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Trade Networks and Cross-Border Acquisitions: Evidence from United States Acquiring Firms*

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Abstract

This study examines the impact of the trade networks of target firms' nation on the announcement returns of the cross-border acquisitions of United States acquirers. By using a sample of 818 cross-border acquisitions during 2000–2007, we find that the centrality measure of trade networks has a positive impact on announcement returns, after controlling for Hofstede's cultural distance measure between the acquiring and target nations and various firm- and deal-specific factors. In sum, trade network analysis, based on strength centrality, better explains the performance of acquiring firms than does the bilateral trade openness measurement used in previous studies.

Keywords Centrality; Cross-border mergers and acquisitions; Cultural distance; Network analysis; World trade network

JEL Classification: G15, G34

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1 Introduction

The world economy has liberalized through deregulation in recent decades. Thus, global financial and product markets have become globalized and open to other countries (Helleiner, 1995), resulting in their greater integration. The globalization of the world market has led both real and financial economies (i.e. trade and financial transactions, respectively) to become integrated (Vo and Daly, 2007). Accordingly, cross-border mergers and acquisitions (M&As) have increased significantly in terms of volume and frequency (Martynova and Renneboog, 2008). However, although global markets are integrated and cross-border acquisitions are prevalent in these markets, variations still exist between the target and acquiring nations in terms of both country-specific (i.e. culture, religion, language) and deal-specific (i.e. payment methods) factors (Morosini *et al.*, 1998; Rossi and Volpin, 2004; Chakrabarti *et al.*, 2008; Aybar and Ficici, 2009; Ahern *et al.*, 2015). Therefore, it is meaningful to investigate the determinants that may affect the stock market evaluation of cross-border merger decisions.

Previous cross-border merger studies have focused on the bilateral relationship between the target and acquiring nations, analyzing, for example, trade openness and cultural distance as the major determinants of the volume and performance of those mergers. However, as global markets have become increasingly integrated, trade openness needs to be measured more comprehensively and new dimensions of cultural distance[1] are required to analyze how they affect the performance of cross-border mergers. Thus, in this study, by using network analysis, we measure the national trade connectivity of the target nations to other countries and examine its impact on the performance of the cross-border acquisitions of United States firms, after controlling for the various dimensions of cultural distance as well as both deal- and firm-specific factors.

In the rising international trade literature, the application of network analysis has played an important role, in both theoretical and empirical approaches. In particular, the cross-border merger literature measures the openness of a country by using international trade volume (Chakrabarti *et al.*, 2008) and gravity models (Di Giovanni, 2005; Ahern *et al.*, 2015) as the crucial determinants of the performance of cross-border mergers. However, the traditional, bilateral trade volume variable only considers *total* trade volume with various countries or the trade connectivity between the target and acquirer, with the trade relations of other individual countries held constant, while gravity models typically consider the physical distance of the target and acquiring nations (Chakrabarti *et al.*, 2008; Erel *et al.*, 2012). In other words, only the interdependences between two nations are measured. Therefore, to measure all possible trading interactions (or connectivities) for the target

[1]Stulz and Williamson (2003) argue that national culture explains the variations in the shareholder protection of the local economy better than does a country's trade openness.

nation with the rest of the world, we must measure the relative position of trade among all countries that have trading relations.

De Benedictis and Tajoli (2011) suggest that geographical representation is moving from "physical space to topological space" using network analysis. They argue, "The position of each country does not depend only on its bilateral links, but also on the indirect effect of others: the trade partners of the country will contribute to the determination of the country's position in the trade network. Thus, network analysis enables us to measure the effect of the relationship between the trading countries and structure of the network itself, revealing patterns that are difficult to see using other approaches" (p. 296). As such, they argue that the benefit of trading network analysis is that "it focuses on the structural dimension of trade relations and on the interdependence of countries, that is, the starting point of network analysis can nicely complement other empirical analysis such as the gravity model" (p. 339). In sum, as the world economy is becoming more globalized and complex, the importance of direct and indirect interactions among countries for decision making is growing. Network analysis provides a comprehensive method for capturing those relations and consequently, investigating the relationship between target and acquiring nations in international trade network contexts may provide valuable insights into understanding the determinants of cross-border acquisition returns.

In this study, we examine whether acquisitions with target nations that have stronger trade network connectivity result in higher returns for acquiring firms because highly interconnected countries operate in a more efficient setting for those acquirers that function in a multinational environment. International M&As have increased since the early 1990s (Martynova and Renneboog, 2008). Because domestic transactions dominated the M&A market until that point, the globalization of M&As is one of the most striking features of the global economy. International deals, unlike domestic ones, thus provide an important means for multinational companies to achieve global market power.

In addition, analyses of the cultural distance between acquiring and target firms have become the main focus of research (Morosini *et al.*, 1998; Rossi and Volpin, 2004; Chakrabarti *et al.*, 2008; Aybar and Ficici, 2009; Ahern *et al.*, 2015). National economic factors can be critical for cross-border acquisitions, since these acquisitions are an important way of gaining international market power. As such, recent studies have started to focus on the economic differences between acquiring and target nations as well as the openness of the target nation to the international trade market (Rossi and Volpin, 2004; Chakrabarti *et al.*, 2008). These studies have introduced the concept of bilateral trade openness between target and acquiring nations, using export and import trade volume data, and have empirically shown a positive and significant relationship between the cross-border performance of M&As and bilateral trade. However, the methodologies adopted in the cross-border literature do not consider international trade to be a network, although researchers in international economics have long considered international trade to be a network structure (De Benedictis and Tajoli, 2011), and do not capture all international trade

connectivity, considering the complexity inherent in world trade linkages. In other words, the concept of bilateral trade openness is limited and the measurement of trade openness should be more than bilateral because of the integrated and interconnected world economy. Likewise, adopting network analysis can complement the measure of a simple bilateral relationship based on the trade volume of the target. Therefore, instead of bilateral trade variables, by using various centrality measures of the trade network, we contribute to the literature by showing that the trade network has a positive impact on the announcement returns of acquiring firms.

Ahern *et al.* (2015) argue that cultural values have a significant impact on financial outcomes in international transactions, such as foreign direct and equity investments, venture capital flows, the cost of borrowing, stock market participation, and stock price momentum. Therefore, the disparity in cultural values between acquiring and target nations must be critical for cross-border mergers, where the incompatible cultures of two entities should be fused for successful post-merger integration. As such, in addition to trade networks, we control for the cultural distance between target and acquiring nations because not only is cultural disparity important in international transactions, it is also the most commonly used variable in recent cross-border M&A studies (Chakrabarti *et al.*, 2008; Reus and Lamont, 2009; Erel *et al.*, 2012; Ahammad *et al.*, 2016). Thus, in this study, we use Hofstede's cultural distance measure as a control variable. Chakrabarti *et al.* (2008) show that this measure has a significant impact on the announcement returns of mergers and on post-merger long-term performance. In addition to the four dimensions of Hofstede's cultural disparity measurements, as used by Chakrabarti *et al.* (2008), we add two additional measurements — pragmatic versus normative (PRA) and indulgence versus restraint (IND) — which have not been examined in previous cross-border merger studies.

