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JOCHEN BIGUS AND FLORIAN DREYER

Country-level Accounting Enforcement and IPO Underpricing

Using a sample of up to 2,503 initial public offerings (IPOs) in 32 countries from 2011–2017, we predict and find that higher levels of country-level accounting enforcement are associated with lower levels of IPO underpricing. IPOs in countries with a relatively low accounting enforcement score (second quintile) exhibit a mean underpricing of 19%, whereas the mean underpricing amounts to just 9% in countries with a relatively high score (fourth quintile). The results remain qualitatively the same when we employ a multi-level model or a difference-in-difference design. In countries that substantially strengthened their accounting enforcement in the 2003–2009 period, the level of IPO underpricing decreased significantly. We show that accounting enforcement matters for the cost of going public.

Key words: Accounting enforcement; Underpricing; Cross-country study; IPOs.

There is a great deal of evidence on underpricing, that is, when the stock price on the first day of trading exceeds the offering price. The extent of underpricing is on average about 10–15% of the offering price, but varies considerably across firms, across time—and across countries (Ibbotson *et al.*, 1994; Loughran and Ritter, 2004). Boulton *et al.* (2017, p. 768) report a range of –1% (Argentina) to 66% (Greece) for the period 1998–2014. In our sample, 30 IPOs in Norway have a median underpricing of –1.1% in the period 2011–2017, while it is 46.4% in Japan in the same period (421 IPOs). Why is there so much variation across countries?

Lin *et al.* (2013) argue that countries differ in their legal settings, and indeed find that higher litigation risk is strongly associated with IPO underpricing. Other papers consider the role of investor protection, the rule of law, legal origin, and the level of legal enforcement (Engelen and van Essen, 2010; Hopp and Dreher, 2013; Banerjee *et al.*, 2011; Hong *et al.*, 2014) referring to the work of, for

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example, LaPorta *et al.* (1998), LaPorta *et al.* (2006), Jackson and Roe (2009), Kaufmann *et al.* (2010), and Djankov *et al.* (2008).

However, corporate finance theory explains underpricing mainly through information asymmetries between IPO participants (Rock, 1986; Allen and Faulhaber, 1989). LaPorta *et al.*'s (2006) private enforcement measure captures prospectus liability and IPO disclosure rules with regard to director compensation, ownership structure, and irregular contracts, but not measures on the quality of financial reporting. And yet financial statements are the core element of a prospectus. Institutional measures referring to the financial reporting environment may therefore be more warranted variables in empirical designs. Differences in the country-level quality of information may explain cross-country heterogeneity in information asymmetries and underpricing. Leuz *et al.* (2003) argue that higher earnings quality reduces information asymmetries and serves to protect outside investors, and Boulton *et al.* (2011, 2017) find that earnings quality is negatively associated with IPO underpricing.

What is missing in this body of literature is a study on the role of country-level accounting enforcement with regard to IPO underpricing. Accounting enforcement is undertaken by independent bodies to foster a firm's compliance with accounting standards; it is an important element of a country's framework to ensure high financial reporting quality; it may even be more important than the quality of the accounting standards themselves (Christensen *et al.*, 2013; Ewert and Wagenhofer, 2019). For instance, Christensen *et al.* (2013) find evidence that the introduction of mandatory IFRS reporting was accompanied by liquidity benefits only in those countries where accounting enforcement concurrently substantively improved. Stricter accounting enforcement tends to improve financial reporting quality, limiting the discretion for earnings management (EM) of the firm going public, and eventually tends to reduce information asymmetries and IPO underpricing.

Even though legal origin, judicial efficiency, and (both private and public) legal enforcement have been shown to affect and increase the protection of minority investors, they do not explicitly address financial accounting standards and their enforcement. We therefore apply a relatively new index developed by Brown *et al.* (2014), who calculate measures of the degree of accounting enforcement activity for 51 countries. Their index covers information on:

- a. whether a security market regulator or another body exists that monitors financial reporting;
- b. whether this body has the power to set accounting or auditing standards;
- c. whether this body reviews financial statements;
- d. whether this body provides a report about its reviews on financial statements;
- e. whether this body has taken enforcement actions regarding financial statements;
- f. and whether the body is well-staffed.

Brown *et al.*'s (2014) index is a public enforcement measure, similar to those developed by Jackson and Roe (2009) and LaPorta *et al.* (2006). In contrast to

both Jackson and Roe (2009) and LaPorta *et al.* (2006), Brown *et al.* (2014) do not consider the enforcement of securities market regulation in general, but focus on *accounting* enforcement.¹ Unlike Jackson and Roe (2009), Brown *et al.* (2014) consider the enforcement body's monitoring, reviewing, and sanctioning activities. In contrast to LaPorta *et al.* (2006), Brown *et al.* (2014) address the human resources of the enforcement body. Taken together, the measure proposed by Brown *et al.* (2014) is narrower in scope, given that it focuses on accounting enforcement, and yet it is also more comprehensive, given that it addresses both the enforcement body's competencies and its resources. Both differences imply improvements in capturing the institutional impact on financial reporting quality.

The impact of accounting enforcement and legal enforcement on underpricing might differ. Stricter accounting enforcement tends to improve financial reporting quality *directly* in both primary and secondary markets. This is especially important for IPOs, because in many countries, such as the US and Canada, firms do not have to disclose their financial statements prior to going public. In European countries, accounting standards for private firms are more lenient than those for publicly listed firms. Thus, potential investors have very limited and/or potentially biased financial accounting information about the private firm seeking to go public. It goes without saying that prospectus liability mitigates incentives for *wrongful* reporting, but still, there is considerable discretion in financial reporting without necessarily violating the accounting standards. Stricter accounting enforcement will limit this discretion, as the probability of inquiries and of undesirable enforcement consequences, for example, fines and reputational effects, increase (Ernstberger *et al.*, 2012). Thus, we may expect stricter accounting enforcement to directly reduce EM and information asymmetry, both before the IPO and afterwards in the secondary market. Managers with limited opportunities to manage earnings will also find it more difficult to conceal wealth transfers at the expense of (minority) shareholders (Leuz *et al.*, 2003). Overall, this should reduce outside investors' information uncertainty and mitigate agency problems of equity, both of which increase outside investors' willingness to pay.

With legal enforcement measures, it is virtually impossible to see a direct impact on reducing information asymmetries because the aforementioned measures are related to the legal system in general or to items of corporate law or securities law, but not explicitly to financial reporting regulation. Consistently, Brown *et al.* (2014) provide evidence that EM aggregated at the country level is neither significantly associated with the rule of law variable proposed by Kaufmann *et al.* (2010) nor with a composite score on legal enforcement based on the judicial

¹ Other legal enforcement measures also ignore the financial reporting framework and accounting enforcement in particular. LaPorta *et al.* (1998) measure legal enforcement using five variables: the efficiency and integrity of the judicial system; the rule of law; the extent of corruption in the government; the risk of expropriation; and the risk of repudiation of contracts by the government. Kaufmann *et al.* (2010) develop a rule-of-law index as well as a corruption index. Djankov *et al.* (2008) measure private enforcement by the extent of shareholder rights. The underpricing literature (e.g., Engelen and van Essen, 2010; Banerjee *et al.* 2011; Hong *et al.*, 2014; Boulton *et al.*, 2017) as well as the accounting literature (e.g., Hope, 2003; Leuz *et al.*, 2003; Daske *et al.*, 2008) has so far controlled for *legal* enforcement as measured by the above variables.

efficiency, rule of law, and corruption variables employed by LaPorta *et al.* (1998). Nonetheless, legal enforcement, especially in corporate and securities law, is likely to restrict and mitigate the wealth-shifting *incentives* of private firms' insiders—managers and controlling shareholders—in both primary and secondary markets. This may also increase outside investors' willingness to pay, but in a different way than accounting enforcement.

In addition, it is conceivable that a country exhibits a high level of legal enforcement, but low levels of accounting enforcement, or vice versa. For instance, in LaPorta *et al.* (2006, pp. 15–16), Belgium and Norway achieve a public enforcement score of 0.15 and 0.32, respectively, which is clearly below the mean value of 0.52 (in a range from zero to one with higher scores implying stricter public enforcement). And yet these same two countries yield the second-highest accounting enforcement score of 22 in 2008 in Brown *et al.* (2014), with scores ranging from two to 24 and a mean value of 12.6. Conversely, LaPorta *et al.* (2006) attach a relatively high public enforcement score to India and Indonesia (0.67 and 0.62, respectively), while the accounting enforcement score of these two countries in Brown *et al.* (2014) is six, which is clearly below the mean value. In fact, the correlation between these two scores is negative (–0.19). With other legal enforcement measures, the correlation coefficient is positive, but it is not one (e.g., with the human and financial resources measures in Jackson and Roe, it is 0.56 and 0.50, respectively). To sum up, measures of accounting enforcement and legal enforcement capture different institutional elements, and might be related to IPO underpricing differently in terms of their concept.

We therefore investigate whether accounting enforcement contributes to reducing the level of IPO underpricing. Using a large set of firm- and country-specific control variables, we analyze up to 2,503 IPOs in 32 countries in the years 2011–2017. Using pooled OLS and a hierarchical linear modelling (HLM) design, we find strong and robust evidence that higher levels of accounting enforcement are associated with lower levels of underpricing. Countries with a relatively low accounting enforcement score (second quintile) exhibit a mean underpricing of 19%, whereas mean underpricing amounts to 9% in countries with a relatively high score (fourth quintile).

We also take advantage of substantive changes (increases) in accounting enforcement. Christensen *et al.* (2013) sent out a survey to security market regulators in 35 countries, asking whether there had been any substantive accounting enforcement changes in the 2001–2009 period (for more detailed information, see Christensen *et al.*, 2013, pp. 172–76). The regulatory bodies of 16 countries confirmed a substantive change and reported the quarter-year in which the intensity of accounting enforcement substantially increased. This allows us to compare underpricing in the quarter-years before and after the substantive change. To avoid the effects of the burst of the dotcom bubble in 2000–2001, and since most substantive changes in accounting enforcement occurred between 2005 and 2007, we conduct this analysis for the 2003–2009 period. We find a substantive increase in accounting enforcement to be significantly negatively associated with IPO underpricing. In fact, the change design supports the view that accounting enforcement may *affect* IPO underpricing.

We contribute to the underpricing literature by showing that accounting enforcement matters for the cost of going public. An improvement in accounting enforcement may be considered as a way to encourage more IPOs and, ultimately, to stimulate innovation in the first place (Lerner and Tåg, 2013; Lerner and Nanda, 2020).

We contribute to the relatively small body of accounting literature that addresses the role of the financial reporting environment on underpricing. Banerjee *et al.* (2011) use two proxies to measure information asymmetry: country-level analyst following, and country-level stock price synchronicity, which they find to be negatively and positively associated with underpricing, respectively. Shi *et al.* (2013) report that the stringency of disclosure requirements for IPO prospectuses—as measured by La Porta *et al.* (2006)—is negatively associated with IPO underpricing, using a sample from 1995–2002. Byard *et al.* (2021) show that the adoption of the EU's Prospectus Directive significantly reduces IPO underpricing. However, they are unable to confirm a negative association between mandatory IFRS adoption and IPO underpricing, as found by Hong *et al.* (2014). None of the above papers addresses the role of accounting enforcement.

There is some research on the IPO level showing that underpricing occurs to a lesser extent with more, more precise, more trustworthy, or less favourable information. Leone *et al.* (2007) find that voluntary disclosures on the use of IPO proceeds reduce underpricing. In a similar vein, Falconieri and Tastan (2018) report that the length of a prospectus is negatively associated with underpricing. Bajo and Raimondo (2017) show that a positive tone in newspaper articles is positively related to underpricing among US IPOs. Chaplinsky *et al.* (2017) and Barth *et al.* (2017) report that IPOs under the US Jumpstart Our Business Startups Act experience significantly higher levels of underpricing than IPOs under the regular securities law, probably due to lower levels of mandatory disclosure. Nielsson and Wójcik (2016) demonstrate that US IPOs with issuers headquartered in local areas are associated with lower levels of underpricing compared to US IPOs from urban firms, suggesting that local information in rural areas seem to be more precise. However, Huang *et al.* (2019) find evidence for Chinese IPOs that underpricing occurs less among firms located closer to a major metropolitan area. Li *et al.* (2019) also analyze Chinese IPOs, and show that firms located in provinces with high social trust experience lower levels of underpricing. All these papers analyze IPO underpricing in a specific country, and consequently do not account for the level of accounting enforcement.

