The Role of Big 4 Auditors in the Global Primary Market: Does Audit Quality Matter Most When Investors Are Protected Least?

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Abstract

This study examines the informational effect of audit quality on IPO underpricing in the global primary market. Using a comprehensive sample of 14,029 IPOs from 37 countries over a period of 1995 to 2014, we document that IPOs audited by Big 4 auditors are on average significantly less underpriced than those audited by non-Big 4 auditors after controlling for other determinants along with country-, industry- and year-fixed effects. When we distinguish cross-country variation in legal institutions, we show that the Big-4 effect on IPO underpricing remains significant only in countries with weak investor protection regimes. Our results are robust to the endogenous nature of auditor choice and various model specifications. Taken together, our findings support the argument that global reputation concerns drive Big 4 auditors to provide a higher level of audit quality, and the differential audit quality matters most in the IPO markets where investors are protected least. One implication of our findings is that hiring a reputable auditor may offer a viable mechanism for entrepreneurs to privately compensate for institutional constraints, thereby lowering the cost of going public.

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1. INTRODUCTION

An initial public offering (IPO) is characterized with information asymmetry. Entrepreneurs and prospective investors are asymmetrically informed about the value of a new issue at the time of IPO. Extant IPO research shows that information asymmetries in the IPO process are a key determinant of IPO underpricing (Rock, 1986; Ritter and Welch, 2002; Ljungqvist, 2007). To reduce the valuation discounts, entrepreneurs often rely on expert intermediaries such as a Big 4 auditor[1] to convey critical information to outside investors (Beatty, 1989; Hogan, 1997; Weber and Willenborg, 2003). The extant IPO auditing research has focused on a single country setting, primarily on the U.S, perhaps because the U.S. has long enjoyed a vibrant IPO market supported by a well-developed legal institution (e.g., Shleifer and Wolfenzon, 2002).

The past two decades, however, have witnessed a considerable shift of global IPO activity away from the U.S. For example, Doidge, Karolyi, and Stulz (2013) report that the average worldwide share of U.S. IPOs has fallen from 27% in the 1990s to 12% in the period of 2000 to 2007.[2] Accompanying this notable change is increased penetration into worldwide capital markets by Big 4 auditors, with fastest growth taking place in the Asia Pacific countries and the European region. Against this backdrop, we examine the certification role of Big 4 auditors in the *international* primary market. Specifically, we investigate whether IPOs audited by more reputable

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[1] There were 8 large international audit firms in the 1980s. Subsequent mergers reduced the number to 6, 5 and the extant Big 4. We use the term Big 4 broadly throughout the paper to refer to these large audit firms.
[2] A recent global IPO report by Ernst &Young (2011) confirms this trend and also highlights increasing IPO activities in emerging markets. For example, emerging market IPOs accounted for a whopping 69% of the global IPO activities in 2010, with several top IPOs from India, Poland and Indonesia.

global auditors exhibit a lower level of underpricing than those audited by local auditors. We further investigate how the local investor protection milieu impacts the IPO investors' assessments of Big 4 audit quality in different countries and how such perceived audit quality affects IPO pricing worldwide.

We focus on the global IPO market for several seasons. First, the so called "underpricing" phenomenon of IPO firms suggests that a huge amount of money is left on the table, resulting in significant costs of capital issuance for the IPO firm. Theoretical research (e.g., Rock, 1986; Grinblatt and Hwang, 1989; Ljungqvist, 2007) emphasizes the prevalence of information asymmetries in the IPO process and shows that a higher level of information asymmetry is associated with more IPO underpricing. The primary market, therefore, provides a powerful setting to examine the certification role of information intermediaries. Second, investor protection laws are generally much weaker in many parts of the world than in the U.S. If weak legal institutions exacerbate managers' incentives to manipulate earnings, then accounting quality (information asymmetry) is much lower (higher) in countries where investors' rights are not well protected (Bhattacharya, Daouk, Welker, 2003; Leuz, Nanda, Wysocki, 2003; DeFond, Hung, Trezevant, 2007). Moreover, IPOs issued in countries with lower accounting quality tend to be more underpriced (Boulton, Smart, Zutter; 2011). In light of these findings, an important question arises as to whether and how reputable information intermediaries like Big 4 auditors can be employed as a curative mechanism to mitigate information asymmetries in an international setting, thereby enabling the IPO issuers to reduce pricing discounts.

We hypothesize that IPOs audited by Big 4 firms are on average less underpriced than those audited by local firms in the global IPO market. To the extent that the audit quality of reputable global firms is higher than that of local auditors, financial reports of IPOs audited by

global firms are more informative to prospective investors (Beatty, 1989; Hogan, 1997), and such IPOs are expected to have less information asymmetries and hence lower underpricing than those audited by non-Big 4 auditors. This line of reasoning is based on evidence from a single legal institution, namely, the U.S market. When analyzing global secondary markets, researchers find mixed evidence on how variation in legal institutions across countries could alter the differential audit quality of Big 4 versus non-Big 4 auditors (e.g., Choi and Wong, 2007: Francis and Wang, 2008). Therefore, it remains an empirical question of whether hiring a Big 4 auditor on average helps reduce IPO underpricing in an international IPO setting.

With respect to the impact of legal institutions, we predict that the Big 4 effect is more significant in countries with weak legal regimes. This prediction flows directly from the theoretical work by Datar, Feltham, and Hughes (1991) who examine the signaling role of auditors in valuing new issues. They demonstrate theoretically that *the informational value of an issuer's financial report audited by a high quality auditor is increasing in the issuer's riskiness*. Prior research shows that the firm's risk can be affected by investor protection regimes in which it operates. For example, a weak legal system can not only exacerbate a firm's information risk and the agency conflicts between its controlling owners and minority shareholders, but also increase the ex ante uncertainty of the firm's future cash flows (e.g., Claessens, Djankov, and Lang, 2000; Leuz et al., 2003; Engelen and Van Essen, 2010). Moreover, the auditing literature argues that Big 4 auditors make costly investments and develop expertise in specialized areas to build a reputation for a higher audit quality (e.g., Simunic and Stein, 1987). To the extent that weak legal regimes increase IPO firms' riskiness, the theory of Datar et al. (1991) above predicts that a Big 4 auditor's concern for global reputation protection could translate into higher information quality of its audited reports, hereby lowering underpricing in the countries with weak investor protection.

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While this prediction is plausible, our prediction may not be borne out empirically. First, it is not clear ex ante whether *global* network synergies can generate gains in terms of higher information quality across different investor protection environments. Potentially, the far lower threat of shareholder litigation outside the U.S., especially in weak legal regimes, could drain rather than add to network synergies in a global context. Second, to the extent that the reputation rationale for audit quality is not valid[3], the Big 4 auditor may not be incentivized (despite possessing superior knowledge) to provide higher information quality in a country with weak investor protection. To the extent these countervailing arguments hold, they would work against finding results supporting our prediction.

Drawing a comprehensive sample consisting of 14,029 IPOs from 37 countries during the period 1995 to 2014[4], we find that hiring a Big 4 auditor as opposed to a local auditor, on average, is associated with 4.2% lower IPO underpricing after controlling for other determinants of underpricing along with country-, industry- and year-fixed effects. Such an association though, applies only to countries with weak institutional qualities measured by a country's rule of law, legal origin and investor protection. In contrast, it is non-existing in countries with strong institutional qualities.

Recall that we argue that weak legal institutions are associated with poor earnings quality and high information risk, and therefore the differential effect of big 4 auditors can be explained by worse information environments in weak institutions. Further analysis provides corroborative evidence. Specifically, we document that country-level information quality measured by earnings management and earnings opaqueness is indeed inferior in weak institutions. We then demonstrate

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[3] Consistent with this argument, Francis and Wang (2008) report that Big 4 auditors provide higher audit quality, relative to non-Big Four auditors, only in countries with strong investor protection.
[4] The sample construction involves laborious hand collection of several key data items from various sources (see Section 3 for details).

that the Big 4 effect in reducing IPO underpricing is significant only in countries with poor information environment.

To address potential self-selection bias in an IPO firm's auditor choice, we utilize a design of propensity score matching and find qualitatively similar results. Finally, our inferences remain intact when we control for pre-IPO fundamentals that capture the IPO firm's operating performance, ownership retention that serves as an alternative signal to the IPO market, and a country's inter-temporal change in its institutional quality.[5] Collectively, our findings support the arguments that global reputation protection concerns drive Big 4 auditors to provide a higher level of audit quality and the differential audit quality matters most in the primary markets where outside investors are least protected.

Our study makes several contributions. First, we add to the law and finance literature that examines the link of countries' institutional frameworks to financial markets development. For example, numerous studies show that poor investor protection regimes are associated with opaque earnings quality, high private benefits of control, low IPO valuation, and a high cost of going public (Sheifer and Wolfenzon, 2002; Bhattacharya et al., 2003; Doidge et al., 2013; Shi, Pukthuanthong, Walker, 2013). Our findings suggest that hiring a reputable expert intermediary may offer a viable mechanism for entrepreneurial firms to privately overcome these shortcomings.[6] We believe that this insight is useful for a large and growing number of firms that operate in many countries constrained with weak legal regimes yet seek access to capital markets on better terms.

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[5] To preserve sample size, these additional controls are excluded in the main analyses due to insufficient data availability.

