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Corporate governance' impact on research and development☆

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ABSTRACT

This study examines the effects of legal and investor protection mechanisms on the efficiency of R&D. This study makes two contributions to the literature. First, when a company lists shares in a common law country or one with higher investor protection (i.e., a company has better country-level corporate governance), the R&D investments of companies create more value. Second, companies that issue ADRs generate higher value from their R&D investments than those that do not issue ADRs. For some companies without ADR issues, their R&D investments decrease the market value of the company. The issuance of ADR strengthens the level of supervision, reducing the agency problem and inducing a higher value of their R&D investment. To the best of our knowledge, no previous studies have examined this phenomenon.

1. Introduction

The agency problem decreases the efficiency of research and development (R&D) and the value of R&D investments. For example, when there is asymmetry between information held by executives (agents) and shareholders (principals), executives tempt to engage in self-interested and not efficient R&D activities. Therefore, agency problems cast uncertainty over the value of R&D investments (Hall & Lerner, 2010; O'Connor, Rafferty, & Sheikh, 2013; Tsao, Lin, & Chen, 2014). Prior studies show that firm-level governance factors solve the agency problem. Therefore, firm-level governance factors positively facilitate R&D and improve its efficiency. For example, firms use equity compensation to reduce the agency problem and improve R&D efficiency Ryan & Wiggins, 2002; Cheng, 2004; Coles, Daniel, & Naveen, 2008; Wu & Tu, 2007; Xue, 2007; O'Connor et al., 2013). Board and ownership structure also affect the efficiency of R&D (Baysinger, Kosnik, & Turk, 1991; Cui & Mak, 2002; Lee & O'neill, 2003; Chen & Hsu, 2009; Eng & Shackell, 2001; Ayyagari, Kunt, & Maksimovic, 2011).

From a macroeconomic perspective, every country has different governance mechanisms. With better country-level governance mechanisms, firms can reduce the agency problem and improve R&D efficiency. Using samples from global ADR data together with manually selected matched samples, this study provides new insight on how much country-level corporate governance mechanism and ADR issues affect R&D efficiency through the reduction of agency problems.

This study contributes to the literature in two ways. First, when a company lists shares in a country with common law or higher investor protection (i.e., the company has better country-level corporate governance) the R&D investments of companies generate more value. Second, companies that do issue ADRs have higher value for their R&D investments than those that do not issue ADRs. For some companies without ADR issues, their R&D investments decrease the company's market value. This is because the issuance of ADR strengthens the level of supervision, reduces the agency problem and induces a higher value of R&D investments. To date, no other studies examine this phenomenon.

The structure of this study is as follows. The first section is the introduction, which describes the research question and contribution. The second section describes theories and hypotheses. The third section describes the source of the data and models. The fourth section describes results and the final section contains the conclusions.

2. Theory and hypothesis development

2.1. Country-level governance mechanisms and R&D investments

Better macro-governance mechanisms, including well-developed legal systems and financial development, overcome the agency problem (King & Levine, 1993; La Porta, Lopez, Shleifer, & Vishny, 1998; Rajan & Zingales, 1998; Beck, Levine, & Loayza, 2000; Beck & Levine, 2002;

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Demirgu & Maksimovic, 2002; Hsu, Tian, & Xu, 2014). While previous studies focus on two or three countries, this is the first study to collect and analyze global American Depositary Receipts (ADRs) to ascertain whether country-level governance mechanisms can overcome the agency problem and thereby improve the efficiency of R&D investments.

This study applies three highly representative country-level governance mechanisms identified from prior studies: the legal system (common law) and shareholder protection (anti-director rights index and anti-self-dealing index). First, countries that follow the common law legal tradition currently provide stronger protection for investors than countries that follow the civil law. Country that follows common law reduces information asymmetry in company (Aggarwal, Erel, Ferreira, & Matos, 2011; Borisova, Brockman, & Salas, 2012; Hsu et al., 2014). Second, La Porta et al., (1998), hereafter referred to as LLSV, construct an anti-director rights index. There are six components in the anti-director rights index: three are concerned with shareholder voting (voting by mail, voting without blocking of shares, and calling an extraordinary meeting), and three with minority protection (proportional board representation, preemptive rights, and judicial remedies) (Spamann, 2010). The value of the anti-director rights index is from one to six. The anti-director rights index has a higher value if laws protect shareholders better. Third, Djankov, La-Porta, Lopez and Shleifer (2008), hereafter referred to as DLLS, extend the basic concepts developed by LLSV (1998) and focus more explicitly on self-dealing. DLLS (2008) propose the anti-self-dealing index by collecting three dimensions of investor protection: transparency of transactions (extent of disclosure index), liability for self-dealing (extent of director liability index), and shareholders' ability to sue managers and directors for misconduct (ease of shareholder lawsuits index). The anti-self-dealing index adopts a more stringent standard to judge a country's investor protection.