We also contribute to the underpricing literature in corporate finance. Most of the studies have only been conducted for single countries, predominantly the US. The extent of underpricing varies considerably across countries, which has stimulated some cross-country studies in order to understand the marginal impact of institutional determinants (Ljungqvist *et al.*, 2003; Engelen and van Essen, 2010; Hopp and Dreher, 2013; Lin *et al.*, 2013). Still, the role of country-level financial reporting quality, and, in particular, the role of *accounting* enforcement, have not yet been investigated in that literature. Moreover, we look at a sample period after the financial crisis, and after securities market regulation had been improved

in many countries, for example, by the Sarbanes-Oxley Act in the US (2002) and by the Markets for Financial Instruments Directive in the European Union (2004).

HYPOTHESIS DEVELOPMENT: ACCOUNTING ENFORCEMENT AND UNDERPRICING

Corporate finance theory suggests that underpricing results from asymmetric information where the underwriting bank, or the IPO firm (issuer), or some investors are assumed to have private information (Baron and Holmström, 1980; Rock, 1986; Allen and Faulhaber, 1989).² Figure 1 provides an overview of the type of information asymmetries identified by the theoretical underpricing literature.

The reasons for private information are manifold. The models of Baron and Holmström (1980) and Baron (1982) assume that the underwriting bank is an agent of the IPO firm, with the task of selling the shares at the highest possible price. Higher effort by the underwriter would increase the offering price.

FIGURE 1

THEORETICAL MODELS EXPLORING INFORMATION ASYMMETRIES WITH AN IPO

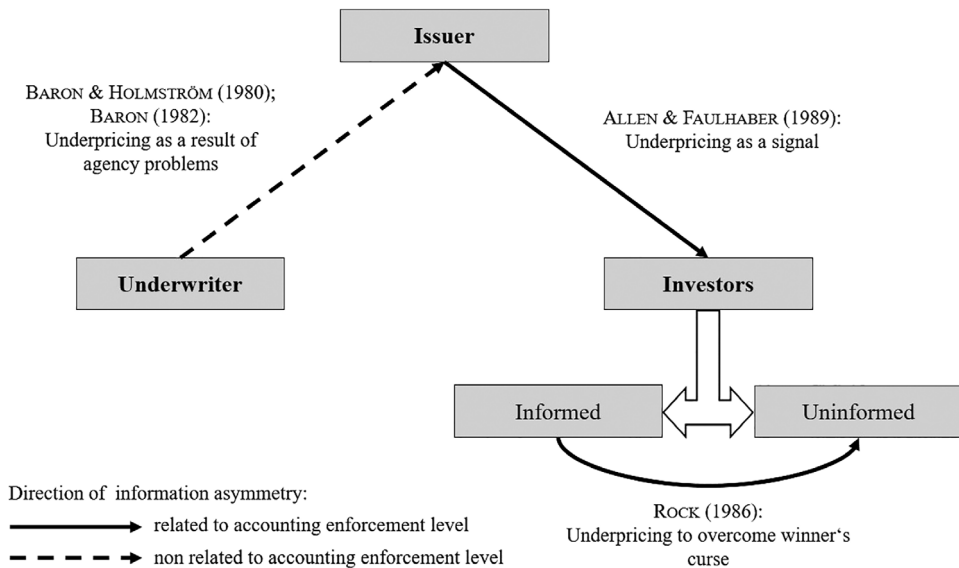


Figure 1 shows important theoretical work that aims to explain IPO underpricing by information asymmetry.

² There are also institutional and behavioural models that are referred to far less frequently in the empirical literature; see Ljungqvist (2007).

However, the IPO firm is unable to observe the ‘fair’ value of the shares or the underwriter’s effort. The underwriter would then have an incentive to suggest a rather low offering price, because investors would be less likely to file claims stating they bought shares at an excessive price.

Rock (1986) assumes that some investors are better informed about the prospects of the IPO firm than others, for example, represented by institutional versus individual investors, respectively. The ‘uninformed’ investors then rationally abstain from buying shares because they anticipate that they would otherwise buy the ‘lemons’, that is, the overpriced shares. They know that informed investors bid when issuing prices are lower than ‘fair’ value and do not bid in the opposite case. However, the IPO firm may need the uninformed investors’ money. The IPO firm will therefore rationally offer the shares at a price sufficiently below fair value to compensate for the adverse selection risk of uninformed investors.

Allen and Faulhaber (1989) assume an information asymmetry between IPO firms and investors. Investors are unable to distinguish between ‘good’ and ‘bad’ IPO firms such that ‘good’ IPO firms use underpricing as a device to credibly signal their better quality. Even though ‘good’ IPO firms bear the cost of underpricing, it provides a positive image and makes it easier and less costly to raise additional equity in later periods.

These theories do not exclude, and may even complement, each other (Loughran and Ritter, 2002). While all of them are based on asymmetric information, only Rock’s (1986) and Allen and Faulhaber’s (1989) models consider information asymmetries with regard to the ‘fair’ value of the IPO firm’s shares. How does accounting enforcement affect those information asymmetries?

Stricter accounting enforcement is believed to increase the reliability and information value of financial statements because enforcement agencies reflect a form of monitoring that limits managerial and auditors’ discretion about reporting choices (Christensen *et al.*, 2013). As a consequence of several severe financial accounting scandals in the US (such as Enron and Worldcom), as well as outside the US (such as Parmalat and Flowtex), regulators around the world started to establish rules and new institutions to improve the financial reporting quality of publicly listed companies. For example, the Public Company Accounting Oversight Board (PCAOB) started reviewing financial reports, disclosing those reviews, and taking enforcement actions in 2002. Soon after, countries outside the US established similar regulatory bodies with varying competences (Brown *et al.*, 2014). Accounting enforcement is an important element of a country’s framework to ensure high financial reporting quality; it may be even more important than the quality of the accounting standards themselves (Ewert and Wagenhofer, 2019). In fact, Christensen *et al.* (2013) find evidence that the introduction of mandatory IFRS reporting is accompanied by liquidity benefits only in those countries where accounting enforcement concurrently substantively improved. Thus, stricter accounting enforcement is supposed to improve financial reporting quality and to reduce information asymmetry.

Considering Rock’s (1986) and Allen and Faulhaber’s (1989) models, we should therefore expect underpricing to decrease with stricter accounting enforcement. In the settings of Baron and Holmström (1980) and Baron (1982), the level of

accounting enforcement should not matter, since underpricing is a consequence of the underwriter's shirking. Similarly, if 'road show' presentations and private communication between managers and investors during the IPO process sufficiently reduce information asymmetries (Hong *et al.*, 2014), the level of accounting enforcement becomes irrelevant. We are not aware of any evidence suggesting that *only* the settings of Baron and Holmström (1980) and Baron (1982) are valid in reality. In fact, prior empirical evidence is in line with the idea that information asymmetries exist between the IPO firm and investors or among investors (Allen and Faulhaber, 1989; Rock, 1986).

While the models of Rock (1986) and Allen and Faulhaber (1989) suggest that stricter accounting enforcement reduces information asymmetry prior to the IPO, investors may also benefit after the IPO. There is evidence that more EM is associated with lower levels of investor protection (Leuz *et al.*, 2003). Stricter accounting enforcement also tends to reduce EM and minority investors' information uncertainty in the secondary market. The prospect of reduced information asymmetry in the secondary market may therefore contribute to reduce underpricing as well. We therefore postulate:

H1: IPOs in countries with stricter accounting enforcement exhibit less underpricing.

RESEARCH DESIGN AND DATA

The Basic Model

In the basic model, we regress IPO-level underpricing against a set of variables measured at the country level j and variables at the IPO level i . Since the extent of underpricing is skewly distributed, we mainly employ the logarithm of underpricing. Among the set of country-level variables, the level of accounting enforcement is the independent variable of interest, as measured by the most recent 2008 values in Brown *et al.* (2014). At the country-year level, we employ two other variables that address the financial reporting environment: average analyst coverage per firm (*#Analysts*) and an aggregated measure of country-level earnings quality (*EQAggr*) (Boulton *et al.*, 2011). We contextualize and describe all variables in more detail below. The model for Hypothesis 1 is specified as follows:

$$\begin{aligned} \ln(\text{Underpricing} + 1)_{i,t} = & \alpha + \beta_1 \text{AccEnforce}_j + \beta_2 \text{\#Analysts}_{j,t} + \beta_3 \text{EQAggr}_{j,t} \\ & + \text{other country - level controls}_{j,t} + \text{IPO - level controls}_{i,t} \\ & + \text{industry - and year - fixed effects} + \varepsilon_{i,j,t}. \end{aligned} \tag{1}$$

The independent variable is the natural logarithm of underpricing. *Underpricing* is defined as the first-day trading return, that is, as the first-day secondary market

closing price divided by the IPO offer price, minus one (Banerjee *et al.*, 2011; Boulton *et al.*, 2011). We obtain the IPO offer data from the Thomson Reuters New Issues Database and match it with the secondary market prices from Datastream using the International Securities Identification Number [ISIN]. We only consider IPOs where the first valid secondary market closing price occurred within -3 to $+10$ days of the IPO issue date.³

Since some important variables show no variation in the investigation period (e.g., *AccEnforce*, *EaseSuits*, and the legal origin variables), we ignore country-fixed effects and run a pooled OLS regression with robust standard errors clustered at the country-year level. In order to control for year- or industry-related sources of observed and unobserved heterogeneity in underpricing, we also control for year fixed effects and industry fixed effects based on the one-digit SIC code (the use of two-digit SIC codes does not change the qualitative results). We thereby reduce correlated omitted variable concerns.

Measurement of Country-level Control Variables

We control for all country-specific variables and characteristics of the IPO or IPO firm that prior literature shows to be significantly associated with the extent of underpricing and where data were available from the Thomson Reuters New Issues Database and from Datastream. We start with country-level variables, beginning with those that are likely to be directly related to the IPO firms' information environment. We then consider variables on the legal and economic/financial environment.

Since we are interested in the information environment at the country level, we measure analyst coverage by determining the average number of sell-side analysts per listed firm in a given country-year. We focus on analysts who forecast earnings per share (EPS) according to the I/B/E/S Estimates Database, since EPS is the most commonly forecasted item (Banerjee *et al.*, 2011). We expect less underpriced IPOs in countries with a larger average number of analysts per listed firm.

Ball and Shivakumar (2008) find that private firms adjust their financial reporting choices to the 'general' standard just before they go public. We therefore account for country-level earnings quality. We measure it as an aggregated sum of four EM measures using a composite scoring method based on four measures, as suggested by Leuz *et al.* (2003) (see Appendix 1 for more precise information). The four measures include two proxies for earnings smoothing, one measure for discretionary accruals, and the propensity to avoid reporting small losses. We obtain the data from the Datastream Worldscope Fundamentals Database.

³ Boulton *et al.* (2011) include observations with closing prices within -3 to $+60$ days of the IPO issue date.

We measure each EM proxy based on the financial data of all publicly listed firms in Datastream in the last five years ($t-4$ to t) in the respective country. If there was a time series of less than five years, we also take four or three years. If the time series was shorter, we omit the observation. For each EM proxy, we take the average over all listed firms as well as over the five years. Table 2 shows the average number of publicly listed firms per year included in the respective countries. Ultimately, our composite measure reflects the average level of EM, and thus, average earnings quality in the respective country at that point of time. In line with Boulton *et al.* (2011), we expect earnings quality to be negatively associated with underpricing.

Legal origin We control for the origin of the *legal system*, because there is evidence suggesting that firms in common law countries exhibit higher firm values than those in civil law countries, due to better investor protection (LaPorta *et al.*, 1997, 1998). We should then also expect lower levels of underpricing in common law countries. For civil law countries, we also control for French, German, and Scandinavian legal origin based on the data provided in LaPorta *et al.* (1998). We were unable to find sources linking the legal system in China to common law or to French, German, or Scandinavian legal origins. LaPorta *et al.* (1998, 2006) are silent on China.

Shareholder rights index The World Bank's⁴ Doing Business database reports this index which measures the monitoring and decision rights of shareholders, including the firm's disclosure requirements on, for example, related-party transactions, executive compensation, and significant shareholders. The stronger the shareholder rights, the lower the expropriation risk of future profits (LaPorta *et al.*, 2002). Therefore, the problems arising from asymmetric information are mitigated, and shareholders supposedly have a greater willingness to pay for new shares. Underpricing should therefore be lower. The index takes values from zero to 10, where a higher value indicates stronger shareholder rights.

