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The value relevance of R&D assets: An inquiry into the institutional role of corruption and law enforcement

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Contents

ABSTRACT

This study examines the value relevance of the capitalized research and development (R&D) costs and the moderating role of corruption and law enforcement therein. The author conjectures that R&D is positively value relevant, and that corruption and law enforcement positively moderate the association between capitalized R&D costs and firm market values. A panel regression is performed on a sample of 13,440 firm-year observations between 2010 – 2020 in East Asian countries. Of this sample, 10,862 report R&D expenses, and 2,578 report capitalized R&D costs. Corruption and law enforcement are measured as public perceptions. Firm share prices are regressed on capitalized R&D costs, and interaction terms between capitalized R&D costs and corruption control measures and law enforcement measures. The findings suggest that at the average level of corruption control, capitalized R&D is negatively value relevant and timely. At the average level of law enforcement, capitalized R&D is value irrelevant but timely. An implication of these findings is that corruption control institutions, while increasing in strength, likely has yet to reach the threshold at which venal forms of corruption that often influence the outcome of R&D capitalization tests are penalized. Additionally, legal institutions in certain legal systems do not effectively protect shareholder rights, thus leading to alternative corporate governance structures that render reported R&D information less relevant in resolving agency problems than insider information. These results are to be viewed in consideration of self-selection.

Keywords: Value relevance, research and development, corruption, law enforcement, institutions, corporate governance

1. Introduction

A major part of corporate growth has been driven by investments in intangible assets. Contrary to the increasing importance of innovative capacity in sustaining competitiveness, the accounting profession has not followed such a paradigm shift. Accounting standard setters remain divided over whether expenditures related to intangible assets should be recognized as assets (i.e. capitalized) or expensed as incurred. Such a mismatch between the accounting profession and the economic environment has contributed to the deteriorating relevance of accounting information, which has real economic consequences.

In the modern economy, 'new economy' companies conduct a great deal of innovation to fuel their expansion and the current accounting treatment of research and development (R&D) may adversely affect these companies. These companies have been rising in prevalence in developing countries, which have provided much -needed innovation for economic development (Dealstreet Asia, 2022a, 2022b, 2022c; Arkolakis et al., 2018). The unique institutional factors present in these countries have contributed a great deal to the role of corruption in commercial affairs. Weak enforcement of shareholder rights and rampant political connections potentially impair the information content of intangible assets. In turn, investors may regard these assets to be less likely in generating economic benefits in the future, thus affecting the valuation of the assets.

1.1. Research problem and motivation

There are two regimes in the accounting treatment of R&D costs. The Financial Accounting Standards Board (FASB) establishes an expensing regime in the U.S. such that the full amount of R&D costs must be expensed as incurred, except for software developers. In contrast, the International Accounting Standards Board (IASB) requires the capitalization of development costs if certain criteria are met. This difference reflects the underlying academic debate informing the standard-setting process.

Two camps exist in the R&D accounting debate, each supporting either the expensing or the capitalization side. The former holds that the uncertainty of future economic benefits deriving from R&D expenditures requires the expensing of such expenditures, as these do not necessarily lead to the generation of an asset (SFAS No. 2 Accounting for Research and Development Costs, 1974, paras. 39–41). The latter holds that failing to capitalize R&D costs causes investors harm by understating both current and future earning power, and that the capitalization of other types of assets is equally uncertain in terms of the realization of future economic benefits (Lev, 2018, 2019).

The accounting literature made attempts to determine the value relevance of R&D costs. Value relevance, defined as the association between accounting amounts and market values, seeks to determine whether investors make use of the former in equity valuation (Barth et al., 2001). Generally, it has been found that both the expensing and capitalization of R&D costs are value relevant. While expensing is less value relevant and negatively related to future performance, the value relevance of capitalization is more nuanced. For example, in France, where companies could either expense or capitalize R&D costs, Cazavan-Jeny & Jeanjean (2006) and Cazavan-Jeny et al. (2011) found that

capitalized R&D costs are negatively related to market values and future performance, citing improper application of accounting standards and the weak legal enforcement attributable to the French civil law system. In contrast, in common law countries such as the U.K., where companies are required to capitalize development costs, Oswald & Zarowin (2007) and Tsoligkas & Tsalavoutas (2011) found that capitalized development costs positively relate to market values. Therefore, it seems that the missing link in value relevance studies is the lack of consideration of country-level institutional factors. In this study, significant attention is paid to both corruption and law enforcement as institutional factors with economic consequences.

Corruption is defined as 'the breaking of a rule by a bureaucrat (or an elected official) for private gain' (Banerjee et al., 2012, p. 6). It could be seen as one of the many consequences of the legal origins of a country's laws and legal traditions (Porta et al., 2008). Developing countries suffer from corruption due to their underdeveloped institutions (Acemoglu & Robinson, 2012), and enforcing property rights might be costly, thus creating a vicious cycle where corruption stifles efficient resource allocation (Acemoglu & Verdier, 1998). Inquiries into the relationship between corruption and accounting have been sparse (Houqe & Monem, 2016) despite the latter's role in reducing asymmetric information. On the other hand, several attempts to investigate the interplay between the law and accounting information have been documented (Ball et al., 2000; Fung et al., 2013).

This study extends past efforts in investigating the value relevance of R&D expenditures, as well as in understanding how institutional features affect the relevance-reliability trade-off often met in the reporting accounting information. East Asia provides a unique context from which answers can be obtained. The region has experienced rapid economic growth despite the relatively underdeveloped institutions compared to Western countries. This study is of interest to standard setters thanks to the study's primary interest in testing jointly the relevance and reliability of accounting information (Barth et al., 2001).

1.2. Research objectives

This study examines the value relevance of capitalized portion of R&D costs. Building upon Mazzi et al. (2019), Houqe & Monem (2016), and La Porta et al. (2008), corruption control and law enforcement are used to moderate the relationship between capitalized R&D costs and market values. Specifically, the main research question is formulated as follows: **How do corruption control and law enforcement affect the value relevance of capitalized R&D costs?**

1.3. Methodology and data

A fixed-effects panel regression is carried out on a panel of firm-level and country-level data between the years 2009-2019. Both market values of firms and annual report numbers indicating the amount of capitalized R&D costs are obtained from the Thomson Reuters Eikon database. Corruption control and law enforcement—both moderators to the relationship between capitalized R&D costs and market values—are measured using World Governance Indicators (WGI) estimates, developed and refined by Kaufmann, Kraay, and Mastruzzi (2010).

1.4. Organization

The remainder of this paper is organized as follows. Section 2 presents a review of extant literature from value relevance studies, as well as economic and legal studies to provide a theoretical framework to sensitize corruption and law enforcement. Hypotheses are provided in this section as well. Section 3 explains the design of this study, the variables used, and the methods of analysis. Section 4 describes the results from the analyses performed on the sample. Section 5 provides a discussion of the findings in Section 4, as well as the ruling out of alternative explanations. Finally, Section 6 concludes the paper and highlights the limitations of this study.

2. Literature review & hypothesis development

2.1. Accounting for intangible assets under IFRS © Standards

The accounting treatment for intangible assets, into which the issue of R&D accounting falls, is prescribed by IAS 38 *Intangible Assets*. Of particular interest in this study is the issue of when an intangible asset is recognized.

Recognition of intangible assets depends on how an entity could have acquired the asset. Undertaking an internal project to create an intangible asset is one such means from which an asset might be recognized. The outlays for the project to create the asset may or may not lead to the entity's control of future economic benefits, thus making it unclear whether an asset could be recognized or not. Therefore, IAS 38 prescribes that the generation of the asset be classified into the *research* phase and the *development* phase (International Accounting Standards 38 Intangible Assets, 2004, para. 52). Outlays for the research phase are immediately expensed as incurred because the entity cannot yet demonstrate the existence of any probable economic benefit (International Accounting Standards 38 Intangible Assets, 2004, para. 55). Outlays for the development phase *must* be capitalized if the entity can demonstrate (International Accounting Standards 38 Intangible Assets, 2004, para. 57): a) technical feasibility, b) intention to complete the asset, c) ability to use or sell the asset, d) the probable future economic benefits of the asset, e) the availability of adequate resources, and f) the ability to measure reliably the development expenditures of the asset.

All the above criteria must be met for an internally generated intangible asset to be recognized. IFRS Standards are principles-based accounting standards, thus, a certain degree of judgment is involved in demonstrating that all paragraph 57 criteria have been satisfied (KPMG, 2017; PricewaterhouseCoopers, 2019).

2.2. The value relevance of capitalized R&D costs

The complexity of the R&D environment render it one of the major sources of asymmetric information (Aboody & Lev, 2000; Chen et al., 2017; G. J. Yu & Hong, 2016) in a principal-agent situation. Its high degree of uncertainty can have economic consequences, demonstrated by the greater probability of R&D-intensive firms having a steep stock price decline (Wu & Lai, 2020). Kumar and Li (2016) found that for large, R&D active firms, intangible capital investment is insignificantly related to subsequent cumulative returns over the first five years, yet the relationship becomes significantly

positive by the sixth year. This result, however, is dependent on the resolution of the uncertainty in the generation of the option (i.e., creating investment opportunities) and in the exercise of the option (i.e., executing innovation). Since corporate disclosure policies constitute market signals that are interpreted by investors in making their decisions (Kumar et al., 2012; Kumar & Li, 2016), the accounting for R&D expenditures plays a role in determining the outcome of capital allocation (Dinh et al., 2019).

Capitalization tests under IAS 38 require that entities gather information to substantiate the capitalization of intangible assets. This requirement generates value-relevant information from which users of financial statements can determine the success or failure of the development of the asset (Chen et al., 2017). Past studies in both U.S. GAAP and non-U.S. GAAP contexts have documented that R&D capitalizing firms provide more value-relevant information than R&D expensing firms (Ballester et al., 2003; Oswald & Zarowin, 2007; Tsoligkas & Tsalavoutas, 2011; R. Zhao, 2002). In the U.S., the difference is demonstrated by studies examining the only exception under U.S. GAAP that allows software development industry firms to capitalize software development costs. These studies indicate the greater relative value relevance of R&D capitalizing firms over R&D expensing (Aboody & Lev, 1998, 2000; Lev & Sougiannis, 1996). Such a difference is likely attributable to investors' knowledge about a firm's possession of information resulting from capitalization tests (for IFRS adopters) which, if passed, could associate the costs of the development to future economic benefits (Chen et al., 2017). As such, when such information is disclosed, market reactions can be expected from R&D-capitalizing stocks.

R&D expenditures, whether capitalized or expensed, hold information content in the financial markets. However, the direction of the relationship between R&D expenditures and market values varies in different accounting regimes and institutional backgrounds. As previously mentioned, the U.S. GAAP expensing regime contributed to the undervaluation of U.S. R&D-intensive firms (Lev & Sougiannis, 1996). The Japanese regime which mandates a similar expensing requirement as the U.S. GAAP, however, did not lead to the undervaluation of Japanese R&D-intensive firms (Nguyen et al., 2010). This difference is reconciled by Nguyen et al. by attributing the mispricing in the U.S. to the valuation biases in U.S. firms that are more diversified in their operations and thus contribute to the high likelihood of R&D expenses representing failed projects.

In the non-U.S. GAAP context where development cost capitalization is mandated or allowed, the results also vary. In France, where the legislation allows both the expensing and capitalization regimes to exist, Cazavan-Jeny and Jeanjean (2006) and Cazavan-Jeny et al. (2011) identified a negative effect of R&D capitalization on the market values of French firms, pointing to a possibility of French managers using R&D capitalization to manage earnings. Such opportunistic R&D capitalization is also encountered in Italy (Markarian et al., 2008). In South Korea and China, the effect of R&D capitalization on market values is found to be positive, suggesting that investors treat R&D as assets (Han & Manry, 2004; Kim et al., 2021; Y. Wang et al., 2017).

These mixed findings are consistent with the two views on earnings management (Z. Lin et al., 2016); R&D capitalization can be opportunistic and expropriative of minority shareholders, or it can be informative to transmit private information about the firms' prospects. The former is consistent with findings that indicate the negative valuation of R&D capitalization, while the latter is in line with the positive valuation of R&D capitalization. Nonetheless, given the definition of R&D in IAS 38 as well as the capitalization test criteria in IAS 38 para. 57, R&D capitalization should hold greater information content in broad terms. Therefore, the following alternative hypothesis is proposed:

H1: *The recognition of R&D expenditures as an intangible asset (i.e. capitalization) has value relevance. Specifically, the effect of capitalized R&D expenditures on market values is significant, with an expected positive direction.*

2.3. Corruption

2.3.1. Defining corruption

There is extant academic literature that has attempted to define corruption, which seems to converge on a consensus that corruption involves the abuse of entrusted power for private gain (Shleifer & Vishny, 1993; Goudie & Stasavage, 1997; Acemoglu & Verdier, 1998; Banerjee et al., 2012; Transparency International, n.d.).

2.3.2. The economics of corruption and its implication on growth

Treisman (2000) finds that deep-rooted institutional factors play a role in controlling the level of corruption in a country. For instance, Dong and Torgler (2011) established a political economy model where democracy can better control corruption when property rights enforcement functions and income inequality is low. The moderating role of income inequality points to the role of economic development in controlling corruption (Treisman, 2000). However, because corruption entails deriving economic rents from discretionary powers, market distortions are bound to follow. These distortions yield nuanced implications for economic growth and private investment (Shleifer & Vishny, 1993; Mauro, 1995; Leff, 1964; Javorcik & Wei, 2002; Paulo et al., 2022; de Vaal & Ebben, 2011; Y. Wang, 2020).

