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## **Technology-acquiring cross-border M&As by emerging market firms: Role of bilateral trade openness**

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### **Abstract**

This paper investigates the role of bilateral trade openness in technology-acquiring cross-border M&As by EMFs (“Emerging Market Firms”). The cross-border M&A, patents, and financial data from January 2000 to December 2013 have been utilized for empirical analyses. By analyzing cumulative abnormal returns of the acquirer EMFs from Brazil, Russia, China, India, and Mexico, the value-creating nature of technology-acquiring cross-border M&As has been confirmed. In addition, the number of the patents owned by the target firms showed a positive and significant effect on the stock performance of cross-border acquirers. Lastly, the bilateral trade openness significantly and positively moderated the relation between the innovation capability of the target firms and EMFs’ stock performance.

Keywords: Emerging Market Firms, Technology Acquisition, Cross-border M&A, Institution

## 1. Introduction

According to the World Investment Report 2010, the outward foreign direct investment (FDI) from emerging economies has increased to a record high of 25% of the global total (UNCTAD, 2010). During the first decade of the 21st century, EMFs from Brazil, Russia, China, India, and Mexico have completed 7140 outbound acquisitions. In fact, the number of completed cross-border M&As by EMFs has increased from 290 in 2000 to 509 in 2013 and the value of deals has exceeded US\$103 billion (See Figure 1).

### Insert Figure 1

Many scholars in the past argued that the motives of the EMFs' outward expansion are mainly shaped by push factors such as appreciating currencies, growing current-account surpluses, rising labor shortages, escalating operating costs, and small yet saturated domestic markets (Deng, 2004; Luo and Tung, 2007). However, recent studies on the EMFs emphasize the importance of their internal strategic motives to secure critical resources, acquire advanced technology, and obtain managerial expertise from externalities (Eun et al., 1996; Seth et al., 2002; Luo and Tung, 2007; Kohli and Mann, 2012; Lee and Yoon, 2015). Among various motives, the relevance of technological motive for M&A has increased sharply (Kale, 2009; Zhao, 2009), which has received relatively less attention by scholars in the past, as they viewed EMFs as laggards in innovation lacking abilities to acquire technology from externalities (Altenburg et al., 2008). Accordingly, this study attempts to capture the technology-acquiring effect in EMFs cross-border M&A deals by comparing the wealth gains in EMFs' technology-acquiring and non-technological cross-border M&A.

In addition, existing studies on technology-acquiring M&A have not explicitly addressed the impact of target firms' innovativeness on bidders' M&A performance by not incorporating target firms' innovation activities (Zhao, 2009; Li, 2010; Kohli and Mann, 2012). In light of the limitation, this study examines the relation between innovation capability of target firms and bidders' wealth gains in cross-border acquisition by adopting reverse internalization theory. Furthermore, several studies (Zhang et al., 2011; Zhang and He, 2014) found that EMFs encounter significant institutional barriers of host countries in technology-acquiring cross-border M&A deals (Economist, 2010). With this in mind, this study argues that bilateral trade openness plays an important role in maximizing the performance of technology-acquiring cross-border M&A deals, as the bilateral trade network helps reducing the institutional barriers and improves emerging economies' access to international economic activities. Thus, the moderating effect of bilateral trade openness on the relation between "innovation capability of target firms" and "EMFs' M&A performance" is examined.

Next section presents a review of the relevant literature and develops the hypotheses. This is followed by an explanation of the data and methodology. We then present the results of the empirical analysis followed by the implications and future research directions.

## **2. Theory and hypotheses**

### **2.1. Technology-acquiring cross-border M&A**

As explained by reverse internalization theory, the acquisition of the technology from target firms provides greater shareholder wealth benefits to acquiring companies in M&A (Eun et al., 1996). Given the increasing importance of technology for competitive advantage, many EMFs try to acquire target firms with high growth potentials derived from their technological assets (Kohers and Kohers, 2000). Seth et al. (2002) also suggested that cross-border acquisitions create most of its value from reverse internalization of target firms' intangible assets. In contrast, the forward internalization scholars argue that international expansion by acquiring firms lacking intangible assets is viewed as liabilities for investors (Morck and Yeung, 1992). However, since recent studies no longer consider EMFs as laggards in technological innovation (Luo and Tung, 2007; Kohli and Mann, 2012), this study adopts reverse internalization theory to examine the technology-acquiring cross-border M&A by EMFs.

Although there are several studies investigating technological M&A, existing literature tends to focus on domestic M&A deals within a single industry such as computer or chemical industry (Ahuja and Katila, 2001; Hagedoorn and Duysters, 2002). Also, since most of technology-acquiring M&A literature mainly used innovation performance as a dependent variable, the impact of acquired technology on M&A performance has not been examined. In fact, the existing studies simply explained that acquisitions of the target firms in high-tech industries generate positive stock performance for EMFs. As such, incorporating target firm's innovation activities to explain the stock performance of bidder firms should be applied to the context of EMFs' cross-border M&A deals, as EMFs actively pursue cross-border M&As to enhance their technological capabilities (Zhao, 2009; Kale, 2009; Kohli and Mann, 2012; Sears and Hoetker, 2014).