Ease of shareholder suits index We use the ease of shareholder suits index of the World Bank's Doing Business database.⁵ The World Bank provides time-series data for almost all countries. The ease of shareholder suits index has six components reflecting the extent to which shareholders have access to internal corporate documents: whether evidence is obtainable during the trial and how

⁴ Originally, Djankov *et al.* (2008) developed the shareholder rights index.

⁵ <https://www.doingbusiness.org/en/methodology/protecting-minority-investors>

TABLE 1

SAMPLE SELECTION FOR POOLED OLS AND HLM ANALYSES (2011–2017)

| Selection step | IPOs dropped | Remaining IPOs | Countries |
|---|-----------------|-------------------|-----------|
| IPOs 2011–2017 from Thomson Reuters New Issues Database excluding: IPOs with unit offerings, IPOs with subscription rights to incumbent shareholders, IPOs of ‘Real Estate Investment Trusts’ or financial institutions, limited partnerships | | 6,208 | 41 |
| Price regulation in China (2014–2017) | 809 | 5,399 | |
| Matching with stock price data in Datastream according to ISIN code | 1,497 | 3,902 | |
| First closing prices >10 days after IPO or > 3 days before it | 178 | 3,724 | |
| IPOs from countries with fewer than 5 IPOs | 19 | 3,705 | |
| Elimination of IPOs with underpricing <1st or > 99th percentile | 74 | 3,631 | 32 |
| No data available for the <i>Age</i> variable | 952 | 2,679 | |
| No data available for the <i>Market Returns</i> variable | 168 | 2,511 | |
| No data available for the <i>Offer Price Revision</i> variable | 558 | 1,953 | 32 |

This table documents the data selection procedure. Brown *et al.* (2014) provide an accounting enforcement score for all 41 countries included in our initial sample.

legal expenses are allocated.⁶ The index ranges from zero to 10, with higher values indicating greater shareholder power in litigation. Some studies, for example, Lin *et al.* (2013), also refer to the prospectus liability index developed by LaPorta *et al.* (2006). However, those index values are based on answers to a questionnaire sent out in 1993 (LaPorta *et al.*, 2006), and there have been significant changes in securities market law in many countries since then (e.g., the 2002 Sarbanes-Oxley Act in the US, and the 2004 Markets for Financial Instruments Directive in the

⁶ The six components are as follows. (1) Whether shareholders owning 10% of the company’s share capital have the right to inspect the buyer–seller transaction documents before filing a suit. Alternatively, whether they can request that a government inspector investigate the buyer–seller transaction without filing a suit. A score of zero is assigned if no; one if yes. (2) The range of documents that are available to the shareholder plaintiff from the defendant and witnesses during trial. A score of one is assigned for each of the following types of documents available: information that the defendant has indicated they intend to rely on for their defence; information that directly proves specific facts in the plaintiff’s claim; and any information relevant to the subject matter of the claim. (3) Whether the plaintiff can obtain categories of relevant documents from the defendant without identifying each document specifically. A score of zero is assigned if no; one if yes. (4) Whether the plaintiff can directly examine the defendant and witnesses during trial. A score of zero is assigned if no; one if yes, with prior approval of the questions by the judge or if the judge can set aside questions for any reason; two if yes, without prior approval. (5) Whether the standard of proof for civil suits is lower than that for a criminal case. A score of zero is assigned if no; one if yes. (6) Whether shareholder plaintiffs can recover their legal expenses from the company. A score of zero is assigned if no; one if plaintiffs can recover their legal expenses from the company upon a successful outcome of their legal action; two if plaintiffs can recover their legal expenses from the company regardless of the outcome of their legal action.

European Union). Considering that our period of investigation is 2011–2017, the World Bank's ease of shareholder suits index seems to be more suitable.

Market return We control for the market return in the 90 days before an IPO, since there is evidence that the market return before an IPO is positively associated with the extent of underpricing (Bradley *et al.*, 2004; Hanley and Hoberg, 2012; Banerjee *et al.*, 2011). Since market return has a skewed distribution, we use its natural logarithm $\ln(\text{market return} + 1)$.

IPO activity Ibbotson and Jaffe (1975) and Ritter (1984) determine that underpricing is higher in 'hot markets', that is, when there are many IPOs. We control for IPO activity by measuring the ratio of the number of IPOs to the number of listed firms on a country-year basis.

Market liquidity Ellul and Pagano (2006) report that underpricing is higher with lower market liquidity, suggesting that underpricing includes a liquidity risk premium. We measure country-year market liquidity by the ratio of a country's total trading volume over year-average market capitalization; see Beck *et al.* (2000).

Market capitalization / GDP In countries with more developed stock markets, investors might be more willing to invest in firms going public. This may affect underpricing. We obtain data on the stock market capitalization to GDP ratio (in %) from the World Bank's Global Financial Development Database.⁷ However, no data were provided for Denmark, Finland, Sweden nor, from 2013 on, for the UK. We found the missing data in the Datastream database.

GDP per capita In more economically developed countries, there might be more wealthy investors who are able to invest in the stock market and IPOs. This potentially larger supply of funding may affect underpricing. We measure economic development by the ratio of GDP per capita in US\$1,000 per capita, in constant 2005 US dollars, from the World Bank's Global Financial Development Database.

Measurement of IPO-specific Control Variables

IPO size We control for IPO size as measured by the number of issued shares times the offering price in 2010, in million US dollars, and then adjusted by the

⁷ See <https://www.worldbank.org/en/publication/gfdr/data/global-financial-development-database>

World Bank's Purchasing Power Index. We expect there to be more information around larger IPOs, such that underpricing should be lower (Ritter, 1987). Since IPO size has a very skewed distribution, we use its natural logarithm.

IPO firm's age A firm's age is measured by the difference in years between the date of going public and the date of the firm's foundation. Age is a proxy for information asymmetry as there is more public information available for more mature firms. We expect less underpricing with more mature IPO firms (Loughran and Ritter, 2004; Engelen and van Essen, 2010).

Volatility The market return volatility after going public has been found to indicate information and pricing uncertainty, which suggests a positive association with underpricing (Loughran and MacDonald, 2013). Volatility is measured as a variance of the IPO-related market return in the first 30 days after the first day of trading.

TopTierUnderwr *TopTierUnderwr* is a binary variable taking the value one if the bookrunner belongs to the Top 25 banks with the highest market share according to the SDC Global League Table in the year of the IPO (Boulton *et al.*, 2017) and zero otherwise. If no bookrunner was mentioned, we assume a value of zero. Underwriters with a higher reputation are usually associated with lower underpricing.

Firm commitment *Firm commitment* is an indicator variable with the value one if the underwriting bank guaranteed to buy the issued stock at a pre-determined price. This variable takes the value zero if the underwriter did not commit to taking over the stock, but assured 'best efforts' to sell the shares within a pre-determined price range to investors. With a guarantee, the underwriter takes a higher risk, and thus underpricing might be expected to be higher. However, Loughran *et al.* (1994) find evidence that it is lower in these cases.

Equity carve-out This variable is binary, and takes the value one if the parent company remains a major shareholder after the subsidiary's IPO. Prezas *et al.* (2000) find that underpricing is significantly lower with equity carve-outs than without.

LockupDays *LockupDays* measures the number of days of lockup after IPO. If there are different lockup types (e.g., management lockup, selling shareholder lockup), we use the longest period. If no information was provided, we assume a

lockup length of zero. A longer lock-up period is considered to be a costly signal of firm quality, reducing information asymmetry (Arthurs *et al.*, 2009).⁸ We therefore expect lower underpricing with longer lock-up periods.

OfferPriceRev *OfferPriceRev* is defined as the percentage deviation of the offer price from the middle of the latest available filing range (Kennedy *et al.*, 2006, p. 61). Following Kennedy *et al.* (2006), we expect a positive sign.

Foreign IPO This is a binary variable with a value of one if the IPO took place in a foreign country, that is, a different country to where the firm's headquarters are located. When the shares are issued in a foreign capital market, for example, in the US, the costs associated with an IPO are higher. Again, these costs can be interpreted as a costly signal of firm quality (Francis *et al.*, 2010). We expect a negative sign.

Data Selection

We start with all IPOs covered in the Thomson Reuters New Issues Database between 1 January 2011 and 31 December 2017 from 29 OECD countries, 22 emerging countries including the BRICS (Brazil, Russia, China, India, and South Africa) countries, and the remaining Member States of the EU (Bulgaria, Romania, and Cyprus). Following the literature (Lowry and Shu, 2002; Schenone, 2004; Boulton *et al.*, 2017), we exclude IPOs with unit offerings, IPOs with subscription rights to incumbent shareholders, IPOs of 'Real Estate Investment Trusts', and IPOs of limited partnerships or financial institutions.⁸ We are left with 6,208 IPOs in 41 countries, all of which are assigned an accounting enforcement score in Brown *et al.* (2014).

We then delete 809 Chinese IPOs from 2014–2017 because of severe price regulation. Since 2014, regulators have typically required issuers to sell IPO shares at no more than 23 times their net earnings to ensure that each deal is successful, but cap first-day gains at 44% to rein in speculation.⁹ In fact, 685 out of 809 IPOs experienced underpricing in the 40%–45% range, rendering price regulation effective. After this, we still retain 451 Chinese IPOs from 2011–2013 in our sample.

⁸ We deleted 'unit offerings', since the combined offer of stocks and options may distort underpricing. We also eliminated offers with subscription rights, since incumbent shareholders are likely to suffer less from information asymmetries likely affecting underpricing. Further, we deleted IPOs from 'Real Estate Investment Trusts' and similar funds, because these are only investment vehicles, rather than actual firms. Finally, we deleted IPOs of financial institutions (SIC codes 60, 61, 62, 67) and of 'limited partnerships', which are often venture capitalists or private equity firms. The information environment is different here, since financial firms may employ analysts on their own or may issue the IPO on their own, both of which makes the information environment specific.

⁹ See <https://www.scmp.com/business/china-business/article/3040792/has-chinas-ipo-bonanza-fizzled-out-amid-oversupply-subdued>

We are unable to find matching price data in Datastream for 1,479 IPOs. For the remaining 3,902 IPOs, 178 of them announced their first closing price after 10 days or more than three days before. We delete another 19 IPOs from countries where we had less than five IPOs. Finally, we delete observations with underpricing less than the 1st percentile and more than the 99th percentile to mitigate the effects of extreme outliers and possible data errors (see Banerjee *et al.*, 2011; Boulton *et al.*, 2011).¹⁰

Finally, we lose observations because data availability for some variables was rather limited, especially concerning the firm's age, offer price revision, and market return, all of which turn out to be significantly associated with underpricing, and thus are important. Table 1 provides an overview of the sample selection. We employ this dataset for both the basic pooled OLS analysis and our analysis employing HLM.

RESULTS FOR POOLED OLS AND HLM ANALYSES

Descriptive Statistics

Table 2 shows that there is significant variation across countries with regard to the number of IPOs, the mean underpricing, and the level of accounting enforcement (*AccEnforce*).

Table 2 also shows that most of the IPOs in the sample are from the US (648), followed by China (451), Japan (421), and India (301). Even though we ignore Chinese IPOs in the period 2014–2017 due to price regulation, they still represent a major share of our sample. Median underpricing is highest in Japan (46.3%) and Thailand (31.3%). Engelen and van Essen (2010) and Boulton *et al.* (2011) report similar mean underpricing for Japanese IPOs. Median underpricing is lowest in Norway, where it is even negative in the 2011–2017 period. Other studies also document low underpricing in Norway (Banerjee *et al.*, 2011; Boulton *et al.*, 2011). In sum, the extent of underpricing is comparable to other studies (Engelen and van Essen, 2010; Loughran *et al.*, 1994).

According to Brown *et al.* (2014), the level of accounting enforcement is highest in the US, Australia, Belgium, Denmark, Hong Kong, Norway, Switzerland, and the UK, while Chile, India, Indonesia, and Russia have the lowest scores. In addition, the far right column in Table 2 shows that, according to Christensen *et al.* (2013), substantive accounting enforcement changes occurred for 10 countries in the 2001–2009 period. This data will become relevant in the next section.

Table 3 provides summary statistics. The average (median) underpricing is 23.9% (8.5%); however, underpricing varies a great deal. There is also significant country-level variation in the level of accounting enforcement, with a mean of

¹⁰ Maximum and minimum underpricing before deleting outliers was 2,904% and –93.75%, respectively.