The effect of corruption on long-term economic growth has been a subject of lively debate. A strand of literature argues that corruption may be conducive to growth—the "grease the wheels" (GTW) hypothesis (Acemoglu & Verdier, 1998; de Vaal & Ebben, 2011; Dzhumashev, 2014; Leff, 1964; Rock & Bonnett, 2004; Song et al., 2021; Vial & Hanoteau, 2010; Y. Wang, 2020). This line of argument has largely fallen out of favor and is often met with rebuttals by the opposing camp that corruption inhibits growth—the "sand the wheels" (STW) hypothesis (Afonso & Longras, n.d.; de Vaal & Ebben, 2011; Domadenik et al., 2016; Huynh & Tran, 2021; Kaufmann & Wei, 2000; Kunieda et al., 2016; Mauro, 1995; Méon & Sekkat, 2005; Sharma & Mitra, 2019; Y. Wang, 2020; Wei, 2000). The prediction that corruption acts as an efficient grease to economic progress assumes the exogeneity of bureaucratic burden and red tapes (Kaufmann & Wei, 2000). That is, efficient grease prediction only holds in a partial equilibrium environment where public officials can create hold-up effects at their discretion (Shleifer & Vishny, 1993).

An efficient grease may work as part of an optimal allocation in an endogenous setting that is plagued with incomplete contracts (Acemoglu & Verdier, 1998). Differentiating between the industrial organization of political institutions in a country offers help in bringing clarity to this alternative case. Wang (2020) argued that organized and collusive forms of corruption are the least damaging to growth, which is consistent with the joint monopoly typology established by Shleifer and Vishny (1993). In addition, differing levels of institutional development have a moderating role in the relationship. When property rights and political stability do not meet certain development thresholds, corruption may serve as a way to evade institutional hurdles and is eventually conducive to growth (de Vaal & Ebben, 2011). Another factor at play is the motivations of public officials. Olson (1993) differentiated corrupt officials with long-term orientations from those with short-term orientations. Relative to the latter, the former's interests will be best served by extracting sustainable rents from entrepreneurs. Vial and Hanoteau (2010) and Rock and Bonnett (2004) vindicate Olson's proposition by looking at the East Asian setting, which is characterized by high rates of economic growth despite high levels of corruption. Vial and Hanoteau (2010) also found corruption to relate positively to output growth in Indonesian manufacturing plants. Corruption's effect on economic growth is especially pronounced in newly industrialized countries in East Asia (e.g. China, South Korea, Japan, Indonesia), owing to these countries' large internal markets and pool of labor supply, thus enabling a longer period of import-substituting industrial policies (Dobson & Safarian, 1997; Rock & Bonnett, 2004). These findings point to a trajectory of institutional and economic development in the East Asian setting which diminishes the validity of the GTW hypothesis. That is, the effect of corruption on economic growth is subject to the institutional threshold of a country.

2.3.3. The economics of corruption on the firm level: East Asian paradox

East Asia has witnessed a period of breakneck economic growth considering its distinct institutional features. One of the most prominent institutions is that of culture. East Asian business culture is characterized by its close-knit relationship both with inside and outside parties, often through informal channels (Dobson & Safarian, 1997), possibly resulting from the high degree of collectivist tendencies. Concerning corruption, such institutions are bound to be reflected in the performance and the subsequent valuation of the firms.

Prior studies have suggested that firms have an incentive to remain on favorable terms with government officials. Xie et al. (2019) found that firms in China are reaping benefits from engaging in corrupt practices with government officials to enable product innovation. Moreover, Vu et al. (2018) found that the performance of firms in Vietnam is not adversely affected by corruption. Alexeev and Song (2013) vindicates these findings by establishing the role of competition in encouraging corruption. These findings are consistent with the theory that firms must respond to institutional requirements to survive and prosper (Scott, 2014). Consequently, firms facing unfavorable environments must adopt non-market strategies such as corruption to secure resources and maintain competitiveness (Zhou et al., 2018).

Past findings that corruption has implications for the choice of competitive strategy suggest that corruption has implications on investment decisions and firm performance. Indeed, Wei (2000) has highlighted the adverse effect of corruption on investment. However, in East Asia, investors may have to acquiesce to the inherence of corruption as part of the *status quo* in the business environment, thus making them less reluctant in making investments despite the existence of corruption (Dobson & Safarian, 1997; Rock & Bonnett, 2004). This is evident in past literature that found support for the role of political connections in encouraging investment in innovation/R&D (Alexeev & Song, 2013; Fengyan et al., 2022; C. Lin et al., 2011; Lu et al., 2022; Xie et al., 2019; F. Yu et al., 2019; Zhang & Guo, 2019). Consistent with earlier mentions of the endogeneity of institutions, these findings are moderated by institutional factors such as anti-graft organizations, law enforcement, and the political system. Referring to the literature highlighting the increasingly important role of intangible investment in promoting value creation both at the aggregate and at the firm level, this finding is consistent with the institutional theory in the sense that firms are trying to capture the greatest driver of value to maintain their competitiveness. Interestingly, opposing findings suggest the adverse effects of corruption on investment in innovation/R&D. In the Chinese context, Hou et al. (2017) found that political connection yields a "political resource curse" effect on a firm's innovation. This is since firms now enjoy greater resources, overinvest in loss-making projects, benefit from increased competitiveness which lowers the pressure to pursue innovation, and make payments to preserve political connections which eventually crowd out R&D expenditures. Bureaucratic corruption is also found to negatively affect firms pursuing innovation (Ayyagari et al., 2010) by offering "efficient grease" to innovators who have high, inelastic demand for option value assets that only the government can grant (e.g. patents, licenses) (Murphy et al., 1993). As such, consistent with Hou et al. (2017), innovating firms are forced to spend more resources to obtain political connections.

The ripples from the effect of corruption on private investments in productive assets are, in turn, reflected in the performance of the firms. In a manner that reflects the two camps of the debate on the effect of corruption on growth, the results are divided between those supporting the STW camp, and those supporting the GTW camp. For example, from the STW camp, corruption retards sales growth more than taxation (Fisman & Svensson, 2007), lowers liquidity (Malinowska, 2019), affects current and future profitability negatively (Faccio, 2010; Jackowicz et al., 2014; Mazzi et al., 2019), increases cost of debt (in Malaysia) (Bliss & Gul, 2012), and increases leverage and thus risk (Fu et al., 2017; Khwaja & Mian, 2005). From the efficient grease/GTW camp, corruption allows politically connected firms to borrow from state-owned banks (Fengyan et al., 2022; Fu et al., 2017; Khwaja & Mian, 2005; Zhang & Guo, 2019) at lower interest rates (Infante & Piazza, 2014; Li et al., 2008), pays fewer taxes (Faccio, 2010; Saeed et al., 2019), and improves financial and accounting performance (Faccio, 2006, 2010; Fisman, 2001; Hung et al., 2015; Li et al., 2008).

Despite the nuanced findings, a partial equilibrium approach to corruption would allow a better understanding of the effect of corruption on performance. That is, as long as a certain threshold of

institutional development has not been met and public officials are not interested in the long run, corruption would be conducive to growth. Since there have been numerous regime changes in East Asia, there may be changes to the institutions and the incentives to public officials which may render corruption meritless in inducing firm growth and value.

2.3.4. Accounting choice and the valuation of corruption

Corruption requires that in the exchange of favors between firms and public officials, both sides will have to obscure facts from the ones holding them accountable (Shleifer & Vishny, 1993). As one may have expected, politically connected firms' financial accounts must remain opaque to hide the existence of such exchanges (Liu et al., 2017). This can be attributable to the principal-agent problem arising from different ownership structures and governance issues. In East Asian firms, the principal-agent problem shifts from that of the conventional case between managers and shareholders to that between controlling and minority shareholders (Claessens & Fan, 2002). When management rights to the firm's resources have been obtained, controlling shareholders can divert resources to themselves and away from minority shareholders.

In a corporate setting, effective control of the firm makes way for accounting policies that will preserve the position of the controlling shareholders. Politically connected firms are more likely to choose the costlier, but more discreet real earnings management strategy (REM) (Braam et al., 2015; Z. Wang et al., 2020). REM is the deliberate cutting back of value-creating expenditures (e.g., R&D, sales and advertising, human capital development) with real long-term consequences on firm value. Intuitively, the quality of accruals would suffer as efforts are shifted to time real activities to smooth earnings in the short term. This is confirmed by Riahi-Belkaoui (2004) and Chaney et al. (2011) who documented poorer accruals quality in companies operating in high corruption countries, as well as those with political connections.

When corruption influences accounting policies, it is transmitted as part of financial information that investors will use in the valuation of the firm. Generally, the disclosure of accounting information can either take the opportunistic (Healy & Wahlen, 1999) or the informative/signaling approach (Holthausen & Leftwich, 1983). In the former, financial statements are prepared to mislead users for the benefit of the preparers, whereas in the latter, the preparers of financial statements are transmitting private information or future expectations on the entity's performance or financial position. The opportunistic setting is more in line with the East Asian setting with its rampant corruption and political connections among firms (Huang et al., 2013; Yeo et al., 2002). That is, as institutions develop and public offices' incentives shift in the long run, the role of corruption in affecting the valuation of firms may diminish. This has been observed in studies examining the moderating role of corruption in various aspects of firm activities (Fengyan et al., 2022; Lu et al., 2022; F. Yu et al., 2019).

2.3.5. Capitalization of R&D expenditures in a corrupt setting

In general, the requirements in IAS 38 para. 57 are subject to a high degree of management discretion. In combination with the earlier discussion on the effects of corruption on business and

reporting practices, there are several ways by which corruption can feed into the capitalization of R&D outlays.

Management discretion plays a great part to demonstrate technical feasibility. Not only does management has the relevant information, but it also controls the process of the undertaking. Therefore, it can take any measures to increase the probability of completing the asset. For example, the pharmaceutical industry relies heavily on the development and approval of pharmaceutical drugs. In this case, the government is involved and requires that the pharmaceutical firm submits the drug for clinical trials. This series of trials serve as evidence of the technical feasibility of completing the development of the drugs (PricewaterhouseCoopers, 2019). Government officials in charge of the trials have the discretion to shorten the time to review all evidence of the safety of the drugs (Light et al., 2013).

The ability to use or sell is closely related to the probable economic benefits deriving from the asset. When a market for the intangible asset or the output of that asset exists, there is a probability that economic benefits will flow into the firm in the future. In turn, when it can satisfy the demand for the products/services produced from the asset, it will have been successful in determining its ability to sell. For example, Covid-19 has created a demand for vaccines and medications, and the demand for these products is characterized by their small elasticity due to the urgency of the situation (Regalado, 2021). Here, the rent potential is large (Su & Fung, 2013), especially when the firms' have access to greater market share due to their political connections (Faccio, 2010).

To demonstrate that adequate resources are available, corruption through political connections can provide an "efficient grease" to obtain financing. For instance, politically connected firms enjoy preferential lending and low interest rates (Fengyan et al., 2022; Fu et al., 2017; Infante & Piazza, 2014; Khwaja & Mian, 2005; Li et al., 2008; Zhang & Guo, 2019).

Intention to complete the intangible asset and the ability to measure reliably the costs attributable to the development of the asset are the only criteria that solely depend on the subjective assessment of the management. Due to the great degree of information asymmetry, external auditors are engaged to provide reasonable assurance as to the true and fair view of such information. However, in the East Asian context, the merit of engaging external auditors is questionable. On one hand, where ownership structure incentivizes controlling shareholders to expropriate minority shareholders, politically connected firms are more likely to appoint Big 4 auditors and benefit more from their appointment (Fang et al., 2017; Guedhami et al., 2014). On the other hand, the likelihood of hiring high-quality auditors diminishes with the magnitude of political connections, and in China, due to widespread anti-corruption campaigns, some firms substitute improved internal governance for external auditors (Jin et al., 2021; Liu et al., 2017).

Considering the discussion on the interplay between corruption and accounting treatment of R&D expenditures, the following alternative hypothesis is proposed:

H2*: The higher the degree of control over corrupt practices in a country, the greater the positive effect of capitalized R&D expenditures on market values will be.*

2.4. Legal enforcement and its role in financial reporting

Previously, there were mixed findings across countries about investors' valuation of firms' R&D outlays. To explain cross-country differences, one must recognize that financial reporting practices are not exogenous. A country's legislations establish what financial reporting frameworks are mandated or permitted in their application by entities. As such, there is a potential explanation that a country's legal system and enforcement can offer about the differing value relevance of capitalized R&D expenditures across countries.

The pervasiveness of legal enforcement on business practices has been documented in extant literature. La Porta et al. (2008) compiled evidence in the legal literature to arrive at a theory of legal origins (Legal Origins Theory-LOT). Primarily, their theory predicts that differences in legal origins are quite entrenched, and their implications are reflected in the different approaches to social control of economic affairs. Such differences persist even after "centuries of legal and regulatory evolution". Legal origins, therefore, explain why some countries use the common law tradition originating in England, and why other countries use the civil law tradition originating in France. La Porta et al. (2008) associated common law practices with better investor protection, lower government ownership and regulation of economic resources, and a more independent judiciary.