In addition, Conn et al. (2005) and Kohli and Mann (2012) found that only those cross-border M&A deals where both the acquiring and the target companies are in hi-tech sector, create higher returns than the domestic acquisitions. However, it is important to note that even low-tech EMFs actively pursue to acquire technological assets from their counterparts (Luo and Tung, 2007). Likewise, innovation activities are not restricted to the high-tech firms, as technological innovation seems to be a concern for many industries (Zhao, 2009). Furthermore, existing studies on EMFs' strategic asset seeking behavior simply arguing that the assets are acquired if EMFs target the firms from advanced countries (Aybar and Ficci, 2009; Nicholson and Salaber, 2013). However, EMFs also enhance their technological capability by acquiring developing country firms (Guillen, 2000). Above all, incorporating target firms' innovation activities to explain the stock performance of bidder EMFs in cross-border M&A deals is of great importance.

## **2.2. Institution-based view**

In EMFs' technology-acquiring cross-border M&A deals, it is prevalent to see the presence of institutional barriers (e.g. Lenovo's M&A deal to acquire IBM). Likewise, the extant of cross-border M&A literature have mentioned the importance of institutional factors, as there is a great deal of hurdles in host countries such as anti-trust laws and M&A regulations (Dikova et al., 2010). According to Bittlingmayer and Hazlett (2000), the institutional barriers are likely induced by three reasons: (1) for private benefit, such as protecting some local firms interests, (2) bureaucratic self-interest, such as government agents (e.g. antitrust officials and attorneys) gaining favorable publicity from legal action, and (3) political extraction, which means government extracts rents from competition between firms (Zhang et al., 2011).

Based on the above theoretical suggestions, some studies have empirically examined the relation between the elements of institutions and the completion of international M&A deals. Dikova et al. (2010) found that there is a negative relationship between institutional distance and the likelihood that an acquisition is completed. Also, a recent study by Dinc and Erel (2013) found that nationalist government reactions have significant impact on cross-border M&A deals in Europe. Although these studies have enriched the understanding of the role of national identification in forming and constructing identity, we still lack in-depth examination of the ways in which representations of international M&As are politically and ideologically embedded in international relations (Riad et al., 2012).

Among the various elements of institutions, bilateral trade network between home and host countries helps acquiring firms overcome the institutional tensions (De Benedictis and Tajoli, 2011). In fact, bilateral trade network is a byproduct of globalization, which made the world economy more integrated and interconnected than ever. Likewise, a strong connection between acquiring and target nations may play an important role, when EMFs encounter significant foreign resistance to deal-making in technology sectors (Economist, 2010). Despite the importance of bilateral trade network, only a few studies examine the significant role of the variable in cross-border M&A research by using export and import trade volume data (Rossi and Volpin, 2004; Chakrabarti et al., 2009). Also, the existing studies do not consider the bilateral trade relationship between acquiring and target countries, but focus on the relationship between target countries and the world economy. Above all, this study adopts bilateral trade openness as a measure for institutional relationship between home and host countries.

### 2.3. Hypotheses development

Based on previous theory and evidence, we develop here several hypotheses related to the technology-acquiring cross-border M&A deals by EMFs.

Technology issues may have far reaching consequences for future strategy and may directly affect the competitive position of the acquired business and its new parent (James et al., 1998). EMFs seek more advanced technological resources such as leading technologies and knowledge-based abilities through their outward internationalization activities (Buckley et al., 2007). As the efficient market hypothesis assumes that 'investors will reflect their expectation of M&A benefits on the stock price during the announcement period', we examine the technology-acquiring effect in EMFs cross border M&As with stock performance (Agrawal et al., 1992). Hence, we posit that technology-acquiring cross-border acquisitions may bring significant product and process technologies to EMFs by propelling their product development and efficiency enhancement efforts (Aybar and Ficici, 2009).

- H1a. EMFs' technology-acquiring cross-border M&A generates positive abnormal returns for their shareholders.
- H1b. EMFs' technology-acquiring cross-border M&A generates higher abnormal returns than EMFs' non-technological cross-border M&A deals.

James et al., (1998) suggested that 'technology' is an imperative knowledge or method that is used to enable or improve the existing production/distribution of products or services, including expertise, commercialized efficiency and market appraisal. Technology transaction is undoubtedly a vital pathway to enhance business technology development capability and overall R&D competence (Glazer, 1991). Acquisition of technology assets existed in other firms will enable fast technological catching-up, bring forward technological up-grading and transform the corporation's inherent technical economic structure (Andrade et al., 2001; Lee and Yoon, 2015). Hence, we posit that innovativeness of target firms has a positive impact on EMFs' abnormal returns in cross-border M&A deals.