15.6, a first quartile of nine, and a third quartile of 22, in a range where scores of zero to 24 are possible.

The country-level average number of analysts per publicly listed firm varies from 0.29 to 7.6, with a mean of 3.02. The median of the *EaseSuits* variable is eight (out of 10), suggesting that many countries provide a relatively favourable litigation framework for shareholders. Fifty percent of observations relate to common law countries. Engelen and van Essen (2010) report that 48% of their observations relate to the French legal origin and only 24% to common law countries.¹¹ The shareholder rights index varies to a lesser extent, with a median of six, first quartile of five, and a third quartile of seven.

The descriptive statistics on market returns, IPO activity, and trading volume are consistent with other studies (Banerjee *et al.*, 2011; Boulton *et al.*, 2017). On the IPO level, IPO firms have an average age of 11.5 years when going public. The average lockup period is 144 days and 34.4% of IPOs have a top tier underwriter.

The correlation matrix (not tabulated) reports significantly ($p < 1\%$) negative correlation coefficients of accounting enforcement with underpricing (-0.16). The correlation coefficients between analyst coverage and accounting enforcement and between analyst coverage and *EaseSuits* are relatively high (0.76 and 0.35, respectively). Otherwise, correlation coefficients do not suggest severe multicollinearity problems.

Results of Pooled OLS Regressions

Table 4 shows the results of the multivariate pooled OLS analysis, where we regress underpricing on the level of accounting enforcement. Column (1) presents the results with all control variables. It shows that stricter accounting enforcement is associated with significantly lower underpricing ($p < 1\%$).

In line with prior literature, IPOs in countries with common law and stronger shareholder rights exhibit lower underpricing (Engelen and van Essen, 2010; Hopp and Dreher, 2013; Boulton *et al.*, 2011, 2017). Interestingly, IPO underpricing is also significantly lower in French law countries. Engelen and van Essen (2010) report a negative, yet insignificant, sign. However, they do not include Chinese IPOs. We include Chinese IPOs but we are unable to assign China to one of English, French, German, or Scandinavian legal origin. We define China as a comparison group for these legal origins.

In contrast to Boulton *et al.* (2011, 2017), we do not find robust evidence that earnings quality is negatively associated with the level of underpricing. However, Boulton *et al.* (2011) also use a larger sample from a different time period (1998–2008, $N = 10,700$) and with a different and smaller set of 13 control variables. In particular, Boulton *et al.* (2011) are unable to control for accounting enforcement since this variable was not available before Brown *et al.* (2014).

¹¹ However, considering the distribution across countries (Table 2 in Engelen and van Essen, 2010, p. 1963), the numbers must have been interchanged.

ACCOUNTING ENFORCEMENT AND IPO UNDERPRICING

TABLE 2

COUNTRY-LEVEL DATA ON IPOs, UNDERPRICING AND ACCOUNTING ENFORCEMENT LEVEL, 2011–2017

| Country | # IPOs | Mean underpricing | Median underpricing | # listed firms per year (for <i>EQAggr</i>) | <i>AccEnforce</i> | Substantive change in accounting enforcement 2001–2009 (no, yes, date) |
|--------------|--------|-------------------|---------------------|--|-------------------|--|
| Australia | 210 | 14.2% | 5.5% | 606.6 | 22 | No |
| Belgium | 9 | 3.0% | 1.0% | 63.1 | 22 | No |
| Brazil | 27 | 1.8% | −0.3% | 187.0 | 8 | No |
| Canada | 63 | 18.1% | 4.1% | 164.6 | 22 | No |
| Chile | 5 | 3.0% | 2.0% | 98.3 | 5 | Yes (2009 Q2) |
| China | 451 | 18.8% | 12.0% | 1,311.4 | 16 | No |
| Denmark | 15 | 5.3% | 0.2% | 64.8 | 22 | No |
| Finland | 24 | 6.0% | 5.4% | 77.3 | 12 | Yes (2005 Q1) |
| France | 110 | 4.8% | 0.4% | 364.0 | 16 | No |
| Germany | 54 | 8.1% | 1.6% | 312.6 | 21 | Yes (2005 Q4) |
| Hong Kong | 104 | 21.1% | 5.1% | 107.8 | 22 | Yes (2008 Q3) |
| India | 301 | 9.9% | 4.4% | 1,697.0 | 6 | No |
| Indonesia | 96 | 19.1% | 11.1% | 295.9 | 6 | No |
| Italy | 61 | 9.0% | 4.6% | 147.3 | 19 | No |
| Japan | 421 | 77.4% | 46.4% | 1,926.1 | 8 | Yes (2005 Q3) |
| Mexico | 10 | 4.2% | 1.2% | 72.7 | 13 | No |
| Netherlands | 25 | 3.2% | 3.1% | 58.0 | 19 | Yes (2005 Q4) |
| New Zealand | 24 | 4.2% | 4.3% | 51.5 | 19 | No |
| Norway | 30 | −0.7% | −1.1% | 76.2 | 22 | Yes (2005 Q4) |
| Philippines | 22 | 9.5% | 1.6% | 119.8 | 16 | na |
| Poland | 40 | 2.6% | 0.5% | 195.0 | 9 | No |
| Russia | 12 | 4.9% | 1.0% | 230.8 | 6 | No |
| Singapore | 89 | 28.1% | 15.0% | 243.9 | 12 | No |
| South Africa | 16 | 10.3% | 7.9% | 122.7 | 10 | No |
| South Korea | 172 | 29.7% | 16.0% | 1,263.4 | 10 | na |
| Spain | 25 | 5.1% | 2.6% | 96.9 | 16 | No |
| Sweden | 113 | 14.1% | 10.3% | 175.6 | 9 | Yes (2007 Q3) |
| Switzerland | 20 | 7.4% | 5.1% | 114.0 | 22 | No |
| Thailand | 135 | 54.0% | 31.3% | 385.3 | 12 | No |
| Turkey | 61 | 7.9% | 1.7% | 206.1 | 9 | Yes (2008 Q1) |
| UK | 238 | 9.9% | 6.7% | 676.3 | 22 | Yes (2005 Q2) |
| US | 648 | 19.1% | 11.1% | 1,459.0 | 24 | na |
| Total | 3,631 | | | | | |

This table reports the number of IPOs, their mean and median underpricing, and the average number of listed firms per year for each country in the initial sample. For definitions of *Underpricing* and *AccEnforce*, see Table A1. Information on substantive accounting enforcement changes is only relevant for the change analysis in section 5, and is based on Christensen *et al.* (2013). If security market regulators provided no response to a change in accounting enforcement (na), we assumed that there was no substantive change.

Consistent with Hanley and Hoberg (2012) and Banerjee *et al.* (2011), market return is significantly positively associated with underpricing. Other variables on financial markets (IPO activity, trading volume, market capitalization) do not show a significant coefficient and, thus, are not in line with prior findings (see, e.g., Ritter, 1984; Ellul and Pagano, 2006).

TABLE 3

SUMMARY STATISTICS (POOLED OLS AND HLM DESIGN, 2011–2017)

| | N = | Mean | 1 st quartile | Median | 3 rd quartile | Min. | Max. | Std. dev. |
|-------------------------------------|-------|--------|--------------------------|--------|--------------------------|--------|--------|-----------|
| <i>Underpricing in %</i> | 3,631 | 23.9 | -0.2 | 8.5 | 28.8 | -32.9 | 353.8 | 47.5 |
| <i>ln (Underpricing + 1)</i> | 3,631 | 0.166 | -0.002 | 0.082 | 0.253 | -0.399 | 1.512 | 0.285 |
| Country-level variables | | | | | | | | |
| <i>AccEnforce</i> | 3,631 | 15.60 | 9 | 16 | 22 | 5 | 24 | 6.63 |
| <i>#Analysts</i> | 3,631 | 3.02 | 1.57 | 2.13 | 4.05 | 0.29 | 7.60 | 2.04 |
| <i>EQAggr</i> | 3,631 | -16.63 | -24.50 | -17.25 | -8.25 | -32.25 | -1.75 | 9.33 |
| <i>Common Law</i> | 3,631 | 0.50 | 0 | 1 | 1 | 0 | 1 | |
| <i>French Law</i> | 3,631 | 0.127 | 0 | 0 | 0 | 0 | 1 | |
| <i>German Law</i> | 3,631 | 0.196 | 0 | 0 | 0 | 0 | 1 | |
| <i>Scandinavian Law</i> | 3,631 | 0.051 | 0 | 0 | 0 | 0 | 1 | |
| <i>Shareholder Rights Index</i> | 3,631 | 6.05 | 5 | 6 | 7 | 4 | 8.7 | 1.23 |
| <i>EaseSuits</i> | 3,631 | 7.16 | 6 | 8 | 9 | 2 | 9 | 1.86 |
| <i>ln (Market Return + 1)</i> | 3,422 | 0.024 | -0.024 | 0.031 | 0.072 | -0.293 | 0.367 | 0.078 |
| <i>ln (IPO Activity)</i> | 3,631 | -3.32 | -3.71 | -3.28 | -2.97 | -6.43 | -0.24 | 0.76 |
| <i>ln (Trad_Vol)</i> | 3,631 | -0.219 | -0.617 | -0.172 | 0.132 | -2.107 | 0.885 | 0.577 |
| <i>GDP/capita</i> | 3,631 | 33.535 | 5.589 | 42.202 | 50.256 | 1.410 | 91.451 | 21.149 |
| <i>Marketcap/GDP</i> | 3,631 | 0.986 | 0.536 | 0.837 | 1.161 | 0.187 | 6.502 | 0.963 |
| IPO-specific controls | | | | | | | | |
| <i>ln (IPO Size in million USD)</i> | 3,631 | 3.419 | 2.146 | 3.714 | 4.708 | -8.725 | 9.638 | 2.038 |
| <i>Age</i> | 2,656 | 11.454 | 3.379 | 8.774 | 14.958 | 0 | 101.85 | 11.97 |
| <i>Volatility</i> | 3,631 | 0.037 | 0.020 | 0.031 | 0.047 | 0.000 | 0.373 | 0.026 |
| <i>TopTierUnderwr</i> | 3,631 | 0.344 | 0 | 0 | 1 | 0 | 1 | |
| <i>Firm Commitment</i> | 3,631 | 0.800 | 1 | 1 | 1 | 0 | 1 | |
| <i>Equity Carve-out</i> | 3,631 | 0.218 | 0 | 0 | 0 | 0 | 1 | 0.413 |
| <i>LockupDays</i> | 3,631 | 143.70 | 0 | 179 | 180 | 0 | 1,095 | 141.53 |
| <i>OfferPriceRev</i> | 2,952 | -0.004 | 0 | 0 | 0.033 | -0.456 | 0.701 | 0.091 |
| <i>Foreign IPO</i> | 3,631 | 0.063 | 0 | 0 | 0 | 0 | 1 | |

This table shows the descriptive statistics. For definitions of the variables, see Table A1. Underpricing is trimmed at the 1st and 99th percentiles.

With regard to firm- and IPO-level characteristics, the variables *Volatility*, *OfferPriceRev*, *Foreign IPO*, and, to a weaker extent, IPO size and firm age, exhibit the expected significant signs, confirming prior literature (Ritter, 1987; Kennedy *et al.*, 2006; Francis *et al.*, 2010; Engelen and van Essen, 2010; Loughran and McDonald, 2013). The explanatory power of the model is relatively high (adj. $R^2 = 36.7\%$) compared to other OLS regressions (Boulton *et al.*, 2011: adj. $R^2 = 18\%–30\%$; Boulton *et al.*, 2017: adj. $R^2 = 12\%–13\%$; Lin *et al.*, 2013: adj. $R^2 = 20\%–25\%$; Shi *et al.*, 2013: adj. $R^2 = 4\%–6\%$). However, the research questions and designs of those papers are also different to ours.

An η^2 -analysis of the impact of the covariates on the model’s explanatory power shows that *AccEnforce* and *Shareholder Rights Index* have a higher impact ($\eta^2 = 1.03\%$ and $\eta^2 = 1.46\%$, respectively) than other legal variables, such as legal origin ($\eta^2 = 0.27–0.66\%$). Only the variables *Volatility* and *OfferPriceRev* and industry-fixed effects exhibit a higher impact on explanatory power (not tabulated).

