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An international study of internal audit function quality

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We investigate organisational and environmental factors that influence firms' incentives to develop high-quality internal audit functions (IAFs) by using a unique international sample formed by matching proprietary data from a global internal auditor survey with public data obtained from Worldscope. Concerning organisational factors, we find that a positive relationship exists between IAF quality and firm complexity and confirm that complex firms have a higher demand for monitoring and advising and, therefore, a greater need for formal controls. In addition, IAF quality is positively related to board monitoring and audit committee diligence but negatively associated with CEO power, which suggests that IAF quality is influenced by other key players in corporate governance. Regarding environmental factors, we document that IAF quality is positively associated with industry competition, which implies that a firm's incentive for a high-quality IAF is enhanced when confronted with greater environmental uncertainty. Furthermore, IAF quality has a significantly positive relationship with our self-constructed index of IAF requirements included in national corporate governance codes, which indicates that strong home-country corporate governance codes play a role in fostering IAF development.

Keywords: internal audit function; internal audit quality; corporate governance; CBOK 2010
JEL Classification: M41; M42

1. Introduction

Recently, internal audit functions (IAFs) have gained increasing prevalence and enhanced status in companies. Such developments have been prompted by worldwide regulatory pressure for improved corporate governance owing to major financial scandals in the early 2000s. In the US, the New York Stock Exchange (NYSE) has mandated that listed companies formalise their IAFs since 2004, and the NASDAQ has considered adopting a similar rule (Securities and Exchange Commission (SEC) 2013). Outside the US, IAFs remain largely voluntary, but they are recommended as a 'best practice' for corporate governance in numerous countries (e.g. the UK, Denmark, Switzerland, and Sweden) and have become a common feature of

medium to large companies worldwide (Mennicken and Power 2013). Evidence from prior studies shows that a high-quality IAF may have various benefits for firms, for instance, by improving internal controls, constraining earnings manipulation and fraud, reducing audit costs, and enhancing audit efficiency (Felix et al. 2001, Prawitt et al. 2009, Lin et al. 2011, Messier et al. 2011, Ege 2015, Pizzini et al. 2015).

Because of the increasing prevalence and importance of IAFs and increasing regulatory attention on IAFs to enhance the quality of corporate governance worldwide (National Association of Corporate Directors (NACD) 1999, SEC 2002, Gramling et al. 2004, SEC 2004, Glover et al. 2008), there is a growing need to understand IAF quality in the current corporate governance context (Sarens 2009). Do variations occur in IAF quality? What are the internal and external factors that incentivise firms to establish high-quality IAFs? Given the complexity of corporate governance structures, what are the relationships between IAFs and other parties in the corporate governance mosaic? These questions are the impetus of our study. We extend prior research by exploring organisational and environmental factors that are associated with high-quality IAFs in an international context. Despite the significant increase in the number of studies on IAFs, most studies have been limited to single-country settings. An international setting offers more diverse levels of internal organisational structures, additional levels of operational complexity, and various external environmental conditions. A better understanding of the factors that influence firms' incentives to develop high-quality IAFs in an international setting not only adds to our knowledge of IAFs but also facilitates awareness of governance practices worldwide.

We rely on agency theory (Jensen and Meckling 1976) and contingency theory (Gordon and Miller 1976, Chapman 1997, Chenhall 2003) to identify factors that potentially influence firms' incentives to establish high-quality IAFs. Agency theory posits that governance mechanisms and management controls are established to alleviate agency costs and respond to a firm's demand for increased monitoring and advising (Jensen and Meckling 1976, Fama and Jensen 1983). Contingency theory states that because governance mechanisms and controls are costly, a firm will be selective in designing and implementing the governance mechanisms and controls in light of the contextual variables that affect the firm (Gordon and Miller 1976). To the extent that an IAF is one component of a firm's sophisticated governance and control system (Khandwalla 1972, Institute of Internal Auditors (IIA) 1999, Gramling et al. 2004), we hypothesise that IAF quality is influenced by organisational factors that affect a firm's demand for monitoring and advising and by environmental factors to which a firm must adapt.

To operationalise our empirical analysis, we match proprietary data from an IIA global internal auditor survey, the 2010 Common Body of Knowledge (CBOK),[1] with public data obtained from Worldscope. We refer to the International Standards for the Professional Practice of Internal Auditing (IIA 2012) and prior studies[2] in order to develop our IAF quality measure, which incorporates four desirable IAF attributes and practices: competence, independence, fieldwork practices, and a quality assurance and improvement programme.

Our IAF quality measure is associated with a variety of organisational factors. Specifically, IAF quality is positively associated with firm complexity, as larger and more complex firms have increased demand for monitoring and advising, which in turn leads to a stronger emphasis on formal controls and superior governance mechanisms (Fama and Jensen 1983, Chenhall 2003, Dey 2008). Furthermore, IAF quality is positively related to board monitoring incentives and audit committee diligence. These results imply that high IAF quality helps directors, and particularly audit committee members, ensure that their monitoring and advising roles are effective. They also contribute to the recent debate of whether certain governance mechanisms are complementary or substitutive (Gramling et al. 2004, Sarens 2009, Armstrong et al. 2010, Sarens 2014, Misangyi and Acharya 2014). Finally, IAF quality is negatively related to CEO power, which implies that more entrenched CEOs prefer less scrutiny from IAFs. Given that it is not uncommon for

internal auditors to face conflicts when serving two masters (Hoos et al. 2014), the results also suggest that IAF characteristics and practices are likely affected by the negotiation and bargaining between directors and top managers.

