to (8)). lnPBR is the natural logarithm of the total transaction value divided by the book value of the transferred shares (target firm's book equity multiplied by the proportion of transferred shares). BPremium is the total transaction value minus the book value of the transferred shares and divided by the book value of the transferred shares. The sample is divided into manufacturing (Models (1), (2), (5), and (6)) and non-manufacturing (Models (3), (4), (7), and (8)) targets based on the target firm's industry code. Raw centrality variables (DC and BC) are adopted. DC is Degree Centrality, measuring the availability of direct flights between a given city and other cities. BC is Betweenness Centrality, which measures the degree to which a city acts as a connecting point with other cities in the air transportation network. A and T at the variable end indicate the acquirer and target city, respectively. lnAirfreq is measured as the natural logarithm of one plus the number of direct flights between the bidder and the target city. SameCity is a dummy variable, which takes on a value of one for deals involving same-city companies, and zero otherwise. Four dummies regarding the geographic distance between the acquirer and target cities are included, having deals with more than 1,000 km as a benchmark (d_1<=Distance<d_2 indicates the dummy variable, which takes on a value of one for deals in which the target is located between d_1 and d_2 km from the acquirer). FirmSize is measured as the natural logarithm of assets. Leverage is the ratio of the firm's total liabilities to total assets. Tobin's Q is measured as the market value of stocks and the book value of debt divided by the book value of the firm's assets. ROA is the ratio of net profits to total assets. CashHold is the ratio of cash and its equivalents over total assets. RelativeSize is the ratio of the transaction value to the acquirer's market value at the time of deal completion. LnGrdp is the natural logarithm of the province's Gross Regional Domestic Product (GRDP). A and T at the end of the variable indicate the acquirer and target city, respectively. T-statistics are given in parentheses, *, **, *** denote statistical significance at the 10, 5, 1 percent level, respectively.

Table 11
(Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Target industry	Manufacturing		Non-manufacturing		Manufacturing		Non-manufacturing	
	Centrality variable: Raw DC and BC							
Dependent variable	lnPBR				BPremium			
DC_A	-0.008		0.002		-0.269		-0.319	
	(-0.58)		(0.10)		(-1.31)		(-0.93)	
DC _T	0.070***		0.055***		0.277		0.903**	
	(5.00)		(2.63)		(1.36)		(2.18)	
BC_A		-0.003		0.006		-0.130		-0.104
		(-0.29)		(0.54)		(-1.01)		(-0.53)
BC _T		0.044***		0.033***		0.189		0.544**
		(4.77)		(2.67)		(1.42)		(2.19)
lnAirfreq	0.003	0.004	0.006	0.005	0.285	0.272	-0.106	-0.134
	(0.30)	(0.35)	(0.50)	(0.43)	(1.37)	(1.26)	(-0.41)	(-0.53)
SameCity	-0.185***	-0.170***	-0.103	-0.101	0.416	0.454	-1.196	-1.231
	(-2.82)	(-2.60)	(-1.06)	(-1.06)	(0.41)	(0.46)	(-0.59)	(-0.62)
Distance<100	-0.061	-0.051	0.122	0.113	0.438	0.559	4.055	3.901
	(-0.62)	(-0.50)	(0.75)	(0.68)	(0.51)	(0.64)	(0.96)	(0.92)
100<=Distance<200	-0.096	-0.085	0.153	0.154	-0.462	-0.416	1.164	1.065
	(-1.13)	(-1.01)	(1.13)	(1.13)	(-0.56)	(-0.51)	(0.39)	(0.35)
200<=Distance<500	-0.057	-0.043	0.180	0.182	0.227	0.303	3.527	3.515
	(-0.63)	(-0.47)	(1.51)	(1.52)	(0.23)	(0.31)	(1.29)	(1.27)
500<=Distance<1000	0.102	0.105	0.173*	0.184*	1.348	1.400	1.495	1.671
	(1.37)	(1.40)	(1.70)	(1.82)	(1.18)	(1.24)	(0.80)	(0.91)
FirmSize	0.013	0.010	-0.031	-0.035	0.816*	0.817*	-0.035	-0.095
	(0.43)	(0.34)	(-0.93)	(-1.06)	(1.82)	(1.78)	(-0.06)	(-0.16)
Leverage	-0.174	-0.179	-0.784***	-0.782***	-3.048	-3.221	-9.329**	-9.259**
	(-0.97)	(-0.99)	(-3.75)	(-3.74)	(-1.09)	(-1.13)	(-2.22)	(-2.22)
Tobin's Q	0.064*	0.065*	-0.004	-0.006	0.767	0.765*	-0.344	-0.386
	(1.93)	(1.95)	(-0.12)	(-0.20)	(1.64)	(1.65)	(-0.58)	(-0.65)
ROA	1.397**	1.335*	0.350	0.377	14.080	13.540	-4.353	-3.862
	(1.97)	(1.88)	(0.54)	(0.58)	(1.40)	(1.36)	(-0.37)	(-0.33)
CashHold	0.353*	0.352*	-0.257	-0.284	3.448	3.292	-4.459	-4.933
	(1.73)	(1.74)	(-1.16)	(-1.29)	(0.96)	(0.93)	(-1.33)	(-1.48)
RelativeSize	0.428***	0.431***	0.247***	0.246***	6.026***	6.026***	3.453**	3.462**
	(4.98)	(5.09)	(4.26)	(4.27)	(2.60)	(2.61)	(2.32)	(2.32)
Relatedness	-0.144***	-0.141***	0.024	0.016	0.168	0.169	1.116	1.038
	(-2.72)	(-2.67)	(0.30)	(0.21)	(0.18)	(0.18)	(0.67)	(0.62)
LnGrdp_A	-0.047	-0.045	-0.034	-0.032	-1.423	-1.399	-1.218	-1.182
	(-1.07)	(-1.01)	(-0.65)	(-0.60)	(-1.63)	(-1.59)	(-1.20)	(-1.15)
LnGrdp_T	0.068	0.070	0.029	0.030	0.970	0.984	0.185	0.205
	(1.51)	(1.54)	(0.60)	(0.61)	(1.08)	(1.10)	(0.21)	(0.23)
Constant	-0.069	-0.093	1.779**	1.880**	-10.677	-11.121	15.872	17.341
	(-0.10)	(-0.14)	(1.99)	(2.05)	(-1.26)	(-1.31)	(1.25)	(1.38)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	740	740	839	839	740	740	839	839
Pseudo/adj. R^2	0.267	0.267	0.328	0.329	0.110	0.110	0.110	0.110