We test the robustness of our results when we exclude the important driver *OfferPriceRev* (column (2)), the constant (column (3)), insignificant variables in a

step-wise procedure (column (4)), and US IPOs (column (5)), or employ underpricing instead of $\ln(\text{underpricing} + 1)$ as a dependent variable (column (6)). Explanatory power drops by about five percentage points when we ignore the variable *OfferPriceRev*; however, the sign of *AccEnforce* remains negative and highly significant (column (2)). Since only about 78% of our observations provide information about the variable *OfferPriceRev*, we had selection concerns. In addition, we run a regression without the constant, as it has a highly significant coefficient. If the constant were important, we should not, however, observe an increase in explanatory power when we drop the constant (see column (3)). Again, the *AccEnforce* variable remains significant. Qualitative results also continue to hold when we drop IPOs from the country for which we have most observations, that is, the US (column (5)).

Figure 2 shows the relationship between the strictness of accounting enforcement and mean underpricing on a country-year level. We have 32 countries and (at most) seven years per country, resulting in 202 country-year observations. We group the observations into five quintiles. Figure 2 shows that underpricing tends to decrease with higher levels of accounting enforcement. For instance, moving from the second to the third *AccEnforce* quintile implies an increase in the mean *AccEnforce* score from 10 to 15, while mean underpricing declines from 19% to 15%. Moving further from the third to the fourth *AccEnforce* quintile results in an increase in the mean *AccEnforce* score from 15 to 20, while mean underpricing decreases from 15% to 9%.

In the next step, we explore whether the impact of the Brown *et al.* (2014) measurement of accounting enforcement differs from other (legal) enforcement measurement mechanisms suggested in the literature. Table 5 provides the regression results on this question. To avoid redundancy, the table displays the main variable of interest, even though we still include all the control variables we used before.

The results in Table 5 suggest that, in our dataset, many measurements of legal enforcement are not significantly associated with underpricing, such as the public enforcement index by Djankov *et al.* (2008) and the rule of law index based on Kaufmann *et al.*'s (2010) work and using World Bank data from 2011–2017.¹² The financial resources of the securities market regulator (Jackson and Roe, 2009) are significantly negatively associated with underpricing, but not its human resources.

Results of Hierarchical Linear Model Regressions

Our pooled OLS design does not control for country-level effects that are likely to induce IPOs within a country to be more similar than IPOs from other countries. Thus, the assumption of the independence of observations could be violated. Accordingly, standard errors for the estimates of covariates might be too small

¹² In contrast, Engelen and van Essen (2010) report a significantly negative association between the public enforcement index of Djankov *et al.* (2008) and the rule of law according to Kaufmann *et al.* (2005). However, their dataset is different, with 2,920 IPOs from 21 countries in the period 2000–2005. In addition, they employ a HLM design.

TABLE 4
DEPENDENT VARIABLE: LN(UNDERPRICING+I), POOLED OLS FOR 32 COUNTRIES, 2011–2017

| Pred. sign | ln (Underpricing + I) coeff. (t-stat.) | | | | Underpricing coeff. (t-stat.) | |
|--------------------------|--|---------------------------|----------------------|------------------------------------|-------------------------------|-------------------|
| | (1) All variables | (2) Without OfferPriceRev | (3) Without Constant | (4) With significant controls only | (5) Without US IPOs | (6) All variables |
| AccEnforce | - | -0.012*** (-3.21) | -0.007** (-2.11) | -0.005*** (-2.96) | -0.014*** (-3.78) | -0.022*** (-3.42) |
| #Analysts | - | -0.003 (-0.29) | -0.008 (-0.77) | | 0.014 (1.43) | -0.013 (-0.81) |
| EQAggr | - | 0.005 (1.53) | 0.002 (0.56) | | 0.005 (1.71) | 0.008 (1.46) |
| Common law | - | -0.232*** (-2.70) | -0.203** (-2.46) | -0.081** (-2.32) | -0.234*** (-2.50) | -0.446*** (-2.87) |
| French Law | - | -0.190*** (-3.64) | -0.189*** (-3.72) | -0.103*** (-3.95) | -0.197*** (-3.50) | -0.356*** (-3.90) |
| German Law | - | -0.158** (-2.05) | -0.116 (-1.57) | -0.067 (-0.79) | -0.182*** (-2.29) | -0.322** (-2.37) |
| Scandinavian Law | - | -0.283*** (-3.13) | -0.226** (-2.40) | -0.173* (-1.83) | -0.311*** (-3.30) | -0.528** (-3.34) |
| Shareholder Rights Index | - | -0.042*** (-5.61) | -0.050*** (-4.76) | -0.038*** (-5.13) | -0.047*** (-5.31) | -0.067*** (-5.55) |
| EaseSuits | + | 0.010 (1.37) | 0.012* (1.74) | 0.007 (0.99) | 0.014* (1.87) | 0.016 (1.40) |
| ln (Market Return + I) | + | 0.303*** (3.52) | 0.270** (2.30) | 0.280*** (3.34) | 0.299*** (3.54) | 0.449*** (3.02) |
| ln (IPO Activity) | + | 0.017 (1.22) | 0.02** (1.51) | -0.002 (-0.10) | 0.013 (0.86) | 0.010 (0.42) |
| ln (Trad_Yol) | - | -0.022 (-0.75) | -0.001 (-0.02) | 0.010 (0.33) | -0.004 (-0.08) | -0.009 (-0.25) |
| Marketcap / GDP | - | 0.052 (1.24) | 0.064 (1.43) | 0.060 (1.33) | 0.044 (1.08) | 0.080 (1.11) |
| GDP/capita | - | 0.0013 (1.54) | 0.0003 (0.29) | 0.0010 (1.06) | 0.0012 (1.48) | 0.0032** (2.32) |
| ln (IPO Size) | - | -0.018** (-1.94) | -0.018** (-2.15) | -0.015* (-1.71) | -0.020** (-1.98) | -0.028* (-1.80) |
| Age | - | -0.002** (-2.17) | -0.001* (-1.67) | -0.0013* (-1.84) | -0.002** (-2.45) | -0.003** (-2.17) |
| Volatility | + | 3.294*** (6.66) | 3.234*** (5.48) | 3.499*** (7.43) | 3.243*** (6.68) | 5.382*** (5.46) |
| TopTierUnderwr | - | 0.001 (0.08) | 0.001 (0.10) | -0.0005 - 0.03) | 0.003 (0.18) | -0.005 (-0.17) |
| Firm Commitment | -/+ | 0.023 (1.03) | 0.003 (0.13) | 0.036 (1.57) | 0.020 (0.88) | 0.039 (1.08) |
| Equity Carve-out | - | 0.009 (0.57) | -0.004 (-0.30) | 0.008 (0.52) | -0.001 (-0.05) | 0.0003 (0.01) |
| LockupDays | - | -0.00005 (-1.09) | -0.00011** (-2.56) | -0.00008 (-1.59) | -0.00005 (-1.03) | -0.00006 (-0.85) |
| OfferPriceRev | + | 0.697*** (9.69) | 0.680*** (9.05) | 0.680*** (9.05) | 0.688*** (10.00) | 0.938*** (8.66) |
| Foreign IPO | - | -0.095** (-2.28) | -0.115*** (-2.65) | -0.089** (-2.07) | -0.093** (-2.40) | -0.157*** (-2.65) |
| Constant | - | 0.669*** (4.09) | 0.669*** (4.24) | 0.686*** (5.06) | 0.486*** (5.06) | 1.057*** (3.64) |
| | | Included | Included | Included | Included | Included |

(Continues)

TABLE 4
CONTINUED

| Pred. sign | <i>ln (Underpricing + I)</i> coeff. (<i>t</i> -stat.) | | | | | <i>Underpricing</i> coeff. (<i>t</i> -stat.) |
|--|--|----------------------------------|----------------------|------------------------------------|---------------------|---|
| | (1) All variables | (2) Without <i>OfferPriceRev</i> | (3) Without Constant | (4) With significant controls only | (5) Without US IPOs | |
| Industry and year fixed effects | Included | Included | Included | Included | Included | Included |
| Robust standard errors clustered at country-year level | | | | | | |
| N | 1,953 | 2,503 | 1,953 | 1,953 | 1,630 | 1,953 |
| Adj. R ² | 36.7% | 31.5% | 53.7% | 36.4% | 38.0% | 35.0% |
| <i>F</i> -stat. (<i>p</i> -value) | 34.88 (0.000) | 29.96 (0.000) | 82.35 (0.000) | 34.47 (0.000) | 47.04 (0.000) | 32.20 (0.000) |

This table reports the results of multivariate regressions with *ln (Underpricing + I)* as the dependent variable; in column (6), underpricing is the dependent variable. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, using a two-tailed test. For definitions of the variables, see Table A1.

FIGURE 2

COUNTRY-LEVEL ACCOUNTING ENFORCEMENT AND UNDERPRICING

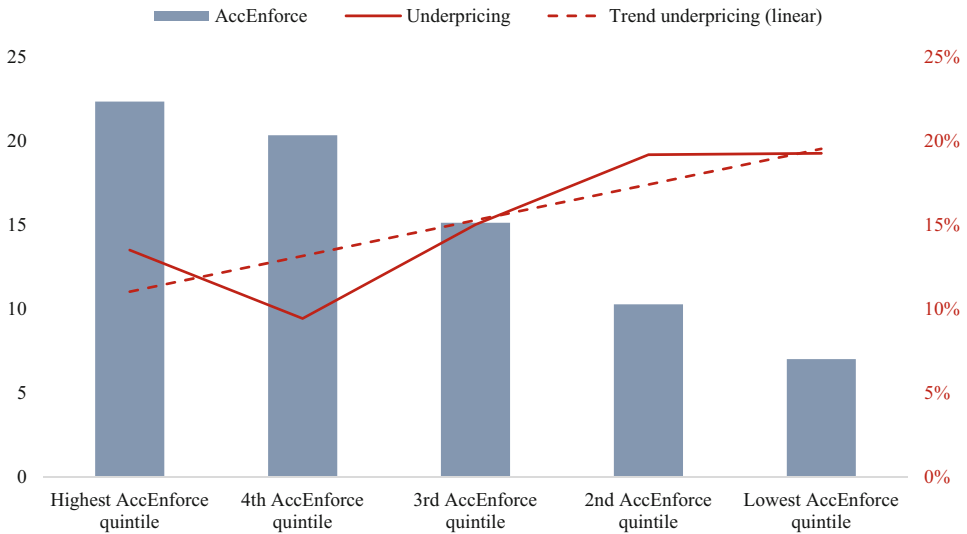


Figure 2 shows the association between country-level accounting enforcement and underpricing. Country-year observations are ranked according to accounting enforcement level, and then grouped into quintiles. The left-hand axis shows the country level of accounting enforcement (AccEnforce); the right-hand vertical axis quantifies the extent of mean underpricing in %.

with OLS regressions bearing the threat of type 1 errors (Hox, 2002). A HLM design corrects for this estimation bias (Engelen and van Essen, 2010) by having two regressions on a different hierarchical level that analyze relationships within or between the levels simultaneously (Chang *et al.*, 2018). Technically, level 1 coefficients enter level 2 regression as dependent variables; therefore HLM accounts for shared variance in data more efficiently than linear estimation methods (Hofmann, 1997; Chang *et al.*, 2018). The predictors of level 1 regression are firm-specific and IPO-specific predictors, whereas those of level 2 regression are country-specific. In contrast to an OLS model, the slopes and intercepts in the level 1 model are estimated for each group separately and therefore may differ between countries. Following Enders and Tofghi (2007), level 1 variables are grand-mean centered.

Analytically, the level 1 model can be described as follows (Engelen and van Essen, 2010):

$$\ln(\text{Underpricing} + 1)_{ij} = \beta_{0j} + \beta_{1j}X_{1ij} + \varepsilon_{ij} \tag{2}$$

The level 2 model can be expressed as:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}Z_{1j} + u_{0j}, \tag{3}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}Z_{1j} + u_{1j}. \quad (4)$$

X are firm-specific and IPO-specific variables; Z are country-specific variables.

Table 6 reports that the corrected overall average underpricing is 11.6% (20.3% in Engelen and van Essen, 2010). As the intraclass correlation coefficient (ICC) shows, there exists significant variation between countries in the level of underpricing; about 10.75% of the total variation is explained by differences between countries (variance component = 0.0097, $df = 30$, p -value = 0.000).¹³ Engelen and van Essen (2010) report a similar intraclass correlation of 10%.