In addition to organisational factors, we document that IAF quality is associated with certain environmental factors. Specifically, IAF quality has a significant positive association with industry competition, which suggests that a high-quality IAF is more valuable for firms that operate in a market environment with greater uncertainty, as independent assurance and consulting services provided by internal auditors improve the effectiveness of internal controls, risk management, and governance and are critical for firms' survival and growth in harsh market conditions.

Expanding environmental factors to home-country institutional characteristics, we construct an index that measures IAF requirements in countries' corporate governance codes. We find that firms that operate in countries with corporate governance codes that include stricter and more detailed IAF requirements have higher quality IAFs. The results of this study are robust to the inclusion of other well-documented institutional factors, such as countries' financial market developments and the overall quality of security laws. These results are important for the regulatory community and highlight the importance of national corporate governance codes in fostering the development of high-quality IAFs. The results are particularly notable because prior studies have documented that a high-quality IAF results in various benefits to firms, such as improvements in internal controls, enhanced financial reporting quality, and reduced external audit costs (e.g. Schneider and Wilner 1990, Felix et al. 2001, Prawitt et al. 2009, Lin et al. 2011, Messier et al. 2011, Ege 2015). Furthermore, our unique self-constructed national index, which captures the intensity of IAF requirements that are contained in corporate governance codes for each country, may be useful for scholars who need to control for country-level differences in an institutional accounting or auditing setting.

Our results should be interpreted as correlations rather than causal relationships. However, even with this caveat in mind, our findings add significant knowledge to the existing literature on IAFs and provide a more comprehensive understanding regarding the factors that influence firms in developing a high-quality IAF in an international context. Our findings are informative about the current state of IAFs and should be of interest to a broad audience including accounting and business scholars, regulators, standard setters, and internal audit professionals.

2. Prior studies and hypothesis development

2.1. *Prior studies and theoretical underpinning*

The IIA defines an internal audit as:

> an independent, objective assurance and consulting activity designed to add value and improve an organization's operation. It helps an organization accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of risk management, control and governance processes. (IIA 1999)

In line with this definition, an IAF is generally considered to be one component of a sophisticated control system (Khandwalla 1972) that is designed to address agency problems. An IAF is expected to provide both assurance and advisory services (IIA 1999) and serves as a valuable resource for parties that are responsible for monitoring, maintaining, and enhancing the overall corporate governance (Gramling et al. 2004). As stated by Walsh (1963):

> the widening gap between management and action has made it necessary to develop a series of controls by means of which the business may be administrated efficiently [… ,] the internal auditors provide on-the-scene appraisal of each form of control [, and] there is no substitute for this activity.

The importance of IAFs has been demonstrated in several prior studies. For example, an effective IAF enhances the quality of internal controls for financial reporting (Lin et al. 2011), constrains earnings management (Schneider and Wilner 1990, Prawitt et al. 2009), and prevents fraud (Ege 2015). A weak IAF represents a weak internal control environment and is an indicator of financial reporting irregularities (Brody et al. 1998). In addition, prior studies that investigate the relationship between internal audits and external audits reveal that an IAF can be a determinant of external audit fees (e.g. Felix et al. 2001, Hay et al. 2006, Messier et al. 2011, Prawitt et al. 2011, Abbott et al. 2012, Bame-Aldred et al. 2013) and that a high-quality IAF is associated with a shorter external audit delay (Pizzini et al. 2015).

Worldwide, the number of studies on IAFs has increased considerably in recent years;[3] however, why certain firms develop a relatively high-quality IAF and others do not is not well understood. A few studies have found that the existence, size, and budget of an IAF are influenced by a variety of firm-level characteristics, such as firm size, industry, profitability, and audit committee characteristics (Wallace and Kreutzfeldt 1991, Carcello et al. 2005a, Barua et al. 2010). In this study, we align with prior studies and consider an IAF as one component of the governance and control system and rely on agency theory and contingency theory to identify organisational and environmental factors that influence firms' incentives to develop a high-quality IAF. Scholars have suggested combining agency theory and contingency theory in organisational studies because these two theories complement each other and provide a richer theoretical foundation to understand the design of organisational controls (Chenhall 2003).

According to agency theory, a firm is organised in a manner that corresponds to the scope and complexity its production processes (Fama and Jensen 1983); therefore, governance mechanisms and controls are implemented to meet the firm's demand for monitoring and advisory services. The IAF, as a component of the governance and control system, is likely to be affected by the firm's internal organisational structure and other governance mechanisms, which influences the monitoring and advising needs of the firm. Agency theory suggests that an IAF is developed to mitigate agency costs inside the firm, and contingency theory demonstrates that the design of organisational governance and control mechanisms, such as the IAF, depends on contextual settings, which are both internal and external to the firm. Based on the premise that a firm must adapt to the characteristics of its own organisational context and the environmental context to be effective and survive in the market, contingency theory argues that firms are selective in designing governance and control systems and that they respond to contingent factors at the organisational and environmental level (Khandwalla 1972, Chenhall and Morris1986, Chenhall 2003). Combining these two theories, we posit that IAF quality is associated with the characteristics of firms' both internal and external environment. We discuss the various factors in detail below.