LOT's prediction has been reflected in extant finance and accounting literature. In corporate governance, La Porta, Lopez-de-Silanez, Shleifer, and Vishny (1997, 1998) show that French civil law countries have the weakest investor protection relative to common law, and German/Scandinavian law in between. Concentrated ownership in French civil law countries is shown to be the culprit behind the weak investor protection. This is consistent with corporate governance in Asia, which displays weak legal protection of investors' rights and property rights (Claessens & Fan, 2002). The concentrated ownership structure in Asia shifts the principal-agent problem from shareholders and the manager to controlling shareholders and minority shareholders, which induces controlling shareholders to expropriate corporate wealth. Consequently, reporting practices shift away from high-quality reporting to an opaquer one that does not resolve information asymmetry.

Concerning R&D activities' inherent uncertainty and their contribution to information asymmetry in financial reporting, the value relevance literature has documented the possible role of legal enforcement. Ball et al. (2000) noted the lower value relevance of accounting earnings in France, Germany, and Japan—civil law countries—relative to Australia, the U.S., the U.K., and Canada—common law countries. Cazavan-Jeny and Jeanjean (2006) have explicitly mentioned the possible role of legal enforcement in the "relevance-reliability trade-off" in accounting practices. In addition, DeFond et al. (2007) found the greater value relevance of earnings in countries with better-enforced insider trading laws. Following the widespread adoption of IFRS Standards, there is evidence pointing to the insignificant improvement in the value relevance of accounting income from mandating a

common law-oriented accounting standard in a civil law setting (Karampinis & Hevas, 2011). In addition, the value relevance of capitalized R&D expenditures is also potentially influenced by how the legal system enforces property rights since this is a mechanism for resolving the uncertainty pertinent to R&D activities (Hunter et al., 2012).

These findings are complemented by the earnings management literature by explaining the factors influencing the reporting incentives of financial statement preparers. Ball et al. (2000) emphasized the insufficiency of accounting standards in explaining why accounting practices exist and the role of incentives in preparers' disposition in implementing accounting standards. For example, in the "one country, two systems" institutional setting in Hong Kong, Chinese firms that are listed on the Hong Kong Stock Exchange (H-shares) are exempt from Hong Kong's common law legal system. Fung et al. (2013) found that H-share firms exhibit higher earnings management than their local Hong Kong peers. Following the Securities Law of 1999 implementation in China—which follows the German-origin civil law tradition—H-share firms diminished in their earnings management. A more specific example demonstrating the role of incentives, it was found that firms incorporated in U.S. states with anti-takeover laws exhibit fewer earnings management, especially in firms more prone to takeovers and with more agency problems (Y. Zhao & Chen, 2009).

In summary, legal enforcement influences the direction of accounting practices. Therefore, the following alternative hypothesis is put forth:

H3: *The better a country's legal enforcement, the greater the positive effect of capitalized R&D expenditures on market values will be.*

3. Methodology and data

3.1. Research design

This study employs a value relevance approach to answer the research question. A value relevance study establishes a causal relationship between accounting information and a measure of market values. In this study, the value relevance of capitalized R&D expenditures is investigated by observing their effect on firm market values. A valuation model used by Ohlson (1995) is employed as the baseline model. Measures of country-level institutional features, namely corruption control and rule of law are introduced to moderate the relationship between capitalized R&D expenditures and market values.

Ordinary least square (OLS) models formalize the relationships and moderations in this study. The use of OLS models necessitates the satisfaction of Gauss-Markov assumptions to ensure the linearity and unbiasedness of the estimators. However, models in value relevance studies typically fail to satisfy these assumptions due to the impossibility of attaining a general equilibrium (Barth et al., 2001). Therefore, some remedies are warranted to account for the possibility of perfect collinearity, the existence of omitted variables, and heteroskedasticity. Also, considering the use of panel data, serial autocorrelation must also be accounted for and rectified.

3.2. Variable measurement

This study employs measures for firm valuation, R&D expenditures, and country-level governance. Firm valuation and R&D expenditures are measured as monetary amounts. Country-level governance is less straightforward in its measurement as there is a great degree of arbitrariness in the definition of governance concepts. Moreover, perceptions of the surveyed population towards country-level governance are the primary source of data for the measurement. For this measure, the work of Kaufmann et al. (2010) in developing the Worldwide Governance Indicator is employed.

3.2.1 Dependent variables

Value relevance studies allow researchers to choose between firm market price and the changes in market price over a period of time as dependent variables. Each alternative has distinct econometric features. In terms of economic significance, both are equivalent. in terms of statistical significance, the former has a less biased slope for its estimators with a greater tendency for being heteroskedastic compared to the latter (Kothari & Zimmerman, 1995). Therefore, there is merit in including both models in the analysis for the results to be complementary to each other.

Following with past literature, the dependent variable of the price model is scaled by the number of shares of a firm, i.e., the price of a share of a firm's equity at fiscal year-end (denoted as $P_{i,t}$). From the price, the author calculates the annual price return for the return model to complement the analysis. Price return is calculated as $\frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}}$ and is denoted as $R_{i,t}$.

3.2.2 Independent variables

The independent variable used to explain share prices is the capitalized portion of R&D expenditures. This is simply the monetary number of R&D expenditures that has satisfied the criteria in para. 57 of IAS 38. This amount is scaled by the number of shares and is labeled *RDCAP_ps*.

Moderation from institutional features is accounted for by including the WGI measures of Control of Corruption (*ControlCorruption*) and Rule of Law (*RuleLaw*). The former captures the extent of abuse of public offices to obtain personal gains, as well as the "capture" of the state by the private sector to further their interests. The latter captures the quality of the enforcement of contracts and property rights. These variables are initially in standard normal units ranging from -2.5 (worst) to 2.5 (best). However, since these variables are used to moderate the relationship between capitalized R&D and share prices (and returns), it is possible that for every observation with positive capitalized R&D, the interaction term will be negative when the corresponding country scores negative in either *ControlCorruption* or *RuleLaw*. Thus, the measurement is rescaled to a range of 0 (worst) to 5 (best).

3.2.2 Control variables

Following Ohlson (1995), book values of firms' equity and earnings are included as control variables after deflating these amounts by the number of shares. These variables are denoted as *BVPS* and *EPS*, respectively. In addition, *RDEXP_ps* is included to control for the potential information content of expensed R&D. Subsequently, *BVPS* is adjusted by deducting *RDCAP_ps*; the result is

labeled adjusted BVPS (*ABVPS*). *EPS* is adjusted by adding back per share R&D expenses and amortization of capitalized R&D; the result is labeled adjusted EPS (*AEPS*).

Additional country-level controls are included to control for political factors. This step follows the Legal Origins Theory as proposed by La Porta et al. (2008) to rule out political factors in explaining economic outcomes. These controls are Voice and Accountability (*VoiceAccountability*), Regulatory Quality (*RegQuality*), and Government Effectiveness (*GovEffective*). Respectively, they measure the degree of a country's democratic institutions, the extent to which policies promote private sector development, and its government's performance and independence from political pressures. All variables are rescaled to a range of 0 (worst) to 5 (best).

3.3. Sample selection

The sample is obtained from Thomson-Reuters Datastream and Worldscope databases for annual report data of each firm in East Asia for the years 2009 - 2020. East Asia is defined as a set of countries that includes China, Japan, South Korea, and the ASEAN. Initially, only firms in their primary country of listing are included to exclude cross-listings. Only firms that have implemented IFRS are selected. Following Mazzi et al. (2019) and Cazavan-Jeny and Jeanjean (2006), companies from the financial services/banking, real estate, and oil and gas industries are excluded due to the differing balance sheet structure and accounting requirements. As a result, 28,212 firm-year observations are obtained.

The next step is replacing the R&D values of R&D inactive firms (i.e., firms reporting neither capitalized R&D nor R&D expenses) with zeroes to enable the calculation of adjustment variables, i.e., $AEPS_{it}$, $ABVPS_{it}$, $RDCAP\_ps_{it}$, and *RDEXPit*. That is, the sample only includes firm-year observations with non-zero values on either $RDCAP\_ps_{it}$ or $RDEXP_{it}$. This is also done to enable the calculation of annual change variables. Because firm-year observations from the year 2009 are only needed to calculate annual change variables for 2010, the author removes them. The procedure is summarized in the following table:

Table 1. Sample selection process

28,212	Initial sample size after excluding cross-listings, several industries, and non-IFRS users
(2,351)	Firm-year observations for year 2009
(11,699)	Firm-year observations where capitalized R&D and R&D expenses are zero (R&D-inactive firms)
(722)	Firm-year observations with missing firm-specific values (EPS, BVPS, shares outstanding, leverage, beta, market capitalization)
13,440	**Final sample of firm-year observations (2010 – 2020) (1,439 firms)**
10,862	Firm-year observations reporting only R&D expenses **(expensers)**
2,578	Firm-year observations reporting capitalized R&D costs **(capitalizers)**
1,910	Firm-year observations reporting both capitalized R&D costs and R&D expenses **(partial capitalizers)**
668	Firm-year observations reporting only capitalized R&D costs **(full capitalizers)**

Table 2. Sample distribution by country and year

Country	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	**Total**
China	8	6	7	7	7	7	7	6	7	5	7	**74**
Hong Kong	9	8	9	9	9	9	9	7	9	8	7	**93**
Japan	141	142	141	143	140	141	142	140	139	142	142	**1,553**
South Korea	420	397	403	410	419	483	479	482	483	481	481	**4,938**

Malaysia	80	79	81	71	61	52	45	37	40	38	43	**627**
Singapore	28	24	28	26	23	22	19	21	22	24	23	**260**
Taiwan	531	528	530	535	538	537	531	534	540	544	547	**5,895**
Total	**1,217**	**1,184**	**1,199**	**1,201**	**1,197**	**1,251**	**1,232**	**1,227**	**1,240**	**1,242**	**1,250**	**13,440**

Note: According to the classification of legal origins in La Porta et al. (2008), China, South Korea, Japan, and Taiwan follow civil law traditions originating in Germany, while Malaysia, Singapore, and Hong Kong follow common law traditions originating in England.

In the sample, there are 13,440 firm-year observations, of which 10,862 are classified as expensers and 2,578 as capitalizers (Table 1). There is a concentration of firm-year observations in Taiwan, South Korea, and Japan, possibly due to the high R&D intensity in firms in these countries (Table 2).

3.4. Analysis method

The primary model for this study follows Ohlson (1995) and takes a firm's share price as the dependent variable. The price model is specified as follows:

$$\begin{aligned} P_{i,t} = {} & b_0 + b_1 ABVPS_{i,t} + b_2 AEPS_{i,t} + b_3 RDCAP\_ps_{i,t} + b_4 RDEXP\_ps_{i,t} \\ & + b_5 Control\_Corruption_{i,t} + b_6 RDCAP\_ps_{i,t} * ControlCorruption_{i,t} \\ & + b_7 RuleLaw_{i,t} + b_8 RDCAP\_ps_{i,t} * RuleLaw_{i,t} \\ & + \; + b_9 VoiceAccountability_{i,t} + b_{10} RegQuality_{i,t} \\ & + b_{10} GovEffectiveness_{i,t} + YEAR_{i,t} + INDUSTRY_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (1)$$

For robustness to serial correlation and anticipate omitted variables (Aboody & Lev, 1998; Cazavan-Jeny & Jeanjean, 2006; Kothari & Zimmerman, 1995), a secondary model takes the annual returns of a firm's share as the dependent variable. The return model is specified as follows:

$$\begin{aligned} R_{i,t} = {} & b_0 + b_1 AEPS_{i,t} + b_2 \Delta AEPS_{i,t} + b_3 \Delta RDCAP\_ps_{i,t} + b_4 Control\_Corruption_{i,t} \\ & + b_5 \Delta RDCAP\_ps_{i,t} * Control\_Corruption_{i,t} + b_6 Rule\_Law_{i,t} \\ & + b_6 \Delta RDCAP\_ps_{i,t} * Rule\_Law_{i,t} + b_6 \Delta RDEXP_{ps_{i,t}} \\ & + b_6 Voice\_Accountability_{i,t} + b_7 Reg\_Quality_{i,t} \\ & + b_8 Gov\_Effectiveness_{i,t} + YEAR_{i,t} + INDUSTRY_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (2)$$

These models incorporate year and industry fixed-effects during the estimation after being subjected to a specification test from Hausman (1978). Hausman test results are provided in the appendix in tabular form (Table 12 and Table 13). Variable description can be seen in Appendix I.

4. Results

4.1. Descriptive results

This section provides a descriptive explanation of the data. In Table 3, descriptive statistics of each country's institutional characteristics are provided. In general, civil law countries (e.g. China, Japan, South Korea, and Taiwan) rank low in corruption control and rule of law relative to common law countries (e.g. Hong Kong SAR, Malaysia, Singapore), except for Japan whose scores on both metrics are on par with the common law average. Surprisingly, democracy as measured by Voice and Accountability in common law countries (ranging from 2.15 to 2.96) ranks no higher than some civil

law countries (ranging from 0.89 to 3.52). Voice and Accountability invariably score lower than other institutional metrics, suggesting that the bureaucratic elites have greater sway over state affairs than the voice of the constituents in these countries. Countries with higher quality regulations and effective governments (e.g., Singapore, Taiwan, Japan, and Hong Kong SAR) are more effective in limiting corrupt practices and in enforcing the law.