Table 12
Regression of bid price: Diversifying and horizontal M&As

This table implements regressions of lnPBR (Models (1) to (4)) and BPremium (Models (5) to (8)). lnPBR is the natural logarithm of the total transaction value divided by the book value of the transferred shares (target firm's book equity multiplied by the proportion of the transferred shares). BPremium is the total transaction value minus the book value of the transferred shares and divided by the book value of the transferred shares. The sample is divided into diversifying (Models (1), (2), (5), and (6)) and horizontal (Models (3), (4), (7), and (8)) deals based on the acquirer and target firm's industry codes. Raw centrality variables (DC and BC) are adopted. DC is Degree Centrality, measuring the availability of direct flights between a given city and other cities. BC is Betweenness Centrality, which measures the degree to which a city acts as a connecting point with other cities in the air transportation network. A and T at the variable end indicate the acquirer and target city, respectively. lnAirfreq is measured as the natural logarithm of one plus the number of direct flights between the bidder and the target city. SameCity is a dummy variable, which takes on a value of one for deals involving same-city companies, and zero otherwise. Four dummies regarding the geographic distance between the acquirer and target cities are included, having deals with more than 1,000 km as a benchmark (d_1<=Distance<d_2 indicates the dummy variable, which takes on a value of one for deals in which the target is located between d_1 and d_2 km from the acquirer). FirmSize is measured as the natural logarithm of assets. Leverage is the ratio of the firm's total liabilities to total assets. Tobin's Q is measured as the market value of stocks and the book value of debt divided by the book value of the firm's assets. ROA is the ratio of net profits to total assets. CashHold is the ratio of cash and its equivalents over total assets. RelativeSize is the ratio of the transaction value to the acquirer's market value at the time of deal completion. LnGrdp is the natural logarithm of the province's Gross Regional Domestic Product (GRDP). A and T at the end of the variable indicate the acquirer and target city, respectively. T-statistics are given in parentheses, *, **, *** denote statistical significance at the 10, 5, 1 percent level, respectively.