2.2. *Organisational factors associated with IAF quality*

Given the importance of the operating environment in determining a firm's demand for monitoring and advisory services (e.g. Fama and Jensen 1983, Klein 1998, Dey 2008) and given the range of different corporate governance mechanisms available to address such demand (e.g. Bushman et al. 2004, Armstrong et al. 2010), we focus on two sets of organisational factors in our analysis: (1) firm complexity and (2) corporate governance mechanisms which are closely related to the IAF. Concerning the latter, we examine the effects of the board of directors, audit committee, and top management on IAF quality. We focus on these three governance mechanisms for the following reasons. First, the IAF serves two masters: the board of directors and top management (IIA 2003, Hoos et al. 2014). Second, the audit committee is responsible for direct oversight of the IAF (Gramling et al. 2004, Brennan and Kirwan 2015). Third, the IIA published a corporate governance framework that establishes the audit committee, top management, external audits, and

internal audits as the four corporate governance cornerstones (Prawitt et al. 2009). Gramling et al. (2004) claim that these corporate governance cornerstones influence each other; therefore, they suggest that additional studies should be conducted to examine the relationships between IAFs and the other corporate governance cornerstones.[4]

2.2.1. *Firm complexity*

Complex firms have greater agency conflicts; therefore, they have a greater demand for monitoring (Dey 2008) and a greater need for advisory services (Klein 1998). Owing to the increased monitoring and advisory needs caused by firm complexity, a firm must establish mechanisms to meet this monitoring and advisory demand. For example, prior studies have shown that firm size and complexity explain cross-sectional variations in the design of controls (Merchant and Simons 1986, Davila 2005).

A high-quality IAF is one of the control mechanisms that firms develop to meet increased monitoring and advisory needs. The IAF is a governance and control mechanism specifically designed to facilitate information gathering, verification, and transmission. The unique position of the IAF provides internal auditors with many opportunities to gather information from a firm's various departments. The internal auditors provide information and independent assurance that can be used by managers to better evaluate resource needs and risks and make better business decisions. In addition, the audit committee and board of directors can use this information to better oversee managers' performance and offer advice for strategic decisions. As a firm becomes more complex, these information and assurance roles played by the IAF should become increasingly important and lead to a greater emphasis on IAF quality. For example, in line with this argument, prior studies document that firm complexity is positively associated with IAF budget (Carcello et al. 2005a) and greater investments in IAFs likely lead to higher quality IAFs (Prawitt et al. 2009). Therefore, we propose the following hypothesis:

H1: IAF quality is positively associated with firm complexity.

2.2.2. *Board monitoring and advising incentives*

The board of directors is a major stakeholder to which an IAF provides assurance services. Therefore, IAF quality should be developed in response to a service demand from the board of directors, which in turn depends on the directors' incentives for monitoring. A high-quality IAF is generally beneficial to directors because it provides relevant information for overseeing management behaviour. Furthermore, high-quality information that is provided by a high-quality IAF is valuable for directors who seek to align their expertise with the firm's specific environment and thereby optimise their ability to contribute the firm's strategy development. Accordingly, a board of directors that is characterised with a high incentive for monitoring and advising is more likely to advocate for increased IAF quality, which suggests a complementary relationship.

Conversely, a counter-argument is that directors who are 'intensive monitors' may have less need for assistance from IAFs because these directors are already extensively involved in the monitoring process and are therefore more likely to proactively obtain the information they need from various alternative information channels. For example, directors with a strong incentive to monitor and advise have more extensive interactions with department managers and obtain information directly; directors may also hire external experts if advisory services are needed for specific issues, such as risk assessment associated with entering a new market (PricewaterhouseCoopers 2016). Hence, a substitutive effect can lead to a reduced incentive for directors to increase IAF quality.

Based on the arguments provided above, the nature of the association between board monitoring incentives and IAF quality remains an unanswered empirical question. Accordingly, we propose the following non-directional hypothesis:

H2: IAF quality is associated with board monitoring and advising incentives.

2.2.3. *Audit committee diligence*

Audit committees are responsible for direct oversight of IAFs. Several studies have investigated the relationship between audit committee characteristics and the size and budget of IAFs (e.g. Barua et al. 2010, Anderson et al. 2012). Because the audit committee is directly responsible for oversight of the IAF, the IAF's attributes and practices and, therefore, the IAF quality should be influenced by the audit committee characteristics, particularly the diligence of the audit committee.[5]

A diligent audit committee is associated with a high-quality IAF for three reasons. First, a diligent audit committee has more frequent interactions with the internal auditors and is more likely to develop a close relationship with the IAF. According to Cohen et al. (2010), a close relationship between the audit committee and the IAF improves the quality and governance capabilities of both parties. Second, more diligent audit committees review IAF performance in a timelier manner, which in turn facilitates quicker discovery (Hoitash et al. 2009) and the remediation of deficiencies in the IAF. Third, diligent audit committee members have stronger incentives to establish a high-quality IAF in order to obtain timely and high-quality information to fulfil their own monitoring responsibilities (DeZoort et al. 2002).