[6] In a similar vein, Lang, Lins and Miller (2004) suggest that analyst following is particularly important for valuations of firms with controlling families in environments where legal institutions provide poor protection for minority shareholders. Moreover, Lang, Lins and Maffett (2012) show that the effect of firm-level transparency on stock liquidity is more pronounced when country-level investor protection is weaker.

Second, we contribute to the IPO research on the role of information intermediaries. A common consensus from prior research, based primarily on the U.S. market, is that financial statements audited by Big 4 firms are of higher quality and thereby reducing IPO underpricing (e.g., Beatty, 1989; Hogan, 1997; Weber and Willenborg, 2003). Our contribution to this line of research is twofold. First, we extend the result to a broad international setting. Second, in contrast to the extant evidence, we show that the Big 4 effect is nonexistent in countries with strong legal institutions.[7] Our finding, therefore, shakes the long held view by academic researchers on the Big 4 effect in the IPO process. In so doing, we hope to spur more debate and further research on the vital role of auditors in the global primary market.

Overall, our results are also relevant to policy makers around the world with an interest in enforcement and governance mechanisms. Collectively, our findings indicate that information quality is driven, at least in part, by auditor concerns for reputation protection as well as local institutional characteristics such as the investor protection environment. Our results suggest that the Big 4 firms' global networks can contribute to greater consistency in cross-border information quality, and therefore attempts by national regulators to hinder, limit, or at the extreme to dismantle these networks have the potential to harm the development of audit expertise as well as to impair information quality and efficiency of capital resource allocation.

The balance of the paper proceeds as follows. We review the literature and develop our hypotheses in Section 2. Section 3 describes the sample formation and variables construction. In Section 4, we describe our empirical results and provide interpretations. Section 5 concludes.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

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[7] The conclusion remains when we restrict our analysis of the strong legal institutions only to the U.S.

2.1 IPO underpricing and information asymmetry

One of the most prominent attributes of initial public offerings (IPOs) is the significant positive stock return on the first trading day, also termed "IPO underpricing", which is defined as the percentage return from the offer price to the closing price on the first trading day. Issuing discounted shares to the public represents a sizable amount of money left on the table and constitutes a significant cost of capital to IPO firms. Not surprisingly, researchers have devoted significant efforts to understand the drivers of IPO underpricing. As summarized by Ljungqvist (2007), information asymmetry appears to be primary factor driving IPO underpricing. More precisely, a higher degree of information asymmetry is associated with greater IPO underpricing.

The seminal work of Rock (1986) proposes a "*winner's curse*" theory. Such a theory describes an adverse selection model characterized with two primary groups of IPO investors: the informed and the uninformed. Because the latter has information disadvantage, they receive full allocation only for IPO shares that are more likely to be overpriced. Absent underpricing, their conditional return will become negative, driving this group of investors out of the IPO market. Therefore, issuers intentionally discount IPO shares to overcome the adverse selection problem. The extent of underpricing increases with the degree of information asymmetry between the informed and the uninformed. Such a prediction is empirically confirmed in Beatty and Ritter (1986) who document a positive association between *ex ante* uncertainty and IPO underpricing.

Subsequent theoretical research provides alternative theories addressing IPO underpricing, including the signaling model (Grinblatt and Hwang, 1989; Welch, 1989), the principal agent model (Baron 1982), and the book-building model (Benveniste and Spindt, 1989). While these studies vary in the aspects of information asymmetries under consideration, they share a common element in that IPO underpricing increases in the degree of information asymmetry.

2.2 World-wide prevalence of IPO underpricing and the role of Big 4 auditors

The literature of IPO underpricing is largely skewed towards the U.S. market. Recent years have witnessed studies analyzing the global IPO market. This line of research has documented two main findings. First, the positive initial-day return is evident in almost all countries around the world. For instance, Boulton et al. (2011) show that IPO underpricing exists in all of the 37 countries employed in their sample with a mean value at 36.5%. Second, substantial variation in country-level IPO underpricing is related to country-level institutional qualities. Generally, underpricing appears to be greater in countries with weaker investor protections (Banerjee et al. 2011; Enegelen and Van Essen, 2010)[8], less stringent disclosure regulations (Shi et al. 2013) and more opaque information environments (Boulton et al. 2011). In light of these findings, an important question arises as to whether and how reputable information intermediaries like Big 4 auditors can be employed as a curative mechanism to mitigate the information problem in an international setting, thereby enabling the IPO issuers to reduce price discounts.

The certification role of Big 4 auditors in new equity issuances has both theoretical grounds and empirical support. An influential theoretical work is Datar et al. (1991). They argue that when a firm goes public, entrepreneurs and investors are asymmetrically informed about the firm's future prospects. The entrepreneurs are motivated to communicate their superior information to investors in order to reduce IPO valuation discount. Datar et al. (1991) then demonstrate that hiring a high quality auditor can serve as a signal to credibly communicate the entrepreneur's private information to investors if higher audit quality is more costly. To the extent that the audit quality of reputable global firms is higher than that of local auditors (e.g., DeAngelo, 1981; Simunic and

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[8] An exception is Boulton et al. (2010) who show that strong institutions tend to underprice more to induce a more dispersed ownership structure after the issuance.

Stein, 1987), financial reports of IPOs audited by global firms are more informative to prospective investors (Balvers et al., 1988; Beatty, 1989; Hogan, 1997, Willenborg, 1999), and such IPOs are expected to have less information asymmetries in the IPO process and thereby lower underpricing than those audited by non-Big 4 auditors. Building upon the discussions above, we formulate our first hypothesis as below:

Hypothesis 1: Hiring a Big 4 auditor is on average associated with lower IPO underpricing around the world.

It is worth noting that the above hypothesis development is based on a single legal institution. One countervailing factor arises from the mixed evidence on how variation in legal institutions across countries could alter the differential audit quality of Big 4 versus non-Big 4 auditors (e.g., Choi and Wong, 2007: Francis and Wang, 2008). Therefore, it remains an empirical question of whether hiring a Big 4 auditor on average helps reduce IPO underpricing more significantly in an international IPO setting.

2.3 The varying effects of hiring Big 4 auditors under different institutions

To examine how the signaling role of auditors in IPO pricing is affected by legal institutions, we resort again to the theoretical work by Datar et al. (1991). One key prediction of their model is that the informational value of an issuer's financial report audited by a high quality auditor is increasing in the issuer's riskiness. Building upon this prediction, we consider how institutional qualities shape the risk profile of an IPO firm. More precisely, we argue that, if weak investor protection increases the riskiness of IPO firms, the informational role of high quality audits will be amplified.

Prior research shows that the firm risk can be affected by investor protection regimes in which it operates. For example, a weak legal system can not only execrates a firm's information

risk and the agency conflicts between its controlling owners and minority shareholders, but also increases the ex ante uncertainty of the firm's future cash flows (e.g., Claessens, Djankov, and Lang, 2000; Leuz et al., 2003; Engelen and Van Essen, 2010). Moreover, to the extent that weak legal institutions exacerbate managers' incentives to manipulate earnings, accounting quality (information asymmetry) is much lower (higher) in countries where investors' rights are not well protected (Bhattacharya, Daouk, Welker, 2003; Leuz, Nanda, Wysocki, 2003; DeFond, Hung, Trezevant, 2007). Overall, these studies imply that weak institutions likely induce more perceived riskiness by investors.

Furthermore, extant auditing research indicates that Big 4 auditors make costly investments and develop expertise in specialized areas to build a reputation for a higher audit quality (e.g., Simunic and Stein, 1987). To the extent that weak legal regimes increase IPO firms' riskiness, the theory of Datar et al. (1991) then predicts that a Big 4 auditor's concern for global reputation protection could translate into higher quality of its' audited reports, hereby lowering underpricing in the countries with weak investor protection. This leads to our second hypothesis below.

Hypothesis 2: The effect of hiring a Big 4 auditor in reducing IPO underpricing is greater in countries with weak investor protections.

3. DATA AND VARIABLES

3.1 IPO sample construction

Our sample construction involves numerous data sources. Much of the process involves manual work, which is rather laborious given the large sample size. Specifically, we start with all IPO deals issued from 1995 to 2014,[9] as recorded in the Securities Data Company's (SDC) Global

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[9] Our sample period merits following discussion: (1) SDC has very limited coverage before 1990 for international IPOs; (2) For data between 1990-1994, the common ID for matching use (we use SEDOL, same approach has been

New Issues database. This database provides information on both issuer-level characteristics (e.g. firm name, industry classification) and issuance-level characteristics (e.g. IPO date, offer price, underwriter name, auditor name, etc). Following Boulton et al. (2011), we exclude unit offerings, privatizations, depository receipts, rights offerings, close end fund, limited partnerships and financial firms (SIC code: 6000 ~ 6999). We are left with 23,444 observations.[10]

Next, we retrieve for the same sample period IPO events recorded in Bloomberg. We match our IPO data from SDC to those from Bloomberg for non-US issues, and to CRSP for US issues. Such a step is an improvement to prior literature on international IPOs for following reasons (Banerjee et al. 2011; Boulton et al. 2011). First, as discussed in Shi et al. (2013), SDC has severe data problems with regard to issue dates and offer prices. The issue date could be any date between the filing date and the real IPO date for non-US observations. In addition, the offer price often has rounding errors. Hence, we follow Shi et al. (2013) and match the IPO data to Bloomberg's IPO data to make adjustment for these two variables. Second, as our main independent variable requires Big 4 auditor identification, and auditor information for IPO firms is largely missing in the SDC, we need to collect and supplement auditors' full names from Bloomberg.[11] Third, Bloomberg also provides secondary market stock prices for our underpricing calculation. For non-US IPOs, we first use SEDOL to match with those IPOs with SEDOL information in Bloomberg. After that, we manually match the remaining issues using issuer names. For US issues, we mostly use CUSIP for matching with CRSP. We are able to match 17,166 observations to Bloomberg and CRSP.