- H2. Innovativeness of target firms has a positive effect on EMFs' abnormal returns in technology-acquiring cross-border M&As.

Many studies suggest that taking over the firms from nations with a strong connectivity to acquiring nations may allow managers of acquiring firms to reinforce the efficiency of the due-diligence and post-merger process (Chakrabarti et al., 2009; Riad et al., 2012; Zhang and He, 2014). In addition, Rossi and Volpin (2004) and Chakrabarti et al., (2009) showed that the bilateral trade between acquiring and target nations positively and

significantly affects propensity for cross-border deals. Hence, we expect bilateral trade openness to positively and significantly moderate the relation between innovativeness of target firms and bidders M&A performance.

- H3. Acquisition of technology results in more positive abnormal returns for bidder firms, when bidders target countries with greater bilateral trade openness.

### **3. Research design**

#### **3.1. Data and methodology**

The data on EMFs cross-border M&A deals from January 2000 to December 2013 have been obtained from SDC Platinum M&A database. The nationality of the acquirer includes the most notable emerging economies such as Brazil, Russia, India, China, and Mexico that have reached a sizable scale of internationalization (Luo and Tung, 2007). We screen the transactions originating from the above nations according to the following criteria used by Chakrabarti et al (2009), where the transaction must (1) be complete; (2) have different acquirer and target nationalities; (3) have publicly traded acquiring firms; (4) exclude the deals targeting Bermuda, the Bahamas, the British Virgin Islands and Puerto Rico to avoid shell operations. We used the announcement date of the cross-border acquisition in constructing the sample. The acquiring firms are then matched with available stock market returns data from DataStream, as well as their total market index returns (Chakrabarti et al., 2009; Nicholson and Salaber, 2013). More importantly, when applying the existing selection criteria to screen out the technology-acquiring cross-border M&A deals, there have been problems with the limited sample size. Zhao (2009) argued that innovation activities are not restricted to the high-tech industries, as technological innovation is a concern for many industries and innovation-motivated acquisitions are a general phenomenon. Thus, we posit that if the deals fall into any of the below criteria suggested by multiple studies investigating technology-acquiring M&A transactions, they are considered as technology-seeking M&A transactions: (1) acquiring and/or target firm is engaged in high-tech industry (Cloudt et al., 2006); (2) target firms had patenting activity in the five year pre-ceding to the M&A (Zhao, 2009); and (3) main purpose of M&A is acquiring technological assets from counterparts. For the first criteria, we have referred to the high-tech industry classification based on acquiring firms' primary high-tech Standard Industrial Classification (SIC) code provided by SDC Platinum database. As for the second criteria, we have searched for target firms' patent data from USPTO database. In regard to the last criteria, we have referred to the deal purpose code provided by SDC platinum database.

After computing cumulative abnormal returns and classifying the deals, we first conducted independent sample t-test and Wilcoxon signed rank test to capture EMFs' wealth gains in technology-acquiring cross-border M&As. For the H1a, 630 EMFs' technology-acquiring cross-border M&A deals have been used to

examine the cumulative abnormal returns over several event windows. Next, we test the statistical difference between the announcement gains of technology-acquiring and non-technological cross-border M&A deals to examine H1b. At this stage, we not only use two-group mean comparison test, but also independent sample t-test to comment upon the difference in abnormal returns. 875 EMFs' non-technological cross-border M&A deals have been used to make a comparison with the cumulative abnormal returns of 630 EMFs' technology-acquiring M&A deals. As for the H2 and H3, we use OLS regression to capture the cross-sectional difference in the wealth gains of technology-acquiring cross-border M&A deals determined by target firms' innovation capability, which is moderated by bilateral trade openness. From our 630 technology-acquiring deals, we kept only the deals for which we have available data on all our control variables, which narrows our final sample for OLS regression to 374. Moreover, both bidder and target companies have been classified by their nationality and industry groups based on their primary Standard Industrial Classification (SIC) code (See Table 1).

#### **Insert Table 1**

In our sample, India takes the largest portion of the acquiring firms followed by China, Russia, Mexico, and Brazil. The sample firms mainly originate from Asia (India and China). Likewise, a large percentage of the transactions (73.7%) covered in our analysis were initiated by Asian EMFs. The EMFs from Latin America (Mexico and Brazil) account for 15.9% of the transaction. Our sample composition is very similar to the study conducted by Aybar and Ficici (2009) which used sample firms originating from a number of countries. United States is the prime target region, followed by United Kingdom, Germany, and Hong Kong. EMFs in our sample favored developed countries for their cross-border transactions. The majority of both bidder and target firms in our regression sample is engaged in manufacturing industry 47.8% for bidders and 46.5% for target firms respectively. The second biggest industry represented in both bidder and target firms is services.

