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Cross-border post-merger integration and technology innovation: A resource-based view

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ABSTRACT

We construct a Markov game of cross-border post-merger integration on technology innovation. The acquirer chooses the integration degree considering resource backgrounds and then makes innovation collaborations. Equilibrium analysis and numerical examples suggest that when resource similarity is high and resource complementarity is low, the acquirer should choose a high integration degree to improve the number of innovation collaborations and increase technology innovation. When resource similarity is low and complementarity is high, the acquirer should choose a low integration degree. When resource similarity and complementarity are both high, the acquirer should choose a medium integration degree. We run quantile regressions using samples of cross-border mergers and acquisitions proposed by acquirers from China, Japan and the United States in the period of 2000–2013. The dynamic game and quantile regressions altogether provide new insight and empirical evidence for understanding post-merger integration's effect on technology innovation under different resource backgrounds. The paper provides theoretical direction for choosing proper cross-border post-merger integration degree to improve innovation with resource-based view.

1. Introduction

Compared with the high difficulty and failure rate of internal research and development, cross-border technology sourcing mergers and acquisitions have become an important mean to achieve technological leapfrog. Considering information asymmetry and the technology gap between the two companies, the acquirer is often unable to achieve effective integration, and fails to assimilate target company's core research and development capabilities and technology innovation abilities.

The post-merger integration process is often considered a complex sequence that involves the combination of two companies' resources in order to realize synergy effects (Puranam et al., 2006). Performances of cross-border mergers and acquisitions heavily depend on the resource relatedness of the acquirer and the target companies. Wernerfelt (1984) first proposed resource-based view of firms. Researchers have applied resource-based view to post-merger studies by analyzing how integrations of similar resources (Makri et al., 2010) and complementary resources (Colombo and Rabbiosi, 2014) can increase post-merger innovation performances. However, existing studies usually focus on one dimension and failed to consider both resource similarity and complementarity at the same time. Considering interaction effect of resource similarity and complementarity, Chen et al. (2016) studied cross-border mergers and acquisitions integration and technology innovation in different resource background groups using dynamic simulation approach.

When we consider theoretical models of cross-border mergers and acquisitions, most studies analyze mergers and acquisitions' role on firm performance and technology transmission/spillover across different countries (Heywood and McGinty, 2011; Sinha, 2013; Kwon and Chun, 2015; Simons, 2014) but ignore the post-merger integration process and the mechanism of how post-merger integration influence innovation performance.

Haspeslagh and Jemison (1991) suggested that the post-merger process is key to the success of M&A. M&A is an interactive and gradual process in which individuals from two organizations learn to work together and it is a dynamic process, but existing models on cross-border post-merger integration and technology innovation lacks the view of dynamic process to ask whether integration strategy changes during the process. The question of how past integration behaviors influence sequential integration strategy and further technology innovation is still open for discussion. In view of this, we construct a Markov game (Maskin and Tirole, 2001) dynamic model with integration degree being state variable to study the mechanism of how cross-border post-merger integration influence technology innovation. We try to model different bargaining power of resource controls

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caused by different integration degree level and how integration degree influence acquirer's innovation.

Existing studies of cross-border post-merger integration analyzed how resource similarity and resource complementarity influence acquirer's integration degree choices by providing the direction and the degree of the influence (Bauer and Matzler, 2014; Puranam et al., 2006). However, existing studies fail to test whether post-merger integration's influence on innovation is different under different resource similarity/complementarity levels. In order to overcome this problem, we provide numerical examples of the number of innovation collaborations achieved by high and low integration degree under different resource similarity/resource complementarity backgrounds. Moreover, we run quantile regressions using samples of cross-border mergers and acquisitions proposed by acquirers from China, Japan and the United States in the period of 2000–2013 to test whether post-merger integration's influence on innovation is different under different resource similarity/complementarity levels.

The rest of the paper is organized as follows. Section 2 is the literature review. Section 3 provides the construction of the Markov game model of cross-border post-merger integration and technology innovation. It also provides equilibrium analysis and comparative statics. Section 4 provides numerical analysis of the model and sensitivity test. Section 5 provides empirical study. We first run regressions on determinants of post-merger integration degree and then provide quantile regressions on post-merger integration's effect on technology innovation. Section 6 provides the conclusion, including scientific contribution compared with existing literature, limitations and future research directions.