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previous literature, e.g. Boulton et al. 2011) is largely missing; (3) Our sample period has covered the longest period among recently international IPO literature (e.g. Boulton et al. 2011, Shi et al. 2013).

[10] SDC records a significant percentage of IPOs in multi lines as these issues involve more than one tranches, most of the time, a domestic tranche and an international tranche. We combine those multi lines into one observation.

[11] We will discuss Big 4 auditor identification in more details in the following section.

To construct the two main variables for our analysis, IPO underpricing and Big 4 auditor indicator, we conduct following steps. We retrieve information on stock prices from the 1st to 15th calendar day after the IPO date, we then use the 1st stock price during the 15 days' period to calculate our underpricing measure which is defined as *(1st secondary price – IPO offer price)/IPO offer price*.[12] For auditor information, we first collect the information of auditor names provided by SDC; when this information is missing, we turn to Bloomberg to search the issuer's auditor's full name for the first fiscal year end after the IPO date.[13] Requiring information for both variables reduce our sample size to 14,431 observations.

We then delete observations that have missing values for any of the control variables used in our main regression. To address concerns regarding the effect of outliers, we trim observations with underpricing at the 1% and 99% cutoff points. Finally, we delete countries with less than 5 observations. Our final sample thus has 14,029 observations covering 37 countries from 1995 to 2014.

3.2 Big 4 auditor identification

Big 4 auditors in out context refer to PricewaterhouseCoopers(PwC), Deloitte Touche Tohmatsu, Ernst & Young, KPMG, and Arthur Anderson before its collapse. Hence, Big 4 here actually represents the current big 4 and previous big 5 (6, 8) auditors. In some countries however, Big 4 auditors cooperate with a local auditing firm to do business, and countries most affected here are Japan, South Korea, India, Indonesia, Philippines, and China. To identify Big 4 auditors in those countries, we obtain from Big 4 auditors' websites information on their local affiliates'

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[12] Due to consideration for trading limit, we use 15 days' stock prices for France, Greece and Taiwan (Boulton et al. 2011).

[13] In so doing, we could have introduced measurement errors if an issuer changed its auditor from a Big 4(non-Big 4) to non-Big 4(Big 4) auditor, after the IPO date, but before the fiscal year end.

names.[14] We then manually compare our auditor names to the names of local affiliates of Big 4 auditors. We code Big 4 dummy (*BIGN*) as one if it is a Big 4 auditor or its local affiliate, and zero otherwise. Our identification approach here is consistent with the one described in Michas (2011).

3.3 Variables construction

In this section, we introduce definitions of key variables used in our empirical analysis. IPO underpricing (*UNDPRC*) is defined as the initial return of the first trading day, in other words, it is formed as the difference between the first secondary market stock price and the IPO offer price, scaled by the offer price. In consideration for price stabilization in certain countries (Boulton et al. 2011), we replace first stock price with the stock price at 15th calendar day after IPO for France, Greece and Taiwan. Our variable of interest is the Big 4 auditor dummy, which is coded as one for firms audited by Big 4 auditors or their affiliates, and zero otherwise.

To control for other determinants that have been found to affect IPO underpricing, we first look at issue level variables. Offer size has been used as a proxy for information uncertainty and found to be negatively correlated with underpricing (Ljqungqvist et a., 2003), hence we control offer size (*OFFERSIZE*) measured as the natural log of total proceeds in CPI-adjusted US dollars. Underwriter reputation may also affect the level of underpricing (Carter and Manaster, 1990; Loughran and Ritter, 2004), following Boulton et al. (2011), we include a dummy variable which equals one if the underwriter is one of the top 25 in SDC's global league table for that IPO year. Previous literature has also suggested that market condition explains a significant extent of underpricing (Ritter 1984), we include two variables to control for it. The first variable is *IPOVOLUME* measured as number of IPOs for that country in the 12 months till current IPO month (Shi et al., 2013); and the second variable is *MKTRUNUP* which is the return of issuer's

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[14] We thank Paul Michas for his suggestions over identifying Big 4 auditors in countries other than the U.S..

market in the 90 days before the IPO date. Ljungqvist et al. (2003) claim that IPO methods matter in explaining underpricing, we include a dummy variable to represent bookbuilding (*BOOKBLDG*). Firm commitment is also shown to be a determinant of IPO underpricing (Ritter, 1987), and we control for this effect by including *FIRMCOMM* dummy which equals one when the IPO involves firm commitment and zero otherwise. Finally, equity carve-outs have been found to be underpriced less than original IPOs (Prezas et al. 2000), and we include dummy variable *CARVEOUT* which equals one when the IPO is a carve-out or spinoff, and zero otherwise. Finally, we include a dummy variable *BUBBLE* to control the effect for US IPOs in 1999 and 2000 (the internet bubble period).

As our work involves an international context, we also control for country level variables that are potentially correlated with IPO underpricing. However, as we include country fixed effects in all main analysis, we have already automatically captured any country factor that doesn't change with time. In addition, such a procedure also implicitly controls country level factors such as investor protection, legal origin, litigation risk among those other factors used in previous studies as they are constant for a country across the whole sample period. We include in the analysis the logarithm of a country's GDP per capita (*LOGGDP*), recorded in US dollars and adjusted for CPI index. We control *LOGGDP* which is a measure of economic development. Countries with a higher value of GDP per capita tend to have higher quality institutions, including property rights and rule of law that could affect financial development (La Porta et al. 1997). Both financial development and institutional qualities have been documented to affect IPO underpricing (Boulton et al. 2011; and Engelen and Van Essen, 2010). However, care should be taken as previous literature has shown opposite findings over the association between institutional quality and IPO underpricing. Engelen and Van Essen (2010), along with Banerjee et al. (2011) show that strong

institutions have less underpricing due to reduced uncertainties and information asymmetry. However, Boulton et al. (2010) find the opposite, and they suggest that issuers in strong institutions have larger incentives to achieve a dispersed ownership structure to reduce outsider's incentive to monitor the firm. Detailed definitions and sources for the variables are outlined in the Appendix.

4. EMPIRICAL RESULTS

4.1 Description Statistics

Table 1 presents country-level statistics, consisting of the number of IPO deals (# of Deals), the mean value of IPO underpricing (Average Underpricing), percentage of deals hiring Big 4 auditors (% Big 4 Auditors), and institutional characteristics employed in subsequent analyses. Not surprisingly, US has the largest number of IPOs (3,560). The average underpricing in US is 25.4%. Outside US, IPO underpricing exists in all countries as documented in prior literature (Ritter 2003; Shi et al., 2013). However, significant variation exists among different countries. Specifically, China stands out with the highest average underpricing level (57.4%) while Mexico has the minimum level of underpricing (1.8%). In addition to IPO underpricing, firms in different countries also exhibit significant heterogeneity in their tendency to hire Big 4 auditors. Spain has the highest percentage of 100% while Greece has the lowest percentage, 0.00%. As for US, 88.2% of its IPOs hire a Big 4 auditor. China, who has the highest average underpricing, exhibits a low level of the percentage of Big 4 auditors (3.2%).[15]

[Table 1 around Here]

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[15] Note that the statistics of China may create some concern. It has the highest underpricing, while a relatively low percentage of firms hiring Big 4 auditors. However, in our empirical analysis, we control for country fixed effects which addresses this concern. The econometric equivalent of this step is that we have demeaned all the regression variables at country level, including IPO underpricing, hence we are only left with the within country variation in IPO underpricing to explain.

Table 2 Panel A tabulates statistics for key variables employed in empirical analyses. The average underpricing worldwide is 30.7% for 14,029 IPOs. The seemingly large standard deviation of underpricing (50.7%) is close to that shown in Boulton et al. (2011). In addition, 56.1% of IPOs in our sample hire a Big 4 auditor. Table 2 Panel B shows pearson correlations among issue-level variables. Though preliminary, a significant and negative correlation (*corr.* = -0.131, *p*<0.01) between underpricing (*UNDPRC*) and Big 4 auditor choice (*BIGN*) is consistent with our hypothesis that reputable auditors reduce information asymmetry in the primary market, leading to a decrease in IPO underpricing. Correlations among other variables suggest limited concerns over potential multicollinearity in subsequent regression analyses.

[Table 2 around Here]

4.2 Big 4 auditors and IPO underpricing around the world

To investigate the role of Big 4 auditors in the global primary market, we begin with estimating the pooled-sample association between IPO underpricing and hiring a Big 4 auditor. Based on the empirical sample consisting of 14,029 observations from 37 countries, we estimate the following OLS regression[16]:

$$UNDPRC = a_0 + a_1*BIGN + a_2*OFFERSIZE + a_3*UNDERWRITER + a_4*INTEGER + a_5*BOOKBLDG + a_6*FIRMCOMM + a_7*CARVEOUT + a_8*MKTRUNUP + a_9*IPOVOLUME + a_{10}*BUBBLE + a_{11}*LOGGDP + \text{Country Effects} + \text{Industry Effects} + \text{Year Effects} + \varepsilon; (1)$$

In Model (1), we employ IPO underpricing (*UNDPRC*) as the dependent variable. Our variable of interest is the indicator *BIGN* that equals one when an IPO firms hires a Big 4 auditor, and zero otherwise. Other variables are defined in Section 3.3. To control for country-level

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[16] Our industry definition follows Lowry and Shu (2002). Inferences remain if we use two-digit SIC codes as the industry classifications.

variation in IPO underpricing, we include country fixed effects. We also control for fixed effects for years and industries. Finally, we adjust standard errors to be robust to heterogeneity.