In this study, we use a sample of 818 acquisitions from United States acquiring firms and 42 target nations during 2000–2007, and we measure announcement returns by using the market model event study to evaluate the market reaction. We also use out- and in-strength-percent centralities to measure the degree of trade network connectivity of target nations compared with other nations, using trade volume data taken from the World Bank. For our robustness test using different network analyses, we examine the impact of weighted-in and -out eigenvector centralities. Thus, we contribute to the literature by investigating the impact of centrality in the world trade network of target nations on the performance of M&As, after controlling for cultural distance (Hofstede's cultural distance measure as well as PRA and IND), firm-specific factors (i.e. firm size, profitability, financial leverage), country-specific factors (i.e. language, religion), and deal-specific effects (i.e. payment method, hostile merger indicators, industry, listing status of target firms). We find that acquisitions with target nations having more centrality in cross-border trade networks yield higher returns for acquiring companies.

The rest of the paper is organized as follows. Section 2 describes previous research and develops the hypothesis. Section 3 presents the sample selection and

applied methodologies, followed, in Section 4, by a discussion of the effect of trade network centrality and cultural distance on the post-performance of cross-border acquisitions. Finally, this paper concludes with the summarized results and several suggestions for future research in this area, in Sections 5 and 6.

2. Literature Review and Hypothesis Development

2.1. Network Analysis in Social Science and Business

Network analysis has rapidly evolved in the area of social science. The growth and application of network analysis has expanded into the fields of sociology, economics, and business, all considered to be "social networks." The earliest application of social networks was the work of Moreno (1934) that analyzes the inter-agent relationship using a sociogram. During the 1960s at Harvard, mainstream network analysis was formed by merging three theories: sociometric analysis and graph theory, interpersonal configurations and cliques, and the theories developed by social physicists (Vega-Redondo, 2007; Scott, 2012). In addition, physicians have recently used network analysis to explain the various complex social phenomena prevalent in society (Scott, 2012).

Network analysis is applied to various fields of social sciences to explain the individual, corporate, and national levels of phenomena. Moreover, to account for prevalent social phenomena, social scientists apply network analysis to derive better outcomes (Borgatti *et al.*, 2009). Further, network analysis has been adopted in the fields of national security, public health, and management consulting to better understand the insight into, and expertise shared within, groups (Levy *et al.*, 2002; Borgatti *et al.*, 2009).

Since centrality, a well-known methodology in network analysis, can capture the positions of a node in the network structure, network methodology serves as a popular tool for measuring complex relationships in broad areas of research such as marketing, accounting, and economics (De Benedictis and Tajoli, 2011; Goyal, 2012; Horton *et al.*, 2012; Yoganarasimhan, 2012). For example, Yoganarasimhan (2012) examines the positions of writers in a local network in terms of their connectivity, clustering, and centrality, which are frequently adopted tools in network analysis. Further, Horton *et al.* (2012) use the network measure to explain the relationship between the board of directors' connectivity and its level of compensation.

In addition, business and finance studies have adopted network analysis to measure the interconnections between banks in the Italian overnight money market and Austrian banking system as well as the networks among managers and boards of directors (Battiston *et al.*, 2003; Boss *et al.*, 2004; Fracassi, 2008; Iori *et al.*, 2008). In addition to network analysis at the individual level, bilateral cross-border trade networks have been examined by using social network analysis at the national level. For example, Schiavo *et al.* (2010) show that international integration has been strengthened in products and commodities rather than in financial markets.

2.2. Network Analysis in Trade Openness

Network analysis focuses on indirect relationships with others rather than on one's own characteristics, since it is difficult to explain fully recent economic or social phenomena by only their features and bilateral relationships. De Benedictis and Tajoli (2011) explore world trade networks by using a centrality measurement, arguing that the use of centrality measurements is better because "representing a network of trade flows is to give emphasis to the relationship between the countries in the network and the structure, or the systemic feature, of the network itself" (p. 1418). They also state that world trade should be considered a network and thus analyzed by using various network analysis measurements such as centrality measurements, because they complement trade openness measures such as gravity models (Anderson and Van Wincoop, 2003; Helpman *et al.*, 2007).

Degree, closeness, and betweenness centralities are widely used in network analysis (De Benedictis and Tajoli, 2011; Yoganarasimhan, 2012). However, these measurements also have limitations, including the fact that they are only useful in rigorously binary connections between nodes (Bonacich, 2007). In particular, centrality measures are separated into two groups: weighted and unweighted measures. Among weighted centrality measurements, strength centrality measures give scores and priorities depending on the connections of the nodes (nations) (De Benedictis and Tajoli, 2011). Therefore, we can analyze the position of each nation accurately by using weighted centrality measurements. More specifically, there are two measures of strength centrality: in-strength centrality, which measures the number of edges (trade partners) entering the node (nation), and out-strength centrality, which measures the number of edges (trade partners) exiting the node (nation). Following the strength equation, we obtain the values of the in- and out-strength centralities for each year. In the regression model, the strength centralities of the target nation are represented as "Out-Strength" and "In-Strength," and used as major determinants to explain acquisition returns. Furthermore, in contrast to unweighted measurements, these two types of strength-percent centralities are weighted differently depending on the centralities of the variables; thus, they provide advanced measures of power in complex networks. Hence, in this study, we use out- and in-strength-percent centralities to investigate world trade networks.

2.3. Cross-Border M&As and Trade Openness

Openness, measured by using national trade volume, can explain the performance of acquiring companies. Generally, the openness measurement, which is computed by dividing a nation's import and export volume by its GDP (Chakrabarti *et al.*, 2008), shows how much one nation is open to other trade partners or world economies. In addition, Chakrabarti *et al.* (2008) argue that the openness of target nations can be a useful resource for acquirers. Indeed, previous studies have found a positive relationship between trade openness and the evaluation of cross-border acquisitions. Moreover, Rossi and Volpin (2004) show that bilateral trade between two acquisition parties positively and significantly affects the propensity for cross-

border deals. Further, although they find the reverse results for the bilateral trade variables of long-term returns for United States acquirers, Chakrabarti *et al.* (2008) conclude that the openness of the target nation to international trade is also an important factor of firm performance with regard to cross-border acquisitions.

2.4. Hypothesis Development

As discussed in previous sections, in recent international M&A studies, the trade relationship, which is referred to as the "openness" between the two acquisition parties, measured by bilateral trade, has emerged as an important factor of M&A performance (Rossi and Volpin, 2004; Chakrabarti *et al.*, 2008; Erel *et al.*, 2012). In addition, as described in Section 2.2, we observe the trend in international trade analyses of adopting network analysis. Besides the properties of countries, network analysis investigates the relationships among countries and emphasizes the power of flow in bilateral trade (De Benedictis and Tajoli, 2011). Moreover, bilateral trade should be investigated as a network and more priority should be given to the interconnectedness among countries rather than countries' attributes.

Stulz and Williamson (2003) argue that the openness of a country positively affects the creditor rights and enforcement of those rights; thus, the impact of openness reduces the local culture that may cause frictions to foreign business partners such as multinational companies operating in the local economy. Similarly, Erel *et al.* (2012) argue that the boundaries of nations are correlated with the friction faced by the firms. Therefore, if the nation's boundaries have less friction through higher openness, its multinational firms may benefit.