Table 3. Country characteristics

Country	*ControlCorruption*	*RuleLaw*	*VoiceAcc*	*RegQuality*	*GovEffective*
China	2.17	2.14	0.89	2.27	2.80
Hong Kong	4.20	4.17	2.96	4.51	4.29
Japan	4.06	3.97	3.52	3.73	4.13
South Korea	3.05	3.58	3.22	3.55	3.69
Malaysia	2.71	3.02	2.15	3.17	3.50
Singapore	4.63	4.28	2.39	4.56	4.71
Taiwan	3.38	3.62	3.43	3.78	3.82

Note: The statistics presented in this table are the mean values of the WGI estimates. In terms of legal origins, civil law countries include China, Japan, South Korea, and Taiwan, and common law countries include Hong Kong SAR, Malaysia, and Singapore.

Appendix II provides firm-level descriptive statistics on economic and R&D characteristics. About 19% of the firm-year observations report some capitalized R&D costs. These observations reveal that capitalization is preferred among larger, more leveraged, riskier, higher valued, and more profitable firms. At the median, capitalizers exhibit a less negative net R&D effect (i.e., RDCAP_ps – RDEXP_ps) on share price (-$0.03) than expensers ($-0.04).

On a statistical note, examining descriptive statistics has allowed the author to identify that the sample distribution does not follow a normal distribution. While this may create doubt as to whether the OLS estimators are consistent, a sample size of 13,440 firm-year observations should be large enough for the estimators to be asymptotically normal. Thus, both *t* and *F* statistics should remain useful in obtaining *p*-values to determine the statistical significance of the OLS estimators.

4.2. Univariate regression results

Appendix IV shows a univariate analysis of all variables of interest using a Pearson correlation matrix (Table 11). The coefficients do not indicate any perfect collinearity among the key variables. However, between *ControlCorruption* and *RuleLaw*, *RegulatoryQuality* and *ControlCorruption*, *RegulatoryQuality* and *RuleLaw*, *GovEffectiveness* and *ControlCorruption*, and *GovEffectiveness* and *RuleLaw*, the observed coefficients are very close to 1. In addition, the variance inflation factors (VIF) are the highest on variables measuring institutional features (see Appendix III). This vindicates Kaufmann, Kraay, and Mastruzzi (2010) in their warning that institutional features are highly interrelated and may influence each other. Nonetheless, the coefficients serve as an indicator that the model does not suffer from perfect collinearity.

4.3. Multivariate regression results

4.3.1 Evaluating value relevance: Price model

The price model is used to determine whether capitalized R&D is (positively) value relevant by regressing share price on the independent variables specified in equation (1). In line with past literature (Barth et al., 2001), the model suffers from heteroskedasticity and autocorrelation (Table 14 and Table 15). Therefore, robust standard errors are obtained from the procedure designed by White (1980).

Table 4. Price model

	(1) Price	(2) Price	(3) Price	(4) Price	(5) Price	(6) Price
AEPS	-0.304***	-0.350***	-0.350***	-0.351***	-0.352***	-0.352***
	(0.044)	(0.070)	(0.069)	(0.069)	(0.069)	(0.069)
ABVPS	0.604***	0.522***	0.520***	0.521***	0.521***	0.521***
	(0.134)	(0.086)	(0.085)	(0.086)	(0.086)	(0.086)
RDCAP_ps	-0.734	208.366*	212.153*	212.960*	213.501*	-25.779**
	(0.769)	(118.016)	(118.414)	(118.677)	(118.679)	(10.112)
RDEXP_ps	-9.579**	-7.026**	-7.197**	-7.281**	-7.298**	-7.298**
	(4.280)	(3.275)	(3.244)	(3.251)	(3.242)	(3.242)
ControlCorruption		-16.396***	-7.968*	-9.476**	-1.791	-1.791
		(4.772)	(4.596)	(4.175)	(4.294)	(4.294)
*RDCAP_ps * ControlCorruption*		-92.332***	-93.113***	-93.255***	-93.408***	-93.408***
		(32.046)	(32.067)	(32.009)	(31.976)	(31.976)
RuleLaw		39.580***	80.249***	76.846***	77.362***	77.362***
		(7.215)	(12.613)	(11.845)	(11.560)	(11.560)
*RDCAP_ps * RuleLaw*		20.335	19.934	19.826	19.805	19.805
		(15.960)	(15.922)	(15.923)	(15.905)	(15.905)
VoiceAccountability			-7.442***	-5.072***	-5.854***	-5.854***
			(1.737)	(1.614)	(1.596)	(1.596)
RegQuality			-47.119***	-43.377***	-46.602***	-46.602***
			(7.294)	(6.879)	(6.833)	(6.833)
GovEffective			-9.916	-9.474	-22.851***	-22.851***
			(7.289)	(7.190)	(7.237)	(7.237)
Constant	10.573***	10.573***	-77.028***	-17.431	14.599	289.152***
	(1.642)	(1.642)	(13.968)	(11.397)	(10.950)	(42.553)
Observations	13,440	13,440	13,440	13,440	13,440	13,440
F-statistic	54.20	118.90	128.90	96.20	75.34	75.34
Adj. R-squared	0.757	0.757	0.801	0.803	0.805	0.805
Industry FE	No	No	No	Yes	Yes	Yes
Year FE	No	No	No	No	Yes	Yes

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

H1 states that capitalized R&D (*RDCAP_ps*) is value relevant with a positive expected sign. Before model (2), capitalized R&D is found to have no significant effect on price. After introducing institutional features and interacting *RDCAP_ps* with *ControlCorruption* and *RuleLaw* in model (2), capitalized R&D is found to have a positive, marginally significant coefficient (p = 0.072, F = 118.9) (Table 4). The negative correlation between *RDCAP_ps* and *ControlCorruption*, and the negative sign on the latter's coefficient suggest a positive bias on the former due to the latter's exclusion. On the other hand, the negative correlation between *RDCAP_ps* and *RuleLaw*, and the positive sign on the latter's coefficient suggest a negative bias on the former. The result persists in models (3), (4), and (5). The

increase in the F-statistic from 54.2 in model (2) to 118.9 and 128.9 in models (3) and (4), respectively, suggests that the estimators jointly increase in statistical power as institutional factors are added.

The stepwise estimation leads to the main model, i.e., model (5), where the coefficient on *RDCAP_ps* amounts to 213.501 (p = 0.072, F = 75.34), meaning that for a country at the bottom end of corruption control and rule of law (i.e., *ControlCorruption* = 0 and *RuleLaw* = 0), capitalizing R&D yields a positive $213.5 effect on share price (Table 4). However, since the lowest *ControlCorruption* and *RuleLaw* score in the sample is 1.94 and 1.96, respectively, this result is not interesting and may create a temptation to conclude that there is support for H1. Mean-centering *ControlCorruption* and *RuleLaw* and re-running the regression using the adjusted values reveal a contrasting result in model (6). Now, *RDCAP_ps* is *negatively* value relevant with a coefficient of -25.779 and an increased statistical significance (p = 0.011, F = 75.34). This means that in a country with an average quality of corruption control and rule of law, the net effect to share price is -$265.06. Therefore, while in H1 the assertion that capitalized R&D is value relevant is supported, the expected positive sign is not. Thus, this result does not supply any evidence in support of H1.

H2 asserts that corruption control measures have a moderating role in the value relevance of capitalized R&D, with a positive expected sign. Surprisingly, while the coefficients on the interaction term *RDCAP_ps* * *ControlCorruption* in models (3) through (6) are significant, the signs are always negative. In model (6), the coefficient on the interaction term amounts to -93.408 (p = 0.003, F = 75.34), meaning that for every increase in standard normal units of corruption control, there is a negative premium of $93.408 on price from capitalizing R&D outlays (Table 4). While this result suggests the value relevance of *RDCAP_ps* in the presence of corruption control (albeit negatively), it contradicts the assertion made in H2.

H3 asserts that law enforcement has a moderating role in the value relevance of capitalized R&D, with a positive expected sign. While the coefficients of *RuleLaw* on their own are consistently significant and positive in models (2) through (6), the coefficients on interaction term *RDCAP_ps* * *RuleLaw* are consistently insignificant while displaying positive signs (Table 4). Thus, these results do not support H3.

4.3.2 Evaluating timeliness: Return model

The return model is used to provide answers to questions pertaining to the timeliness of accounting information, which is an enhancing characteristic of relevance (Barth et al., 2001). Therefore, the results presented in this section complement the results of the price model. The return model also serves as a robustness check with respect to heteroskedasticity, serial autocorrelation, and omitted variables (see Appendix VI, Appendix VII, and Appendix VIII).

Table 5. Return model

	(1) Return	(2) Return	(3) Return	(4) Return	(5) Return	(6) Return
AEPS	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δ*AEPS*	0.001	0.001	0.001	0.001	0	0
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Δ*RDCAP_ps*	-0.000***	0.057*	0.057*	0.064*	0.085***	-0.007***
	0.000	(0.033)	(0.032)	(0.036)	(0.029)	(0.003)
Δ*RDEXP_ps*	0.001	0.001	0.001	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ControlCorruption		0.112**	-0.012	-0.084	-0.12	-0.12
		(0.050)	(0.086)	(0.087)	(0.104)	(0.104)
Δ*RDCAP_ps* * *ControlCorruption*		-0.016*	-0.016*	-0.016	-0.023***	-0.023***
		(0.009)	(0.009)	(0.010)	(0.008)	(0.008)
RuleLaw		-0.313***	-0.509***	-0.514***	-0.203	-0.203
		(0.084)	(0.156)	(0.156)	(0.254)	(0.254)
Δ*RDCAP_ps* * *RuleLaw*		-0.003	-0.003	-0.004*	-0.005**	-0.005**
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
VoiceAccountability			0.05	0.037	-0.055	-0.055
			(0.065)	(0.064)	(0.081)	(0.081)
RegQuality			0.125	0.18	0.065	0.065
			(0.134)	(0.135)	(0.163)	(0.163)
GovEffective			0.260*	0.336**	0.249	0.249
			(0.134)	(0.132)	(0.175)	(0.175)
Constant	0.111***	0.885***	0.406	0.268	0.497	-0.641
	(0.012)	(0.194)	(0.313)	(0.312)	(0.347)	(1.076)
Observations	1,862	1,862	1,862	1,862	1862	1862
F-statistic	179.6	.	.	.	.	.
Adj. R-squared	0.00105	0.016	0.0126	0.0284	0.124	0.124
Industry FE	No	No	No	Yes	Yes	Yes
Year FE	No	No	No	No	Yes	Yes

Note: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Focusing on models (5) and (6), the author finds that the annual change in capitalized R&D has a significant, *negative* effect on share returns in the average corruption control and rule of law environment. The coefficient on Δ*RDCAP_ps* in model (6) represents a -0.7% return for every 1% increase in capitalized R&D in a country at an average level of corruption control and rule of law (p = 0.006, F = N/A) (Table 5). Furthermore, the addition of year FEs in model (5) reveals that Δ*RDCAP_ps* is time-variant, evident in the change in R-squared from 2.84% in model (4) to 12.4% in model (5) (Table 5). This result signifies the timeliness of capitalized R&D and complements the result in the price model concerning H1.

Concerning H2, the coefficients on the interaction term Δ*RDCAP_ps* * *ControlCorruption* is consistently negative throughout models (3) to (6), only differing in the level of significance when subjected to industry and/or year FEs. In model (6), where the time-varying feature of Δ*RDCAP_ps* affects the results, the coefficient on the interaction term represents a significant, negative 2.3% return for every increase in standard normal units of corruption control (p = 0.008, F = N/A) (Table 5). This result attests to the timeliness of capitalized R&D in the presence of corruption control measures, and thus complements the result in the price model.

Concerning H3, the coefficients on the interaction term $\Delta RDCAP\_ps * RuleLaw$ is consistently negative throughout models (3) to (6) with differing levels of significance. In model (6), the coefficient on the interaction term represents a negative 0.5% return for every increase in standard normal units of rule of law (p = 0.01, F = N/A) (Table 5).

5. Discussion

5.1. Summary of findings

This study examines the value relevance of capitalized R&D costs by employing the price model as the primary mode of analysis and the return model to complement the results from the price model. Corruption control and law enforcement are added to moderate the relationship between capitalized R&D costs and share prices/annual returns.

The findings show that capitalized R&D is *negatively* value relevant and highly timely, thus providing no support for H1. Moderating control of corruption on the effect of capitalized R&D on share prices and annual returns reveals the *negative* value relevance of capitalized R&D as a decreasing function of control of corruption; this supplies evidence against H2. Moderating rule of law on the effect of capitalized R&D on share prices and annual returns reveals the lack of value relevance, but high timeliness of capitalized R&D, thus ruling out any support for H3. These findings are robust to serial autocorrelation and heteroskedasticity, but not to omitted variables.

5.2. Interpretation of results

The evidence that capitalized R&D is negatively value relevant in a setting where corruption control moderates the direction of value relevance, while law enforcement does not, is subject to several interpretations.