Table 12
(Continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample	Diversifying		Horizontal		Diversifying		Horizontal	
	Centrality variable: Raw DC and BC							
Dependent variable	lnPBR				BPremium			
DC_A	0.002		-0.016		-0.139		-0.671	
	(0.14)		(-0.77)		(-0.61)		(-1.60)	
DC _T	0.060***		0.082***		0.569**		0.844*	
	(3.67)		(4.25)		(2.02)		(1.87)	
BC_A		0.004		-0.007		-0.071		-0.315
		(0.42)		(-0.57)		(-0.50)		(-1.22)
BC _T		0.040***		0.043***		0.436**		0.408
		(4.05)		(3.32)		(2.56)		(1.45)
lnAirfreq	0.002	0.0002	0.011	0.014	-0.084	-0.121	0.324	0.351
	(0.15)	(0.02)	(0.80)	(1.01)	(-0.41)	(-0.62)	(0.99)	(1.05)
SameCity	-0.175**	-0.174**	-0.057	-0.025	-1.364	-1.452	2.245	2.607
	(-2.21)	(-2.24)	(-0.67)	(-0.29)	(-0.90)	(-0.98)	(1.27)	(1.51)
Distance<100	-0.018	-0.022	0.221	0.234	-0.243	-0.257	8.965	9.219
	(-0.16)	(-0.20)	(1.18)	(1.21)	(-0.16)	(-0.17)	(1.50)	(1.51)
100<=Distance<200	-0.002	0.0001	0.151	0.166	-0.106	-0.150	3.160	3.303*
	(-0.01)	(0.00)	(1.21)	(1.33)	(-0.05)	(-0.06)	(1.62)	(1.69)
200<=Distance<500	-0.001	-0.001	0.185	0.196	0.027	-0.049	5.415	5.622
	(-0.01)	(-0.02)	(1.31)	(1.37)	(0.02)	(-0.03)	(1.52)	(1.56)
500<=Distance<1000	0.129	0.137*	0.173*	0.175*	1.166	1.278	3.078*	3.138*
	(1.58)	(1.67)	(1.86)	(1.88)	(0.86)	(0.94)	(1.65)	(1.70)
FirmSize	-0.039	-0.042	0.059	0.055	-0.130	-0.148	1.696**	1.674**
	(-1.41)	(-1.51)	(1.44)	(1.34)	(-0.29)	(-0.32)	(2.10)	(2.07)
Leverage	-0.388**	-0.389**	-0.807***	-0.799***	-4.563	-4.559	-12.858**	-13.180**
	(-2.11)	(-2.13)	(-3.23)	(-3.17)	(-1.24)	(-1.24)	(-2.55)	(-2.54)
Tobin's Q	0.024	0.022	0.043	0.045	0.038	0.015	0.501	0.528
	(0.90)	(0.82)	(0.82)	(0.84)	(0.08)	(0.03)	(0.66)	(0.69)
ROA	0.784	0.793	0.831	0.846	9.574	9.648	-0.724	-1.595
	(1.19)	(1.20)	(1.02)	(1.04)	(0.88)	(0.88)	(-0.05)	(-0.10)
CashHold	-0.027	-0.042	-0.037	-0.039	-2.979	-3.106	-0.052	-0.284
	(-0.13)	(-0.20)	(-0.15)	(-0.16)	(-0.90)	(-0.95)	(-0.01)	(-0.06)
RelativeSize	0.247***	0.249***	0.456***	0.457***	2.703**	2.721**	7.873***	7.862***
	(4.29)	(4.34)	(5.07)	(5.10)	(1.97)	(1.97)	(2.88)	(2.87)
LnGrdp_A	-0.027	-0.026	-0.054	-0.051	-0.677	-0.670	-2.768**	-2.660*
	(-0.63)	(-0.59)	(-0.94)	(-0.88)	(-0.87)	(-0.86)	(-2.03)	(-1.96)
LnGrdp_T	0.049	0.052	0.042	0.036	-0.012	0.027	1.790	1.708
	(1.14)	(1.19)	(0.81)	(0.69)	(-0.02)	(0.04)	(1.46)	(1.40)
Constant	1.355*	1.428*	-0.645	-0.642	10.758	11.266	-19.446	-19.524
	(1.72)	(1.77)	(-0.78)	(-0.76)	(1.18)	(1.25)	(-1.44)	(-1.44)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1015	1015	564	564	1015	1015	564	564
Pseudo/adj. R^2	0.263	0.266	0.399	0.393	0.107	0.110	0.119	0.115