### **3.2. Measurement**

Dependent variable. Our measure of wealth gains in cross-border M&A is cumulative abnormal return of the acquiring firms' stock which has been extensively used in management literature. Although used less often in the study of technological innovation literature, it offers a special advantage in this context, as it captures investors' perception of the acquirer's ability to create future cash flows from the acquisition technology from target firms (Sears and Hoetker, 2014). In order to compute the cumulative abnormal returns, we use an event study methodology and compute daily abnormal returns around the acquisition announcement date. The calculation of these returns is based on the market model with parameters estimated from 258 days to 11 days before the announcement date following Mikkelsen and Partch's (1986) method. The cumulative

abnormal returns are calculated around the announcement window of  $(-1, 0)$ , where zero denotes the initial announcement date. We also create other windows including  $(-1, 0)$ ,  $(-1, +1)$ ,  $(-2, +1)$ ,  $(-3, +1)$ , and  $(-5, +5)$ . We mainly used the CARs  $(-1, 0)$  as the dependent variable for multivariate regression models in this study.

**Independent variable.** In line with our second hypothesis, we chose target firms' patent count to measure their innovation intensity. The measure indicates the number of patents granted by target firms three years prior to the M&A (Zhao, 2009). We only take into account the patents that have been granted by USPTO, as the patent system has long been recognized as a very rich and potentially fruitful source of data for the study of innovation (Zhao, 2009).

**Moderating variable.** In line with our third hypothesis, we include the interaction terms of innovativeness of target firms and target countries' bilateral trade openness toward acquiring countries. In order to develop the measurement, we refer to the economic openness, which is defined as total trade (imports plus exports) divided by GDP which captures the full impact of globalization on each country (OECD, 1999). After modifying the existing measurement, we measure target countries' bilateral trade openness toward acquiring countries as the sum of imports and exports between acquiring and target country, as a percentage of target countries' GDP.

**Control variables.** We included a number of control variables that may have an impact on M&A performance. The control variables are classified into three categories: (1) deal-specific; (2) acquiring firm-specific; and (3) country-specific. Our deal-specific control variables include industry relatedness (Moeller and Schlingemann, 2005; Akbulut and Matsusaka, 2010; Nicholson and Salaber, 2013), level of control (Aybar and Ficici, 2009; Nicholson and Salaber, 2013), and payment mode (Faccio and Masulis, 2005; Martynova and Renneboog, 2008). In regard to the firm-specific control variables, most of the studies only have taken into acquiring firms' financial status consisting of a number of measures, as better-performing firms self-select the type of acquisition they make to induce a favorable reaction from the market. Following extant studies in the cross-border M&A literature, several control measures such as market power (Gubbi et al., 2010) and firm size (Uhlenbruck et al., 2006). To account for other performance-relevant variables, we take into account average leverage (Gubbi et al., 2010) and average return on asset (Zhao, 2009). In addition to these factors, we control for the country-specific effect stemming from the regional domicile of EMFs, as the regional characteristics of Asian, Latin America, and European EMFs may lead to discernible patterns (Aybar and Ficici, 2009).

## **Insert Table 2**

## **4. Results**

### **4.1. Wealth gains in technology-acquiring cross-border M&As**

Hypothesis 1a was tested by analyzing CARs for varying event windows in EMFs' technology-acquiring cross-border M&A deals. The results, reported in Table 3, show that announcements of technology-acquiring international acquisitions by EMFs are on average, associated with positive abnormal returns. Mean CARs from 1-day to 5-day event windows yield approximately 2% abnormal returns to shareholders of acquiring firms which is statistically significant at the 10% level. The Wilcoxon signed-rank test also confirmed that acquiring firms' CARs are highly significant at the following windows: 53.49% of the firms on (-1, 0), 52.06% of the firms, and 53.02% of the firms on (-3, +1). Hence, hypothesis 1a is supported.

#### **Insert Table 3**

The positive CARs suggest the potential benefits of technology-acquiring cross-border M&A such as developing new skills and improving their exploratory learning to increase the technological knowledge-base for bidder firms. The results indicate that overall investor sentiment with reference to the EMFs' technology-acquiring international expansions through acquisitions is positive. These findings are in line with hypothesized value creation elaborated in studies by Morck and Yeung (1992), Kohli et al., (2012), and Nicholson and Salaber (2013). Thus, an analysis of the announcement returns of technology acquiring cross-border acquisitions that the shareholders of the bidder firms have earned significant and positive wealth gains.

In order to provide a robust analysis result on wealth gains in technology-acquiring cross-border M&A deals, Hypothesis 1b was tested by comparing the mean difference in technology-acquiring and non-technological cross-border M&A deals. The table 4 shows that technology-acquiring cross-border M&A deals have created significant higher returns for the shareholders during the 1-day event window. According to the 1-day event window, technology acquiring cross-border M&A deals generate 1.4% higher abnormal returns than non-technological M&A deals which is statistically significant at 10% level. However, technology-acquiring effect in wider event windows is statistically insignificant. Our results are consistent with Kohers and Kohers (2000) findings that the market is optimistic about such technology-acquiring acquisitions which explain the expectations of investors that the acquisition will provide future growth benefits for the bidder firms.