We argue that acquisitions with target nations more open to the world trade network may provide acquiring companies with the opportunity to expand globally, allowing them to operate efficiently and support the functioning of the newly acquired division (Chakrabarti *et al.*, 2008). Furthermore, acquisitions with target nations that have stronger power through international connectivity in their trade networks may allow managers of acquiring firms to make the post-merger integration process more efficient; higher international connectivity may induce higher market valuation. Thus, we propose the following:

Hypothesis: The world trade network connectivity of the target nation has a positive impact on the announcement returns of the United States acquiring firms of cross-border mergers.

3. Variables

3.1. Centralities

Since the 1970s, the centrality methodology in physics and economics has aimed to capture the level of connectivity in reciprocal relationships or social networks. Further, it can be broadly separated into two groups: local and global centralities. Local centrality only focuses on direct relationships or contacts, while ignoring the

indirect; thus, it shows the comparative importance of one point among its own direct connections. With regard to local centrality, two measurements are prevalent in network analysis: degree and strength centralities. Degree centrality is obtained by the number of close neighborhoods of a point, and is an unweighted measurement. Since this measurement only focuses on the number of adjacent nodes, it does not consider the size of the graph (i.e. trade volume). Strength centrality is calculated by using the weights of the size of the graph (i.e. trade volume). However, it also has limitations because of its lack of consideration of the relative connections with its neighbors. Owing to globalization, nations are highly connected to each other; therefore, it would be more meaningful to analyze the world trade network by using trade volume data. Thus, in this study, we use two types of strength centrality as the main components to explain connectivities in the world trade network. Among the various strength centrality methods, we especially use those normalized by the sum of the weights of total world trade.

Differing from local centralities that focus on direct relationships, global centralities are designed to analyze the whole structure of the network, or the network itself. Thus, they also focus on the indirect relationships among the nodes, and their strategic positions in the whole network are more important in these measures. Closeness centrality is a type of measurement of global centrality, and is designed to see the topological or geodesic distance between one specific point and all other points in the overall network. In this study, topological distance means the number of trade partners needed to finally reach the nation.

Another measure of global centrality is eigenvector centrality, which focuses on the characteristics of nodes. Therefore, one with high eigenvector centrality is the point that has a large number of connections with other points in the whole network. Different from the other measurements, eigenvector centrality weighs variables differently, depending on the their centralities (Bonacich, 1972). Eigenvectors and eigenvector centrality provide advanced measures of power in complex networks (Bonacich, 2007). As such, we use weighted-out (export) and -in (import) eigenvector centrality, which weights unweighted eigenvector centralities by using mean bilateral trade volume. Although there are only 42 target nations in this study, we collect all the data provided to capture the target nation's centrality in the entire world trade network.

3.2. Cultural Distance

In addition to openness factors, cultural factors help determine the success of cross-border M&As. Although recent studies have discussed the effects of cultural disparity on M&A returns, there is some controversy surrounding this issue. Morosini *et al.* (1998) posit that cultural distance has both positive and negative effects on cross-border acquisitions, as it creates synergies between the target and acquiring firms, but also disrupts the post-merger integration. Further, they empirically show that cultural distance positively affects the sales growth of acquiring firms, since it provides a variety of patterns and methods in the management and business

operations of the firm. However, their study only uses the percentage of sales growth as the dependent variable to show the performance of the acquiring company (Morosini *et al.*, 1998). Indeed, more recent studies have shown that the acquisitions of more culturally dispersed firms result in higher returns in the long-term (Chakrabarti *et al.*, 2008).

By contrast, some studies argue that cultural distance can negatively affect the shareholder returns of acquiring firms, since it can be costly to these firms and cultural risk affects the post-acquisition process (Stahl and Voigt, 2008). Further, Datta and Puia's (1995) findings reveal a negative effect of cultural fitness on shareholders in cross-border acquisitions in the United States. Their study contributes to the literature, as it focuses on the announcement effect rather than on long-term performance.

In addition to the cultural difference factors of Hofstede (1984), cultural factors such as language and religion are important variables in international finance studies (Stulz and Williamson, 2003; Rossi and Volpin, 2004; Chakrabarti *et al.*, 2008; Ahern *et al.*, 2015). Stulz and Williamson (2003) argue that language can promote the transfer of ideas among employees during international acquisitions, while religion can be a route for innovation and plays a key role in finance. When two acquisition partners share the same language, the propensity for cross-border acquisitions is positively affected, whereas that for domestic deals is unaffected (Rossi and Volpin, 2004). Therefore, language and religion affect the values, resource allocations, and institutions of a country (Stulz and Williamson, 2003).

We examine cultural factors using several variables. First, we use the cultural distance measure developed by Hofstede (1980), and Hofstede and Hofstede (2001). Moreover, we observe cultural disparity by using the following six-dimensional factors: the power distance index (PDI), individualism versus collectivism (IDV), masculinity versus femininity (MAS), uncertainty avoidance (UAI), PRA, and IND. Each variable is calculated as the absolute difference between the target and acquiring nations. To capture the impact of each variable, we run the regression with the six variables separately. In addition, we investigate the overall influence of cultural disparity by using equation (1) (Morosini *et al.*, 1998). However, the significant results with separate variables are not shown, and thus we do not include these variables in our regression models. Instead, we use LN(Aggregate Cultural Distance), the natural logarithm of aggregate cultural distance, to examine the combined influence of the six-dimensional factors of Hofstede's cultural distance measure:

$$\text{Aggregate Cultural Distance(T, U)} = \sqrt{\sum_{i=1}^{6} \left(H_{i,t} - H_{i,u}\right)^2} \tag{1}$$

We also investigate the impact of language, religion, and legal origin on acquisition returns. In addition, we construct a dummy language variable coded one if the

target and acquiring nations share the same first language and zero otherwise. Moreover, we construct a dummy religion variable coded one if the target and acquiring nations share the same primary religion and zero otherwise. Further, we construct a dummy common law variable, since all United States acquiring companies follow common law (coded one if the legal origin of the target nation is common law rather than civil law and zero otherwise). All the required data are obtained from the CIA World Factbook.

4. Data and Descriptive Statistics

4.1. Sample

Our empirical analysis of cross-border acquisitions is based on a sample of M&As from 2000 to 2007. Acquisitions data are obtained from the Securities Data Corporation (SDC) Platinum M&A database. First, we obtained all acquisitions observations from United States acquirers, excluding targets or acquirers from the financial industry. From there, we selected events that met the following six criteria: (i) the acquirer is publicly traded; (ii) the deal has been completed; (iii) the target or acquirer is not from the utility industry, SIC codes 4900–4999; (iv) the acquirer owns 100% of the shares of the target firm after the transaction; (v) the United States is not the target nation; and (vi) the target nations have trade volume data. We narrowed our selection to 818 samples, with the United States as the acquiring nation and 42 target nations.

Table 1 shows the number of transactions for each target nation in 2000–2007. As shown in Panel A, the majority of acquisitions with the United States as the acquirer was made by the top two target nations, the United Kingdom and Canada. In addition, the number of cross-border mergers by United States acquirers increased in 2000–2007. Panel B of Table 1 shows the number of acquisitions, categorized by the main industry sector of acquirers and target companies in descending order. The top five industry sectors frequently involved in cross-border M&As by United States acquirers during the sample period were "Electronic and Electrical Equipment," "Business Services," "Measuring, Medical, Photo Equipment; Clocks," "Prepackaged Software," and "Machinery."