Table 13
Regression results: Alternative measures of transportation convenience

This table implements regressions of lnPBR (Models (1) to (3)) and BPremium (Models (4) to (6)) by adopting alternative measures of transportation convenience: the national fixed assets investments in urban service facilities in the Road and Bridge (RoadBridge), new fixed assets of the current year (NewFixedAsset), and the number of vehicles in service in the urban rail transit system (Vehicles). A and T at the variable end indicate the acquirer and target city, respectively. lnPBR is the natural logarithm of the total transaction value divided by the book value of the transferred shares (target firm's book equity multiplied by the proportion of the transferred shares). BPremium is the total transaction value minus the book value of the transferred shares and divided by the book value of transferred shares. SameCity is a dummy variable, which takes on a value of one for deals involving same-city companies, and zero otherwise. Four dummies regarding the geographic distance between the acquirer and target cities are included, having deals with more than 1,000 km as a benchmark (d_1<=Distance<d_2 indicates a dummy variable, which takes on a value of one for deals in which the target is located between d_1 and d_2 km from the acquirer). FirmSize is measured as the natural logarithm of assets. Leverage is the ratio of the firm's total liabilities to total assets. Tobin's Q is measured as the market value of stocks and the book value of debt divided by the book value of the firm's assets. ROA is the ratio of net profits to total assets. CashHold is the ratio of cash and its equivalents over total assets. RelativeSize is the ratio of the transaction value to the acquirer's market value at the time the deal was completed. Relatedness is a dummy variable that takes on a value of one if the bidder and target have the same two-digit SIC (Standard Industry Classification) code, and zero otherwise. LnGrdp is the natural logarithm of the province's Gross Regional Domestic Product (GRDP). A and T at the variable end indicate the acquirer and target city. T-statistics are given in parentheses, *, **, *** denote statistical significance at the 10, 5, and 1 percent levels, respectively.

Table 13
(Continued)

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)
Estimation	lnPBR			BPremium		
RoadBridge_A	0.008			-0.005		
	(1.52)			(-0.07)		
RoadBridge_T	0.010**			0.138**		
	(2.28)			(2.32)		
NewFixedAsset_A		0.010**			0.095	
		(1.97)			(1.32)	
NewFixedAsset_T		0.009**			0.092*	
		(2.19)			(1.65)	
Vehicles_A			-0.001			-0.187
			(-0.17)			(-1.49)
Vehicles_T			0.035***			0.453***
			(5.23)			(3.46)
SameCity	-0.159***	-0.156***	-0.132***	-0.447	-0.398	-0.162
	(-3.08)	(-3.03)	(-2.62)	(-0.49)	(-0.44)	(-0.18)
Distance<100	-0.046	-0.044	0.012	1.754	1.798	2.480
	(-0.48)	(-0.46)	(0.13)	(0.82)	(0.84)	(1.17)
100<=Distance>200	0.003	0.008	0.034	0.296	0.339	0.493
	(0.03)	(0.11)	(0.44)	(0.23)	(0.26)	(0.38)
200<=Distance<500	0.025	0.031	0.070	1.832	1.900	2.075
	(0.34)	(0.41)	(0.93)	(1.30)	(1.35)	(1.50)
500<= Distance<1000	0.098	0.102	0.144**	1.214	1.275	1.648
	(1.55)	(1.61)	(2.30)	(1.11)	(1.18)	(1.53)
FirmSize	-0.003	-0.004	-0.000	0.460	0.424	0.530
	(-0.13)	(-0.16)	(-0.02)	(1.13)	(1.05)	(1.36)
Leverage	-0.567***	-0.569***	-0.562***	-7.281**	-7.264**	-7.225**
	(-3.95)	(-3.97)	(-3.92)	(-2.57)	(-2.56)	(-2.57)
Tobin's Q	0.035	0.035	0.031	0.203	0.196	0.182
	(1.53)	(1.53)	(1.33)	(0.53)	(0.51)	(0.47)
ROA	0.683	0.662	0.795	2.704	2.670	3.816
	(1.39)	(1.33)	(1.61)	(0.32)	(0.31)	(0.45)
CashHold	0.035	0.030	-0.003	-1.583	-1.690	-1.455
	(0.23)	(0.20)	(-0.02)	(-0.60)	(-0.64)	(-0.56)
RelativeSize	0.333***	0.333***	0.328***	4.644***	4.641***	4.553***
	(6.48)	(6.51)	(6.56)	(3.43)	(3.44)	(3.44)
Relatedness	-0.084*	-0.088*	-0.083*	0.183	0.169	0.221
	(-1.84)	(-1.94)	(-1.85)	(0.22)	(0.20)	(0.26)
LnGrdp_A	-0.042	-0.040	-0.038	-1.202*	-1.234*	-1.179*
	(-1.22)	(-1.17)	(-1.13)	(-1.83)	(-1.89)	(-1.84)
LnGrdp_T	0.025	0.026	0.028	0.271	0.313	0.316
	(0.76)	(0.77)	(0.87)	(0.45)	(0.52)	(0.53)
Constant	0.827	0.813	0.868	1.345	1.765	0.813
	(1.36)	(1.33)	(1.45)	(0.17)	(0.22)	(0.11)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
N	1566	1566	1566	1566	1566	1566
Pseudo/adj. R^2	0.305	0.306	0.318	0.118	0.118	0.126