However, similar to the alternative argument regarding board monitoring incentives, a diligent audit committee may demand less help from the IAF and may therefore be less likely to develop a high-quality IAF. A diligent audit committee has more frequent and effective communications with the Chief Financial Officer (CFO), accounting department staff, and external auditors. To the extent that diligent audit committee members are more likely to acquire information and assistance from these alternative sources, their need for assistance from the IAF is reduced, which also reduces their incentive to increase IAF quality. Prior studies have shown that the relationship between audit committee monitoring and the IAF may be substitutive in certain circumstances. For example, Barua et al. (2010) find that an audit committee's auditing expertise is negatively associated with investments in an IAF. Because of the conflicting arguments discussed above, we propose the following non-directional hypothesis:

H3: IAF quality is associated with audit committee diligence.

2.2.4. *CEO power*

Support from top management is important for the development of an IAF (Roussy 2013). However, CEOs have conflicting incentives for establishing a high-quality IAF because of the dual role played by the IAF. A CEO relies on the assurance and advisory role of the IAF, particularly regarding internal controls and risk management, which provides an incentive to establish a high-quality IAF. Conversely, the monitoring role of an IAF implies that a high-quality IAF can potentially constrain the CEO's ability to obtain personal gain, as a high-quality IAF is more likely to disclose a CEO's opportunistic behaviour to the board. For example, Prawitt et al. (2009) and Ege (2015) document that high-quality IAFs deter earnings manipulation and accounting fraud. Consequently, a CEO's influence on IAF quality largely depends on the CEO's need for advisory services from the IAF and the CEO's incentive and ability to resist monitoring from the IAF.

We examine the influence of one specific CEO characteristic, that is, CEO power, on IAF quality.[6] Prior studies regarding CEO entrenchment demonstrate that CEOs with significant power are entrenched in their position and are likely to strategically utilise power to pursue personal interests, even at the cost of shareholder value and firms' public reputation (Bebchuk et al. 2002, Abernethy et al. 2015, Van Essen et al. 2015). Hermalin and Weisbach (1998) argue that a firm's governance structure results from a bargaining process among various corporate stakeholders, particularly between the CEO and the board of directors, and that it is contingent on their incentives and power. Powerful CEOs are more likely to bargain with the board to reduce potential monitoring because of their stronger incentives to gain personal interests and their ability to influence the board owing to their perceived superior ability (Hermalin and Weisbach 1998). Because an IAF plays an important role in supporting board monitoring, bargaining to constrain IAF capacity allows powerful CEOs to resist or avoid monitoring.

Although the entrenchment theory predicts that, as CEOs become more powerful, their incentives for a high-quality IAF diminishes, directors could increase monitoring and hence demand a higher quality IAF that helps to prevent and deter the entrenched CEOs' distortive behaviours (Laux and Laux, 2009). To the extent that the IAF serves two masters, the direction of the relation between CEO power and IAF quality remains an empirical issue. Therefore, we make the following non-directional hypothesis:

H4: IAF quality is associated with CEO power.

2.3. *Environmental factors associated with IAF quality*

Regarding external environmental factors, we focus on (1) industry competition and (2) IAF requirements in countries' corporate governance codes (hereafter, CG codes). We consider industry competition because greater environmental uncertainty induced by intensified competition increases the demand for assurance that the firm's risk management, governance and controls are operating effectively (Khandwalla 1972). We analyse IAF requirements in countries' CG codes for three reasons. First, firms' incentives to design their controls and enhance their governance quality are constrained by the institutional environment of their home country (e.g. Chenhall 2003, John and Kedia 2003, Klapper and Love 2004, Krishnamurti et al. 2005, Doidge et al. 2007). The CG code is one important regulatory aspect of a country's overall institutional environment, particularly because of a recent worldwide increase in CG codes (Aguilera and Cuervo-Cazurra 2004).[7] Second, owing to the relevance of CG codes for firms' corporate governance practices (Gregory and Simmelkjær 2002) and the recently documented tendency of listed firms to follow these recommendations (Aguilera and Cuervo-Cazurra 2004), CG code requirements related to the IAF may be of particular importance to the development of an IAF. Third, although a large number of studies have analysed how firm-level corporate governance is influenced by countries' financial market development and ability to protect investors (e.g. La Porta et al. 1998, 2000, Klapper and Love 2004, Doidge et al. 2007, Aggarwal et al. 2009, Hugill and Siegel 2012), the relationship between corporate governance codes and firm-level governance practices is not well understood. We endeavour to add to existing literature by examining whether a significant relationship exists between IAF quality and CG codes' IAF requirements.

In the following sub-sections, we develop specific hypotheses regarding the relationships between IAF quality and industry competition and between IAF quality and IAF requirements in CG codes.

2.3.1.   *Industry competition*

Industry characteristics are key environmental contingent factors that influence the adoption and features of a governance and control system (Gordon and Narayanan 1984, Fisher 1998). Industry competition accentuates the use of controls because of increased demand to control costs and assess whether production, investing, and financing activities are operating in accordance with expectations. Khandwalla (1972) documents that increased industry competition is associated with a more extensive use of sophisticated controls. Furthermore, intensified industry competition increases the potential benefits of controls because competitors will take advantage of poor decisions that result from inadequate and untimely information caused by a lacking controls.

Similarly, we expect that increased industry competition incentivises a firm to develop superior IAFs. This is because industry competition represents stress, risk, and uncertainty, which increases a firm's demand for assurance that the firm's risk management, governance, and controls operate effectively. Firms' need for timely information and ability to adapt in highly competitive industries require that firms implement internal controls to effectively and rapidly respond to a shifting environment and address the threats and opportunities of the competitive environment. An IAF is a component of the governance and control system and is a powerful adaptive function that firms can leverage to develop more predictable and coordinated responses to competition, particularly because the IAF is significantly involved in internal controls, governance, and risk management.