4.2. Descriptive Statistics

Complex network analysis can explain the complexity of world trade networks and show the relative position and power of target nations. Table 2 shows the target nations' strength centralities in the world trade network and openness measurement, ranked in descending order in Panel A and ascending order in Panel B. The order fluctuates from year to year. We also add the openness measurement previously adopted in financial and economic studies to explain the degree of exposure to the world trade network. This measurement is computed by dividing one nation's export and import volume per year by its own GDP volume. Although the basic concepts are implicit in both methodologies, when comparing the out- and

Table 1 Sample distribution

Table 1 presents the breakdown of the sample of target nations that conducted cross-border acquisitions. There are 818 M&A deals acquired by United States firms from 42 target nations. Panel A shows the number of acquisitions categorized by target nation and year, while Panel B shows the number of acquisitions categorized by the acquirer and target's industry sectors. The sample period is from 2000 to 2007.

Panel A: Target Nation

Target Nation	No. of Acquisitions	2000	2001	2002	2003	2004	2005	2006	2007
United Kingdom	173	13	16	19	17	32	32	19	25
Canada	146	11	24	17	12	18	11	24	29
Germany	95	5	9	13	6	21	12	14	15
France	62	2	8	9	4	9	11	6	13
Australia	36	1	4	6	4	5	6	5	5
Israel	31	4	1	2	2	4	4	10	4
Netherlands	27	3	1	2	6	3	3	3	6
China	22	0	3	1	3	3	4	3	5
Switzerland	22	1	3	2	4	1	3	4	4
Sweden	19	3	3	0	0	2	1	4	6
Italy	17	2	3	0	2	3	2	2	3
Japan	13	2	1	4	0	1	1	2	2
Belgium	12	0	3	1	1	3	2	2	0
Denmark	12	1	3	1	2	0	2	1	2
Taiwan	12	2	1	0	0	4	3	2	0
Spain	11	2	1	1	0	4	1	2	0
Brazil	10	1	0	0	1	1	2	3	2
Ireland-Rep	10	0	0	2	0	2	1	3	2
Others	88	5	7	9	7	15	13	13	19
Total	818	58	91	89	71	131	114	122	142

Panel B: Industry classification

Acquirer industry sector	No. of acquisitions	Target industry sector	No. of acquisitions
Electronic and electrical equipment	97	Business Services	114
Measuring, medical, photo equipment; clocks	92	Prepackaged Software	110
Business services	92	Electronic and Electrical Equipment	79
Prepackaged software	82	Measuring, Medical, Photo Equipment; Clocks	74
Machinery	60	Machinery	43
Drugs	44	Drugs	40

Table 1 (*Continued*)

Panel B: Industry classification

Acquirer industry sector	No. of acquisitions	Target industry sector	No. of acquisitions
Oil and gas; petroleum refining	35	Chemicals and Allied Products	34
Metal and metal products	34	Oil and Gas; Petroleum Refining	33
Computer and office equipment	34	Metal and Metal Products	28
Chemicals and allied products	27	Wholesale Trade-Durable Goods	25
Food and kindred products	23	Food and Kindred Products	19
Communications equipment	23	Communications Equipment	18
Transportation equipment	16	Transportation Equipment	18
Wholesale trade-durable goods	14	Telecommunications	16
Telecommunications	11	Computer and Office Equipment	15
Paper and allied products	11	Transportation and Shipping (except air)	13
Mining	11	Printing, Publishing, and Allied Services	12
Printing, publishing, and allied services	10	Rubber and Miscellaneous Plastic Products	11
Others	102	Others	116
Total	818		818

in-strength-percent centralities in Panel A, the ranking and value of the centralities vary slightly. Specifically, for out-strength-percent centrality in 2007 in Panel A, China is ranked first and its index value is 10.2447. However, for in-strength-percent centrality in 2007 in Panel A, China is ranked second and its index value is only about half that of out-strength-percent (5.360). Therefore, based on these results, we assume that positions and reciprocal relationships in the world trade network differ depending on the type of data (i.e. export or import volumes) and methodology (i.e. out- or in-strength-percent).

Table 3 presents the descriptive statistics for the explanatory and control variables. Panel A shows the mean explanatory trade network variables of out- and in-

Table 2 Target countries' centrality in world trade network

Table 2 presents the strength centralities and openness of target nations each year. Panel A (B) shows the centralities and openness in descending (ascending) order.

	Out-strength-percent		In-strength-percent		Openness	
Rank	Country	Index	Country	Index	Country	Index
Panel A: Descending order						
2000						
1	Germany	8.2981	Germany	7.1048	Singapore	3.6607
2	Japan	7.8446	Japan	5.6354	Netherlands	1.2772
3	France	4.6266	United Kingdom	5.2951	Switzerland	0.9825
4	United Kingdom	4.3060	France	4.8631	Canada	0.8318
5	Canada	4.2793	Italy	3.7379	Denmark	0.8307
2001						
1	Germany	8.9857	Germany	7.5430	Belgium	1.5206
2	Japan	6.9759	Japan	5.3274	Netherlands	1.2877
3	China	5.9957	United Kingdom	5.3028	Philippines	0.9891
4	France	4.8072	France	4.8828	Denmark	0.8792
5	United Kingdom	4.2684	Italy	3.7952	Sweden	0.8590
2002						
1	Germany	9.1676	Germany	7.1232	Singapore	3.5428
2	Japan	6.8964	United Kingdom	5.3787	Ireland-Rep	1.7045
3	China	6.7506	Japan	4.9826	Belgium	1.4765
4	France	4.7990	France	4.8530	Netherlands	1.2179
5	United Kingdom	4.1164	China	3.9524	Thailand	1.2170
2003						
1	Germany	9.5765	Germany	7.2987	Belgium	1.4246
2	China	7.5238	United Kingdom	5.2571	Netherlands	1.1973
3	France	4.8487	France	4.9333	Denmark	0.8452
4	United Kingdom	3.8866	China	4.7395	Switzerland	0.7938
5	Italy	3.8611	Italy	3.8892	Israel	0.7397
2004						
1	Germany	9.6526	Germany	7.4127	Ireland-Rep	1.5203
2	China	8.1461	United Kingdom	5.0969	Belgium	1.4696
3	Japan	6.5182	China	5.0681	Hungary	1.3029
4	France	4.5861	France	4.8187	Netherlands	1.2541
5	Italy	3.7272	Japan	4.6873	Slovenia	1.1691
2005						
1	Germany	9.1948	Germany	7.0873	Hong Kong	3.7709
2	China	8.9471	China	5.1760	Luxembourg	2.8615
3	Japan	6.0795	United Kingdom	4.7658	Belgium	1.5342
4	France	4.2338	Japan	4.7616	Ireland-Rep	1.5101
5	Italy	3.5088	France	4.6956	Netherlands	1.3072
2006						

Table 2 (*Continued*)