There is a possibility that corrupt practices remain as the 'efficient grease' to investments in innovative capacity. As institutions enforcing corruption control increase in strength, these investments fail to arrive at a state where economic benefits can be expected. This holds *if* investments are enabled through corrupt practices, e.g., political connections (Faccio, 2006; Faccio et al., 2006). The findings in this study cannot point out whether corrupt practices significantly determine the decision to capitalize R&D, and thus this explanation is ruled out.

A more consistent explanation comes from the public scrutiny literature (Samuels et al., 2021). The intuition is as follows: if corruption control contributes to greater transparency and accountability in state-firm contracting activities, increased scrutiny may induce informed managers to misreport due to the greater weight that the investing public place on accounting information for valuation purposes. When public scrutiny becomes high enough, misreporting becomes costly relative to the valuation benefits from increased share price response to accounting information, leading to a decline in misreporting.

The results in this study suggest that investors do use the information about R&D assets, albeit with a negative view. This result is in contrast with most studies conducted in common law-leaning countries (Lev & Sougiannis, 1996; Aboody & Lev, 1998; R. Zhao, 2002; Oswald & Zarowin, 2007;

Tsoligkas & Tsalavoutas, 2011; Chen et al., 2017), and is in line with studies in civil law-leaning countries (Cazavan-Jeny et al., 2011; Cazavan-Jeny & Jeanjean, 2006) as well as in some common law-leaning countries (Oswald, 2008). Furthermore, concerning Oswald (2008), the result of this study suggests that managers exercise their discretion in accounting for R&D, and likely points to opportunistic earnings management tendencies. In a corrupt setting, Riahi-Belkaoui (2004) and Chaney et al. (2011) found the tendency of politically connected firms to have poorer accruals quality as a result of opportunistic earnings management tendencies. In this study, observations are highly concentrated in Japan, South Korea, and Taiwan; firms hailing from both countries are characterized by concentrated ownership structures (Bae & Jeong, 2007; Lee et al., 2011). As such, these firms' managers tend to exercise discretion to the benefit of the principal owners, including misreporting to increase shareholder value (Samuels et al., 2021).

The strengthening of anti-corruption institutions, which contribute to greater public scrutiny of firms operating in a corrupt context would increase the demand from the investing public for accounting information. As a result, politically connected firms are incentivized to misreport to gain greater valuation. This misreporting has costs; where a firm's ownership characteristics lead to severe agency problems and where national-level governance is poor, firms with political connections tend to legitimize themselves by hiring Big 4 auditors (Guedhami et al., 2014). When institutional development reaches a level that allows for a sufficiently high public scrutiny, misreporting becomes too costly. This study suggests that the negative value relevance of capitalized R&D likely is attributable to the greater demand for accounting information enabled by a more transparent reporting environment. However, the discretion allowed in IFRS and the broadness of para. 57 criteria for capitalization in IAS 38 undermine the positive signaling capability of capitalized R&D (Mazzi et al., 2022). Such discretion means that preferential treatments enabled by political connections are accessible to connected firms in legitimizing their claim to the economic benefits of R&D assets despite the lack of such benefits, hence the negative value relevance. Indeed, Dinh et al. (2016) documented a negative association between market values and capitalized R&D for firms that are more likely to use capitalization opportunistically. It is also likely that these explanations point to venal forms of corruption that take place in the private sector.

On the role of law, Cazavan-Jeny and Jeanjean (2006) raised the possibility of law enforcement influencing accounting information. The results presented in this study suggest that higher quality law enforcement does not necessarily lead to higher value relevance of capitalized R&D. This can be attributable to the differences in the rights conferred to investors under different legal systems (La Porta et al., 1998). In civil law countries, the poor quality of shareholder protection leads to alternative governance structures, such as concentrated ownership with a significant wedge between control and cash flow rights. In contrast, the high quality of shareholder protection leads to diffuse ownership in common law countries. A concentrated ownership structure is associated with poor shareholder protection (Claessens & Fan, 2002; La Porta et al., 1997). While accounting standards are one channel

through which shareholder protection can be delivered, implementing common law-originating standards in a civil law context does not ensure that the benefits accrue to shareholders without common law penalties. Therefore, the results of this study are consistent with Karampinis et al. (2011). Furthermore, the concentrated ownership structure often encountered in East Asian firms suggests that the demand for conservative and timely accounting numbers is smaller. Given the weaker role of financial statements to protect shareholders' interests, insider information is likely to be more relevant and reliable (Ball et al., 2000; Claessens & Fan, 2002), hence the lack of influence of law enforcement in the value relevance and the direction of value relevance of capitalized R&D.

Attention must be paid to countries implementing the German civil law system given the concentration of the observations in these countries (i.e., Japan, South Korea, and Taiwan). The system is observed to uphold better shareholder protection (La Porta et al., 2008), and to tend toward income conservatism in financial reporting (Ball et al., 2000). However, the results in Table 4 and Table 5 point out that when moderated on law enforcement, capitalized R&D is *not* value relevant but is timely, and the control variable expensed R&D is value relevant but *not* timely. If conservatism is to be construed as a greater tendency to incorporate losses in a timelier manner, then the results of this study rule out that the conservatism induced by the German-origin civil laws is the culprit behind the value irrelevance of capitalized R&D when moderated on law enforcement. For conservatism to influence the value relevance of capitalized R&D, it must be proved that both capitalized R&D and expensed R&D are value relevant *and* timely. When capitalized R&D is timely but value irrelevant, this only sheds light on its inability to signal future economic benefits; instead, capitalization may have been done aggressively. Also, the fact that expensed R&D is value relevant but untimely suggests the lack of conservatism championed by German civil law systems.

While it is impossible to rule out exhaustively all alternative explanations, the results of this study are at least consistent with the institutional threshold of public scrutiny explanation as well as the legal origins theory. That is, as corruption control increases in strength, greater transparency puts a heavier weight on accounting information despite the lack of signals of future economic benefits. This will reverse when corruption control makes misreporting very costly relative to its benefits. In addition, legal traditions tend to hold greater influence on the value relevance of accounting information despite the changes in the rules and regulations, including changes due to accounting standards that tend toward conservative accounting.

6. Conclusions and limitations

In this study, the role of corruption control and law enforcement in the value relevance of R&D expenditures is investigated. The East Asian context is selected given the existing divide in the literature over how institutional factors influence the reporting environment. The conventional wisdom in the literature posits the adverse effects of corruption and poor legal enforcement on the reporting environment, including the matter of R&D accounting.

The author conjectures that higher quality corruption control and law enforcement institutions influence the value relevance of R&D assets in the positive direction. This conjecture is formalized within a valuation model developed by Ohlson (1995). The sample includes 13,440 firm-year observations gathered from Thomson-Reuters Datastream and Worldscope databases, as well as the World Governance Indicators databases. The test is carried out in two designs: in the first, share prices are set as the explained variable to evaluate value relevance; in the second, share returns are set as the explained variable to evaluate timeliness—an enhancing feature of relevance.

The results of this study show that corruption influences value relevance of capitalized R&D in the negative direction while law enforcement has no influence whatsoever on value relevance. Since the hypotheses are all directional, none of them are supported by the results. Nonetheless, this study suggests that 1) corruption control seems to have created a more transparent R&D reporting environment despite the opportunistic application of IAS 38, hence the *negative* value relevance of R&D assets, and 2) the lax enforcement of shareholder rights in civil law countries lead to alternative governance structures to resolve asymmetric information, i.e., the reported R&D numbers in financial statements are value irrelevant compared to insider information.

The author contends that this study does not provide a case against accounting standards mandating the capitalization of successful R&D. Instead, it provides insight for standard setters and the academic community alike on the role of institutions in the relevance-reliability tradeoff in the reporting environment. The main thrust from this study is that the conventional wisdom that eliminating corruption creates a better reporting environment may not hold when corruption takes a venal, more institutional form.

This study's results are to be evaluated in light of some limitations. First, the results of this study are not robust to omitted variable bias despite the use of the return model (see Appendix VIII) and possibly suffer from self-selection. This is so because this study does not attempt to determine the factors leading to the capitalization of R&D expenditures. Second, due to the sample selection process and the emphasis on capitalized R&D, the observations are concentrated in countries exhibiting similar legal systems (see Appendix III), which may impair the strength of the analysis in explaining cross-country differences. Finally, institutional variables used in this study measure perceptions considering the lack of objectivity in the measurements of governance concepts.

The author recommends the following in light of the limitations. There are ample opportunities to identify instrumental variables to address self-selection issues. As to the second limitation, future researchers may consider extending the scope to IFRS applying countries with differing legal systems (e.g., Scandinavian civil law, French civil law) to add diversity to the sample. Finally, future researchers may consider developing a more objective measure of governance concepts.

Bibliography

Aboody, D., & Lev, B. (1998). The Value Relevance of Intangibles: The Case of Software Capitalization. *Journal of Accounting Research*, *36*, 161–191. https://doi.org/10.2307/2491312

Aboody, D., & Lev, B. (2000). Information Asymmetry, R&D, and Insider Gains. *The Journal of Finance*, *55*(6), 2747–2766. https://doi.org/10.1111/0022-1082.00305

Acemoglu, D., & Robinson, J. A. (2012). *Why nations fail*. Profile Books Ltd.

Acemoglu, D., & Verdier, T. (1998). PROPERTY RIGHTS, CORRUPTION AND THE ALLOCATION OF TALENT: A GENERAL EQUILIBRIUM APPROACHÃ. *THE ECONOMIC JOURNAL*, 23.

Afonso, Ó., & Longras, A. R. (n.d.). Corruption, institutional quality, and offshoring: How do they affect comparative advantage, inter-country wage inequality, and economic growth? *Metroeconomica*, *n/a*(n/a). https://doi.org/10.1111/meca.12388

Alexeev, M., & Song, Y. (2013). Corruption and product market competition: An empirical investigation. *Journal of Development Economics*, *103*, 154–166. https://doi.org/10.1016/j.jdeveco.2013.02.010

Arkolakis, C., Ramondo, N., Rodríguez-Clare, A., & Yeaple, S. (2018). Innovation and Production in the Global Economy. *American Economic Review*, *108*(8), 2128–2173. https://doi.org/10.1257/aer.20141743

Ayyagari, M., Demirgüç-Kunt, A., & Maksimovic, V. (2010). *Are Innovating Firms Victims or Perpetrators? Tax Evasion, Bribe Payments, and the Role of External Finance in Developing Countries*. World Bank. https://doi.org/10.1596/1813-9450-5389

Bae, K.-H., & Jeong, S. W. (2007). The Value-relevance of Earnings and Book Value, Ownership Structure, and Business Group Affiliation: Evidence From Korean Business Groups. *Journal of Business Finance & Accounting*, *34*(5–6), 740–766. https://doi.org/10.1111/j.1468-5957.2007.02017.x

Ball, R., Kothari, S. P., & Robin, A. (2000). The effect of international institutional factors on properties of accounting earnings. *Journal of Accounting and Economics*, *29*(1), 1–51. https://doi.org/10.1016/S0165-4101(00)00012-4

Ballester, M., Garcia-Ayuso, M., & Livnat, J. (2003). The economic value of the R&D intangible asset. *European Accounting Review*, *12*(4), 605–633. https://doi.org/10.1080/0963818031000162843 7

Banerjee, A., Mullainathan, S., & Hanna, R. (2012). *Corruption* (No. w17968; p. w17968). National Bureau of Economic Research. https://doi.org/10.3386/w17968

Barth, M. E., Beaver, W. H., & Landsman, W. R. (2001). The relevance of the value relevance literature for financial accounting standard setting: Another view$. *Journal of Accounting and Economics*, 28.