The above argument indicates a positive association between the intensity of industry competition and IAF quality; however, other factors may adversely affect this association. To survive in an industry with fierce competition, managers and directors may be less willing to invest scarce resources in the IAF, which is generally perceived as a 'cost centre'. A lack of funding for the IAF is considered to ultimately result in a lower quality IAF (Carcello et al. 2005a, Prawitt et al. 2009). Therefore, it is unclear how industry competition affects IAF quality. Accordingly, we propose the following non-directional hypothesis:

H4: IAF quality is associated with industry competition.

2.3.2.   *IAF requirements in corporate governance codes*

In most countries, the establishment of an IAF is voluntary, and IAF practices are discretionary; however, stricter and more detailed IAF requirements in CG codes can incentivise firms to adopt a better quality IAF. Although most CG codes adhere to the 'comply or explain' principle and hence compliance with code provisions is not compulsory, listed companies are pressured by market forces to 'do the right thing' and comply with legitimate practices (Aguilera and Cuervo-Cazurra 2004). Stock exchange listing rules in numerous countries require firms to justify non-compliance with CG codes in their annual reports. This 'comply or explain' disclosure requirement generally encourages companies to comply with CG codes. Furthermore, it is easier for firms that adhere to CG codes in order to develop a high-quality IAF if specific requirements and recommendations regarding the IAF's responsibilities and practices are outlined in the CG codes. Therefore, we propose the following hypothesis:

H5: IAF quality is positively associated with IAF requirements in CG codes.

3.   Sample and data

We use a unique sample to address our research questions. The sample is constructed by matching proprietary data obtained from CBOK 2010 global internal auditor survey with data obtained

from Worldscope.[8] The matching and sample selection procedure is outlined in Table 1. The CBOK 2010 survey includes 5942 responses from publicly listed companies that identify a country of origin. Questions and corresponding answers regarding internal auditors' competence include individual respondents' personal information. To ensure that the responses are comparable across firms, we include only responses from Chief Audit Executives (CAEs) to avoid comparing a CAE's competence in one company with a junior internal auditor's competence in another company.

We obtained 857 CAE responses that are eligible for matching. We merge the survey responses with Worldscope data on public firms from the same country by matching firms' website domain names with corresponding information that is provided by the survey respondents who voluntarily disclosed email addresses.[9] This matching process produces 329 matched firms; financial data are then downloaded from Worldscope. Variables related to the characteristics of boards of directors, audit committees, and CEOs are manually collected from the firms' annual reports or proxy statements. A total of 64 firms have missing values for at least one of the primary tested variables and are subsequently deleted from the sample.[10] The final sample for the empirical analysis includes 265 firms.[11]

The sample distribution by country that is provided in Table 2 confirms that our sample includes a wide range of countries. However, this table also indicates that US firms account for a large portion of the sample (111 out of 265). This is not surprising because the US stock market is large and because IAFs are more prevalent and expected in the US than in other countries (Alkafaji et al. 2010, Bailey 2010).[12] Nevertheless, to address potential bias that is introduced by the proportion of US firms, we control for the large number of US firms in the subsequent empirical tests. In addition, we exclude US firms when performing robustness checks.

4. Research design

4.1. *Measuring IAF quality*

Most prior studies measure IAF quality based on external auditing standards because they focus on the IAF's role in financial reporting. Although the IAF may initially be a closely related extension of the work of external auditors (Moeller and Witt 1999), the current scope of work varies across internal and external auditors (Mennicken and Power 2013). External auditors are primarily concerned with the quality of financial statements; however, internal auditors play a combined monitoring and advisory role and have a much broader responsibility, which includes assurance and advisory activities in internal control, risk management, and governance (IIA 1999, Spira and Page 2003, Cohen et al. 2010).

Table 1. Data matching and sample selection procedure.

Original survey responses from public companies with country identified	5,942
Minus:	
Non-CAE responses	4,415
CAE responses with missing email addresses	670
CBOK CAE responses eligible for matching	**857**
Minus:	
Responses not matched with public firms in Worldscope	528
Firms with missing values for variables in empirical models	64
Final sample for empirical analysis	**265**

Note: This table presents the data matching and sample selection process. The sample is constructed by matching the anonymous 2010 CBOK survey responses with data on public firms in Worldscope. The matching between 2010 CBOK and Worldscope data was authorised by the Institute of Internal Auditors Research Foundation (IIARF).

Table 2. Sample distribution and country-level variables.