	Out-strength-percent		In-strength-percent		Openness	
Rank	Country	Index	Country	Index	Country	Index
1	China	9.6453	Germany	7.1864	Belgium	1.5772
2	Germany	9.0221	China	5.3631	Hungary	1.5640
3	Japan	5.6995	United Kingdom	4.6784	Ireland-Rep	1.4883
4	France	4.0827	Japan	4.6255	Netherlands	1.3793
5	Italy	3.4201	France	4.5270	Austria	1.0766
2007						
1	China	10.2447	Germany	6.8762	Hong Kong	3.9677
2	Germany	9.1471	China	5.5360	Luxembourg	3.1953
3	Japan	5.4407	United Kingdom	4.5844	Malaysia	1.9247
4	France	3.9656	France	4.4981	Ireland-Rep	1.5171
5	Italy	3.5433	Japan	4.3881	Netherlands	1.4017
Panel B: Ascending Order						
2000						
1	El Salvador	0.0312	El Salvador	0.0711	Japan	0.2031
2	Israel	0.5225	Finland	0.5386	Brazil	0.2172
3	Denmark	0.6922	Israel	0.5417	Australia	0.4090
4	Finland	0.7338	Norway	0.5510	Italy	0.5045
5	Brazil	0.9278	Denmark	0.6977	United Kingdom	0.5459
2001						
1	Egypt	0.1008	New Zealand	0.2132	Argentina	0.1804
2	New Zealand	0.2387	Egypt	0.2989	Japan	0.2026
3	Argentina	0.4528	Argentina	0.3291	Brazil	0.2568
4	Israel	0.5044	Israel	0.5296	Egypt	0.3981
5	Philippines	0.6517	Philippines	0.5345	China	0.4308
2002						
1	New Zealand	0.2361	Venezuela	0.2024	Japan	0.2116
2	Venezuela	0.4156	New Zealand	0.2338	Australia	0.4130
3	Israel	0.4917	Israel	0.5043	China	0.4770
4	Finland	0.7259	Finland	0.5305	Mexico	0.4837
5	Denmark	0.7930	Norway	0.5639	Venezuela	0.4858
2003						
1	New Zealand	0.2372	New Zealand	0.2493	Brazil	0.2706
2	Israel	0.4428	Israel	0.4471	India	0.3007
3	Finland	0.7283	Finland	0.5651	Australia	0.3994
4	Denmark	0.7999	Norway	0.5677	Italy	0.4829
5	Norway	0.9430	Brazil	0.6835	France	0.5093
2004						
1	Slovenia	0.1777	Slovenia	0.1949	Japan	0.2446
2	Argentina	0.3962	Argentina	0.2420	Brazil	0.2897
3	Israel	0.4238	Israel	0.4392	Australia	0.3670

Table 2 (*Continued*)

	Out-strength-percent		In-strength-percent		Openness	
Rank	Country	Index	Country	Index	Country	Index
4	Hungary	0.5906	Philippines	0.4849	India	0.3686
5	Philippines	0.5969	Finland	0.5613	Argentina	0.3697
2005						
1	Bulgaria	0.1194	Bulgaria	0.1655	Brazil	0.2665
2	Chile	0.3860	Chile	0.3017	Japan	0.2722
3	Israel	0.4167	Israel	0.4222	Australia	0.3883
4	Finland	0.6819	Norway	0.5623	Italy	0.5181
5	Denmark	0.7574	Finland	0.5737	France	0.5335
2006						
1	New Zealand	0.2008	New Zealand	0.2221	Brazil	0.2583
2	Israel	0.3967	Argentina	0.2863	Japan	0.3109
3	Argentina	0.4076	Israel	0.3862	Argentina	0.3619
4	Philippines	0.5032	Philippines	0.4591	Australia	0.4099
5	Hungary	0.6010	Hungary	0.6450	India	0.4530
2007						
1	New Zealand	0.2051	New Zealand	0.2260	Brazil	0.2521
2	Portugal	0.3598	Israel	0.3988	Japan	0.3380
3	Israel	0.3939	Portugal	0.5738	Australia	0.4136
4	Hong Kong	0.6877	Finland	0.6006	India	0.4488
5	Finland	0.6962	Norway	0.6073	France	0.5526

strength-percent centralities, weighted-out and -in eigenvector centralities, and regular openness measurements for the top 17 target nations. It shows that the countries with the top five trade network variables are Germany, China, the United Kingdom, France, and Japan, while the top five openness countries are Ireland, Belgium, the Netherlands, Israel, and Switzerland. Further, the number of openness variables is fewer than those of centrality measures, since we could not obtain GDP data for Taiwan. By looking at the mean, median, and standard deviation of the out- and in-strength-percent centralities, the national power in the network obtained from the export volume data fluctuates more than that obtained by the import volume data. Therefore, we hypothesize that out-strength-percent centrality more clearly shows the characteristics implied in the trade network.

Panel B of Table 2 presents the descriptive statistics of the cultural distance between acquiring and target nations as well as the natural logarithm of Hofstede's six-dimensional aggregate cultural distance measure. About 49.1% of acquiring and target nations share the same language and 61.3% the same religion, while 53.2% of target nations are under common law. In addition, the deal-specific characteristics likely to affect the performance of acquiring firms are in Panel B. Therefore, the deal-specific variables are added into our regression models as the independent

Table 3 Descriptive statistics

Table 3 presents the descriptive statistics of the variables used in the analysis. Panel A shows the mean network centrality variables and openness categorized by target nation. Panel B describes the deal- and culture-specific variables.

Panel A: Mean value of trade network variables

Target nation	Out-strength-percent	In-strength percent	Openness	W-Out Eigenvector	W-In Eigenvector
United Kingdom	3.77	5.04	0.54	0.16	0.21
Canada	3.61	3.15	0.73	0.35	0.35
Germany	9.13	7.20	0.67	0.30	0.24
France	4.49	4.76	0.53	0.16	0.19
Australia	1.03	1.11	0.41	0.05	0.06
Israel	0.45	0.46	0.75	0.03	0.02
Netherlands	3.05	3.20	1.24	0.12	0.13
Switzerland	1.46	1.43	0.98	0.06	0.07
China	7.85	4.52	0.53	0.40	0.18
Sweden	1.30	1.08	0.82	0.05	0.04
Italy	3.67	3.75	0.50	0.13	0.13
Japan	6.52	4.91	0.25	0.36	0.21
Taiwan	2.40	1.97	–	0.16	0.09
Belgium	2.62	3.08	1.41	0.10	0.13
Denmark	0.75	0.73	0.88	0.03	0.03
Brazil	1.09	0.81	0.27	0.05	0.04
Ireland-Rep	1.33	0.75	1.56	0.07	0.04
Others	0.28	0.32	0.91	0.01	0.01

Panel B. Deal- and Culture-specific variables

	Variable (N = 818)	Dummy (1)	Dummy (0)	Proportion (%)
Deal-specific	Hostile	4	814	0.5
	Same industry	260	558	31.8
	Payment by cash	406	412	49.6
	Listing status of target firm	107	711	13.1
	OECD membership of target nation	702	116	85.8
		Mean	Median	Std. dev.
	Value of transaction (deal size)	US$310 mil.	US$65 mil.	US$918 mil.
Cultural distance	Same language	419	399	51.2
	Same religion	316	502	38.6
	Common law origin	319	499	39.0
		Mean	Median	Std. dev.
	LN(Aggregate Cultural Distance)	4.39	4.69	0.72

dummy for the control variables. From the SDC Platinum database, we also obtain deal-specific variables regarding deal type. These variables show that only four of 818 cases are hostile mergers. Moreover, 31.8% of deals are conducted between acquiring and target firms in the same industry. Further, 13.1% of target firms are listed, and 85.8% of target nations are OECD member countries.