Following Engelen and van Essen (2010), we start our analysis with only firm-specific and IPO-specific variables before adding country-specific variables. Following Hox (1995, p. 20), we check the inclusion of each variable step-wise, using the likelihood ratio test. In the course of this test, we consider random slopes for the variables *ln(IPO size)*, *Volatility*, and *OfferPriceRev*, and random intercepts for all other variables.¹⁴ Furthermore, we control for industry and year, and for robust standard errors at the country level.¹⁵

Column (1) of Table 7 depicts a regression without country-level variables. As with the pooled OLS analyses, *Volatility*, *OfferPriceRev*, *Foreign IPO*, *ln(IPO size)*, and *Age* are significantly associated with the level of underpricing, and exhibit the predicted sign.

In Model 2 (column (2)), we add country-level variables. Both R^2 between countries increases and deviance decreases, suggesting that the inclusion of level 2 variables improves the fit of the model. *AccEnforce* exhibits the expected negative sign, with a higher absolute t -statistic than in the pooled OLS regressions. In countries with stricter accounting enforcement, IPOs are less underpriced. Similar to the pooled OLS results, the legal origin variables exhibit negative signs, suggesting that underpricing of Chinese IPOs are higher on average.¹⁶ Engelen and van Essen (2010), who, to the best of our knowledge, published the only other underpricing paper employing HLM analysis, report an opposite sign for the German legal origin variable, but they do not include Chinese IPOs. Consistent with Engelen and van Essen (2010) and Hopp and Dreher (2013), IPOs are less underpriced in countries with stronger shareholder rights. In contrast to Lin *et al.* (2013) and Boulton *et al.* (2011), we do not find that higher litigation risk (*EaseSuits*) or better

¹³ The ICC is calculated as $\rho = \frac{Var(u_{ij})}{Var(u_{ij}) + Var(\epsilon_{ij})}$ (Raudenbush and Bryk, 2002). Another interpretation of the ICC is that it reflects the expected correlation in the level of underpricing of two IPOs in the same country.

¹⁴ Stata only allows random slope estimation for three variables at most for our dataset and binary variables technically do not have random slopes.

¹⁵ Since we control for robust standard errors (as do Engelen and van Essen, 2010), we employ the full maximum likelihood (FML) method, because the restricted maximum likelihood method is less suitable for unbalanced panel data (see Stata manual with regard to the command 'mixed'). Moreover, only with the FML method, the likelihood ratio test for model-adjusting fixed effects is valid.

¹⁶ As we are unable to assign Chinese IPOs to one of the legal origins, these IPOs are subsumed in the constant (i.e., they are the comparison group).

TABLE 5
 HYPOTHESIS 1: DIFFERENT ENFORCEMENT MEASURES AND UNDERPRICING: POOLED OLS FOR 32 COUNTRIES, 2011–2017

| | (1) Acc Enforce, Brown <i>et al.</i> (2014) | (2) Public enforcement, Djankov <i>et al.</i> (2008) | (3) Staff per million population, Jackson and Roe (2009) | (4) Budget per billion USD of GDP, Jackson and Roe (2009) | (5) Rule of law, Kaufmann <i>et al.</i> (2011–2017) |
|--|---|---|--|---|---|
| Dependent variable: $\ln(\text{Underpricing} + I)$ | | | | | |
| Enforcement measure | –0.012*** (–3.21) | –0.043 (–1.20) | –0.001 (–1.05) | –0.0000014** (–2.49) | –0.041 (–1.54) |
| Controls | Included | Included | Included | Included | Included |
| Industry and year fixed effects | Included | Included | Included | Included | Included |
| Robust standard errors clustered at country-year level | Included | Included | Included | Included | Included |
| N | 1,953 | 1,896 | 1,896 | 1,615 | 1,953 |
| Adj. R ² | 36.7% | 36.3% | 36.3% | 38.8% | 36.1% |
| F-stat. (p-value) | 34.88 (0.000) | 28.20 (0.000) | 28.46 (0.000) | 31.70 (0.000) | 29.23 (0.000) |
| Dependent variable: Underpricing (t-stat.) | | | | | |
| Enforcement measure | –0.022*** (–3.42) | –0.111* (–1.78) | –0.003* (–1.82) | –0.000003*** (–3.07) | –0.050 (–1.04) |
| Controls | Included | Included | Included | Included | Included |
| Industry and year fixed effects | Included | Included | Included | Included | Included |
| Robust standard errors clustered at the country-year level | Included | Included | Included | Included | Included |
| N | 1,953 | 1,896 | 1,896 | 1,615 | 1,953 |
| Adj. R ² | 35.0% | 34.4% | 34.4% | 36.5% | 34.3% |
| F-stat. (p-value) | 32.20 (0.000) | 26.49 (0.000) | 26.35 (0.000) | 32.58 (0.000) | 27.99 (0.000) |

This table reports the results of multivariate regressions with $\ln(\text{Underpricing} + I)$ and Underpricing as the dependent variables, using different measurements for legal enforcement. *, ** and *** indicate significance at the 10%, 5% and 1% levels, using a two-tailed test. Controls include variables at the country level (#Analysts, EQAggr, Common Law, French Law, German Law, and Scandinavian Law, Shareholder Rights Index, EaseSuits, $\ln(\text{Market return} + I)$, $\ln(\text{IPO Activity})$, $\ln(\text{Trad Vol})$, Marketcap/GDP, GDP/capita) and on an IPO level ($\ln(\text{IPO Size})$, Age, Volatility, TopTierUnderwr, Firm Commitment, Equity Carve-out, LockupDays, OfferPriceRev, Foreign IPO). The index values for the Kaufmann *et al.* index are taken from the World Bank, see www.govindicators.org. For definitions of variables, see Table A1.

TABLE 6

RESULTS FROM THE ONE-WAY ANOVA MODEL

| Fixed effect | Coefficient | Standard error | |
|-------------------------------------|--------------------|----------------|-----------------|
| Average underpricing, γ_{00} | 0.116 | 0.022 | |
| Random effect | Variance component | <i>df</i> | <i>p</i> -value |
| Level 2 effect, u_{0j} | 0.0097 | 30 | 0.000 |
| Level 1 effect, ε_{ij} | 0.0804 | | |
| Intraclass correlation (ICC) | 10.75% | | |
| Deviance | 664.97 | | |
| N | 1,953 | | |

This table shows the results of the one-way ANOVA with random effects.

country-level earnings quality, respectively, reduces IPO underpricing, but they do not employ HLM analysis and do not control for accounting enforcement.

The main qualitative results do not change when we run the model with significant predictors only (see column (3)). Column (4) reports the results when we employ random intercept estimation for all variables, that is, without any random slope estimation. Almost all variables that are significant with the Model 2 specification remain significant. *AccEnforce* still exhibits a negative sign at the $p < 1\%$ level.

RESULTS FOR A CHANGE DESIGN ON SUBSTANTIVE CHANGES IN ACCOUNTING ENFORCEMENT

Major Improvements in Accounting Enforcement

As a third approach, we employ a model where we account for substantive changes, that is, substantive improvements in accounting enforcement and a set of country-, industry-, and quarter-year fixed effects. We then compare underpricing before and after the change in accounting enforcement. In many countries, the introduction of mandatory IFRS reporting was accompanied by substantive changes in financial reporting enforcement (Christensen *et al.*, 2013). Based on a survey that Christensen *et al.* (2013) sent out to the authorities responsible for supervising compliance with accounting standards, they identify the quarter-year when a substantive change in accounting enforcement occurred in the respective countries. In order to disentangle the effect of IFRS reporting, they also control for the quarter-years from when IFRS were mandatory. The introduction of mandatory IFRS reporting and substantive changes in accounting enforcement did not usually occur in the same quarter-year, meaning that the relevant impacts can be distinguished (see Appendix A in Christensen *et al.*, 2013). We adopt this design, defining the variable $\Delta AccEnforce$ (IFRS), which takes the value one from the quarter-year from when the accounting enforcement became substantively stricter (where IFRS reporting became mandatory, respectively) and the value zero for the quarter-years before the change.

TABLE 7
RESULTS FROM HLM ANALYSES: DEPENDENT VARIABLE: $LN(UNDERPRICING+I)$, 2011–2017

| Fixed effect | Pred. sign | $\ln(Underpricing + I)$ Coeff. (z-stat.) | | | |
|---------------------------|------------|--|------------------------------------|--|---|
| | | (1) Model 1: Level 1 variables only | (2) Model 2: Level 1 + 2 variables | (3) Model 3: Level 1 + 2 variables, significant variables only | (4) Model 4: Level 1 + 2 variables, random intercept only |
| Level 1 predictors | | | | | |
| $\ln(IPO\ Size)$ | - | -0.020** (-2.24) | -0.013* (-1.73) | -0.013* (-1.72) | -0.018 (-1.03) |
| Age | - | -0.001** (-1.98) | -0.002* (-1.83) | -0.002* (-1.95) | -0.002** (-2.29) |
| Volatility | + | 0.268*** (5.79) | 0.269*** (5.56) | 0.270*** (5.39) | 0.329*** (3.93) |
| <i>TopTierUnderwr</i> | - | 0.001 (0.04) | 0.008 (0.46) | | 0.001 (0.04) |
| <i>Firm Commitment</i> | -/+ | 0.026 (1.13) | -0.014 (-0.67) | | 0.020 (0.63) |
| <i>Equity Carve-out</i> | - | 0.014 (0.94) | 0.012 (0.65) | | 0.008 (0.40) |
| <i>LockupDays</i> | - | -0.00002 (-0.38) | 0.00000 (0.00) | | -0.000056 (-0.82) |
| <i>OfferPriceRev</i> | + | 0.623*** (4.04) | 0.527*** (4.08) | 0.530*** (4.18) | 0.697*** (6.37) |
| <i>Foreign IPO</i> | - | -0.087*** (-3.28) | -0.104** (-2.40) | -0.099** (-2.45) | -0.096** (-2.25) |
| Year dummies | | Included | Included | Included | Included |
| Industry dummies | | Included | Included | Included | Included |
| Level 2 predictors | | | | | |
| <i>AccEnforce</i> | - | | -0.008*** (-4.23) | -0.009*** (-7.50) | -0.012*** (-2.75) |
| <i>#Analysis</i> | - | | -0.006 (-0.57) | | -0.003 (-0.34) |
| <i>EQAggr</i> | - | | 0.003** (2.43) | 0.003** (2.15) | 0.005*** (3.10) |
| <i>Common Law</i> | - | | -0.203*** (-3.87) | -0.192*** (-3.04) | -0.247*** (-2.99) |
| <i>French Law</i> | | | -0.223*** (-4.96) | -0.225*** (-5.14) | -0.205*** (-4.82) |
| <i>German Law</i> | | | -0.181*** (-3.93) | -0.172*** (-2.92) | -0.168** (-2.27) |

(Continues)

TABLE 7
CONTINUED

| Fixed effect | Pred. sign | <i>ln (Underpricing + 1)</i> Coeff. (z-stat.) | | | |
|----------------------------------|------------|---|------------------------------------|--|---|
| | | (1) Model 1: Level 1 variables only | (2) Model 2: Level 1 + 2 variables | (3) Model 3: Level 1 + 2 variables, significant variables only | (4) Model 4: Level 1 + 2 variables, random intercept only |
| <i>Scandinavian Law</i> | | | -0.248*** (-3.65) | -0.255*** (-3.96) | -0.299*** (-3.99) |
| <i>Shareholder Rights Index</i> | - | | -0.032*** (-6.22) | -0.031*** (-6.09) | -0.041*** (-5.25) |
| <i>EaseStatis</i> | + | | 0.004 (0.62) | | 0.011* (1.66) |
| <i>ln (Market Return + 1)</i> | + | | 0.319*** (6.54) | 0.316*** (6.27) | 0.302*** (6.23) |
| <i>ln (IPO Activity)</i> | + | | 0.017 (1.23) | 0.016 (1.30) | 0.018 (1.09) |
| <i>ln (Trad_Vol) -</i> | | | -0.017 (-0.56) | -0.023* (-1.64) | -0.021 (-0.90) |
| <i>GDP/capita</i> | | | 0.0001 (0.16) | 0.000005 (1.02) | 0.0013 (1.28) |
| <i>Marketcap/GDP</i> | | | 0.057 (1.21) | 0.043 (1.39) | 0.051 (1.11) |
| Robust standard errors | | Included | Included | Included | Included |
| N | | 1,953 | 1,953 | 1,953 | 1,953 |
| R ² between countries | | 16.5% | 23.0% | 23.0% | 14.3% |
| R ² within countries | | 10.6% | 15.4% | 15.2% | 2.5% |
| Random effect | | | | | |
| Level 2 effect, u_{0j} | | 0.0037 | 0.0020 | 0.0019 | 0.0000 |
| Variance component | | | | | |
| Level 1 effect, e_{ij} | | 0.0581 | 0.0550 | 0.0551 | 0.0634 |
| Deviance | | 62.93 | -63.86 | -61.16 | 156.39 |

This table reports the results for the HLM analysis. Models 1 to 3 employ random slope estimation for *ln(IPO Size)*, *Volatility*, and *OfferPriceRev*. They were selected according to the likelihood-ratio test following Hox (1995). We employ random intercept estimation for other variables, also because binary variables technically have no random slope. Level 1 variables are grand-mean centered, level 2 variables are not, following Enders and Tofghi (2007). In Model 4, we employ random intercept estimation for all variables. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, using a two-tailed test. For definitions of the variables, see Table A1.