Country	Freq.	CGCODE	FINDEV	SECLAW
Australia	2	4	1.38	1.34
Austria	3	4	−0.83	−1.86
Belgium	4	4	−0.09	−1.29
Canada	8	2	1.38	1.91
Denmark	1	4	0.47	−0.37
Finland	4	3	0.47	−0.19
France	9	2	−0.09	0.20
Germany	1	1	−0.89	−1.81
Greece	1	1	−0.21	−1.11
India	1	2	−0.49	0.81
Ireland	2	1	−0.66	−0.19
Italy	10	3	−1.28	0.64
Japan	25	2	0.3	−0.02
Malaysia	6	5	1.21	1.47
Mexico	1	4	−1.79	−0.89
Netherlands	3	4	−0.09	0.29
New Zealand	2	2	−0.6	−0.59
Norway	1	2	0.36	−0.80
Portugal	3	1	−1.34	−0.15
Singapore	2	4	1.66	1.60
South Africa	6	4	0.53	0.03
Sweden	2	4	0.76	−0.45
Switzerland	9	4	1.27	−0.32
Taiwan	35	4	0.98	0.60
Thailand	1	1	−0.83	0.51
Turkey	5	2	−1.57	−0.63
UK	7	4	1.21	1.08
US NYSE	64	5	0.64	2.17
US NASDAQ	47	4	0.64	2.17
Total	265			

Note: This table presents the sample distribution by country and the values of country-level variables used in the regressions. CGCODE represents a self-constructed index that captures the intensity of IAF requirements contained in corporate governance codes in each country as of 2009. It is an ordinal variable taking values from 1 to 5; higher values indicate stricter and more detailed IAF requirements in the corporate governance codes. Examples of the coding of corporate governance codes are available in Appendix 3. FINDEV is an index that measures the country's financial market development. SECLAW is an index that measures the overall quality of a country's security laws obtained from Leuz (2010). FINDEV and SECLAW are standardised values. All variable definitions are summarised in Appendix 4.

The mixed role of an IAF is explicitly recognised in the International Standards for the Professional Practice of Internal Auditing (IIA 2012; hereafter, the Standards), on which we based our measure of IAF quality. In alignment with the Standards and IAF quality measures utilised in prior studies (e.g. Prawitt et al. 2009, Lin et al. 2011, Lenz et al. 2014, Christ et al. 2015, Ege 2015, Abbott et al. 2016), we identify three primary components of IAF quality: (1) internal auditors who perform the internal audit, (2) the process that the internal auditors follow to conduct their internal audit, and (3) regular IAF quality reviews that identify weaknesses and opportunities for improvement. Then, we search the Standards for the corresponding key desirable attributes and practices related to each of the components.[13]

First, internal auditors' profiles affect the quality of internal audit work (Sarens and Lamboglia 2014). We identify two major desirable attributes of internal auditors: competence (*Competence*)[14] and independence (*Independence*) (Abbott et al. 2016).[15] Second, regarding internal audit process, the Standards specify certain key aspects that pertain to how the IAF plans the

audit, reports the results, and ensures any necessary corrections are instituted. Accordingly, we collectively consider these key aspects as desirable fieldwork practices of the IAF (*Plan_Report*). Third, we associate a IAF quality review with a quality assurance and improvement programme (*Quality_Assure*), which is emphasised by the Standards as an important method to '[assess] the efficiency and effectiveness of the internal audit activity and [identify] opportunities for improvement' (IIA 2012, p. 7).

We use several items derived from the CBOK 2010 survey questions to measure each of the attributes and practices. Appendix 1 defines the measurement items, which are listed according to the relevant attributes and practices. Appendix 1 also provides information about how each item from the CBOK 2010 survey is measured, the survey question number for each item, and the specific Standards corresponding to the items included in the measurement model. Descriptive statistics for the measurement items are presented in Appendix 2. Note that the measurement items are coded such that their values range from zero to one.

As in prior studies (e.g. Prawitt et al. 2009), we construct a composite score for overall IAF quality, which is subsequently treated as the primary variable of interest in our analysis. First, the score for each attribute or practice is calculated as the average of the measurement items for that attribute or practice. The composite score for overall IAF quality (*IAFQ*) is subsequently calculated as the mean score of all desirable attributes and practices. This calculation ensures equal weighting for each measurement item that corresponds to an attribute or practice and also ensures equal weighting for all attributes and practices when we aggregate their values to obtain the final composite IAF quality score.[16]

4.2. *Empirical models*

We estimate the following two models to test the factors that are expected to be associated with IAF quality:

$$\text{Model (1)} : \text{IAFQ}_{i,t} = \alpha + \beta' X_{i,t-1} + \gamma' \, \text{FControl}_{i,t-1} + \varepsilon_{i,t},$$

$$\text{Model (2)} : \text{IAFQ}_{i,t} = \alpha + \beta' X_{i,t-1} + \lambda' C_{i,t-1} + \gamma' \, \text{FControl}_{i,t-1} + \phi' \, \text{CControl}_{i,t-1} + \varepsilon_{i,t},$$

where for each firm i, IAFQ represents the composite IAF quality score; X and C are organisational and environmental tested variables, respectively; FControl is a group of firm-level control variables that have been cited in prior research as factors that influence firms' corporate governance ratings and audit efforts; and CControl is a set of country-level control variables. We explain the variables included in our models in detail as follows.