#### **Insert Table 4**

Thus, an analysis of the announcement returns of EMFs' technology-acquiring cross-border M&As and a comparison of the returns between EMFs' technology-acquiring and non-technological cross-border M&A deals have captured the technology-acquiring effect. Specifically, the effect reveals that the shareholders of the acquiring companies have earned higher wealth gains on the announcement of technology-acquiring foreign acquisitions as compared to those of non-technological acquisitions. These results are in consonance of EMFs' tendency to consolidate target firms' new technological assets with their cheap labor forces for manufacturing

activities and natural resources for production. At same time, the results may lead us to capture the possibility of enhanced innovation capabilities of EMFs throughout the recent decades. In particular, the enhanced innovation capabilities of EMFs allow them to consolidate their core innovation capabilities to be complemented with target firms. Hence, hypothesis 1b is supported.

#### **4.2. Technology acquisition and role of bilateral trade openness**

Table 5 gives descriptive statistics and correlations between the variables used in the analysis. There is no high correlation between the independent and moderating variable, which allows us to use the two measures in the same regression model.

##### **Insert Table 5**

However, there are some correlations among several control variables. First, the firm size measured as total asset and the market power measured as market capitalization are highly and positively correlated to one another with its correlation coefficient of 0.85. For instance, large firms tend to have large market power and vice-versa (Moeller and Schlingemann, 2005). Nevertheless, Gubbi et al., (2010) used these two control variables in the same regression model. In addition, region dummy variables to indicate the regional domicile of the firms from Asia and Latin America are highly and negatively correlated to one another with its correlation coefficient of -0.74. However, this does not negate the importance of controlling for the effect of regional domicile on bidders' stock returns, as our sample consists of the bidders from five nations (Aybar and Ficici, 2009). Above all, despite some notable correlations, variance inflation factors (VIFs) of all the correlated variables indicate its value of lower than 5.00 in which the variables are not instances of multicollinearity. Thus, we use all the control variables in the same regression model.

##### **Insert Table 6**

The OLS regression model results are presented in Table 6. Model 1 is the regression with only control variables. Among the control variables used in this study, acquirers' firm size is significantly negative at the 1% level, which is consistent with the findings of Morck and Yeung (1992). As suggested by Morck and Yeung (1992), small acquiring firms outperform the larger ones owing to their rapidly growing nature with their substantial intangible assets. In fact, small firms are better capable of capitalizing their intangible assets in generating greater wealth gains than the larger firms in cross-border acquisitions.

Model 2 tested main effect of target firms' innovativeness, while Model 3 tested moderating effect of target countries' bilateral trade openness to acquiring countries. According to the model 2, target firms' innovativeness is significantly positive at the 5% level. As indicated in the table 6, the F-value was significant at the 5% level. The evidence implies that a high level of technological innovation by target firms in cross-border

M&A deals can boost stock performance in the long run. The market has welcomed technology-acquiring cross-border M&A pursued by EMFs, recognizing the possible synergy between EMFs' low cost manufacturing skills and intangible resources of the target companies across new geographies (Kohli and Mann, 2012). In other words, if EMFs aim to increase shareholder wealth through cross-border M&A activities, they should target and invest in firms with higher innovation capabilities. Our results are consistent with reverse internalization scholars who argued and found that target firms' intangible assets are important motives for acquiring firms' decision to pursue cross-border acquisition, which eventually contribute to their wealth gains (Eun et al., 1996; Seth et al., 2002).

In addition, industry relatedness between acquiring firms and target firms showed a negative impact on acquiring firms' stock performance. Although the value is not statistically significant, we may still find some partial support for reverse internalization theory. In fact, many scholars adopting forward internalization theory argue and found that cross-border acquisitions create higher returns for acquiring firms, when both acquiring and target firms are in similar sectors or possess similar resources (Conn et al., 2005; Pyykko, 2009). Unlike the firms from advanced countries, EMFs in various sectors have started acquiring target companies' state-of-art technological assets, as these companies lacked technological competitiveness to compete with the foreign rivals in foreign markets (Kale, 2009). Above all, hypothesis 2 was supported, as there is a significant relationship between innovation capabilities of the target firms and abnormal returns of the acquiring firms.