Panel C of Table 3 shows the firm-specific characteristics of United States acquirers, such as mean total assets, total liability, net income, and total market capitalization, retrieved from the COMPUSTAT database. The firm-specific characteristics such as firm size, financial leverage, profitability, and Tobin's Q are measured by using the above variables as control variables to illuminate the impact of other major variables such as network centrality. LN(Total Asset) is the natural logarithm of total assets, as a proxy for firm size. Leverage is the debt ratio, calculated as total debt divided by total assets, as a proxy for financial leverage. Return on assets (ROA) is calculated as net income divided by total assets, as a proxy for profitability. The Tobin's Q variable is measured as the sum of total market capitalization and total liabilities, divided by total assets, to measure the investment opportunities of the firm. United States acquirers have an asset size of US$10.4 billion, 46% leverage, 3% ROA, and a Tobin's Q of 3.53 on average.

5. Empirical Results

5.1. Univariate Analysis

In this study, we use cumulative abnormal returns (CARs) to measure the short-term announcement performance of acquiring firms. We use the market-adjusted model based on an estimation period of fully −100 to −10 days and CRSP value-weighted market returns. Since we focus on the announcement effect, we collect five windows of data for this event study based on the announcement date: CARs (−1, 0), CARs (0, +1), CARs (−1, +1), CARs (−3, +3), and CARs (−5, +5). Among them, we use the 2-day window from the event day to 1 day after the event, CARs (0, +1), in the multivariate analysis.

Table 4 shows the univariate analysis results of the CARs (0, +1) of acquiring firms. Although studies focusing on the long-term performance of acquiring firms show negative returns (Chakrabarti *et al.*, 2008), we observe positive and significant CARs through four windows, as shown in Panel A of Table 4. More specifically, we find the one-sample *t*-test of CARs for all five windows, which shows the positive and significant results throughout the four windows, except for CARs (−1, 0). For example, CARs (0, +1) has a mean of 0.0081 with a *t*-value of 2.91. Therefore, cross-border acquisitions are positively evaluated for acquiring companies, consistent with the findings of Francis *et al.* (2008).

In Panel B of Table 4, we perform the one-sample *t*-test, two-sample mean difference *t*-test, and Wilcoxon test with the main dependent variable, CARs (0, +1); they show that the abnormal returns (ARs), in which the target nation has a mean out- and in-strength-percent centrality higher than those of the median, are positive

Table 4 Univariate analysis

Table 4 presents the univariate analysis results of CARs. Panel A shows the one-sample t-test results of CARS based on the different windows of (−1, 0), (0, +1), (−1, +1), (−3, +3), and (−5, +5) where $t = 0$ is the announcement date of the cross-border M&As. Panel B shows the two-sample *t*-test and Wilcoxon test results based on the above and below median levels of the trade network, openness, and cultural distance variables. Panel C shows the two-sample *t*-test and Wilcoxon test results based on the same language, same religion, and common law origin of legal system dummy variables. The sample period is from 2000 to 2007. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

Panel A: One-sample *t*-test

CAR Windows	(−1, 0)	(0, + 1)	(−1, +1)	(−3, +3)	(−5, +5)
Mean CARs	0.0017 (1.05)	0.0081 (2.91)***	0.0072 (2.44)**	0.0143 (4.31)***	0.0166 (4.37)***
	$N = 818$	$N = 818$	$N = 818$	$N = 817$	$N = 817$

Panel B: Two-sample *t*-test for CARs (0, +1)

	Above median	Below median	*t*-Test	Wilcoxon test
Out-Strength-Percent	0.0101 (2.91)***	0.0021 (0.53)	−0.008 (−1.25)	−0.36 (0.72)
	$N = 612$	$N = 206$		
In-Strength-Percent	0.0096 (2.75)***	0.0036 (0.96)	−0.006 (−0.93)	−0.33 (0.74)
	$N = 612$	$N = 206$		
Openness	0.0042 (1.11)	0.0104 (2.73)***	0.0061 (1.07)	1.77 (0.08)*
	$N = 309$	$N = 509$		

Table 4 (*Continued*)

Panel B: Two-sample *t*-test for CARs (0, +1)				
	Above median	Below median	*t*-Test	Wilcoxon test
Aggregate cultural distance	0.0115 (1.26) *N* = 183	0.0071 (2.93)*** *N* = 635	−0.0044 (−0.66)	0.49 (0.62)
Panel C: Two-sample *t*-test for CARs (0, +1)				
	Dummy (1)	Dummy (0)	*t*-Test	Wilcoxon Test
Same language	0.0073 (2.54)** *N* = 419	0.0089 (1.84)* *N* = 399	0.0016 (0.30)	−0.46 (0.64)
Same religion	0.008 (2.73)*** *N* = 316	0.0081 (1.96)* *N* = 502	0.0001 (0.01)	−0.73 (0.46)
Common law origin	0.0069 (2.36)** *N* = 391	0.0091 (1.99)** *N* = 427	0.0022 (0.40)	−0.16 (0.88)

(1.01% and 0.96%, respectively) and significant at the 1% level, while below median ones are not significant. However, we do not find any statistically significant mean differences for those. On the contrary, below median openness shows statistically significant and positive CARs, while above median ones are not statistically significant.

In Panel C, if acquiring and target nations use different languages and origins of legal system (common law) and have different religious backgrounds, mean CARs show a higher mean but no significant statistical differences. Therefore, in the univariate setting without controlling for the control variables, some variations exist in CARs based on different levels of trade networks but we do not find any statistical differences. Therefore, further multivariate analyses are necessary to test our research hypothesis after controlling for other firm-, deal-, and country-specific factors.

5.2. Multivariate Analysis

We use multiple linear regression models to test the impact of the cross-national trade network on acquirer performance. Since we capture heteroskedasticity in our models, we perform ordinary least squares (OLS) regression, with MacKinnon and White's (1985) heteroskedasticity-consistent standard errors (Tables 5 and 6). We also control for clustered standard errors at the target nation level, because target companies from the same country are likely to be dependent.

Tables 5 and 6 show the results of our multivariate regression analysis using the independent and control variables. The dependent variable is CARs (0, +1), obtained from the event study methodologies explained in Section 5.1. In this study, the main independent variables are trade network centrality. Further, we control for several cultural differences, country-specific, deal-specific and firm-specific factors, as shown in Table 3.

In Table 5, we investigate eight models, in which the dependent variable is CARs (0, +1). The basic model contains the centrality measurement as an explanatory variable, and includes other control variables. In Model (1), the out-strength-percent trade network connectivity of the target nation shows a positive and significant relationship with CARs at the 1% level with a *t*-value of 1.96, which is consistent with our hypothesis. In terms of economic significance, all else being equal, Model (1) suggests that a one standard deviation increase in out-strength-percent is associated with a 0.93% increase in an acquiring firm's CARs on average. The out-strength-percent measurement has a consistently positive relation with the performance of the acquiring firm. As this measurement is computed by using import data and focuses on interrelationships with other nations, positive centrality means that acquisitions with nations that have stronger positions positively affect acquiring companies.