We present the results in Table 3. The coefficient on our variable of interest, *BIGN*, is negative and significant (-0.042, t = -4.043), suggesting that, on average, hiring a Big 4 auditor reduces IPO underpricing by 4.3%. Such an impact is economically sizable as the sample average of underpricing equals 30.7%. The finding is thus consistent with Hypothesis 1 that Big 4 auditors reduce the information asymmetry during the IPO process, and hence IPO underpricing.

With regard to control variables, we find that larger offers tend to have lower underpricing which is consistent with the view that larger offers are viewed as less risky (Ljungqvist et al. 2003). Underwriter reputation is significantly and positively associated with IPO underpricing. Such a result rejects the possibility that underwriters also serve as reputable intermediaries, reducing both information asymmetry and IPO underpricing. It is, however, more consistent with the recent view that issuers intentionally underprice their stocks to please reputable underwriters for future services such as analyst coverage. The insignificant coefficient on the *INTEGER* dummy is similar to that found in Boulton et al. (2011). IPOs using the book-building method seem to have higher underpricing, while firm-commitment is negatively associated with underpricing (Ritter 1987). Carve-out is found to be negatively associated with underpricing, although the association is statistically insignificant. The negative association is consistent with the theoretical prediction stated in Prezas et al. (2000). Prior studies though, have shown mixed evidence on this link as Boulton et al. (2011) find it to be insignificant, and Banerjee et al. (2011) show both positive and negative estimates under different specifications. Market run-up is found to be positively associated with underpricing, supporting the view that IPO underpricing is higher in hot markets. Recent IPO volume has a negative association with underpricing, consistent with Lowry and

Schwert (2002) and Shi et al. (2013). Also consistent with our conjecture, bubble period has significantly higher underpricing. Finally, the coefficient on *LOGGDP* is negative and significant. Although we are silent over the expected relationship between a country's GDP level and IPO underpricing, evidence here is consistent with the assertion that higher institutional quality and better economic development reduce IPO underpricing (Engelen and Van Essen, 2010; Banerjee et al., 2011).

[Table 3 around Here]

4.3 Institutional qualities and the Big 4 auditor effect

Building upon the baseline results that hiring a Big 4 auditor reduces IPO underpricing, we next move to examine whether such an effect is conditional on institutional factors (Hypothesis 2). We rely on three constructs to evaluate a country's institutional quality: the rule of law index (*RULLAW*), a country's legal origin (*ENGLISH*) and the investor protection score (*INVESTOR_PR*). The information on the rule of law index is collected from the World Governance Index database (WGI) from the World Bank while a country's legal origin and investor protection score is from La Porta et al. (2006). Countries with a higher value of rule of law, English common law as its legal origin, or higher investor protection score are deemed to have better institutional qualities.[17] These constructs have also been used in previous cross-country studies to measure a country's institutional quality (Daske et al. 2008; Francis et al. 2013; Michas, 2011).

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[17] We based on the rule of law index (*RULLAW*) to categorize countries. We use *RULLAW* to proxy for country level legal enforcement regime as in Daske et al. (2008). This country-year variable is drawn from the World Governance Index of World Bank (Kaufmann et al. 2010), and it captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. The variable has also been used in previous literature (Daske et al. 2008; Francis et al. 2013; Michas 2011; Wang and Welker, 2011).

To test Hypothesis 2, we partition the sample into two subsamples based on the aforementioned three country-level institutional measures. Strong (weak) institutions are defined as those with higher (lower) than median rule of law index, English common law (French civil law) legal origin and higher (lower) than median investor protection score. We then estimate Equation (2) separately for these subsamples. Results in Table 4 suggest a consistent pattern. We find that the Big 4 effect in reducing IPO underpricing is only observed in weak institutions, while it is non-existing in strong institutions. The coefficient on *BIGN* in the weak subsample is reliably negative and significant (-0.095, t = -5.607 for *RULLAW*; -0.046, t = -3.272 for *ENGLISH*; and -0.086, t = -4.999 for *INVESTOR_PR*). In sharp contrast are the insignificant coefficients on *BIGN* in strong institutions (0.009, t = 0.657 for *RULLAW*; 0.011, t = 0.704 for *ENGLISH*; -0.011, t = -0.802 for *INVESTOR_PR*). Collectively, results suggest that the negative association between Big 4 auditor choice and IPO underpricing exists only in weak institutions, but not so in strong institutions. In other words, empirical evidence supports the hypothesis H2B (the strong view) instead of H2A (the weak view).

[Table 4 around Here]

4.4 Information environment as an explanation

In developing the hypotheses, we argue that as the information environment in weak institutions is worse, the role of Big 4 auditors can become more prominent. In this section, we conduct analyses to seek corroborative evidence. Prior literature has suggested that weak (strong) institutions possess less (more) transparent information environment. For example, Leuz et al. (2003) argue that, as managers in countries with more stringent investor protection find it less beneficial in acquiring private control rights, they have less incentive to manage earnings. As the information asymmetry of the IPO firm is less severe in these institutions, hiring a Big 4 auditor

can prove to be less effective in reducing underpricing. Such an assertion, though appealing, requires empirical evidence. We thus supplement with additional analyses mainly consisting of following two steps.

First, for a self-containing purpose, we test the association between institutional qualities and information environment proposed in prior literature (Leuz et al. 2003; Bhattarcharya et al. 2003). Our test hinges on the issue that whether information asymmetry, measured by country-level earnings management and earnings opacity, is more severe in weak institutions. Second, we examine whether the effect of Big 4 auditors in reducing IPO underpricing is more pronounced in countries with a higher level of information asymmetry.

4.4.1 Institutional quality and information environment

To measure a country's information environment, we construct two country-level measures of earnings quality: the earnings management measure in Leuz et al. (2003) and the earnings opacity measure in Bhattacharya et al. (2003). Both measures are shown to explain country-level IPO underpricing in Boulton et al. (2011), further justifying their appropriateness to be used in our setting.

We retrieve firm-level fundamental data from Compustat Global for public non-financial firms during the period 1991-2014 (our information asymmetry measures requires data in the three years preceding the IPO year). Our construction for the first measure follows that in prior literature. Leuz et al. (2003) constructs four measures of earnings management. *EM1* is the country median of the firm-level standard deviations of operating earnings over the cash flow from operations (both scaled by lagged total assets) in one country, multiplied by -1. *EM2* is the cross-sectional correlation between the change in accruals and change in cash flows from operations (both scaled by lagged total assets) in one country, multiplied by -1. *EM3* is the country median of the absolute

accruals over absolute cash flow from operations. *EM4* is the ratio of the number of firms reporting small profits over the sum of the number of firms reporting small losses and small profits in one country, whereas small profit (loss) is defined as a value of net earnings scaled by lagged total assets in the range [0, 0.01] ([-0.01, 0)). The earnings management measure (*E_MGT*) then aggregates those four variables by ranking them separately and then taking the average rank. A higher *E_MGT* score indicates more earnings management and higher information asymmetry in that country. The second measure follows Bhattacharya et al. (2003) who constructs an earnings opacity measure. In addition to *EM2* and *EM4* mentioned above, they also construct an earnings aggressiveness measure defined as the median value of the ratio of total accruals divided by lagged assets. Ranks are then taken for those three variables. Again, their average rank is calculated to proxy a country's earnings opacity and a higher value is equivalent to more earnings opacity and higher information asymmetry.

We then test whether the level of information asymmetry is more severe in weak institutions and present the results in Table 5. Comparing statistics of the two earnings quality measures for weak and strong institutions suggest evidence that is consistent with that in prior literature (Leuz et al. 2003). Specifically, we find that, on average, both *E_MGT* and *E_OPA* have higher values in weak institutions compared with their values in strong institutions. For example, the average *E_MGT* is 26.46 in weak institutions and 10.05 in strong institutions with the difference being 16.41 and statistically significant. Similarly, the average *E_OPA* is 25.88 in weak institutions and 11.80 in strong institutions with the difference being 14.09 and again statistically significant. Hence, results here confirm our previous argument that weak regimes have more information asymmetry which presumably enables Big 4 auditors to play a more pronounced role in the IPO process. The latter link can also be tested and we provide the analysis results below.

[Table 5 around Here]

4.4.2 Information environment and the Big 4 effect

To investigate whether it is the higher level of information asymmetry that leads to a larger impact of Big 4 auditors in weak institutions, we partition the whole sample based on country level earnings management and earnings opacity, and separately estimate Equation (1) in each subsample. If the more pronounced Big 4 effect in weak institutions is due to their higher level of information asymmetry, we expect to observe that the effect of Big 4 auditors becomes amplified in countries with worse information environments.