#### **Insert Figure 2**

To demonstrate the moderating effect of "target countries' bilateral trade openness to acquiring countries" on the relation between target firms' innovation capabilities and bidder firms' cumulative abnormal returns, we multiplied the moderator with the independent variable. In model 3, the F-value was also significant at the 5% level along with increased R2 values implying the overall model is distinctly improved after including interaction terms. The independent variable "target firms' innovativeness" is significantly positive at the 10% level. The moderator "openness of target country to acquiring country" is insignificant. The coefficient of the interaction terms is significantly positive at the 1% level. In addition, since interaction terms are often difficult to interpret, we refer to the study of Brambor et al., (2006) and plot the estimated marginal effect of the patent and the 95% confidence interval over the range of "openness of target country to acquiring country" (See Figure 2). The marginal effect on the patent is always above zero and the marginal effect increases when there is an increase in "openness of target country to acquiring country". The result is consistent with the observations by Rossi and Volpin (2004) and Chakrabarti et al., (2009) that the bilateral trade between acquiring and target nations positively and significantly affect the success of cross-border deals. In other words, this result combined with the views of the previous studies implies that EMFs are more likely to benefit from technology-acquiring

cross-border M&A deals in countries, where the bilateral trade openness between acquiring and target countries is greater. Hence, hypothesis 3 was supported and suggests that EMFs acquiring innovative target firms should consider aiming at target nations with greater trade openness toward acquiring nations.

## **5. Discussion and conclusion**

With the remarkable economic achievements made by emerging economies in the recent decades, the firms from these fast-growing economies have played an increasingly important role in the world's M&A activity. Aligned with this trend, our research enriches the extant literature by formally testing the relation between the acquisition of technology from target firms and the bidder's performance as well as examining the role of bilateral trade openness. The results of this study offer important implications and suggestions for future research.

Technology-acquiring cross-border M&As were found to have created substantially greater wealth gains than non-technological cross-border M&As. Also, cross-border M&As that are aiming to exploit technological resources of the target firms are well-favored by the shareholders of the bidder firms, which is consistent with the reverse internalization theory. The findings suggest that EMFs should consider acquiring target firms' technologies to accelerate their catching-up with the incumbent leaders in their respective industry. In addition, this study enriches the development of a dynamic view of institution theory by investigating the effect of bilateral trade openness. The result of this study indicates that the governments of emerging economies should reduce trade barriers with other countries in order for EMFs to effectively acquire new technological assets through cross-border M&A deals. Despite the importance of reducing trade barriers, "Trade Protectionism" is prevalent in emerging economies. In order to reduce the trade barriers, these emerging economies should promote non-tariff trade agreements and exchange of human capital (Noorbakhsh et al., 2001; Yoon et al., 2015).

The findings and implications presented in this study are beneficial to understand the importance of technology acquisition and bilateral trade network for successful cross-border M&A deals for EMFs. However, several limitations remain. Although we have addressed the usefulness of cross-border M&A for EMFs to acquire technologies, this study could not examine how EMFs combine, integrate and reconfigure externally required technologies with the existing knowledge-base, due to the lack of the data (Kogut and Zander, 1992). In this sense, future studies should be replicated by deploying some enhanced measurement such as patent citation, and complementarity and similarity of their technological assets. Last but not least, as evidenced from previous studies, EMFs encounter institutional thresholds from host-countries. Although there are other institutional dimensions, this study focused on bilateral trade network in order to concentrate on introducing and

examining a new dimension of institutions in the context of cross-border M&A deals. In this sense, future studies should be replicated to other relevant measures by considering various pillars and dimensions of institutions (Shimizu et al., 2004; Zhang and He, 2014)

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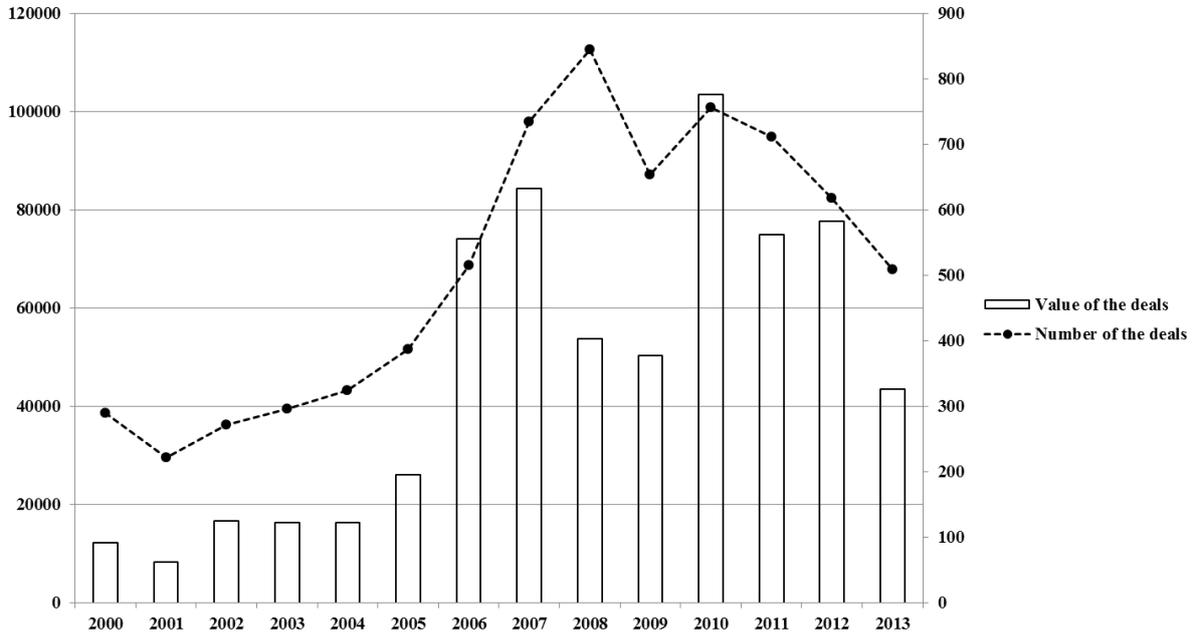
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**Figure 1. Completed cross-border M&A deals by the emerging economies**