4.2.1. *Organisational variables*

Concerning organisational factors, we focus on firm complexity, board monitoring incentives, audit committee diligence, and CEO power. We use three variables to measure firm complexity: firm size (LogAT) (Klein 1998, Doyle et al. 2007, Dey 2008), the number of business segments (SEG) (Rose and Shepard 1997, Hermalin and Weisbach 1998), and the ratio of foreign sales to total sales (FORSALE) (Ashbaugh-Skaife et al. 2007). Because firm complexity increases with any of these dimensions, we use a composite variable to extract the underlying complexity factor. Specifically, for each firm, we compute the variable COMPLEX as the factor score based on LogAT, SEG, and FORSALE. The factor score is a linear combination of the standardised value of these three variables. A factor analysis reduces the dimensionality of variables and

circumvents potential difficulties that may occur because of multicollinearity and therefore increases the power of regression-based tests (Coles et al. 2008). We expect IAF quality to be positively associated with COMPLEX.[17]

We measure directors' monitoring and advising incentives by using three characteristics of directors: the percentage of independent directors (BODINDE) (Hermalin 2005), the percentage of busy directors who serve on at least three additional board of directors for other companies (BODBUSY) (Fich and Shivdasani 2006), and the number of board meetings held per year (BODMEET) (Adams et al. 2010).[18] Note that BODBUSY is an inverse measure of directors' monitoring incentives. In alignment with prior studies (e.g. Hoitash et al. 2009, Barua et al. 2010, Anderson et al. 2012), we measure audit committee diligence by the number of audit committee meetings per year (ACMEET). Finally, we measure CEO power by CEO duality, that is, whether the CEO is also the chairman of the board of directors (CEODUA) (Lara et al. 2007, Tuggle et al. 2010, Depoers and Jeanjean 2012).

4.2.2. *Environmental variables*

We measure a firm's industry competition by using the Herfindahl index of the primary industry in which the firm operates. We identify a firm's primary industry by using its two-digit SIC code. For each sample firm, we use all firms in the same country-industry in Worldscope to calculate the Herfindahl index. We compute the Herfindahl index for each year during the period 2006–2008 and then use the mean as our measure of industry competition (INDCOM). Because the Herfindahl index decreases as industry competition intensifies, we expect IAF quality to have a negative relationship with INDCOM.

To measure the CG codes' IAF requirements, we first obtain the sample countries' CG codes from the European Corporate Governance Institute, which maintains CG codes that are released in different countries.[19] Then, we manually code the CG codes based on requirements regarding the establishment of an IAF and internal audit practices. One of the coauthors and a research assistant coded the CG codes independently. The research assistant did not know the research question when the coding was conducted. The coding results from two raters are highly correlated (Spearman's correlation coefficient = 0.90), and the inter-rater reliability calculated by the weighted Kappa statistic indicates 95% agreement between the two raters' coding results.[20] The two raters eventually resolved the slight differences in their coding through discussion and mutual agreement.

Five types of CG codes emerge from the coding based on their IAF requirements. Appendix 3 provides examples to illustrate each type. The first type of CG code requires publicly listed companies to have an IAF, and the second type of CG code strongly recommends that an IAF should be established (i.e. companies should have an IAF) and that if a company does not have an IAF, the need for one should be annually reviewed by the audit committee or the board of directors. The third type of CG code explicitly recommends an IAF and provides guidance on IAF practices in its presentation of the requirements and responsibilities of the audit committee, board of directors, and managers. The fourth type of CG code does not explicitly recommend having an IAF, although the IAF and its practices are mentioned in the responsibilities of the audit committee, board of directors, and managers. The fifth type of CG code does not mention the IAF. We assign values of one to five to represent the five types of CG codes (CGCODE), where higher values indicate stricter and more detailed IAF requirements.[21]

4.2.3. *Control variables*

We include both firm- and country-level control variables in our empirical models. The firm-level control variables are as follows: market-to-book ratio (MTB), leverage ratio (LEV), percentage of

total inventory and receivables to total assets (INVREC), cash flow from operations to total assets (CFO), percentage of closely held shares by insiders to total number of common shares (CLOSE-HELD), whether a company is audited by a Big 4 audit firm (BIG4), and whether a non-US company is crosslisted on a major US stock exchange (CROSSLIST). As previously mentioned, a relatively high percentage of US firms are included in the sample, and we explicitly control for the effect of these US firms (US).[22] Furthermore, we include board size (BODSIZE) and audit committee size (ACSIZE) to control for the potential effect of larger boards and audit committees. In addition, we do not treat audit committee independence as a tested variable because of a lack of variation; however, we control for audit committee independence (ACINDE) in our model. We also add IAF age (AGE) as a control for the possible influence of IAF maturity on IAF quality. For country-level control variables, given the important influence of countries' financial market development and security laws on firms' corporate governance structures and reporting quality (La Porta et al. 1998, 2000, Leuz 2010), we include countries' financial market development (FINDEV) and overall quality of security laws (SECLAW) as two additional control variables. Finally, we control for industry fixed effects and region fixed effects.[23] The variable definitions are summarised in Appendix 4. All firm- and country-level variables are lagged by a minimum of one year relative to the year when IAF quality is measured.

5. Empirical results

5.1. *Main results*

Descriptive statistics are reported in Table 3. In our sample, the mean IAFQ is 0.63, with a minimum value of 0.22 and a maximum value of 0.93. On average, directors meet eight times per year, and audit committees meet five times per year. We note significant variations in the number of board and audit committee meetings. The minimum number of board meetings (audit committee meetings) in a year is 1 (1) and the maximum is 31 (10), indicating that corporate governance practices vary considerably in an international context. The majority of board members are independent, and 53% of board members serve on at least three additional boards of directors in other companies. In all, 42% of the CEOs in our sample are also the chairman of the board of directors.

The correlation matrix of the variables used in the regressions is presented in Table 4. When the significance level is set at 5% (untabulated), IAFQ has significantly positive correlations with COMPLEX, BODINDE, BODMEET, ACMEET, MTB, LEV, CGCODE, FINDEV, and SECLAW and significantly negative correlations with BODBUSY, CEODUA, and INVREC.