We present results in Table 6. Consistent with our expectation, the effect of Big 4 auditors on IPO underpricing only exists in the subsample of countries with worse information environment, i.e, those with earnings management and earnings opacity levels that are higher than the median value. When using our earnings management measure (*E_MGT*) to split the sample, we find that the coefficient on *BIGN* is negative and significant (-0.076, t = -4.941) in countries with more earnings management, and positive and insignificant (0.012, t = 0.829) in countries with less earnings management. Alternatively, we split the sample based on earnings opacity measure (*E_OPA*). The coefficient on *BIGN* is negative and significant in countries with high opacity (-0.077, t = -4.763) while it is positive and insignificant in countries with less opacity (0.003, t = 0.200). Collectively, evidence here confirms our expectation that the effect of Big 4 auditors in reducing IPO underpricing is more pronounced in countries with higher information asymmetry. Such a finding supports our previous assertion that the larger effect of Big 4 auditors in weak institutions is due to their worse information environments.

[Table 6 around Here]

4.5 Addressing the self-selection of auditor choice

In the majority of the analyses, we employ an OLS regression model on the pooled sample to estimate the effect of Big 4 auditor on IPO underpricing. Such a model implicitly assumes that the auditor choice has the property of random-sampling. However, a firm's auditor choice *per se* is endogenous. Firm attributes are relevant to its probability of choosing a Big 4 auditor. For example, large firms are more resourceful and are more capable of affording the costs of hiring a Big 4 auditor. Firms with more risk may be less likely to attract Big 4 auditors in an exposure of higher litigation risk. These self-selection issues can bring in biases in our estimated Big 4 effect, especially if any factor relevant to the auditor selection is latent and uncontrolled for. To address this methodological issue, we follow Francis et al. (2012) and employ a propensity score matching (PSM) estimation specification.

We conduct two steps in the empirical analyses. In the first step, we estimate a firm's propensity to choose a Big 4 auditor using the following probit model.

$$\text{Prob}(BIGN=1) = a_0 + a_1*OFFERSIZE + a_2*UNDERWRITER + a_3*LOGAT + a_4*LEV + a_5*ROA + a_6*ATURN + a_7*LOSS + a_8*RETENTION + \text{Country Effects} + \text{Industry Effects} + \text{Year Effects} + \varepsilon; \text{ (2)}$$

where we follow prior auditor choice literature in selecting the determinants (Hogan, 1997; Choi et al. 2008). Since a firm's auditor choice can be affected by how much resource a firm has, we thus include the natural log of total asset (*LOGAT*) to measure firm size. The size of the offering (*OFFERSIZE*) is included as firms with a larger offer will benefit more from hiring a Big 4 auditor. Firm risk affects Big 4 auditors' willingness for engagement. We thus include leverage (*LEV*), return on assets (*ROA*), asset turnover (*ATURN*) and an indicator for previous loss (*LOSS*). Note that some of the variables are more relevant to firm profitability or operational efficiency which are indeed risky measures in alternative dimensions. As auditor choice represents a signal sent by the auditor firm, it will be affected by other signals through either a complementary or substitutive

channel. We thus include a firm's underwriter choice (*UNDERWRITER*) and ownership retention (*RETENTION*). Finally, we include fixed effects for country, industry and year. We estimate equation (3) and preserve the estimated probability for each firm to hire a Big 4 auditor.

In the second step, we match each IPO firm who hires a Big 4 auditor with an IPO firm who hires a non-Big 4 auditor. The matching is determined by the fact that the two firms are in the same country and the difference in their estimated probabilities to choose a Big 4 auditor is less than 0.01.[18] We then estimate the following empirical model:

$$\begin{aligned}
UNDPRC = a_0 &+ a_1*BIGN + a_2*OFFERSIZE + a_3*UNDERWRITER + a_4*INTEGER + \\
&a_5*BOOKBLDG + a_6*FIRMCOMM + a_7*CARVEOUT + a_8*MKTRUNUP \\
&+ a_9*IPOVOLUME + a_{10}*BUBBLE + a_{11}*LOGGDP + a_{12}*LOGAT + \\
&a_{13}*LEV + a_{14}*ROA + a_{15}*ATURN + a_{16}*LOSS + a_{17}*RETENTION + \\
&\text{Country Effects} + \text{Industry Effects} + \text{Year Effects} + \varepsilon; \ (3)
\end{aligned}$$

where we also include variables in the first stage such as *RETENTION*, *LNAT*, *LNSALE*, *LEV*, *ROA* and *ATURN*. Results are presented in Table 7. To be consistent with our previous analyses, we split the sample into weak and strong institutions based on a country's rule of law. We first estimate our baseline specification (Model 1). Pooled sample estimation reveals a negative and significant coefficient on BIGN (-0.023, $t = $ -2.658). Such an effect is reinforced in the subsample of weak institutions (-0.074, $t = $ -3.732), yet it is non-existing in the subsample of strong institutions (-0.004, $t = $ -0.448). Thereafter, we enhance the regression model by including variables used in the first-stage probit model and estimate Model (3). Results are qualitatively similar. Combined, evidence here mitigates the concern that self-selection bias in auditor choice may have caused the negative association between Big 4 auditor choice and IPO underpricing.

[Table 7 around Here]

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[18] Countries with less than 50 observations are combined into two groups. The first group contains such countries with rule of law index that is lower than median. The second group contains such countries with rule of law index that is higher than median. The matching firm is then searched within each group.

4.7 Additional robustness tests

4.7.1 Pre-IPO fundamentals

Certain firm characteristics can be related to both a firm's auditor choice and IPO underpricing. Due to data availability of our international IPO sample, our baseline specification does not control firm characteristics before the IPO year. To address this concern, we collect pre-IPO fundamentals based on their availability. The variables we consider include the natural logarithm of total assets in US dollars (*LOGAT*), the natural logarithm of total revenue in US dollars (*LOGSALE*), firm leverage (*LEV*), asset turnover (*ATURN*) and a loss indicator (*LOSS*). We include them as additional controls and re-estimate the Big 4 effect for weak and strong institutions, separately. Results in Table 8 Panel A are consistent with our previous findings. We find a negative and significant coefficient on *BIGN*, and the effect is concentrated in the subsample of weak institutions.

4.7.2 Ownership retention

Share issued in the IPO market include both primary shares and secondary shares (those previously held by others, e.g. managers). It has been suggested that the percentage of shares retained by the management can serve as a signal to the capital market of the IPO firm's quality. Such a signal can affect the role played by the auditor because audit quality also serves as a signal of the firm (Datar et al., 1991). We thus construct another variable to measure ownership retention. *RETENTION* is defined as the percentage of pre-IPO shares retained by the management. We include it as an additional control and re-estimate the primary regressions. Results in Table 8 Panel A reveal that our inference regarding the Big 4's effect on IPO underpricing remains unchanged.

4.7.3 Time-varying institutional quality and information environment

In the main analyses, we consider institutional qualities and country level information environment largely as time-invariant. We control for these factors mainly through including country fixed effects. In this section, we perform sensitivity analyses by incorporating additional controls for time-varying institutional quality and information environment. First, we add to our Model (1) an additional control of rule of law (*RULE OF LAW*). Results in Table 8 Panel B suggest that our main findings continue to hold. Big 4 auditors are associated with lower IPO underpricing, with such an effect concentrated in the subsample of weak institutions. Second, we control for time-varying information quality captured by the degree of earnings management (*E_MGT*). Our inferences are unchanged. Finally, we estimate an enhanced model including both variables, despite the inherent association between institutional quality and information environment. Again, empirical findings are qualitatively similar to those documented in earlier analyses.

As to the coefficients on *RULE OF LAW* and *E_MGT*, we find that improved institutional quality is associated with lower IPO underpricing, a result that is consistent with Banerjee et al. (2011). Further, a higher of earnings management is associated with higher IPO underprcing. This result is in line of the view in Boulton et al. (2011) suggesting that worse country-level financial reporting environment increases information asymmetry between the issuer and IPO investors, leading to higher cost of capital in the primary market.

[Table 8 around Here]

5. CONCLUSION

In this study, we investigate the certification role of Big 4 versus non-Big 4 auditors in the global primary market. Employing a comprehensive IPO sample from 37 countries over a period from 1995 to 2014, we document that hiring a Big-4 auditor in place of a local auditor, on average, is associated with 4.2% lower IPO underpricing. Further analysis of the effect of legal institutions

shows that the Big 4 effect is significant only in IPO markets where investor protection laws are weak. In the absence of litigation threat, our findings suggest the critical role of global reputation concerns in driving Big 4 firms' audit quality. Moreover, our study implies that entrepreneurs in countries plagued with weak legal regimes and high information risk may employ reputable information intermediaries as a private solution to overcome the institutional constraints, thereby reducing the cost of issuing new equity.