Bliss, M. A., & Gul, F. A. (2012). Political connection and cost of debt: Some Malaysian evidence. *Journal of Banking & Finance*, *36*(5), 1520–1527. https://doi.org/10.1016/j.jbankfin.2011.12.011

Braam, G., Nandy, M., Weitzel, U., & Lodh, S. (2015). Accrual-based and real earnings management and political connections. *The International Journal of Accounting*, *50*(2), 111–141. https://doi.org/10.1016/j.intacc.2013.10.009

Cazavan-Jeny, A., & Jeanjean, T. (2006). The negative impact of R&D capitalization: A value relevance approach. *European Accounting Review*, *15*(1), 37–61. https://doi.org/10.1080/09638180500510384

Cazavan-Jeny, A., Jeanjean, T., & Joos, P. (2011). Accounting choice and future performance: The case of R&D accounting in France. *Journal of Accounting and Public Policy*, *30*(2), 145–165. https://doi.org/10.1016/j.jaccpubpol.2010.09.016

Chaney, P. K., Faccio, M., & Parsley, D. (2011). The quality of accounting information in politically connected firms. *Journal of Accounting and Economics*, *51*(1–2), 58–76. https://doi.org/10.1016/j.jacceco.2010.07.003

Chen, E., Gavious, I., & Lev, B. (2017). The positive externalities of IFRS R&D capitalization: Enhanced voluntary disclosure. *Review of Accounting Studies*, *22*(2), 677–714. https://doi.org/10.1007/s11142-017-9399-x

Claessens, S., & Fan, J. P. H. (2002). Corporate Governance in Asia: A Survey. *International Review of Finance*, *3*(2), 71–103. https://doi.org/10.1111/1468-2443.00034

de Vaal, A., & Ebben, W. (2011). Institutions and the Relation between Corruption and Economic Growth. *Review of Development Economics*, *15*(1), 108–123. https://doi.org/10.1111/j.1467-9361.2010.00596.x

Dealstreet Asia. (2022a). *At $2.9b in April, startup funding lowest so far this year*. https://www.dealstreetasia.com/dealsbarometer/report-india-apr-2022/

Dealstreet Asia. (2022b). *PE-VC fundraising remains muted in Q1 despite uptick in March*. https://www.dealstreetasia.com/dealsbarometer/report-china-mar-2022/

Dealstreet Asia. (2022c). *Startup funding at four-month high of $2b in April*. https://www.dealstreetasia.com/dealsbarometer/report-se-asia-apr-2022/

DeFond, M., Hung, M., & Trezevant, R. (2007). Investor protection and the information content of annual earnings announcements: International evidence. *Journal of Accounting and Economics*, *43*(1), 37–67. https://doi.org/10.1016/j.jacceco.2006.09.001

Dinh, T., Kang, H., & Schultze, W. (2016). Capitalizing Research & Development: Signaling or Earnings Management? *European Accounting Review*, *25*(2), 373–401. https://doi.org/10.1080/09638180.2015.1031149

Dinh, T., Sidhu, B. K., & Yu, C. (2019). Accounting for Intangibles: Can Capitalization of R&D Improve Investment Efficiency? *Abacus*, *55*(1), 92–127. https://doi.org/10.1111/abac.12149

Dobson, W., & Safarian, A. E. (1997). *East Asian Capitalism: Diversity and Dynamism*. University of Toronto Press. http://ebookcentral.proquest.com/lib/eur/detail.action?docID=4671454

Domadenik, P., Prašnikar, J., & Svejnar, J. (2016). Political Connectedness, Corporate Governance, and Firm Performance. *Journal of Business Ethics*, *139*(2), 411–428. https://doi.org/10.1007/s10551-015-2675-4

Dong, B., & Torgler, B. (2011). Democracy, Property Rights, Income Equality, and Corruption. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1756816

Drukker, D. M. (2003). Testing for Serial Correlation in Linear Panel-data Models. *The Stata Journal*, *3*(2), 168–177. https://doi.org/10.1177/1536867X0300300206

Dzhumashev, R. (2014). Corruption and growth: The role of governance, public spending, and economic development. *Economic Modelling*, *37*, 202–215. https://doi.org/10.1016/j.econmod.2013.11.007

Faccio, M. (2006). Politically Connected Firms. *American Economic Review*, *96*(1), 369–386. https://doi.org/10.1257/000282806776157704

Faccio, M. (2010). Differences between Politically Connected and Nonconnected Firms: A Cross-Country Analysis. *Financial Management*, *39*(3), 905–928. https://doi.org/10.1111/j.1755-053X.2010.01099.x

Faccio, M., Masulis, R. W., & McCONNELL, J. J. (2006). Political Connections and Corporate Bailouts. *The Journal of Finance*, *61*(6), 2597–2635. https://doi.org/10.1111/j.1540-6261.2006.01000.x

Fang, J., Pittman, J., Zhang, Y., & Zhao, Y. (2017). Auditor Choice and Its Implications for Group-Affiliated Firms. *Contemporary Accounting Research*, *34*(1), 39–82. https://doi.org/10.1111/1911-3846.12276

SFAS No. 2 Accounting for Research and Development Costs, 2 Statement of Financial Accounting Standards 12 (1974). https://fasb.org/Page/ShowPdf?path=aop_fas2.pdf&title=FAS+2+%28AS+AMENDED%29&acceptedDisclaimer=true&Submit=

Fengyan, Y., Hongjuan, Z., Tan, J., & Qi, L. (2022). Non-Market Strategies and Credit Benefits: Unpacking Heterogeneous Political Connections in Response to Government Anti-Corruption Initiatives. *Journal of Management Studies*, *59*(2), 349–389. https://doi.org/10.1111/joms.12741

Fisman, R. (2001). Estimating the Value of Political Connections. *American Economic Review*, *91*(4), 1095. https://doi.org/10.1257/aer.91.4.1095

Fisman, & Svensson. (2007). Are corruption and taxation really harmful to growth? Firm level evidence. *Journal of Development Economics*, *83*(1), 63–75. https://doi.org/10.1016/j.jdeveco.2005.09.009

Fu, J., Shimamoto, D., & Todo, Y. (2017). Can firms with political connections borrow more than those without? Evidence from firm-level data for Indonesia. *Journal of Asian Economics*, *52*, 45–55. https://doi.org/10.1016/j.asieco.2017.08.003

Fung, S. Y., Su, L. (Nancy), & Gul, R. J. (2013). Investor legal protection and earnings management: A study of Chinese H-shares and Hong Kong shares. *Journal of Accounting and Public Policy*, *32*(5), 392–409. https://doi.org/10.1016/j.jaccpubpol.2013.06.004

Goudie, A., & Stasavage, D. (1997). *Corruption: The Issues*. https://doi.org/10.1787/623840765428

Guedhami, O., Pittman, J. A., & Saffar, W. (2014). Auditor Choice in Politically Connected Firms. *Journal of Accounting Research*, *52*(1), 107–162. https://doi.org/10.1111/1475-679X.12032

Han, B. H., & Manry, D. (2004). The value-relevance of R&D and advertising expenditures: Evidence from Korea. *The International Journal of Accounting*, *39*(2), 155–173. https://doi.org/10.1016/j.intacc.2004.02.002

Hausman, J. A. (1978). Specification Tests in Econometrics. *Econometrica (Pre-1986)*, *46*(6), 1251–1271. http://www.proquest.com/docview/214661646/abstract/99AC780F8BD346E1PQ/1

Healy, P. M., & Wahlen, J. M. (1999). A Review of the Earnings Management Literature and Its Implications for Standard Setting. *Accounting Horizons*, *13*(4), 365–383. https://doi.org/10.2308/acch.1999.13.4.365

Holthausen, R. W., & Leftwich, R. W. (1983). The economic consequences of accounting choice implications of costly contracting and monitoring. *Journal of Accounting and Economics*, *5*, 77–117. https://doi.org/10.1016/0165-4101(83)90007-1

Hou, Q., Hu, M., & Yuan, Y. (2017). Corporate innovation and political connections in Chinese listed firms. *Pacific-Basin Finance Journal*, *46*, 158–176. https://doi.org/10.1016/j.pacfin.2017.09.004

Houqe, M. N., & Monem, R. M. (2016). IFRS Adoption, Extent of Disclosure, and Perceived Corruption: A Cross-Country Study. *The International Journal of Accounting*, *51*(3), 363–378. https://doi.org/10.1016/j.intacc.2016.07.002

Huang, H. H., Wang, W., & Zhou, J. (2013). Shareholder Rights, Insider Ownership and Earnings Management. *Abacus*, *49*(1), 46–73. https://doi.org/10.1111/j.1467-6281.2012.00390.x

Hung, M., Wong, T. J., & Zhang, F. (2015). The Value of Political Ties Versus Market Credibility: Evidence from Corporate Scandals in China. *Contemporary Accounting Research*, *32*(4), 1641–1675. https://doi.org/10.1111/1911-3846.12134

Hunter, L., Webster, E., & Wyatt, A. (2012). Accounting for Expenditure on Intangibles. *Abacus*, *48*(1), 104–145. https://doi.org/10.1111/j.1467-6281.2012.00359.x

Huynh, C. M., & Tran, H. N. (2021). Moderating effects of corruption and informality on the fiscal decentralization—economic growth nexus: Insights from OECD countries. *Annals of Public and Cooperative Economics*, *92*(2), 355–373. https://doi.org/10.1111/apce.12298

International Accounting Standards 38 Intangible Assets, 38 International Accounting Standards (2004).

Infante, L., & Piazza, M. (2014). Political connections and preferential lending at local level: Some evidence from the Italian credit market. *Journal of Corporate Finance*, *29*, 246–262. https://doi.org/10.1016/j.jcorpfin.2014.06.003

Jackowicz, K., Kozłowski, Ł., & Mielcarz, P. (2014). Political connections and operational performance of non-financial firms: New evidence from Poland. *Emerging Markets Review*, *20*, 109–135. https://doi.org/10.1016/j.ememar.2014.06.005

Javorcik, B. S., & Wei, S.-J. (2002). Corruption and Cross-Border Investment: Firm Level Evidence. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.344660

Jin, Q., Jin, Y., Tian, G. G., & Xuan, Y. (2021). Does Internal Corporate Governance Complement or Substitute for External Auditing? Evidence from China's Anti-corruption Campaign. *Abacus*, *57*(1), 153–182. https://doi.org/10.1111/abac.12215

Karampinis, N. I., & Hevas, D. L. (2011). Mandating IFRS in an Unfavorable Environment: The Greek Experience. *The International Journal of Accounting*, *46*(3), 304–332. https://doi.org/10.1016/j.intacc.2011.07.001

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2010). The Worldwide Governance Indicators. *World Bank Policy Research Working Paper*, *5430*, 31.

Kaufmann, D., & Wei, S.-J. (2000). Does "Grease Money" Speed Up the Wheels of Commerce? *IMF Working Paper*. https://doi.org/10.3386/w7093

Khwaja, A. I., & Mian, A. (2005). DO LENDERS FAVOR POLITICALLY CONNECTED FIRMS? RENT PROVISION IN AN EMERGING FINANCIAL MARKET. *QUARTERLY JOURNAL OF ECONOMICS*, *120*(4), 1371–1411. https://doi-org.eur.idm.oclc.org/10.1162/003355305775097524

Kim, Y., Cho, H., & Yang, S. (2021). Analyst Coverage and the Market Valuation of Capitalized versus Expensed R&D*. *Asia-Pacific Journal of Financial Studies*, *50*(4), 367–390. https://doi.org/10.1111/ajfs.12346

Kothari, S. P., & Zimmerman, J. L. (1995). Price and return models. *Journal of Accounting and Economics*, *20*(2), 155–192. https://doi.org/10.1016/0165-4101(95)00399-4

KPMG. (2017). *IFRS vs. US GAAP: R&D costs*. https://advisory.kpmg.us/articles/2017/ifrs-vs-us-gaap-rd-costs.html

Kumar, P., Langberg, N., & Sivaramakrishnan, K. (2012). Voluntary Disclosures, Corporate Control, and Investment. *Journal of Accounting Research*, *50*(4), 1041–1076. https://doi.org/10.1111/j.1475-679X.2012.00454.x

Kumar, P., & Li, D. (2016). Capital Investment, Innovative Capacity, and Stock Returns. *The Journal of Finance*, *71*(5), 2059–2094. https://doi.org/10.1111/jofi.12419

Kunieda, T., Okada, K., & Shibata, A. (2016). Corruption, Financial Development and Economic Growth: Theory and Evidence From an Instrumental Variable Approach With Human Genetic Diversity. *Economic Notes*, *45*(3), 353–392. https://doi.org/10.1111/ecno.12061

La Porta, R., Lopez-de-Silanes, F., & Shleifer, A. (2008). The Economic Consequences of Legal Origins. *Journal of Economic Literature*, *46*(2), 285–332. https://doi.org/10.1257/jel.46.2.285

La Porta, R., Lopez-De-Silanes, F., Shleifer, A., & Vishny, R. W. (1997). Legal Determinants of External Finance. *The Journal of Finance*, *52*(3), 1131–1150. https://doi.org/10.2307/2329518

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., & Vishny, R. W. (1998). Law and Finance. *Journal of Political Economy*, *106*(6), 1113–1155. https://doi.org/10.1086/250042

Lee, S.-C., Lin, C.-T., & Chang, P.-T. (2011). An Ohlson valuation framework for valuing corporate governance: The case of Taiwan. *Pacific-Basin Finance Journal*, *19*(4), 420–434. https://doi.org/10.1016/j.pacfin.2011.03.003

Leff, N. H. (1964). Economic Development Through Bureaucratic Corruption. *American Behavioral Scientist*, *8*(3), 8–14. https://doi.org/10.1177/000276426400800303

Lev, B. (2018). The deteriorating usefulness of financial report information and how to reverse it. *Accounting and Business Research*, *48*(5), 465–493. https://doi.org/10.1080/00014788.2018.1470138

Lev, B. (2019). Ending the Accounting-for-Intangibles Status Quo. *European Accounting Review*, *28*(4), 713–736. https://doi.org/10.1080/09638180.2018.1521614

Lev, B., & Sougiannis, T. (1996). The capitalization, amortization, and value-relevance of R&D. *Journal of Accounting and Economics*, *21*(1), 107–138. https://doi.org/10.1016/0165-4101(95)00410-6

Li, H., Meng, L., Wang, Q., & Zhou, L.-A. (2008). Political connections, financing and firm performance: Evidence from Chinese private firms. *Journal of Development Economics*, *87*(2), 283–299. https://doi.org/10.1016/j.jdeveco.2007.03.001

Light, D. W., Lexchin, J., & Darrow, J. J. (2013). Institutional corruption of pharmaceuticals and the myth of safe and effective drugs. *The Journal of Law, Medicine & Ethics: A Journal of the American Society of Law, Medicine & Ethics*, *41*(3), 590–600. https://doi.org/10.1111/jlme.12068

Lin, C., Lin, P., Song, F. M., & Li, C. (2011). Managerial incentives, CEO characteristics and corporate innovation in China's private sector. *Journal of Comparative Economics*, *39*(2), 176–190. https://doi.org/10.1016/j.jce.2009.12.001