*Unit: \$million*



Source: SDC Platinum M&A Database

\*Note: Emerging economies include Brazil, Russia, India, China, and Mexico (Luo and Tung, 2007)

**Table 1. Regression sample description**

Number of deals		Number of deals	
<b>Nationality of acquiring firms</b>		<b>Industry of acquiring firms</b>	
Brazil	25 (6.6%)	Retail	2 (0.5%)
Russia	38 (10.1%)	Wholesale	1 (0.2%)
India	212 (56.6%)	Transport	69 (18.4%)
China	64 (17.1%)	Financial	14 (3.7%)
Mexico	35 (9.3%)	Services	104 (27.8%)
Total	374	Manufacturing	179 (47.8%)
		Others	5 (1.3%)
		Total	374
<b>Nationality of target firms</b>		<b>Industry of target firms</b>	
United States	125 (33.4%)	Wholesale	12 (3.2%)
United Kingdom	30 (8.0%)	Transport	49 (13.1%)
Germany	21 (5.6%)	Financial	18 (4.8%)
Hong Kong	20 (5.3%)	Services	111 (29.6%)
Canada	13 (3.4%)	Manufacturing	174 (46.5%)
Spain	11 (2.9%)	Others	10 (2.6%)
South Africa	9 (2.4%)	Total	374
Australia	8 (2.1%)		
Others	137 (36.6%)		
Total	374		

The table presents the deal characteristics of EMFs' technology-acquiring cross-border acquisitions between January 2000 and December 2013. The regression sample includes cross-border deals for which information is available for all control variables.

**Table 2. Overview of hypotheses, variables, and measures**

Hypotheses	Variables	Measures	Data source
H2 (Independent)	Target patent	Number of patents granted to target company	- USPTO
H3 (Moderator)	Openness of target country to acquiring country	Ratio of its trade (exports plus imports) to GDP	- UNCTAD
	Industry relatedness	Dummy variables with the value of 1 if the first two digits of the two firms' SIC code are the same and 0 otherwise	- SDC Platinum
	Level of control	Percentage of stake owned after transaction	- SDC Platinum
	Payment mode	Dummy variables with the value of 1 if the payment was made in cash and 0 otherwise	- SDC Platinum
	Market power	Logarithm of the average market capitalization over 365 days prior to the event	- Thomson Reuters Datastream
Control Variables	Firm size	Logarithm of the average total assets over three years prior to the acquisition	- Thomson Reuters Datastream
	Average ROA	Average return on asset over three years prior to the acquisition	- Thomson Reuters Datastream
	Average leverage	Logarithm of debt to equity ratio (leverage) averaged over three years prior to the acquisition	- Thomson Reuters Datastream
	Region dummy1	Dummy variables, taking the value 1 if the acquiring firm comes from Asia, and 0 otherwise	- SDC Platinum
	Region dummy 2	Dummy variables, taking the value 1 if the acquiring firm comes from Latin America, and 0 otherwise	- SDC Platinum

**Table 3. Cumulative abnormal returns of technology-acquiring cross-border M&As**

Windows	Mean	Median	s.d.	t-Stat	Positive:negative	%positive	WSR test
<b>All (n=630)</b>							
(-1, 0)	0.0205	0.0027	0.2846	1.81*	337:293	53.49	2.26**
(-1, +1)	0.0198	0.00215	0.2828	1.76*	328:302	52.06	1.67*
(-2, +1)	0.0202	0.00355	0.2793	1.82*	342:288	54.29	1.26
(-3, +1)	0.0201	0.00267	0.2716	1.86*	334:296	53.02	1.78*
(-5, +5)	0.0124	-0.00057	0.2198	1.43	314:316	49.84	1.01

Note: The table gives daily cumulative abnormal returns over the event windows. The sample is larger than in Table 2 as it includes all cross-border deals for which stock market data is available over the event window. One sample t-test statistics conducted to test the significance of cumulative abnormal returns. WSR (Wilcoxon signed-rank test) examines the significance of positive or negative market movement.