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Appendix: Key variable definitions

Variable	Definition and Data Source
Dependent variable	
UNDPRC	IPO underpricing, defined as (1st trading day closing price – offer price)/offer price. *Source: SDC, Bloomberg and CRSP*.
Issue-level independent variable	
BIGN	Dummy variable equal to one if the issuer employs a Big-4 auditor, and zero otherwise. *Source: SDC, Bloomberg, Big 4 websites*.
OFFERSIZE	Natural logarithm of IPO issue proceeds in U.S. dollars.
UNDERWRITER	Dummy variable equal to one if the issuer's lead underwriter is in the top 25 of SDC's global league tables in the issue year, and zero otherwise. *Source: SDC*.
INTEGER	Dummy variable equal to one for integer offer price (in local currency), and zero otherwise. *Source: SDC and Bloomberg*.
BOOKBLDG	Dummy variable equal to one if an IPO is priced using the book-building method, and zero otherwise. *Source: SDC*.
FIRMCOMM	Dummy variable equal to one if an IPO is underwritten on a firm-commitment basis. *Source: SDC*.
CARVEOUT	Dummy variable equal to one if an IPO results from equity carve-out or spin-off, and zero otherwise. *Source: SDC*.
MKTRUNUP	Market index return for the issuer's country during the three months before the IPO. *Source: Datastream and CRSP*.
IPOVOLUME	Number of IPOs in the issuer's country during 12 months up to and including the IPO month (in thousands). *Source: SDC*.
BUBBLE	Dummy variable equal to one if an IPO is issued in the U.S. during the bubble period of 1999-2000, and zero otherwise. *Source: SDC*.
LOGAT	The natural logarithm of total assets in US dollars at the end of pre-IPO fiscal year. *Source: Compustat Global*;

LEVERAGE	Ratio of the issuer's long term debt to total asset in the pre-IPO fiscal year. *Source: Compustat Global;*
ATURN	Ratio of the issuer's total sales to total asset in the pre-IPO fiscal year. *Source: Compustat Global;*
LOSS	Dummy variable equal to one if the issuer incurred a loss in the pre-IPO fiscal year, and zero otherwise. *Source: Compustat Global;*
ROA	Ratio of the issuer's EBIT to total asset in the pre-IPO fiscal year. *Source: Compustat Global;*
LOGSALE	The natural logarithm of total revenue in US dollars during the pre-IPO fiscal year. *Source: Compustat Global*;
RETENTION	Ownership retention, defined as the percentage of pre-IPO shares (secondary shares) retained by the management. *Source: SDC;*
REVISION	The percentage change from the midpoint of the initial price range to the offer price. *Source: SDC.*

Country-year independent variable

LOGGDP	Natural log of GDP per capita in CPI-adjusted US dollars for the issuer's domicile country. *Source: World Bank.*
RULLAW	The rule of law index for the issuer's domicile country in the issue year, capturing perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. It ranges from -1.6753 to 2.0431 with a higher value indicating more effective enforcement of laws. *Source: World Bank.*
E_MGT	Country-wide average earnings management estimated as in Leuz et al. (2003, Table 2). It is the average of four country-level earnings management measures: EM1, EM2, EM3 and EM4. A higher score indicates more earnings management and lower information quality in the country. *Source: Compustat Global.*
E_OPA	Country-wide overall earnings opacity estimated as in Bhattacharya et al. (2003). It is the average of three earnings quality measures of (1) the "earnings smoothing" variable, (2) the "loss avoidance" variable, and (3) the "earnings aggressiveness" variable. A higher score indicates more earnings management and lower information quality in the country. *Source: Compustat Global.*

Country-level variable

ENGLISH   Dummy variable equal to one if the issuer's domicile country's legal origin is English common law indicating a stronger legal environment, and zero otherwise. *Source: Djankov et al. 2008.*

INVESTOR_PR   The first principle component of the anti-director rights index, disclosure requirements and burden of proof. A higher value indicates stronger legal enforcement and greater investor protection. *Source: La Porta et al. 2006.*

Table 1: Country-level summary statistics

This table describes country level statistics. The sample consists of 14,029 observations from 37 countries over the period of 1995-2014. The table lists, by each country, the total number of IPOs (# of Deals), average IPO underpricing (Average Underpricing), the percentage of IPO firms hiring a Big 4 auditor (% Big 4 Auditors), average rule of law index (RULLAW), investor protection index (INVESTOR_PR), legal origin (ENGLISH), average country-level earnings management score (Earnings Management), and average country-level earnings opacity score (Earnings Opacity). All variables are defined in the Appendix.

Nation	# of Deals	Average Underpricing	% Big 4 Auditors	Rule of Law	Investor Protection	English Origin	Earnings Management	Earnings Opacity
AUSTRALIA	1061	0.197	0.322	1.759	6.863	1	7.213	8.300
AUSTRIA	29	0.043	0.759	1.857	1.034	0	21.906	18.558
BELGIUM	34	0.066	0.588	1.327	0.478	1	19.150	16.067
BRAZIL	55	0.047	0.891	-0.268	2.908	0	15.850	17.033
CANADA	555	0.343	0.618	1.743	9.716	1	6.063	6.633
CHILE	6	0.032	0.833	1.269	6.294	0	18.969	21.958
CHINA	1824	0.574	0.032	-0.420		0	32.788	30.250
DENMARK	32	0.085	0.781	1.914	4.444	0	15.756	15.258
FINLAND	23	0.262	0.826	1.951	4.886	0	14.481	15.992
FRANCE	172	0.161	0.453	1.414	4.238	0	22.431	19.925
GERMANY	296	0.261	0.524	1.655	0.102	0	24.563	22.717
GREECE	20	0.334	0.000	0.700	2.443	0	26.825	23.433
HONG KONG	507	0.196	0.844	1.406	8.556	1	23.519	19.742
INDIA	398	0.257	0.080	0.065	8.556	1	27.081	29.975
INDONESIA	93	0.275	0.366	-0.668	3.762	0	24.888	25.850
ITALY	113	0.100	0.796	0.522	1.705	0	24.213	21.150
JAPAN	1383	0.359	0.385	1.313	6.863	0	21.813	22.483
MALAYSIA	418	0.470	0.522	0.506	7.432	1	24.981	23.442
MEXICO	6	0.018	0.667	-0.522	1.046	0	11.000	15.633
NETHERLANDS	28	0.134	0.964	1.772	4.921	0	15.850	16.817
NEW ZEALAND	24	0.114	0.875	1.859	5.829	1	10.744	13.042
NORWAY	61	0.057	0.852	1.924	5.545	0	10.581	8.608
PHILIPPINES	40	0.130	0.175	-0.424	7.182	0	21.069	14.592
POLAND	32	0.240	0.406	0.602		0	26.788	26.383
PORTUGAL	8	0.149	0.875	1.118	4.602	0	24.906	19.758
RUSSIA	6	0.048	0.833	-0.871		0	13.938	20.067

SINGAPORE	435	0.265	0.625	1.608	7.716	1	23.631	20.892
SOUTH AFRICA	7	0.043	0.714	0.095	8.272	1	9.144	15.058
SOUTH KOREA	770	0.414	0.538	0.905	4.614	0	24.425	24.350
SPAIN	24	0.116	1.000	1.164	6.011	0	22.400	21.900
SWEDEN	59	0.072	0.627	1.881	4.045	0	9.981	14.142
SWITZERLAND	48	0.157	0.792	1.859	3.580	0	17.088	19.867
TAIWAN	881	0.291	0.927	0.913	5.739	0	25.250	25.867
THAILAND	118	0.200	0.424	0.062	4.069	1	22.763	20.700
TURKEY	7	0.083	0.571	0.037	2.261	0	23.619	25.925
UK	896	0.161	0.532	1.684	8.272	1	11.688	12.683
US	3560	0.254	0.882	1.554	10.000	1	5.650	7.950

Table 2: Summary statistics and correlation coefficients of key variables

This table shows summary statistics and correlations for key variables in the final sample. The sample consists of 14,029 IPOs from 37 countries over the period of 1995-2014. Panel A provides the summary statistics of key variables, and Panel B shows the pearson correlations among them. Correlations significant at the 1% level are in bold type. All variables are defined in the appendix.

Panel A: Summary statistics of key variables

Variables	N	Mean	Std. Dev	25%	Median	75%
UNDPRC	14029	0.307	0.507	0.006	0.134	0.421
BIGN	14029	0.561	0.496	0	1	1
OFFERSIZE	14029	3.014	1.678	1.872	3.135	4.156
UNDERWRITTER	14029	0.138	0.345	0	0	0
INTEGER	14029	0.641	0.480	0	1	1
BOOKBLDG	14029	0.648	0.478	0	1	1
FIRMCOMM	14029	0.698	0.459	0	1	1
CARVEOUT	14029	0.052	0.221	0	0	0
MKTRUNUP	14029	0.028	0.096	-0.024	0.034	0.079
IPOVOLUME	14029	0.196	0.198	0.059	0.122	0.237
BUBBLE	14029	0.049	0.216	0	0	0
LOGGDP	14029	9.986	1.075	9.764	10.492	10.685

Panel B: Correlation coefficients between key variables

Variables		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNDPRC	(1)	1											
BIGN	(2)	-0.131	1										
		<0.01											
OFFERSIZE	(3)	-0.084	0.208	1									
		<0.01	*<0.01*										
UNDERWRITTER	(4)	-0.051	0.080	0.301	1								
		<0.01	*<0.01*	*<0.01*									
INTEGER	(5)	-0.073	0.180	0.176	0.086	1							
		<0.01	*<0.01*	*<0.01*	*<0.01*								
BOOKBLDG	(6)	-0.079	0.149	0.373	0.157	0.304	1						
		<0.01	*<0.01*	*<0.01*	*<0.01*	*<0.01*							
FIRMCOMM	(7)	0.016	0.023	0.202	0.067	0.123	0.205	1					
		0.06	*0.01*	*<0.01*	*<0.01*	*<0.01*	*<0.01*						
CARVEOUT	(8)	-0.032	-0.012	0.138	0.097	-0.011	0.119	0.013	1				
		0.00	*0.16*	*<0.01*	*<0.01*	*0.18*	*<0.01*	*0.13*					
MKTRUNUP	(9)	0.145	0.040	0.078	0.008	-0.003	-0.021	0.032	-0.023	1			
		<0.01	*<0.01*	*<0.01*	*0.33*	*0.72*	*0.01*	*0.00*	*0.01*				
IPOVOLUME	(10)	-0.049	0.018	0.171	0.109	0.175	0.353	0.298	0.021	-0.005	1		
		<0.01	*0.04*	*<0.01*	*<0.01*	*<0.01*	*<0.01*	*<0.01*	*0.01*	*0.54*			
BUBBLE	(11)	0.138	0.177	0.164	-0.010	0.146	0.167	0.148	0.002	0.014	0.230	1	
		<0.01	*<0.01*	*<0.01*	*0.23*	*<0.01*	*<0.01*	*<0.01*	*0.77*	*0.10*	*<0.01*		
LOGGDP	(12)	-0.201	0.384	0.044	0.069	0.162	0.201	-0.062	0.015	-0.001	-0.009	0.150	1
		<0.01	*<0.01*	*<0.01*	*<0.01*	*<0.01*	*<0.01*	*<0.01*	*0.07*	*0.92*	*0.30*	*<0.01*	