Lin, Z., Liu, M., & Noronha, C. (2016). The Impact of Corporate Governance on Informative Earnings Management in the Chinese Market. *Abacus*, *52*(3), 568–609. https://doi.org/10.1111/abac.12084

Liu, Y., Li, X., Zeng, H., & An, Y. (2017). Political connections, auditor choice and corporate accounting transparency: Evidence from private sector firms in China. *Accounting & Finance*, *57*(4), 1071–1099. https://doi.org/10.1111/acfi.12207

Lu, F., Zhu, Z., Zhu, L., & Gao, H. (2022). Political tie hot potato: The contingent effect of China's anti-corruption policy on cash and innovation. *Research Policy*, *51*(4), 104476. https://doi.org/10.1016/j.respol.2022.104476

Malinowska, A. P. (2019). Corruption versus societal trust—New evidence from Poland's limited liability companies. *Journal of Corporate Accounting & Finance*, *30*(4), 85–98. https://doi.org/10.1002/jcaf.22405

Markarian, G., Pozza, L., & Prencipe, A. (2008). Capitalization of R&D costs and earnings management: Evidence from Italian listed companies. *The International Journal of Accounting*, *43*(3), 246–267. https://doi.org/10.1016/j.intacc.2008.06.002

Mauro, P. (1995). Corruption and Growth. *The Quarterly Journal of Economics*, *110*(3), 681–712. https://doi.org/10.2307/2946696

Mazzi, F., Slack, R., Tsalavoutas, I., & Tsoligkas, F. (2019). Country-level corruption and accounting choice: Research & development capitalization under IFRS. *The British Accounting Review*, *51*(5), 100821. https://doi.org/10.1016/j.bar.2019.02.003

Mazzi, F., Slack, R., Tsalavoutas, I., & Tsoligkas, F. (2022). Exploring investor views on accounting for R&D costs under IAS 38. *Journal of Accounting and Public Policy*, *41*(2), 106944. https://doi.org/10.1016/j.jaccpubpol.2022.106944

Méon, P.-G., & Sekkat, K. (2005). Does Corruption Grease or Sand the Wheels of Growth? *Public Choice*, *122*(1/2), 69–97. http://www.jstor.org/stable/30026673

Murphy, K. M., Shleifer, A., & Vishny, R. W. (1993). Why is rent-seeking so costly to growth? *American Economic Review*, *83*(2), 409. https://search.ebscohost.com/login.aspx?direct=true&db=buh&AN=9306305862&site=ehost-live&scope=site

Nguyen, P., Nivoix, S., & Noma, M. (2010). The valuation of R&D expenditures in Japan. *Accounting & Finance*, *50*(4), 899–920. https://doi.org/10.1111/j.1467-629X.2010.00345.x

Ohlson, J. A. (1995). Earnings, Book Values, and Dividends in Equity Valuation*. *Contemporary Accounting Research*, *11*(2), 661–687. https://doi.org/10.1111/j.1911-3846.1995.tb00461.x

Olson, M. (1993). Dictatorship, Democracy, and Development. *American Political Science Review*, *87*(3), 567–576. https://doi.org/10.2307/2938736

Oswald, D. R. (2008). The Determinants and Value Relevance of the Choice of Accounting for Research and Development Expenditures in the United Kingdom. *Journal of Business Finance & Accounting*, *35*(1–2), 1–24. https://doi.org/10.1111/j.1468-5957.2007.02060.x

Oswald, D. R., & Zarowin, P. (2007). Capitalization of R&D and the Informativeness of Stock Prices. *European Accounting Review*, *16*(4), 703–726. https://doi.org/10.1080/09638180701706815

Paulo, L. D. de, Lima, R. C. de A., & Tigre, R. (2022). Corruption and economic growth in Latin America and the Caribbean. *Review of Development Economics*, *26*(2), 756–773. https://doi.org/10.1111/rode.12859

PricewaterhouseCoopers. (2019). *1.1 Capitalisation of internal development costs*. https://viewpoint.pwc.com/dt/ca/en/pwc/industry/industry_INT/industry_INT/pharmaceutical_and_l_INT/ifrs_issues_and_solu_INT/1_rd_and_intangible__INT/11_capitalisation_of__1_INT.html

Ramsey, J. B. (1969). Tests for Specification Errors in Classical Linear Least-Squares Regression Analysis. *Journal of the Royal Statistical Society. Series B (Methodological)*, *31*(2), 350–371. https://www.jstor.org/stable/2984219

Regalado, A. (2021). *How Pfizer made an effective anti-covid pill*. MIT Technology Review. https://www.technologyreview.com/2022/02/04/1044714/pfizer-covid-pill-paxlovid-pandemic/

Riahi-Belkaoui, A. (2004). EFFECTS OF CORRUPTION ON EARNINGS OPACITY INTERNATIONALLY. *Advances in International Accounting*, *17*, 73–84. https://doi.org/10.1016/S0897-3660(04)17004-9

Rock, M. T., & Bonnett, H. (2004). The Comparative Politics of Corruption: Accounting for the East Asian Paradox in Empirical Studies of Corruption, Growth and Investment. *World Development*, *32*(6), 999–1017. https://doi.org/10.1016/j.worlddev.2003.12.002

Saeed, A., Belghitar, Y., & Clark, E. (2019). Political connections and corporate performance: Evidence from Pakistan. *Economics of Transition and Institutional Change*, *27*(4), 863–889. https://doi.org/10.1111/ecot.12213

Samuels, D., Taylor, D. J., & Verrecchia, R. E. (2021). The economics of misreporting and the role of public scrutiny. *Journal of Accounting and Economics*, *71*(1), 101340. https://doi.org/10.1016/j.jacceco.2020.101340

Scott, W. R. (2014). Institutions and Organizations. Ideas, Interests and Identities. *@gement*, *17*(2), 136–140. http://www.proquest.com/docview/1552827253/abstract/960492E471F0473EPQ/1

Sharma, C., & Mitra, A. (2019). Corruption and Economic Growth: Some New Empirical Evidence from a Global Sample. *Journal of International Development*, *31*(8), 691–719. https://doi.org/10.1002/jid.3433

Shleifer, A., & Vishny, R. W. (1993). *Corruption* (Working Paper No. 4372; Working Paper Series). National Bureau of Economic Research. https://doi.org/10.3386/w4372

Song, C.-Q., Chang, C.-P., & Gong, Q. (2021). Economic growth, corruption, and financial development: Global evidence. *Economic Modelling*, *94*, 822–830. https://doi.org/10.1016/j.econmod.2020.02.022

Su, Z., & Fung, H.-G. (2013). Political Connections and Firm Performance in Chinese Companies. *Pacific Economic Review*, *18*(3), 283–317. https://doi.org/10.1111/1468-0106.12025

Transparency International. (n.d.). *What is corruption?* Transparency.Org. Retrieved May 10, 2022, from https://www.transparency.org/en/what-is-corruption

Treisman, D. (2000). The causes of corruption: A cross-national study. *Journal of Public Economics*, *76*(3), 399–457. https://doi.org/10.1016/S0047-2727(99)00092-4

Tsoligkas, F., & Tsalavoutas, I. (2011). Value relevance of R&D in the UK after IFRS mandatory implementation. *Applied Financial Economics*, *21*(13), 957–967. https://doi.org/10.1080/09603107.2011.556588

Van Vu, H., Tran, T. Q., Van Nguyen, T., & Lim, S. (2018). Corruption, Types of Corruption and Firm Financial Performance: New Evidence from a Transitional Economy. *Journal of Business Ethics*, *148*(4), 847–858. https://doi.org/10.1007/s10551-016-3016-y

Vial, V., & Hanoteau, J. (2010). Corruption, Manufacturing Plant Growth, and the Asian Paradox: Indonesian Evidence. *World Development*, *38*(5), 693–705. https://doi.org/10.1016/j.worlddev.2009.11.022

Wang, Y. (2020). Growth and development under different corruption regimes. *The Manchester School*, *88*(2), 305–323. https://doi.org/10.1111/manc.12302

Wang, Y., Du, R., Koong, K. S., & Fan, W. (2017). Effects of R&D policy choice on accounting performance and market value. *R&D Management*, *47*(4), 545–556. https://doi.org/10.1111/radm.12225

Wang, Z., Braam, G., Reimsbach, D., & Wang, J. (2020). Political embeddedness and firms' choices of earnings management strategies in China. *Accounting & Finance*, *60*(5), 4723–4755. https://doi.org/10.1111/acfi.12690

Wei, S.-J. (2000). How Taxing is Corruption on International Investors? *Review of Economics and Statistics*, *82*(1), 1–11. https://doi.org/10.1162/003465300558533

White, H. (1980). A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heterosked Asticity. *Econometrica (Pre-1986)*, *48*(4), 817. http://www.proquest.com/docview/214658727/abstract/6A324E4ADC074ED5PQ/1

Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data* (2nd ed.). The MIT Press.

Wu, K., & Lai, S. (2020). Intangible intensity and stock price crash risk. *Journal of Corporate Finance*, *64*, 101682. https://doi.org/10.1016/j.jcorpfin.2020.101682

Xie, X., Qi, G., & Zhu, K. X. (2019). Corruption and New Product Innovation: Examining Firms' Ethical Dilemmas in Transition Economies. *Journal of Business Ethics*, *160*(1), 107–125. https://doi.org/10.1007/s10551-018-3804-7

Yeo, G. H. H., Tan, P. M. S., Ho, K. W., & Chen, S. (2002). Corporate Ownership Structure and the Informativeness of Earnings. *Journal of Business Finance & Accounting*, *29*(7–8), 1023–1046. https://doi.org/10.1111/1468-5957.00460

Yu, F., Guo, Y., Lettic, F., & Barnes, S. J. (2019). Regional Anti-Corruption Effort, Political Connections and Firm Innovation Effort: Evidence from China. *Bulletin of Economic Research*, *71*(1), 18–32. https://doi.org/10.1111/boer.12146

Yu, G. J., & Hong, K. (2016). Patents and R&D expenditure in explaining stock price movements. *Finance Research Letters*, *19*, 197–203. https://doi.org/10.1016/j.frl.2016.07.012

Zhang, D., & Guo, Y. (2019). Financing R&D in Chinese private firms: Business associations or political connection? *Economic Modelling*, *79*, 247–261. https://doi.org/10.1016/j.econmod.2018.12.010

Zhao, R. (2002). Relative Value Relevance of R&D Reporting: An International Comparison. *Journal of International Financial Management & Accounting*, *13*(2), 153–174. https://doi.org/10.1111/1467-646X.00082

Zhao, Y., & Chen, K. H. (2009). Earnings quality effect of state antitakeover statutes. *Journal of Accounting and Public Policy*, *28*(2), 92–117. https://doi.org/10.1016/j.jaccpubpol.2009.01.007

Zhou, S. L., Smulders, S., & Gerlagh, R. (2018). *Closing the Loop in a Circular Economy: Saving Resources or Suffocating Innovations?* 43.

Appendix I. Variable description

Table 6. Variable description - Price model

Variable Denotation	Description
$P_{i,t}$	Per share price of firm *i*'s equity at the end of fiscal period *t*
$ABVPS_{i,t}$	BVPS of firm *i* at the end of fiscal period *t*, net of capitalized R&D
$AEPS_{i,t}$	EPS of firm *i* at the end of fiscal period *t*, before R&D expenses and amortization of capitalized R&D
$RDCAP\_ps_{i,t}$	Yearly amount of capitalized R&D divided by common shares outstanding
$RDEXP\_ps_{i,t}$	Yearly amount of R&D expenses divided by common shares outstanding
$Control\_Corruption_{i,t}$	Perception of corruption control in the country in which firm *i* is listed in period *t* (WGI indicator: *Control of Corruption*)
$Rule\_Law_{i,t}$	Perception of law enforcement in the country in which firm *i* is listed in period *t* (WGI indicator: *Rule of Law*)
$Voice\_Accountability_{i,t}$	Perception of democracy in the country in which firm *i* is listed in period *t* (WGI indicator: *Voice and Accountability*)
$Reg\_Quality_{i,t}$	Perception of the quality of regulations promoting private sector development (WGI indicator: *Regulatory Quality*)
$Gov\_Effectiveness_{i,t}$	Perception of government performance and independence from political pressures (WGI indicator: *Government Effectiveness*).
$YEAR_{i,t}$	Year dummies which equal 1 if the observation is from year *t* and 0 if otherwise
$INDUSTRY_{i,t}$	Industry dummies which equal 1 if the firm belongs to one of the ICB industry group and 0 if otherwise

Table 7. Variable description - Return model

Variable Denotation	Description
$R_{i,t}$	Annual return of firm *i*'s equity at the end of fiscal period *t*
$AEPS_{i,t}$	Same definition as before; this variable equals the annual change in ABVPS since EPS = ΔBVPS
$\Delta AEPS_{i,t}$	Annual change in AEPS for firm *i* at the end of fiscal period *t*
$RDCAP\_ps_{i,t}$	Yearly amount of capitalized R&D divided by common shares outstanding
$\Delta RDEXP\_ps_{i,t}$	Annual change in R&D expenses
$Control\_Corruption_{i,t}$, $Rule\_Law_{i,t}$, $Voice\_Accountability_{i,t}$, $Reg\_Quality_{i,t}$, $Gov\_Effectiveness_{i,t}$	As previously defined (see Table 6)
$YEAR_{i,t}$,$INDUSTRY_{i,t}$	As previously defined (see Table 6)