Table 2 shows that 10 out of 31 sample countries improved the level of accounting enforcement in the 2003–2009 period substantively; most changes occurred in 2005. In six of those countries (Chile, Finland, Japan, Norway, Sweden, United Kingdom), IPOs were less underpriced afterwards; in Germany, IPO underpricing barely changed; and in three countries (Hong Kong, Netherlands, Turkey), it increased slightly.¹⁷

We follow Christensen *et al.* (2013) and employ a fixed-effects structure to control for country-, industry-, and quarter-year sources of observed and unobserved heterogeneity in underpricing, thereby mitigating correlated omitted variable and related endogeneity concerns. Since accounting enforcement changes (and IFRS adoption) occur at the country level in specific time periods, statistical inferences are based on two-way clustered standard errors by country and quarter-year. However, since clustering at the quarter-year can be problematic with shorter sample periods, leading to biased standard errors (Petersen, 2009), we also present the results based on one-way clustering at the country level.

The fixed-effects structure reduces the degrees of freedom considerably. Consequently, Christensen *et al.* (2013) employ a limited number of important control variables. We therefore dropped country-level variables such as legal origin, shareholder rights, and economic or financial development, and only control for country-fixed effects and mandatory IFRS reporting. With regard to the firm-specific and IPO-specific variables, we focus on variables that are significant in the pooled OLS and HLM analysis such as IPO size, firm age, stock return volatility, offer price revision, and foreign IPO.

Sample Selection and Descriptive Statistics

Most changes occurred in the 2005–2007 period. We therefore set up a new dataset. To avoid the impact of hot issue markets in 2000–2001, our dataset starts in 2003. For the 32 countries of the pooled OLS and HLM analyses, we consider all available IPOs registered in the Thomson database since 2003 until the end of 2009. Thomson reports the precise date of the IPO, enabling us to assign the respective quarter-year. As with the pooled OLS design, we exclude IPOs with unit offerings, IPOs with subscription rights to incumbent shareholders, IPOs of ‘Real Estate Investment Trusts’, and IPOs of limited partnerships or financial institutions. We are left with 6,662 IPOs.

For 4,592 IPOs, we find exchange share prices in Datastream, but 406 of them announced their first closing price after 10 days or more than three days before it. We delete another 84 IPOs with underpricing less than the 1st

¹⁷ When we consider countries with at least 10 IPOs prior to and at least 10 IPOs after the change in accounting enforcement, average IPO underpricing decreases by 28.8% in Japan (N = 294 prior to the change and N = 396 after the change), by 7.3% in the UK (N = 165; 229) and by 2.7% in Norway (N = 18; 36). Average IPO underpricing increases in Hong Kong by 3.9% (N = 87; 26).

TABLE 8
SAMPLE SELECTION AND SUMMARY STATISTICS FOR CHANGE DESIGN, 2003–2009

| Panel A: Sample selection | | | | | | | | |
|---|--------------|----------------|--------------------------|--------|--------------------------|--------|-------|-----------|
| Selection step | IPOs dropped | Remaining IPOs | Countries | | | | | |
| IPOs from Thomson Reuters New Issues Database for the 32 countries considered in pooled OLS analysis, 2003–2009 excluding: IPOs with unit offerings, IPOs with subscription rights to incumbent shareholders, IPOs of ‘Real Estate Investment Trusts’ or financial institutions, limited partnerships | | 6,662 | 32 | | | | | |
| - Matching with stock price data in Datastream according to ISIN code | 1,070 | 4,592 | 31 | | | | | |
| - First closing prices <3 days before or > 10 days after IPO | 406 | 4,186 | | | | | | |
| - Elimination of IPOs with underpricing <1st or > 99th percentile | 84 | 4,102 | 31 | | | | | |
| - No data available for the <i>OfferPriceRev</i> variable | 1,873 | 2,229 | 30 | | | | | |
| Panel B: Summary statistics | | | | | | | | |
| | N = | Mean | 1 st quartile | Median | 3 rd quartile | Min. | Max. | Std. dev. |
| Underpricing in % <i>ln</i> (<i>Underpricing</i> + 1) | 4,102 | 32.8 | 0.7 | 11.9 | 41.2 | -35.3 | 355.8 | 56.5 |
| $\Delta AccEnforce$ | 4,102 | 0.221 | 0.006 | 0.112 | 0.345 | -0.435 | 1.517 | 0.330 |
| <i>IFRS</i> | 4,102 | 0.193 | 0 | 0 | 0 | 0 | 1 | |
| <i>ln</i> (<i>IPO Size in million USD</i>) | 4,102 | 0.233 | 0 | 0 | 0 | 0 | 1 | |
| <i>Age</i> | 4,102 | 3.051 | 1.862 | 2.984 | 4.366 | -6.908 | 8.901 | 1.933 |
| <i>Volatility</i> | 4,102 | 8.765 | 0.788 | 5.185 | 11.04 | 0 | 98.56 | 11.70 |
| <i>OfferPriceRev</i> | 4,102 | 0.041 | 0.023 | 0.036 | 0.053 | 0.000 | 0.388 | 0.027 |
| <i>Foreign IPO</i> | 2,233 | 0.008 | -0.029 | 0 | 0.064 | -0.990 | 1 | 0.128 |
| | 4,102 | 0.082 | 0 | 0 | 0 | 0 | 1 | |

This table shows the data selection and descriptive statistics for the change design. For definitions of the variables, see Table A1. Underpricing is trimmed at the 1st and 99th percentiles.

TABLE 9

ANALYSIS OF SUBSTANTIVE IMPROVEMENTS IN ACCOUNTING ENFORCEMENT,
DEPENDENT VARIABLE: LN (UNDERPRICING + 1), POOLED OLS, 2003–2009

| | Pred. sign | ln (Underpricing +1) Coeff. (t-stat.) | | | |
|--|------------|---------------------------------------|----------------------|----------------------|----------------------|
| | | (1) | (2) | (3) | (4) |
| <i>ΔAccEnforce</i> | – | –0.103** (–2.16) | –0.118** (–2.49) | –0.118*** (–3.80) | –0.118** (–2.86) |
| <i>IFRS</i> | ? | 0.064 (1.32) | 0.089 (1.76)* | 0.089 (1.60) | 0.089 (1.92) |
| <i>ln (IPO Size)</i> | – | | –0.027* (–1.74) | –0.027* (–1.71) | –0.027 (–1.43) |
| <i>Age</i> | – | | –0.004** (–2.58) | –0.004** (–2.57) | –0.004** (–2.90) |
| <i>Volatility</i> | + | | –0.523*** (–4.43) | –0.523*** (–4.87) | –0.523*** (–4.70) |
| <i>OfferPriceRev</i> | + | | 0.444*** (3.91) | 0.444*** (3.91) | 0.444*** (4.04) |
| <i>Foreign IPO</i> | – | | –0.256** (–2.51) | –0.256** (–2.47) | –0.256* (–2.72) |
| Constant | | 0.226*** (–29.36) | 0.401*** (5.99) | 0.401*** (5.72) | 0.401*** (4.86) |
| Robust standard errors clustered at the country level | | Included | Included | Included | -- |
| Robust standard errors clustered at the quarter-year level | | Included | Included | -- | Included |
| Robust standard errors clustered at the region level | | -- | -- | -- | Included |
| Industry fixed effects | | Included | Included | Included | Included |
| Country fixed effects | | Included | Included | Included | Included |
| Quarter-year fixed effects | | Included | Included | Included | Included |
| N = | | 4,102 | 2,229 | 2,229 | 2,229 |
| Adj. R ² | | 24.2% | 38.7% | 38.7% | 38.7% |

Table 9 reports the results of an accounting enforcement change design with *ln (Underpricing + 1)* as the dependent variable. *ΔAccEnforce (IFRS)* takes the value one from the quarter in which a substantive change in accounting enforcement took effect, for example, the initiation of a proactive review process of financial statement information by the local supervisory authority (when IFRS reporting became mandatory, respectively). *ΔAccEnforce* takes the value zero for observations before the substantive change occurred. Region-fixed effects are based on the following regions: Latin America, North America, Europe, APAC, and MEA. For more details, see Christensen *et al.* (2013). *, **, and *** indicate significance at the 10%, 5%, and 1% levels, using a two-tailed test. For definitions of variables, see Table A1.

percentile and more than the 99th percentile to mitigate the effects of extreme outliers and possible data errors. Finally, we lose observations because data availability for *OfferPriceRev* is limited. Table 8 provides an overview of the sample selection.

Table 8 shows that in the 2003–2009 period, compared to the sample used in the pooled OLS and HLM analyses from 2011 to 2017, IPO size is on average smaller and firms are younger (8.8 versus 11.5 years). Mean IPO underpricing is higher (32.6% versus 23.9%), as is its standard deviation. 19.3% of observations relate to substantive accounting enforcement improvements, and 23.3% to mandatory IFRS reporting.

Results of the Change Design

Column (1) of Table 9 only considers the $\Delta AccEnforce$ and *IFRS* variables. $\Delta AccEnforce$ is significant at the 5% level, indicating that, after controlling for quarter-year, country, and industry fixed effects, IPOs were less underpriced after a substantive improvement of accounting enforcement. The introduction of mandatory IFRS reporting did not decrease IPO underpricing. The result on $\Delta AccEnforce$ is robust when we include significant IPO-specific and firm-specific variables (column (2)) and when we employ one-way country-level clustering at the country level or clustering at the quarter-year and regional level (see columns (3) and (4), respectively). Consistent with the pooled OLS and HLM analyses, the variables *OfferPriceRev*, *Volatility*, *Foreign IPO*, *Firm Age*, and *IPO Size* are significantly associated with the level of underpricing.

The results of the change design support the claim that changes in accounting enforcement might affect IPO underpricing, while the pooled OLS and HLM analysis identified a mere association. Moreover, we find a significant relation between accounting enforcement and IPO underpricing for two different time periods, 2003–2009 and 2011–2017.

SUMMARY

We argue that stricter accounting enforcement restricts both insiders' opportunistic behaviour and incentives to manage earnings prior to and after an IPO, which leads to both lower information asymmetry and moderated agency problems. This decreases investors' uncertainty about realizing a sufficient rate of return, which in turn justifies a lower level of underpricing.

Based on a sample of up to 2,503 IPOs in 32 countries in the years 2011–2017, using both a pooled OLS design and a HLM approach, we find robust and significant evidence that IPOs are less underpriced in countries with stricter accounting enforcement even when we control for legal origin, shareholder rights, and litigation risk. Furthermore, a change design for the 2003–2009 period indicates that substantive changes in accounting enforcement might reduce IPO underpricing significantly.

Our findings suggest that improvements in accounting enforcement may decrease the cost of going public. Since an IPO is an attractive exit strategy of venture capitalist firms and other private equity investors, and the perspective of an IPO drives the decision to invest in innovative firms in the first place, stricter accounting enforcement might enhance innovative activity in an economy. Our study contributes to the literature in several ways. First, it contributes to the relatively small financial accounting literature on IPOs and the underpricing literature on corporate finance by highlighting the role of accounting enforcement for IPO underpricing. Second, the paper sheds light on country-level differences in underpricing by using a cross-country setting and a dataset from a sample period after the financial crisis and after various improvements in enforcement regimes around the globe were implemented. Furthermore, to the best of our knowledge,

this is one of the few studies in accounting research applying a HLM design to account for the nested structure of observations within countries.