In Model (2), we do not find any significant impact of in-strength-percent on the announcement returns of cross-border acquisitions. Further, in Model (3), the openness measure used in the literature to explain the extent to which

Table 5 Regressions for announcement period abnormal returns associated with acquiring companies that announce cross-border acquisitions in 2000–2007

Table 5 presents the heteroskedasticity-robust OLS regression results with the CARs (0, +1) as the dependent variable and out-strength-percent, in-strength-percent centralities and openness measurement as the main independent variables. The sample period is from 2000 to 2007. ***, **, and * represent significance at the 1%, 5%, and 10% levels, respectively.

	DEP: CARs (0, +1)							
INDEP:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Out-Strength-Percent	0.0021 (1.96)**			0.0021 (2.03)**			0.0019 (1.77)*	
In-Strength-Percent		0.0028 (1.35)			0.0028 (1.46)			0.0027 (1.32)
Openness			−0.0112 (−1.31)			−0.0113 (−1.36)	−0.0103 (−0.45)	−0.0104 (−1.24)
LN(Aggregate Cultural Distance)	−0.0072 (−0.74)	−0.0095 (−1.01)	−0.0041 (−0.40)	−0.0083 (−1.43)	−0.0097 (−1.66)*	−0.0033 (−0.56)	−0.0047 (−0.45)	−0.0069 (−0.71)
Same language	0.0031 (0.18)	0.0007 (0.04)	−0.0020 (−0.12)				0.0056 (0.32)	0.0038 (0.20)
Same religion	−0.0099 (−1.28)	−0.0114 (−1.13)	−0.0068 (−0.93)	−0.0095 (−1.40)	−0.0114 (−1.28)	−0.0070 (−1.06)	−0.0117 (−1.39)	−0.0135 (−1.27)
Common law origin	−0.0065 (−0.62)	−0.0084 (−0.69)	−0.0029 (−0.29)	−0.0048 (−0.85)	−0.008 (−1.32)	−0.0039 (−0.70)	−0.0071 (−0.69)	−0.0094 (−0.77)
Hostile	−0.0218 (−0.77)	−0.0221 (−0.80)	−0.0208 (−0.77)	−0.0219 (−0.78)	−0.0221 (−0.80)	−0.0208 (−0.77)	−0.0216 (−0.78)	−0.0219 (−0.80)
Same industry	−0.0067 (−1.29)	−0.0066 (−1.28)	−0.0060 (−1.12)	−0.0068 (−1.30)	−0.0066 (−1.27)	−0.0059 (−1.10)	−0.0059 (−1.10)	−0.0057 (−1.08)
LN(Total Asset)	−0.0021 (−1.51)	−0.0021 (−1.54)	−0.0025 (−1.78)*	−0.0021 (−1.51)	−0.0021 (−1.54)	−0.0025 (−1.78)*	−0.0024 (−1.68)*	−0.0024 (−1.71)*
Leverage	−0.0045 (−0.27)	−0.0050 (−0.30)	−0.0042 (−0.25)	−0.0045 (−0.27)	−0.0051 (−0.30)	−0.0041 (−0.25)	−0.0042 (−0.25)	−0.0048 (−0.28)
ROA	−0.0419 (−1.3)	−0.0417 (−1.29)	−0.0426 (−1.29)	−0.0419 (−1.30)	−0.0417 (−1.29)	−0.0426 (−1.30)	−0.0425 (−1.30)	−0.0423 (−1.29)
Tobin's Q	−0.0001 (−0.35)	−0.0001 (−0.32)	0.0000 (−0.15)	−0.0001 (−0.35)	−0.0001 (−0.32)	0.0000 (−0.16)	0.0000 (−0.25)	0.0000 (−0.23)

Table 5 (*Continued*)

	DEP: CARs (0, +1)							
INDEP:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Payment by cash	0.0011 (0.24)	0.0013 (0.27)	0.0019 (0.42)	0.0012 (0.25)	0.0013 (0.28)	0.0019 (0.42)	0.0013 (0.28)	0.0014 (0.30)
Listing status of target firm	−0.0185 (−2.39)**	−0.0180 (−2.34)**	−0.0174 (−2.23)**	−0.0184 (−2.39)**	−0.018 (−2.35)**	−0.0174 (−2.24)**	−0.0178 (−2.27)**	−0.0174 (−2.22)**
OECD membership of target nation	−0.0006 (−0.06)	−0.0046 (−0.49)	−0.0005 (−0.05)	−0.0013 (−0.16)	−0.0047 (−0.57)	0.0000 (0.00)	−0.0020 (−0.18)	−0.0063 (−0.63)
Intercept	0.0660 (1.29)	0.0799 (1.61)	0.0700 (1.38)	0.0722 (2.23)**	0.0812 (2.36)**	0.0657 (2.08)**	0.0655 (−1.41)	0.0797 (1.60)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-value	1.22	1.17	1.21	1.28	1.23	1.26	1.20	1.18
R-squared	0.0341	0.0334	0.0343	0.0341	0.0334	0.0343	0.0366	0.0364
No. of observations	818	818	806	818	818	806	806	806

Table 6 Regressions for announcement period abnormal returns associated with acquiring companies that announce cross-border acquisitions in 2000–2007

Table 6 presents the heteroskedasticity-robust OLS regression results with the CARs (0, +1) as the dependent variable and w-out and w-in eigenvector centralities as the main independent variables. The sample period is from 2000 to 2007. ***, **, and * represent significance at 1%, 5%, and 10% levels, respectively.

	DEP: CARs (0, +1)									
INDEP:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
W-Out eigenvector	0.0373 (2.05)**	0.0358 (2)**	0.0361 (2)**	0.0353 (1.94)*	0.0371 (2.08)**					
W-In eigenvector						0.0540 (1.97)**	0.0416 (1.68)*	0.0460 (1.86)*	0.0410 (1.71)*	0.0532 (2.01)**
LN(Aggregate Cultural Distance)	–0.0045 (–0.46)	–0.0011 (–0.22)				–0.0045 (–0.44)	0.0002 (0.04)			
Same language	0.0015 (0.09)		–0.0006 (–0.10)			0.0022 (0.12)		–0.0030 (–0.49)		
Same religion	–0.0041 (–0.64)			–0.0036 (–0.56)		–0.0040 (–0.62)			–0.0039 (–0.62)	
Common law origin	–0.0070 (–0.70)				–0.0021 (–0.38)	–0.0110 (–0.96)				–0.0054 (–0.89)
Hostile	–0.0219 (–0.77)	–0.0236 (–0.86)	–0.0232 (–0.85)	–0.0229 (–0.82)	–0.0227 (–0.83)	–0.0221 (–0.78)	–0.0241 (–0.89)	–0.0236 (–0.87)	–0.0235 (–0.85)	–0.0230 (–0.84)
Same industry	–0.0069 (–1.32)	–0.0066 (–1.27)	–0.0065 (–1.23)	–0.0066 (–1.24)	–0.0065 (–1.23)	–0.0068 (–1.31)	–0.0065 (–1.24)	–0.0065 (–1.22)	–0.0065 (–1.22)	–0.0065 (–1.22)
LN(Total Asset)	–0.0021 (–1.51)	–0.0022 (–1.57)	–0.0022 (–1.58)	–0.0022 (–1.57)	–0.0022 (–1.56)	–0.0021 (–1.53)	–0.0023 (–1.62)	–0.0023 (–1.61)	–0.0023 (–1.62)	–0.0022 (–1.58)
Leverage	–0.0043 (–0.26)	–0.0030 (–0.18)	–0.0031 (–0.18)	–0.0032 (–0.19)	–0.0034 (–0.2)	–0.0047 (–0.28)	–0.0029 (–0.18)	–0.0032 (–0.19)	–0.0031 (–0.19)	–0.0038 (–0.22)