Appendix II. Firm-level descriptive statistics

Table 8. Firm economic characteristics

Variables	N	Mean	Std. Dev.	Min.	0.25 Perc.	Median	0.75 Perc.	Max.
Panel 1: Whole sample								
Total assets (in '000 US$)	13,440	4,501.37	20,559.95	2.09	145.87	388.13	1,583.75	506,810.50
Net sales (in '000 US$)	13,440	3,426.91	13,673.48	0.00	113.51	326.94	1,337.63	289,892.90
Market capitalization (in '000 US$)	13,440	2,522.15	12,466.25	2.23	82.31	215.75	893.31	506,495.70
Leverage (debt-to-total assets) (%)	13,440	21.20	16.47	0.00	6.73	19.63	32.56	121.81
Beta	13,440	1.08	0.58	-2.40	0.72	1.05	1.39	6.07
BVPS	13,440	26.96	329.80	-3,434.94	0.58	1.41	10.26	19,517.71
EPS	13,440	-1.89	156.13	-11,295.71	0.01	0.09	0.57	1,431.76
RDCAP_ps	13,440	0.61	22.15	0.00	0.00	0.00	0.00	1,545.49
RDEXP_ps	13,440	0.54	3.82	0.00	0.01	0.04	0.20	232.59
Net sales/R&D (%)	13,440	3.73	21.51	0.00	0.31	1.38	3.61	1,847.06
Panel 2: Capitalizers								
Total assets (in '000 US$)	2,578	7,627.31	24,957.57	4.91	213.80	882.52	3,406.36	344,251.80
Net sales (in '000 US$)	2,578	5,627.11	17,516.82	1.05	153.96	668.38	2,751.62	223,787.10
Market capitalization (in '000 US$)	2,578	3,638.59	17,966.86	4.58	104.02	310.86	1,739.22	506,495.70
Leverage (debt-to-total assets) (%)	2,578	25.24	17.28	0.00	11.04	24.83	37.37	121.81
Beta	2,578	1.13	0.66	-2.40	0.75	1.08	1.43	6.07
BVPS	2,578	66.99	713.10	-3,434.94	1.20	7.29	32.79	19,517.71
EPS	2,578	-9.06	292.84	-11,295.71	0.01	0.23	1.85	1,431.76
RDCAP_ps	2,578	3.19	50.51	0.00	0.01	0.05	0.49	1,545.49
RDEXP_ps	2,578	1.36	8.05	0.00	0.00	0.08	0.86	232.59
Net sales/R&D (%)	2,578	2.39	5.69	0.00	0.00	0.68	2.56	187.47
Panel 3: Expensers								
Total assets (in '000 US$)	10,862	3,759.45	19,297.32	2.09	136.08	335.59	1,212.05	506,810.50
Net sales (in '000 US$)	10,862	2,904.72	12,534.61	0.00	106.93	287.18	1,036.36	289,892.90
Market capitalization (in '000 US$)	10,862	2,257.18	10,739.48	2.23	78.54	200.98	740.73	489,112.70
Leverage (debt-to-total assets) (%)	10,862	20.24	16.13	0.00	5.84	18.71	31.31	106.44
Beta	10,862	1.06	0.56	-2.40	0.71	1.03	1.38	4.80
BVPS	10,862	17.45	116.01	-3,297.04	0.55	1.09	7.47	3,616.12
EPS	10,862	-0.18	98.98	-10,246.34	0.01	0.08	0.41	304.61
RDCAP_ps	10,862	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RDEXP_ps	10,862	0.35	1.56	0.00	0.01	0.04	0.15	77.11
Net sales/R&D (%)	10,862	4.04	23.76	0.00	0.42	1.62	3.78	1,847.06

Appendix III. Accounting treatment of R&D

Table 9. Accounting treatment of R&D by country

	Country							
Accounting treatment of R&D	**China**	**Hong Kong**	**Japan**	**South Korea**	**Malaysia**	**Singapore**	**Taiwan**	**Total**
Expense	53	52	1,370	3,093	268	144	5,882	10,862
% expenser	*71.62%*	*55.91%*	*88.22%*	*62.64%*	*42.74%*	*55.38%*	*99.78%*	
Capitalize	21	41	183	1,845	359	116	13	2,578
% capitalizer	*28.38%*	*44.09%*	*11.78%*	*37.36%*	*57.26%*	*44.62%*	*0.22%*	
Avg. R&D intensity (R&D/sales)	3.16%	2.49%	4.94%	1.77%	7.87%	12.52%	5.00%	
Total	**74**	**93**	**1,553**	**4,938**	**627**	**260**	**5,895**	**13,440**

Table 10. Accounting treatment of R&D by industry

	Industry Classification Benchmark (ICB)								
Accounting treatment of R&D	**BSC**	**CDS**	**CST**	**HCR**	**IDU**	**TEC**	**TEL**	**UTI**	**Total**
Expensers	1,754	1,654	830	657	2,507	2,905	480	75	**10,862**
% expenser	*84%*	*76%*	*85%*	*69%*	*77%*	*90%*	*83%*	*54%*	
Capitalizers	343	535	142	298	762	339	96	63	**2,578**
% capitalizer	*16%*	*24%*	*15%*	*31%*	*23%*	*10%*	*17%*	*46%*	
Total	**2,097**	**2,189**	**972**	**955**	**3,269**	**3,244**	**576**	**138**	**13,440**

Appendix IV. Correlation and variance inflation factor (VIF)

Table 11. Pearson correlation matrix and VIF

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	VIF**
1) Price	1										
2) Adj. EPS	-0.1146*	1									1.16
3) Adj. BVPS	0.8317*	0.0967*	1								2.86
4) RDCAP_ps	0.6036*	-0.0741*	0.7208*	1							2.23
5) ControlCorruption	-0.0418*	0,009	-0.0422*	-0,019	1						5.91
6) RuleLaw	-0,002	0,0114	-0,01	-0,011	0.8306*	1					6.30
7) RDEXP_ps	0.3465*	-0.1794*	0.5155*	0.3233*	-0,012	0.0252*	1				1.51
8) VoiceAccountability	-0,002	0,0038	-0,004	-0,003	0.4025*	0.5821*	0,0124	1			1.76
9) RegulatoryQuality	-0.0469*	0,009	-0.0432*	-0,021	0.7233*	0.7861*	-0.0429*	0.4463*	1		2.84
10) GovernmentEffectiveness	-0.0259*	0,0104	-0.0245*	-0,01	0.9012*	0.8460*	-0,006	0.3372*	0.7473*	1	7.33

*Note: * significant at 1% level; ** avg. VIF = 3.54*

Appendix V. Hausman test

Table 12. Hausman test - Price model

	Coefficients			
	FE	**RE**	**Difference (FE-RE)**	**Std. Errors**
AEPS	-0.2995	-0.3510	0.0515	0.0029
ABVPS	0.6039	0.5369	0.0670	0.0030
RDCAP_ps	220.4429	219.4586	0.9843	2.6237
ControlCorruption	-4.0587	-7.8186	3.7599	8.0393
*RDCAP_ps * ControlCorruption*	-77.7399	-91.9982	14.2583	0.6926
RuleLaw	25.6995	74.4511	-48.7516	8.4820
*RDCAP_ps * RuleLaw*	3.7966	16.8188	-13.0223	0.4135
RDEXP_ps	-10.6606	-8.2382	-2.4224	0.1492
VoiceAcc	-8.1061	-6.6625	-1.4436	13.3575
RegQual	12.0136	-41.7685	53.7821	6.8014
GovEffective	-4.9295	-9.3180	4.3885	3.9519

FE = consistent under Ho and Ha; obtained from xtreg

RE = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 2370.26

Prob>chi2 = 0.0000

Note: The test result displays a p-value of 0.0000, suggesting that a fixed-effects approach is appropriate for the price model. Note that this test is performed before mean-centering *ControlCorruption* and *RuleLaw*.

Table 13. Hausman test - Return model

	Coefficients			
	FE	**RE**	**Difference (FE-RE)**	**Std. Errors**
AEPS	0.0000259	0.000076	-0.00005	0.0000175
deltaAEPS	0.0006077	0.0006094	-0.00000172	0.0004665
deltaRDCAP_ps	0.0835204	0.0565107	0.0270097	0.0286445
deltaRDEXP_ps	0.0016828	0.0012245	0.0004583	0.0005967
ControlCorruption	-0.6472157	-0.0118129	-0.6354028	0.1993422
*deltaRDCAP_ps * ControlCorruption*	-0.0207981	-0.0155824	-0.0052156	0.0082178
RuleLaw	-0.6000634	-0.5092715	-0.0907919	0.0981174
*deltaRDCAP_ps * RuleLaw*	-0.0058271	-0.0026468	-0.0031803	0.0030361
VoiceAcc	0.3487047	0.0504595	0.2982452	0.2712357
RegQual	0.0770815	0.1249512	-0.0478697	0.1930195
GovEffective	0.5314826	0.260268	0.2712146	0.1400462

FE = consistent under Ho and Ha; obtained from xtreg

RE = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 16.93

Prob>chi2 = 0.049

Note: The test result displays a p-value of 0.049. While the consistency of a fixed-effects model is less significantly different than a random-effects model, this result suggests that a fixed-effects approach is appropriate for the return model. This test is performed prior to mean-centering *ControlCorruption* and *RuleLaw*.

Appendix VI. Testing for heteroskedasticity

A White (1980) specification test was run on the price model to confirm the suspicion that heteroskedasticity may exist in the model. The test is preferred to Breusch-Pagan's test to account for possible non-linearities posed by the existence of interaction terms in the model. The test was performed on Stata and the output returns a p-value of 0.0000 (Table IIIA). The result is in line with Kothari and Zimmerman (1995).

Table 14. White's test for heteroskedasticity - Price model

Source	chi2	df	p
Heteroskedasticity	13136.72	335	0.0000
Skewness	850.41	28	0.0000
Kurtosis	1.21	1	0.2709
Total	13988.34	364	0

Note: The test was performed prior to the inclusion of heteroskedasticity-robust SEs. Because the test returns a p-value that is less than 0.001, the use of heteroskedasticity robust SEs is appropriate in the model.

Considering the heteroskedasticity present in the price model, using a return model potentially has some merit if a non-significant test result is obtained. The same test is repeated on the return model, and the resulting p-value is 0.4013 (Table IIIB). Given the insignificant result, the existence of heteroskedasticity in the return model is ruled out, confirming Kothari and Zimmerman (1995) in addressing model selection.

Table 15. White's test for heteroskedasticity - Return model

Source	chi2	df	p
Heteroskedasticity	310.54	305	0.4013
Skewness	36.42	28	0.1322
Kurtosis	2.36	1	0.1248
Total	349.31	334	0.2711

Note: The test was performed prior to the inclusion of heteroskedasticity-robust SEs. Because the test returns a p-value that is greater than 0.1, the use of heteroskedasticity robust SEs may be unnecessary.

However, this study does not rule out the use of the price model in favor of the return model. Despite the latter model's apparent superiority in terms of its homoskedasticity, it does not provide an answer to the value relevance of accounting information. Instead, it only provides insight into a subset of relevance, i.e., timeliness.

Appendix VII. Testing for serial autocorrelation

Testing for serial autocorrelation was performed using the test prescribed by Wooldridge (2010) with an algorithm created by Drukker (2003) for both the price and return models. Past literature suggests the presence of serial autocorrelation in the former (Aboody & Lev, 1998; Kothari & Zimmerman, 1995), to which the latter can provide a remedy if the null hypothesis that no serial autocorrelation exists cannot be sufficiently rejected (i.e., if $p > 0.05$).

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,    1343) =     10.189
          Prob > F =      0.0014
```

Figure 1. Stata output for test for serial autocorrelation in the price model

Note: Running the test on the price model reveals that serial correlation exists in the price model ($p = 0.0014$, $F = 10.189$) (Figure II). As such, concerns raised in Aboody & Lev (1998) and in Kothari & Zimmerman (1995) are legitimate and may justify the use of an additional model.

```
Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,     239) =      1.237
          Prob > F =      0.2671
```

Figure 2. Stata output for test for serial autocorrelation in the return model

Note: The test result on the return model shows a non-significant test result ($p = 0.2671$, $F = 1.237$), thus suggesting the absence of serial autocorrelation in the return model's errors.

Appendix VIII. Testing for omitted variables

Cazavan-Jeny and Jeanjean (2006) noted the possibility that the Ohlson valuation model suffers from omitted variables. To test for omitted variables, the approach designed by Ramsey (1969) to detect specification errors is employed.

```
Ramsey RESET test using powers of the fitted values of price
       Ho:  model has no omitted variables
                F(3, 13408) =   2088.15
                   Prob > F =      0.0000
```

Figure 3. Stata output for Ramsey (1969) specification error test

```
Ramsey RESET test using powers of the fitted values of return
       Ho:  model has no omitted variables
                 F(3, 1830) =      8.39
                   Prob > F =      0.0000
```

Figure 4. Stata output for Ramsey (1969) specification error test

Both the outputs in Figure 3 and Figure 4 show a p-value of 0.0000, which is well beyond significant to conclude that both models omit some variables. Therefore, the results in this study must be viewed in consideration of self-selection issues.