This paper suggests the following hypothesis:

H1. Better country-level governance mechanisms (common law countries or those having a higher investor protection index) are able to solve the agency problem and induce higher efficiency of R&D investments.

2.2. Impact of the issue of ADRs on research and development

The issuances of ADRs strengthen corporate governance. Stulz (1999) proposes that by issuing ADRs, companies "bond" themselves to American laws and the supervision system to protect their investors and that such bonding reduces the agency problem (Doidge, Karolyi, & Stulz, 2004; Lins, Strickland, & Zenner, 2005; Seigel, 2005). Hence, the supervisory system used in the United States is comparatively stricter than that in other countries and compliance with U.S. laws and regulations strengthen the supervisory system. Therefore, companies experience a reduction in agency problems after they issue ADRs (Miller, 1999; Foerster & Karolyi, 1999; Doidge et al., 2004; Lins et al., 2005; Hail & Leuz, 2009). Extending previous studies, this study attempts to offer a new perspective on the benefit of the issuance of ADRs for firms' managers and investors: companies increase the efficiency of their R&D activities with the issuance of ADRs.

When a company issues an ADR, there are four different types of issuing programs, or facilities, that a company can choose. Level 1 ADRs are the lowest level of sponsored ADRs that a company can issue. The issuing programs of Level 1 depositary receipts have minimal reporting requirements with the Securities and Exchange Commission (SEC). Investors can only trade Level 1 shares on OTC markets. Issuing programs of Level 2 depositary receipts are more complicated than issuing programs of Level 1 depositary receipts. When a foreign company wants to list the shares on a U.S. stock exchange, it must at least set up issuing programs of Level 2 depositary receipts, which are required to follow the Generally Accepted Accounting Principles (GAAP) or the International Financial Reporting Standards (IFRS) as published by the International Accounting Standards Board (IASB). Issuing programs of Level 3 depositary receipts not only list firms' shares in the U.S. but also issue shares to raise capital. Issuing programs of Level 3 depositary receipts are the highest level that a foreign company can sponsor. The company is required to adhere to rules similar to those followed by U.S. companies. Higher requirements induce higher investor protection. The sequence from highest to lowest issuance standard is Level 3, Level 2, and Level 1.

This paper suggests the following hypothesis:

H2. The issuance of ADRs strengthens the level of supervision and reduces the agency problem. Those companies that do issue ADRs create higher market value for their R&D investments than those that do not issue ADRs.

3. Research design

3.1. Data

This study constructs the sample by collecting research and development data on all ADR firms for the period of 1973–2014. The stock prices and trading volumes of related companies are from Datastream and CRSP. The registration country and the issue category of related companies are from the SEC-424 and 20-F files. The financial data of related companies are from Worldscope-Datastream and Compustat.

This study deletes some data because Level 1 ADR trades occur only once every several days and the trade volumes are small. When the liquidity of the Level 1 ADRs is too low, investors could easily control or manipulate the company's stock price. Under such circumstances, the share price cannot correctly reflect the actual value of the company. To avoid this problem, we refer to Callaghan and Barry (2003) to define "thinly traded" and delete those thinly traded ADRs. Callaghan and Barry (2003) define "thinly traded" as stocks trading on fewer than 90% of the trading days during the estimation period.

For each ADR firm, a matching non-ADR firm is selected that meets the following criteria: (1) they are in the same country and industry (6-digit GICS code) and (2) the matching (non-ADR) firm is the closest in terms of total assets, net sales, and cash holdings to each ADR firm.

In total, there are 11,823 records of research and development data from 38 countries. Summary statistics are presented in Table 1.

From Table 1, companies in countries with higher corporate governance (common law, higher anti-director rights index, and higher anti-self-dealing index) have higher R&D/total asset and R&D/cash ratios than those located in countries with lower standards of corporate

Table 1
Summary statistics.

	RD/TA	RD/CASH
Panel A law		
Common law	0.0348	9.7290
Other law	0.0315	0.7014
Increased	0.1037***	12.8713***
Panel B anti-director rights index		
Higher anti-director rights index	0.0360	3.3019
Lower anti-director rights index	0.0314	0.5408
Increased	0.1466***	5.1056**
Panel C anti-self-dealing index		
Higher anti-self-dealing index	0.0355	4.8261
Lower anti-self-dealing index	0.0326	0.7582
Increased	0.0887***	5.3656***
Panel D ADR		
Level 23	0.0443	6.1668
No-ADR	0.0206	0.5928
Increased (23 no)	1.1561***	9.4023***

Source: Datastream-Worldscope.
***, **, and * indicate significant at 1%, 5%, and 10% levels, respectively.