\* $p \leq 0.10$ ; \*\* $p \leq 0.05$ ; \*\*\* $p \leq 0.01$

**Table 4. Technology-acquiring effect in EMFs' cross-border M&A**

Windows	EMFs' Non-technological M&A (n=875)		EMFs' Technology-acquiring M&A (n=630)		Technology-acquiring effect	
	CAR <sub>D</sub>	t-Stat	CAR <sub>F</sub>	t-Stat	CAR <sub>F</sub> - CAR <sub>D</sub>	t-Stat
(-1, 0)	0.0062	2.93***	0.0205	1.81*	0.0142	1.43*
(-1, +1)	0.0100	4.05***	0.0198	1.76*	0.0098	0.98
(-2, +1)	0.0110	4.08***	0.0202	1.82*	0.0092	0.93
(-3, +1)	0.0105	3.88***	0.0201	1.86*	0.0095	0.98
(-5, +5)	0.0107	2.47**	0.0124	1.43	0.0016	0.18

\* $p \leq 0.10$ ; \*\* $p \leq 0.05$ ; \*\*\* $p \leq 0.01$

**Table 5. Descriptive statistics and correlation matrix of variables**

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. CAR (-1, 0)	1											
2. Industry relatedness	-0.08**	1										
3. Level of control	-0.12	0.02	1									
4. Payment mode	0.12	-0.01	-0.11**	1								
5. Market power	-0.10**	0.09**	-0.03	0.11**	1							
6. Firm size	-0.16***	0.01	-0.02	0.10**	0.85***	1						
7. Average ROA	-0.12***	0.15***	0.04	0.07*	0.15***	-0.03	1					
8. Average leverage	-0.22	-0.01	-0.08*	0.07*	0.06	0.22***	-0.13***	1				
9. Target patent	0.09**	0.03	0.19	-0.10	0.01	0.00	0.00	0.00	1			
10. Openness of target country to acquiring country	0.07	-0.04	-0.10**	0.08*	0.02	0.04	-0.11**	-0.07*	-0.03	1		
11. Region dummy 1 (Asia)	-0.16	0.05	0.05	0.00	-0.00	0.03	-0.04	0.05	0.01	0.07*	1	
12. Region dummy 2 (Latin America)	-0.72*	-0.00	-0.08*	-0.00	0.07*	0.07*	0.02	-0.03	0.00	-0.04	-0.74***	1
Mean	0.007	0.400	0.832	0.530	6.074	5.827	11.804	69.544	1.13	0.058	0.75	0.16
S.D.	0.038	0.490	0.279	0.499	0.884	0.835	9.255	67.543	7.724	0.174	0.433	0.362
VIF		1.05	1.04	1.04	4.53	4.67	1.18	1.16	1.01	1.12	2.34	2.33

\*p ≤ 0.10; \*\*p ≤ 0.05; \*\*\*p ≤ 0.01

**Table 6. OLS regression results**

Variables	Model 1	Model 2	Model 3
<b>Control Variables</b>			
Industry relatedness	-0.0058 (0.0039)	-0.0060 (0.0039)	-0.0056 (0.0039)
Level of control	-0.0004 (0.0069)	-0.0007 (0.0069)	-0.0000 (0.0068)
Payment mode	0.0022 (0.0038)	0.0022 (0.0038)	0.0020 (0.0038)
Market power	0.0121*** (0.0045)	0.0120*** (0.0045)	0.0115** (0.0045)
Firm size	-0.0186*** (0.0049)	-0.0186*** (0.0049)	-0.0182*** (0.0048)
Average ROA	-0.0007*** (0.0002)	-0.0006*** (0.0002)	-0.0006*** (0.0002)
Average leverage	0.0000 (0.0000)	0.0000 (0.0000)	0.0000 (0.0000)
Region Dummy 1 (Asia)	-0.0090 (0.0067)	-0.0094 (0.0067)	-0.0096 (0.0066)
Region Dummy 2 (Latin America)	-0.0140* (0.0080)	-0.0144* (0.0080)	-0.0143* (0.0079)
<b>Main Effect</b>			
Target patent		0.0005** (0.0002)	0.0004* (0.0002)
<b>Moderator</b>			
Openness of target country to acquiring country			-0.0078 (0.0114)
<b>Interaction Terms</b>			
Target patent X Openness of target country to acquiring country			0.0145*** (0.0052)
R <sup>2</sup>	0.079	0.090	0.109
Adj. R <sup>2</sup>	0.056	0.065	0.079
ΔR <sup>2</sup>		0.11	0.19
F-value		3.587**	3.681**
Number of observation	374	374	374

\*p≤0.10; \*\*p≤0.05; \*\*\*p≤0.01

**Figure 2. Marginal effect of patent on cumulative abnormal returns**