2. Related literature

Researchers analyze post-merger integration and innovation performances regarding resource similarity and resource complementarity's effects on post-merger integration and innovation performances. Resource similarity provides similar knowledge backgrounds, skills, languages and recognition structures that will advance knowledge sharing and interactions in the post-merger process to gain synergy effect (Makri et al., 2010). Technological overlap plays a key role in achieving such synergy effect (Bena and Li, 2014). Resource complementarity has the opposite effect on the post-merger process. Colombo and Rabbiosi (2014) suggested that when complementarity of the product market is high, companies should choose a low degree of integration to motivate innovation. Synergies gained from complementary resources will promote sales and reduce cost of research and development per product, which in turn promotes further research and development (Puranam et al., 2006). Without proper integration of the complementary resources in promoting the efficiency of resource combinations, mergers and acquisitions will fail to create value (Kim and Finkelstein, 2009). Sochirca et al. (2013) established a directed technology change model and analyzed complementarity's effect on technology knowledge bias and relative productive power. Schweizer (2005) used a case study to analyze the relationship of integration, especially the effect of the target's autonomy on innovation output in the biology/pharmaceutical industry. When knowledge is more specific, the target should have higher autonomy and there should be less knowledge transfer in post-merger integration. Chen et al. (2016) constructed a global game model of overseas mergers and acquisitions integration and firms' innovation based on the perspective of resource similarity and complementarity. In addition, the relative size of the acquirer's and the target's knowledge bases is also crucial to innovation output after mergers and acquisitions (Ahuja and Katila, 2001).

As for modeling of cross-border mergers and acquisitions, Heywood and McGinty, (2011) constructed a mixed oligopoly model. Then test public firms' mergers and acquisition behaviors with both linear and convex costs to answer for the well-known paradox of low returns for the merging units after mergers and acquisitions. Sinha (2013) analyzed R & D information sharing in cross-border mergers and acquisitions by constructing a Cournot duoply model. He suggested that in small size markets or medium size markets with relative more efficient R & D technology, the firms are more willing to share information. While in larger size markets or medium size markets with less efficient R & D technology, the firms are declined to share information. Kwon and Chun (2015) analyze how technology gap between local firm and multinational firm influence technology acquisition strategies. Considering quality completion, when technology gap between the firms are large, the local firm will not transfer technology to avoid further direct competition even if they have the ability the integration the technology which blocks technology spillovers. Existing models on cross-border post-merger integration and technology innovation lacks the view of dynamic process to ask whether integration strategy changes during the process.

Apparent from domestic mergers and acquisitions, cross-border mergers and acquisitions face different culture backgrounds and the culture distance of different countries is a big challenge to cross-border post-merger integration (Denison et al., 2011). Hofstede (2001) suggested culture distance to analyze culture differences among different countries. Halkos and Tzeremes (2011) use Hofstede's country culture dimensions to analyze how culture affects cross-border bank merger performances. Researchers have drawn conflicting conclusions when dealing with national culture difference in cross-border mergers and acquisitions performances. On the one side, culturally distant countries can improve performances after acquisitions as a result of new routines and practices which help a company to function in global market than of acquisitions in culturally similar countries (Morosini et al., 1998). On the other side, some researchers suggested that national cultural difference is negatively related to post-merger performances (Huang et al., 2017; Jemison and Sitkin, 1986). In addition, Stahl and Voigt (2008) found culture difference's effect on acquisition performance approaching to zero using meta-analysis. In view of this, we add country culture distance as an exogenous parameter in the modeling process and take culture distance of the acquirer and the target firms as a control variable in the empirical analysis.

3. Markov game of cross-border post-merger integration and technology innovation

3.1. Games on innovation collaboration in post-merger

The innovation collaboration formation depends on the bargaining power comparison between the acquirer and target companies in the integration process. In stage t, there are two states of integration denoted as st, which is st = D if the integration state is high and st = N if the integration state is low, $st \in \{D, N\}$. Different states of the post-merger integration will lead to different bargaining power between the acquirer and the target companies on the newly built innovation collaborations during the integration process.

We use Z_t to denote the total innovation collaborations made during post-merger process as follows: $Z_t = \sum \theta_t^i$, $i \in M$. θ_t^i represents the total number of innovation collaborations that are made in time t. Furthermore, we denote P_t^A as the bargaining power of the target on innovation collaboration formation in the integration process:

$$P_t^A = d\varnothing Z_t = d\varnothing \sum \theta_t^i \quad (1)$$

Here $\varnothing$ stands for resource complementarity and according to Chen et al. (2017), we set $\varnothing \in (1, 10)$. Eq. (1) suggests that in the process of post-merger integration, the power of the target is positively related with resource complementarity. When resource complementarity is high, the target has more information advantage in different resources and more bargaining strength in innovation collaboration formation proposals. d is the culture distance value of the acquirer and the target.