Table 3: Auditor quality and IPO underpricing – worldwide evidence

This table presents results of OLS regression of IPO underpricing on auditor quality (*BIGN*), controlling for various IPO determinants and year-, industry- and country-fixed effects. The sample consists of 14,029 IPOs from 37 countries over the period of 1995-2014. The dependent variable is IPO underpricing (*UNDPRC*) defined as 1st trading day closing price – offer price)/offer price. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level (two-tailed), respectively. T-statistics based on robust standard errors are reported in parentheses. All variables are defined in the appendix.

Variables	Underpricing
BIGN	-0.042***
	(-4.043)
OFFERSIZE	-0.043***
	(-12.727)
UNDERWRITTER	0.030***
	(2.652)
INTEGER	-0.011
	(-1.147)
BOOKBLDG	0.046***
	(3.505)
FIRMCOMM	-0.040***
	(-3.408)
CARVEOUT	-0.023
	(-1.432)
MKTRUNUP	0.792***
	(14.886)
IPOVOLUME	-0.466***
	(-13.913)
BUBBLE	0.442***
	(12.121)
LOGGDP	-0.327***
	(-13.979)
Constant	3.773***
	(14.901)
Year Fixed Effects	YES
Industry Fixed Effects	YES
Country Fixed Effects	YES
Observations	14,029
R^2	0.219

Table 4: Auditor quality and IPO underpricing – The conditional role of institutional quality

This table presents results of OLS regression of IPO underpricing on auditor quality (*BIGN*), conditional on the strength of a country's investor protection. The sample consists of 14,029 IPOs from 37 countries over the period of 1995-2014. The dependent variable is IPO underpricing (*UNDPRC*) defined as 1st trading day closing price – offer price)/offer price. We split the full sample into two subsamples based on three alternative investor protection variables (*RULLAW, ENGLISH and INVESTOR_PR*) in Table 1. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level (two-tailed), respectively. T-statistics based on robust standard errors are reported in parentheses. All variables are defined in the appendix.

	Rule of Law		Investor Protection		English Legal Origin	
	Weak	Strong	Weak	Strong	No	Yes
Variables	(1)	(2)	(3)	(4)	(5)	(6)
BIGN	-0.095***	0.009	-0.046***	0.011	-0.086***	-0.011
	(-5.607)	(0.657)	(-3.272)	(0.704)	(-4.999)	(-0.802)
OFFERSIZE	-0.046***	-0.049***	-0.031***	-0.054***	-0.045***	-0.046***
	(-10.420)	(-9.569)	(-7.083)	(-9.328)	(-9.402)	(-9.448)
UNDERWRITTER	-0.031*	0.085***	-0.050**	0.093***	-0.021	0.100***
	(-1.928)	(4.903)	(-2.392)	(5.101)	(-1.361)	(5.768)
INTEGER	-0.027*	0.013	0.035*	-0.001	-0.036**	0.017
	(-1.687)	(1.197)	(1.847)	(-0.105)	(-2.337)	(1.356)
BOOKBLDG	0.095***	-0.012	0.167***	0.053**	0.000	0.068***
	(4.374)	(-0.682)	(8.503)	(2.347)	(0.002)	(3.635)
FIRMCOMM	-0.017	-0.056***	-0.013	-0.083***	0.067***	-0.091***
	(-0.922)	(-4.121)	(-0.851)	(-4.727)	(3.378)	(-6.350)
CARVEOUT	-0.048**	0.006	-0.067**	0.016	-0.058***	0.007
	(-2.369)	(0.253)	(-2.575)	(0.545)	(-2.831)	(0.279)
MKTRUNUP	0.683***	0.976***	1.044***	0.784***	0.712***	0.860***
	(10.991)	(9.635)	(14.964)	(7.968)	(10.166)	(10.847)
IPOVOLUME	-0.638***	-0.109**	-0.042	-0.271***	-0.618***	-0.372***
	(-12.319)	(-2.101)	(-0.251)	(-5.273)	(-9.232)	(-7.645)
BUBBLE		0.314***		0.395***		0.396***
		(7.700)		(6.733)		(8.594)
LOGGDP	-0.339***	-0.014	-0.216***	0.086	-0.406***	0.099*
	(-11.880)	(-0.276)	(-4.638)	(1.132)	(-13.185)	(1.941)
Constant	3.734***	0.724	2.170***	-0.395	4.570***	-0.724
	(13.226)	(1.132)	(4.346)	(-0.464)	(14.470)	(-1.253)

Year Fixed Effects	YES	YES	YES	YES	YES	YES
Industry Fixed Effects	YES	YES	YES	YES	YES	YES
Country Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	6,922	7,107	6,244	5,923	6,016	8,013
R^2	0.251	0.166	0.145	0.171	0.284	0.158

Table 5: Institutional quality and information environment

This table presents descriptive analysis of differential information quality in countries with weak vs. strong rule of law (*RULLAW*). The full sample of 14,029 IPOs are divided into two based on the rankings of the country-level rule of law index in Table 1. If a country's rule of law index is below its median, then IPOs in the country are classified into the "Weak" subsample. All other IPOs are in the "Strong" subsample. A country's information quality is proxied by two measures of country-wide earnings management (*E_MGT*) and earnings opacity (*E_OPA*), as in Table 1. A higher value of *E_MGT* or *E_OPA* indicates lower overall information quality in the country. T-test is performed on the difference in the means (Diff.). ***, **, * indicate statistical significance at the 1%, 5% and 10% level, respectively.

	Earnings Management (*E_MGT*)			Earnings Opacity (*E_OPA*)		
Statistics	Weak	Strong	Diff.	Weak	Strong	Diff.
Mean	26.46	10.05	16.41***	25.88	11.80	14.09***
Minimum	4	1.25		5.33	1	
25%	21.5	4.5		22	6.67	
Median	25.75	8.75		25.33	10.33	
75%	31.75	12.25		31.67	15.33	
Maximum	36.75	30.5		36.33	29.67	
Observations	6922	7107		6922	7107	

Table 6: Auditor quality and IPO underpricing – The conditional role of information environment

This table reports the regression of IPO underpricing on auditor quality (*BIGN*) in differential information environments. The sample consists of 14,029 IPOs from 37 countries over the period of 1995-2014. The dependent variable is IPO underpricing (*UNDPRC*) defined as 1st trading day closing price – offer price)/offer price. A country's information environment is proxied by its average earnings quality ranked by country-level earnings management (*E_MGT*) and earnings opacity (*E_OPA*) as in Table 1. Countries with more earnings management, or higher earnings opacity are those with poorer earnings quality. ***, **, and * indicate significance at the 1%, 5%, and 10% level (two-tailed), respectively. T-statistics with robust standard errors are reported in parentheses. All variables are defined in the appendix.

VARIABLES	Earnings Management (*E_MGT*)		Earnings Opacity (*E_OPA*)	
	More	Less	High	Low
	(1)	(2)	(3)	(4)
BIGN	-0.076***	0.012	-0.077***	0.003
	(-4.941)	(0.829)	(-4.763)	(0.200)
OFFERSIZE	-0.046***	-0.050***	-0.047***	-0.046***
	(-10.721)	(-9.379)	(-10.650)	(-8.927)
UNDERWRITTER	-0.028*	0.086***	-0.027*	0.081***
	(-1.737)	(4.910)	(-1.692)	(4.715)
INTEGER	-0.020	0.013	-0.020	0.008
	(-1.245)	(1.171)	(-1.202)	(0.786)
BOOKBLDG	0.079***	0.007	0.078***	0.051***
	(3.984)	(0.348)	(3.467)	(2.704)
FIRMCOMM	-0.011	-0.063***	-0.001	-0.069***
	(-0.599)	(-4.506)	(-0.063)	(-4.815)
CARVEOUT	-0.047**	0.004	-0.046**	-0.005
	(-2.380)	(0.146)	(-2.286)	(-0.214)
MKTRUNUP	0.737***	0.811***	0.737***	0.784***
	(12.014)	(7.679)	(11.513)	(8.550)
IPOVOLUME	-0.622***	-0.102*	-0.624***	-0.159***
	(-12.218)	(-1.847)	(-11.748)	(-3.026)
BUBBLE		0.338***		0.351***
		(7.456)		(7.611)
LOGGDP	-0.336***	-0.021	-0.349***	-0.005
	(-11.879)	(-0.392)	(-11.881)	(-0.082)
Constant	3.720***	0.814	3.838***	0.514
	(13.103)	(1.227)	(13.093)	(0.763)
Year Fixed Effects	YES	YES	YES	YES
Industry Fixed Effects	YES	YES	YES	YES
Country Fixed Effects	YES	YES	YES	YES
Observations	7,528	6,501	6,996	7,033
R^2	0.238	0.172	0.240	0.164