Table 6 (*Continued*)

	DEP: CARs (0, +1)									
INDEP:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ROA	–0.0419	–0.0408	–0.0411	–0.0414	–0.0414	–0.0419	–0.0406	–0.0409	–0.0410	–0.0414
	(–1.30)	(–1.27)	(–1.28)	(–1.29)	(–1.28)	(–1.29)	(–1.26)	(–1.27)	(–1.28)	(–1.28)
Tobin's Q	–0.0001	–0.0001	–0.0001	–0.0001	–0.0001	–0.0001	–0.0001	–0.0001	–0.0001	–0.0001
	(–0.39)	(–0.36)	(–0.32)	(–0.35)	(–0.29)	(–0.39)	(–0.34)	(–0.3)	(–0.36)	(–0.29)
Payment by cash	0.0011	0.0006	0.0006	0.0007	0.0008	0.0012	0.0005	0.0007	0.0006	0.0008
	(0.25)	(0.12)	(0.14)	(0.15)	(0.18)	(0.26)	(0.11)	(0.15)	(0.14)	(0.19)
Listing status of target firm	–0.0188	–0.0180	–0.0174	–0.0179	–0.0171	–0.0187	–0.0177	–0.0171	–0.0182	–0.0169
	(–2.42)**	(–2.40)**	(–2.33)**	(–2.29)**	(–2.29)**	(–2.40)**	(–2.36)**	(–2.29)**	(–2.31)**	(–2.26)**
OECD membership of target nation	–0.0001	0.0014	0.0024	0.0040	0.0022	–0.0048	–0.0004	–0.0009	0.0013	–0.0023
	(–0.01)	(0.18)	(0.42)	(0.58)	(0.41)	(–0.48)	(–0.05)	(–0.14)	(0.17)	(–0.37)
Intercept	0.0538	0.0333	0.0277	0.0276	0.0283	0.0566	0.0287	0.0306	0.0298	0.0314
	(1.06)	(1.29)	(1.36)	(1.41)	(1.39)	(1.08)	(1.09)	(1.52)	(1.53)	(1.55)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-value	1.24	1.41	1.41	1.40	1.42	1.22	1.36	1.37	1.35	1.40
R-squared	0.0341	0.0329	0.0328	0.0332	0.0330	0.0344	0.0324	0.0327	0.0329	0.0333
No. of observations	818	818	818	818	818	818	818	818	818	818

the nation is open to the world trade market (e.g. Chakrabarti *et al.*, 2008) does not show any significant relationship with CARs. In unreported results, we run the regression separately for the six cultural dimensions since cultural distance factors might be related to one another and find consistent results. Similarly, we find consistent results in Models (4)–(6) without controlling for the same language.

Finally, for the robustness check, which examines whether trade network centrality complements conventional openness, we run the regression with both measures (Models (7) and (8)). Consistent with the previous results, Model (7) shows the marginally significant impact of out-strength-percent on CARs at the 10% level.[2]

In Table 6, the other network centrality variables are used as the main explanatory variables to show the robustness of the network centrality models. We investigate 10 models with the two types of weighted eigenvector centralities as the independent variables. The dependent variable in these models is CARs (0, +1), the same as in Table 5. In Models (1)–(5), we use weighted-out eigenvector centrality as the independent variable to show the relative position and power of the target nation in the international export trade network. The first model contains the centrality measurement as an explanatory variable, and includes all the other independent and control variables. It shows that the trade network is positive and statistically significant at the 5% level, which supports the consistency of the network centrality measurements. Moreover, throughout the other four models, weighted-out eigenvector centrality shows positive and significant results consistently irrespective of the inclusion of the cultural distance variables.

In Models (6)–(10), we use weighted-in eigenvector centrality as the independent variable, computed by using the target nation's import volume data to capture the complexity of the international import trade network. In Model (6), we add the cultural distance and other control variables, finding a positive and significant result. Moreover, the other four models consistently show positive and significant results. Therefore, these results support our hypothesis that acquisitions with target

[2]Note that the *R*-square values of our regressions are around 3% and, similarly, the *F*-values are not high. There are at least two possible reasons for the weak model fits. First, while M&A targets' CARs are generally well explained by deal characteristics, the regressions of bidders' CARs in the M&A literature often have low *R*-squares, possibly because of the relatively small size of target firms and heterogeneous bidder characteristics. Hence, we report heteroskedasticity-robust *t*-statistics for our regression coeffici. Second, since our cross-border acquisitions setting requires international M&A samples, heterogeneous country characteristics may weaken the fit of our regression models. To partly address this concern, we include country characteristics (e.g. same language, same religion, OECD membership) in our regressions. Given the weak model fit, we must caution that our regression specifications do not fully predict the variations in acquiring firms' CARs.

nations that have higher power positively affect the performance of acquiring companies.

In terms of economic significance, the weighted-out eigenvector and weighted-in eigenvector also have economically significant effects on acquiring firms' CARs. Specifically, Model (1) suggests that all else being equal, a one standard deviation increase in the weighted-out eigenvector is associated with a 12.74% increase in an average acquirer's CARs. In addition, Model (5) suggests that a one standard deviation increase in the weighted-in eigenvector is associated with a 4.70% increase in an average acquirer's CARs.

6. Conclusion

In this study, we examine whether cross-border trade relationships assessed by using network measurements such as strength and eigenvector centralities better explain the stock market evaluation of cross-border acquisitions compared with traditional bilateral trade openness measured by trade volume and GDP data. We argue that network analysis can capture the complexity embedded in world trade networks compared with traditional bilateral trade openness. Thus, in this study, we add a centrality variable as the main explanatory variable. Consistent with our research hypothesis, we find that acquisitions with target nations that are more open to, or have stronger power in, the world trade network show positive and higher returns for acquiring firms.

Previous studies argue that cultural distance can negatively affect acquiring firms, since it is a cost for acquirers to integrate with target companies. Therefore, in the multivariate analysis, we control for various cultural distance measures such as Hofstede's cultural distance index, language, religion, and origin of the legal system. Furthermore, we control various firm-specific and deal-specific factors.

We contribute to the cross-border M&A literature by extending the examination of the role of the cross-national trade network instead of using the openness measurement suggested in previous studies. We examine the relationships between acquiring and target nations, whereas previous research has only focused on the openness of acquiring firms to the international trade market. We find that the trade network variable complements the traditional bilateral traditional openness measure and show that cultural distance does not significantly affect the announcement returns of acquiring firms.

However, this study has several limitations. First, our sample is limited to United States acquiring firms and is unbalanced to target nations from the United Kingdom and Canada. Therefore, for the general applicability of the results, in future study, this may be extended to other nations' samples. Second, further study is needed to explore the determinants of cross-border M&As by adopting other network methodologies. Moreover, we examine import and export volume data separately; thus, analyzing trade networks using export and import data together is needed in future research.

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