Our analysis is subject to a number of limitations. Since we focus on the country-level financial reporting environment and are constrained by data limitations, we ignore individual IPO firms' earnings quality before going public. Furthermore, despite employing a change design with a set of fixed effects, we are unable to prove a causal link between accounting enforcement and underpricing. Even though we control for many variables, we still cannot rule out the possibility that correlated omitted variables drive the association between accounting enforcement and underpricing. Finally, the Brown *et al.* (2014) index refers to the accounting enforcement environment in 2008, while our sample period covers the years 2011–2017. An updated index would be desirable, but this wish also holds for many measures on legal enforcement.

Future research may be better able to address those issues and to answer the regulatory question of whether further improvements in accounting enforcement are warranted to reduce underpricing. An interesting question is to *what extent* improvements in accounting enforcement would result in lower levels of underpricing. Recent theoretical research by Ewert and Wagenhofer (2019) suggests that enforcement levels beyond an 'optimal' level may cause overly strong negative side effects, such as impaired auditor incentives and an overall decrease in financial reporting quality.

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APPENDIX 1

MEASUREMENT OF EARNINGS QUALITY

As Dechow *et al.* (2010) note, higher earnings quality increases the informativeness of earnings for investor decisions. Evidence indicates that earnings quality is impaired by the firm's intention and discretion to manage earnings (Healy and Wahlen, 1999). Following this line of argument, earnings quality decreases with more EM.¹⁸

Since there are different ways to measure earnings management (EM), we used a composite scoring method based on four measures, as suggested by Leuz *et al.* (2003). The four EM measures include two proxies for earnings smoothing, one proxy for discretionary accruals, and the propensity to avoid reporting small losses. We obtained the data from the Datastream Worldscope Fundamentals Database.

¹⁸ However, EM may sometimes also improve the informativeness of earnings, for example, if it is used to properly assign expenses and income to their economic use in the respective periods (Healy and Wahlen, 1999).

We measured each EM proxy based on the financial data of all publicly listed firms in Datastream in the last five years ($t-4$ to t) in the respective country. If there was a time series of less than five years, we also took four or three years. If the time series was shorter, we omitted the observation. For each EM proxy, we took the average over all listed firms as well as over the five years. Thus, we obtained a proxy for EM which reflects the average level of EM and, thus, average earnings quality in the respective country at that point of time (Boulton *et al.*, 2011).

The first measure of EM refers to the extent of earnings smoothing measured by the median ratio in country j of the firm-level standard deviations of operating earnings over standard deviations of the cash flow from operations, both scaled by lagged total assets (Leuz *et al.*, 2003). If this ratio is one, the volatility of operating earnings equals the volatility of cash from operations, suggesting that, on the country average, there is no earnings smoothing. If this ratio is zero, all the volatility of cash from operations is offset by EM. Thus, higher median values of this ratio indicate higher earnings quality (EQ1).

We determined cash flow from operations as the difference between operating earnings and accruals. Accruals are defined according to Dechow *et al.* (1995):

$$\text{Acc}_t = \Delta\text{CA}_t - \Delta\text{CL}_t - \Delta\text{Cash}_t + \Delta\text{STD}_t - \text{Dep}_t \quad (5)$$

with ΔCA_t : change in current assets from $t-1$ to t ; ΔCL_t : change in current liabilities from $t-1$ to t ; ΔCash_t : change in cash and cash equivalents from $t-1$ to t ; ΔSTD_t : change in short-term liabilities from $t-1$ to t ; and Dep_t : depreciation expenses in period t .

The second proxy (EQ2) refers to earnings smoothing as well, as measured by the cross-sectional rank correlation in country j in year t between the change in accruals and the change in cash flow from operations, both scaled by lagged total assets (see Leuz *et al.*, 2003). All publicly listed firms in year t for each country were considered. Higher correlation values correspond to higher earnings quality. For instance, if the correlation were -1 , a more negative change in cash flows would be 'offset' by a more positive change in accruals.

The third proxy for earnings quality (EQ3) is the extent of absolute accruals, which we define as the median in country j and year t of the absolute differences between operating earnings and cash flow from operations, scaled by cash flow from operations. With higher absolute accruals, earnings and cash flows differ more, indicating a higher extent of EM. Similar to EQ2, we calculated each country's median value of the absolute value of firms' accruals, scaled by the absolute value of cash flow from operations (see Leuz *et al.*, 2003; Boulton *et al.*, 2011). We transformed this ratio by multiplying its value by -1 , such that higher values correspond to less EM and higher earnings quality.

EQ4 measures the propensity of a country's listed firms to avoid reporting small losses. EM usually allows the transformation of small negative cash flows from

operations into slightly positive earnings (Leuz *et al.*, 2003). We measured loss avoidance behaviour by the ratio of the number of firms reporting small profits over the sum of the number of firms reporting small losses or small profits (Burgstahler and Dichev, 1997). The term ‘small profit’ is defined as a ratio of net income to lagged total assets in the interval $[0.00; 0.01]$; small losses imply a ratio of net income to lagged total assets in the interval $[-0.01; 0)$ (Leuz *et al.*, 2003). A higher ratio shows a higher propensity for loss avoidance. We therefore multiplied this ratio by -1 , such that higher values correspond to higher earnings quality.

Finally, we defined a composite score of the four earnings quality measures for each country for each of the four earnings quality measures, and calculated the average ranking, *EQAggr* (Leuz *et al.*, 2003). A higher average ranking thus indicates higher earnings quality. The benefit of this aggregate measure is that it covers different aspects of earnings quality and tends to reduce measurement errors related to one EQ measure or the influence of outliers within countries with regard to one measure.

APPENDIX 2
DEFINITIONS OF VARIABLES

TABLE A1
DEFINITIONS OF VARIABLES

| Variable | Definition | Measurement | Source |
|--|--|--|--|
| <i>Underpricing</i> <i>AccEnforce</i> | Stock return on first trading day | $\frac{\text{Closing stock price on first day of trading}_i - 1}{\text{Offering price}_i}$ Score on country-level accounting enforcement in 2008 | Brown <i>et al.</i> (2014) Christensen <i>et al.</i> (2013) |
| $\Delta AccEnforce$ | | Only with change design in Table 9: dummy variable with the value one from the quarter-year from when the accounting enforcement became substantively stricter, and the value zero for the quarter-years before the change | |
| Country-level control variables <i>#Analysts</i> | Average number of sell-side financial analysts that forecast earnings per share (EPS), per listed firm in country <i>j</i> | $\frac{\text{Number of EPS Forecasts}_{jt}}{\text{Number of listed firms}_{jt}}$ | I / B / E / S |
| <i>EQAggr</i> | Composite score based on the mean rankings using four earnings quality measures* | Average of the four ranks with regard to the earnings quality measures EQ1, EQ2, EQ3 and EQ4 | Datastream and Leuz <i>et al.</i> (2003) |
| <i>Common Law</i> | Dummy variables indicating origins of the legal system | Dummy variable with a value of one if common law, and zero otherwise | LaPorta <i>et al.</i> (2008) |
| <i>French Law</i> | | Dummy variable with a value of one if of French legal origin, and zero otherwise | LaPorta <i>et al.</i> (2008) |
| <i>German Law</i> | | Dummy variable with a value of one if of German legal origin, and zero otherwise | LaPorta <i>et al.</i> (2008) |
| <i>Scandinavian Law</i> | | Dummy variable with a value of one if of Scandinavian legal origin, and zero otherwise | LaPorta <i>et al.</i> (2008) |

(Continues)

TABLE A1
CONTINUED

| Variable | Definition | Measurement | Source |
|---|---|--|---|
| <i>Shareholder Rights Index</i> | Level of investor protection based on investors' decision-making and oversight rights and by the transparency on corporate governance** | Index value of shareholder rights index for country <i>j</i> in year <i>t</i> | World Bank, <i>Doing Business</i> ¹⁹ database, based on Djankov <i>et al.</i> (2008) |
| <i>EaseSuits</i> | Index indicating shareholder litigation rights | Index value of ease of shareholder suits index for country <i>j</i> in year <i>t</i> | World Bank, <i>Doing Business</i> database Datastream |
| <i>Market Return</i> | Market return in country <i>j</i> in the 90 trading days before IPO + 1 | $\ln \left(\frac{P_{t-1}(\text{market}_j)}{P_{t-91}(\text{market}_j)} \right)$ | Thomson Reuters New Issues Database Beck <i>et al.</i> (2000) |
| <i>IPO Activity</i> | Indicates the relevance of IPOs in country <i>j</i> and year <i>t</i> | $\ln \left(\frac{\text{Number of IPOs}_{j,t}}{\text{Number of listed firms}_{j,t}} \right)$ | |
| <i>Trading Volume</i> | Trading volume in country <i>j</i> and year <i>t</i> over average market capitalization | $\ln \left(\frac{\text{Market value of traded securities}_{j,t}}{\text{market capitalization}_{j,t} \text{ beginning } \text{market cap}_{j,t} \text{ end}} \right)$ | |
| <i>Marketcap/GDP</i> <i>GDP/capita</i> | Financial market development Country's economic development | Stock market capitalization / GDP in % Gross domestic product in US\$1,000 per capita in constant 2005 US dollars ²⁰ | World Bank's Global Financial Development Database |
| <i>IFRS</i> | | Only with change design in Table 9: dummy variable with value one from the quarter-year when IFRS reporting became mandatory and the value zero for the quarter-years before | |

(Continues)

TABLE A1
CONTINUED

| Variable | Definition | Measurement | Source |
|---|--|---|-------------------------------------|
| IPO- and firm-specific control variables | | | |
| <i>IPO Size</i> | Proceeds from IPO in 2010 million US dollars, adjusted by purchasing power index | $\frac{(\text{Offering price in 2010 US\$} \times \#\text{Issued shares}) \times VPI_{t,2010}}{VPI_{t,r}}$ | Thomson Reuters New Issues Database |
| <i>Age</i> | Maturity of the firm going public | Difference in years between the date of going public and the date of the firm's foundation | Thomson Reuters New Issues Database |
| <i>Volatility</i> | Level of return volatility in the first 30 trading days after IPO according to the standard deviation of daily returns | $\sigma_t(\text{daily return}_{t,r,1,0,31})$ | Thomson Reuters New Issues Database |
| <i>TopTierUnderwr</i> | Reputation of underwriter | Dummy variable with a value of one if the underwriter belongs to the Top 25 banks with the highest market share according to the SDC Global League Table in the IPO year, and zero otherwise. If no underwriter is mentioned, we assume a value of zero | Thomson Reuters New Issues Database |
| <i>Firm Commitment</i> | Commitment of underwriter bank in IPO | Dummy variable with the value one if underwriter guaranteed to buy issued stock at a pre-determined price, and zero if not | Thomson Reuters New Issues Database |
| <i>Equity Carve-out</i> | Dummy variable indicating whether parent company remains a major shareholder after the IPO | Dummy variable with the value one if equity carve-out, and zero if not | Thomson Reuters New Issues Database |
| <i>LockupDays</i> | Lockup length for insider sales | Number of days of lockup after IPO. If there were different lockup types (e.g., management lockup, selling shareholder lockup), we used the shortest period. If no information was provided, we assumed a lockup period of zero days | Thomson Reuters New Issues Database |

(Continues)

TABLE A1
CONTINUED

| Variable | Definition | Measurement | Source |
|-----------------------|--|---|-------------------------------------|
| <i>OfferPrice Rev</i> | Difference between offer price and filing range | Percentage deviation of the offer price from the middle of the latest available filing range | Thomson Reuters New Issues Database |
| <i>Foreign IPO</i> | | Dummy variable with a value of one if the IPO took place in a foreign country, and zero otherwise | Thomson Reuters New Issues Database |
| | <i>with country j, IPO firm i and year/day t</i> | | |

*The earnings quality measures that enter the *EQAggr* composite score are measured as follows (Leuz *et al.*, 2003): EQ1 (Earnings smoothing): Median ratio of firm-level standard deviations of operating earnings over firm-level standard deviations of cash flow from operations, EQ2 (Earnings smoothing): Rank correlation in country *j* in year *t* between change in accruals and change in cash flow from operations, both scaled by lagged total assets, EQ3 (Extent of absolute accruals): Country-year median of absolute differences between firm-level operating earnings and cash flow from operations scaled by cash flow from operations, EQ4 (Propensity to avoid reporting small losses): Number of firms in country *j* with $0 \leq ROA \leq 1\%$ over number of firms with $-1\% \leq ROA \leq 1\%$.

**The shareholder rights index rates shareholders' rights and their role in major decisions, governance safeguards protecting shareholders from undue board control/entrenchment, and corporate transparency on significant owners, executive pay, annual meetings, and audits. See <http://www.doingbusiness.org/en/methodology/protecting-minority-investors>.