Table 7: Propensity score matching (PSM) analyses to address selection bias

This table presents results of propensity score matching (PSM) analyses. In the first step, we employ the following probit model

$$Prob(BIGN=1) = a_0 + a_1*OFFERSIZE + a_2*UNDERWRITER + a_3*LOGAT + a_4*LEV + a_5*ROA + a_6*ATURN + a_7*LOSS + a_8*RETENTION + \text{Country Effects} + \text{Industry Effects} + \text{Year Effects} + \varepsilon; \quad (2)$$

to estimate each firm's propensity to hire a Big 4 auditor. In the second step, we match for each IPO firm who hires a Big 4 auditor, a control firm who hires a non-Big 4 auditor. The matching is conducted based on the requirement that the two firms must be in the same country and the difference in propensity is less than 0.01. We then estimate OLS regression of IPO underpricing on auditor quality (*BIGN*). The dependent variable is IPO underpricing (*UNDPRC*) defined as 1st trading day closing price – offer price)/offer price. ***, **, and * indicate significance at the 1%, 5%, and 10% level (two-tailed), respectively. T-statistics with robust standard errors are reported in parentheses. All variables are defined in the appendix.

	Baseline specification			Controlling for first stage determinants		
	Pooled Sample	Weak Institution	Strong Institution	Pooled Sample	Weak Institution	Strong Institution
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
BIGN	-0.023***	-0.074***	-0.004	-0.025***	-0.077***	-0.008
	(-2.658)	(-3.732)	(-0.448)	(-3.046)	(-3.867)	(-0.822)
OFFERSIZE	-0.006	-0.057***	0.021***	0.034***	-0.027**	0.075***
	(-1.445)	(-6.654)	(4.147)	(5.919)	(-2.541)	(10.108)
UNDERWRITTER	0.040**	0.020	0.037**	0.062***	0.026	0.056***
	(2.413)	(0.468)	(2.054)	(3.980)	(0.620)	(3.280)
INTEGER	0.012	0.014	0.029**	-0.007	-0.048*	0.023*
	(0.922)	(0.545)	(2.260)	(-0.600)	(-1.664)	(1.941)
BOOKBLDG	-0.048*	0.096***	-0.248***	-0.042	0.074**	-0.225***
	(-1.732)	(2.932)	(-3.832)	(-1.555)	(2.151)	(-3.892)
FIRMCOMM	-0.008	0.071***	-0.024	-0.038***	0.037	-0.042**
	(-0.548)	(2.765)	(-1.286)	(-2.584)	(1.331)	(-2.305)
CARVEOUT	-0.176***	-0.022	-0.238***	-0.123***	0.001	-0.147***
	(-9.343)	(-0.609)	(-10.751)	(-6.691)	(0.029)	(-6.617)
MKTRUNUP	1.009***	0.971***	1.035***	1.000***	0.982***	0.990***
	(11.666)	(7.797)	(8.051)	(11.673)	(7.939)	(7.824)
IPOVOLUME	0.013	-0.782***	0.118	-0.051	-0.698***	0.050
	(0.199)	(-3.732)	(1.305)	(-0.770)	(-3.400)	(0.554)
BUBBLE	0.142***		0.079	0.152***		0.094
	(2.788)		(1.181)	(3.070)		(1.443)
LOGGDP	-0.196***	-0.120	0.121	-0.154***	-0.066	0.094

	(1)	(2)	(3)	(4)	(5)	(6)
	(-4.499)	(-1.308)	(1.446)	(-3.563)	(-0.728)	(1.078)
LOGAT				-0.053***	-0.059***	-0.059***
				(-10.490)	(-5.263)	(-9.395)
LEV				-0.120***	-0.078	-0.115***
				(-5.713)	(-0.767)	(-5.211)
ROA				0.052***	0.212	0.053***
				(4.453)	(1.576)	(4.561)
ATURN				-0.023***	-0.059***	-0.017***
				(-4.736)	(-4.696)	(-3.164)
LOSS				-0.002	-0.123**	0.025*
				(-0.175)	(-2.194)	(1.931)
RETENTION				-0.173**	0.254	-0.256***
				(-2.103)	(1.595)	(-3.101)
Constant	2.240***	1.415	-0.796	2.131***	0.969	-0.214
	(4.677)	(1.498)	(-0.903)	(4.282)	(1.026)	(-0.230)
Industry Effects	YES	YES	YES	YES	YES	YES
Year Effects	YES	YES	YES	YES	YES	YES
Country Effects	YES	YES	YES	YES	YES	YES
Observations	7,280	2,052	5,228	7,280	2,052	5,228
R^2	0.150	0.195	0.183	0.183	0.225	0.229

Table 8: Robustness analyses controlling for additional issuer-specific and institution-specific characteristics

This table presents results of robustness analyses by including additional control variables, both firm-level and country-level, into the baseline regression model on the association between IPO underpricing and Big 4 auditors.. The dependent variable is IPO underpricing (*UNDPRC*) defined as 1st trading day closing price – offer price)/offer price. In Panel A, we include additional firm-level controls including pre-IPO fundamentals and ownership retention. We control for the natural logarithm of total assets in US dollars (*LOGAT*), the natural logarithm of total revenue in US dollars (*LOGSALE*), firm leverage (*LEV*), asset turnover (*ATURN*), a loss indicator (*LOSS*) and the percentage of pre-IPO shares retained by the management (*RETENTION*). In Panel B, we include two additional country-level variables: the rule of law index (*RULLAW*) and country-level earnings management rank (*E_MGT*). In both panels, we perform OLS regressions for the pooled sample and the two subsamples for weak institutions and strong institutions, respectively. We categorize countries into weak vs. strong institutions based on their average rule of law index. ***, **, and * indicate significance at the 1%, 5%, and 10% level (two-tailed), respectively. T-statistics with robust standard errors are reported in parentheses. All variables are defined in the appendix.

Panel A: Additional controls of issuer-specific characteristics

Variables	Pooled (1)	Weak (2)	Strong (3)	Pooled (4)	Weak (5)	Strong (6)
BIGN	-0.034***	-0.113***	-0.017	-0.033**	-0.095***	-0.025
	(-2.661)	(-4.856)	(-1.198)	(-2.341)	(-3.919)	(-1.515)
LOGAT	-0.036***	-0.055***	-0.043***	-0.044***	-0.061***	-0.051***
	(-6.148)	(-4.720)	(-4.961)	(-7.252)	(-4.993)	(-5.512)
LOGSALE	0.007*	0.001	0.016**	0.012***	0.005	0.020***
	(1.663)	(0.084)	(2.411)	(2.711)	(0.508)	(2.821)
LEV	-0.092***	-0.049	-0.114***	-0.056***	0.031	-0.089***
	(-5.299)	(-0.812)	(-6.225)	(-2.930)	(0.449)	(-4.587)
ROA	0.000	-0.006	-0.002	0.002	0.017	-0.001
	(0.051)	(-0.081)	(-0.763)	(0.718)	(0.241)	(-0.263)
ATURN	-0.007***	-0.006	-0.025***	-0.006***	-0.008	-0.022**
	(-5.183)	(-0.837)	(-3.316)	(-6.230)	(-1.125)	(-2.501)
LOSS	-0.001	-0.038	0.017	-0.013	-0.032	0.008
	(-0.046)	(-0.638)	(1.152)	(-0.792)	(-0.490)	(0.486)
RETENTION				0.116***	0.247**	0.146***
				(2.887)	(2.290)	(4.260)
Original Controls	YES	YES	YES	YES	YES	YES
Industry Effects	YES	YES	YES	YES	YES	YES
Year Effects	YES	YES	YES	YES	YES	YES
Country Effects	YES	YES	YES	YES	YES	YES

| Observations | | 8,198 | 3,967 | 4,231 | 6,753 | 3,524 | 3,229 |
| R^2 | | 0.296 | 0.353 | 0.237 | 0.262 | 0.326 | 0.206 |

Panel B: Additional controls of time-varying institutional quality and information quality

	Pooled	Weak	Strong	Pooled	Weak	Strong	Pooled	Weak	Strong
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
BIGN	-0.042***	-0.095***	0.008	-0.042***	-0.094***	0.007	-0.042***	-0.094***	0.007
	(-4.044)	(-5.609)	(0.643)	(-4.091)	(-5.578)	(0.568)	(-4.095)	(-5.563)	(0.552)
RULE OF LAW	-0.148**	-0.193**	-0.233**				-0.151**	-0.195**	-0.238**
	(-2.486)	(-2.526)	(-2.106)				(-2.525)	(-2.531)	(-2.150)
E_MGT				0.002	0.000	0.005**	0.003*	0.001	0.005**
				(1.606)	(0.093)	(1.984)	(1.690)	(0.286)	(2.022)
Original Controls	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Year Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country Effects	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	14,029	6,922	7,107	14,029	6,922	7,107	14,029	6,922	7,107
R^2	0.219	0.252	0.167	0.219	0.251	0.167	0.219	0.252	0.167