The primary regression results are reported in Table 5. Because the dependent variable IAFQ in our models is bounded between zero and one by construction, we estimate our empirical models using the Fractional Response Model proposed by Papke and Wooldridge (1996, 2008), and Gallani et al. (2015).[24] In Model (1) of Table 5, environmental tested variables and country-level control variables are excluded. We note that the coefficient for COMPLEX is significant and positive, which confirms that a firm's IAF quality is positively associated with its operating complexity. Therefore, Hypothesis 1 is supported. In addition, the coefficients for BODINDE, BODMEET, and ACMEET are significant and positive, which suggests that IAF quality is positively related to directors' monitoring incentives and audit committee diligence. The significantly negative coefficient for BODBUSY also confirms that IAF quality is positively associated with board monitoring incentives, as busy directors are generally less intensive monitors. These findings support Hypothesis 2. Board monitoring and advising incentives reinforce directors' willingness to develop a high-quality IAF, that is, a complimentary relationship exists between board monitoring and IAFs. The significantly negative coefficient for

Table 3. Descriptive statistics.

Variable	N	Mean	Median	STD	Min	Max
IAFQ	265	0.63	0.63	0.15	0.22	0.93
COMPLEX	265	0.00	−0.10	1.30	−2.86	3.42
BODINDE	265	0.52	0.56	0.29	0.00	1.00
BODMEET	265	8.16	8.00	3.90	1.00	31.00
BODBUSY	265	0.52	0.54	0.35	0.00	1.00
ACMEET	265	4.62	4.00	2.52	1.00	10.00
CEODUA	265	0.42	0.00	0.49	0.00	1.00
BODSIZE	265	9.16	9.00	3.21	3.00	34.00
ACSIZE	265	3.44	3.00	1.16	1.00	12.00
ACINDE	265	0.85	1.00	0.31	0.00	1.00
MTB	265	1.66	1.16	1.89	0.01	13.58
LEV	265	0.17	0.13	0.17	0.00	0.87
CLOSEHELD	265	0.26	0.19	0.24	0.00	0.93
BIG4	265	0.84	1.00	0.37	0.00	1.00
CROSSLIST	265	0.05	0.00	0.22	0.00	1.00
INVREC	265	0.30	0.29	0.17	0.02	0.76
CFO	265	0.08	0.07	0.08	−0.09	0.31
AGE	265	4.14	4.00	1.50	1.00	7.00
US	265	0.42	0.00	0.49	0.00	1.00
INDCOM	265	0.24	0.14	0.25	0.02	1.00
CGCODE	265	3.74	4.00	1.14	1.00	5.00
FINDEV	265	0.49	0.64	0.68	−1.79	1.66
SECLAW	265	1.07	1.08	1.11	−1.86	2.17

Note: This table presents the descriptive statistics for the variables used in the regressions. Continuous variables are winsorised at both the top and bottom 1% level. All variable definitions are summarised in Appendix 4.

CEODUA implies that powerful CEOs are related to lower quality IAFs, which is consistent with the entrenchment theory.

Model (2) of Table 5 tabulates the results when the environmental tested variables and country-level control variables are included in the regression. The results with respect to the organisational factors remain unchanged. Concerning the environmental factors, the coefficient for INDCOM is significantly negative, which is consistent with Hypothesis 4 that IAF quality increases as industry competition intensifies (recall that a larger value of INDCOM indicates a lesser degree of industry competition). Furthermore, the coefficient for CGCODE is significantly positive even after we control for countries' financial market development and overall quality of security laws, which supports Hypothesis 5, indicating that IAF quality has a significant positive relationship with the IAF requirements in the CG codes. In addition, for the two country-level control variables, the positive coefficients for FINDEV and SECLAW further suggest that IAF quality is higher in countries with more developed financial markets and stricter security laws. These results are in line with prior studies documenting that firm-level governance quality is influenced by countries' financial development and overall regulation quality.

The control variables also show some interesting patterns. The positive coefficients for MTB and CORSSLIST suggest that firms with a better future prospect and that crosslist on major US stock exchanges have better quality IAFs, consistent with firms with higher demand for monitoring and advising having stronger incentives to develop a high-quality IAF. In addition, the positive coefficient for CFO indicates that firms with more resources are associated with better quality IAFs. This result is in line with the finding in Carcello et al. (2005a, 2005b) that firms which are

Table 4. Variable correlations.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1	IAFQ	1.00																						
2	COMPLEX	0.33	1.00																					
3	BODINDE	0.44	0.27	1.00																				
4	BODMEET	0.20	0.18	0.12	1.00																			
5	BODBUSY	−0.22	−0.08	−0.11	0.14	1.00																		
6	ACMEET	0.45	0.28	0.52	0.19	−0.07	1.00																	
7	CEODUA	−0.21	−0.09	−0.05	−0.06	0.07	−0.05	1.00																
8	BODSIZE	0.05	0.33	0.10	0.10	0.01	0.25	−0.04	1.00															
9	ACSIZE	0.04	0.14	0.19	0.07	−0.05	0.19	−0.03	0.38	1.00														
10	ACINDE	−0.05	−0.20	0.17	0.09	0.15	−0.01	0.15	−0.11	0.03	1.00													
11	MTB	0.18	0.18	0.14	0.10	−0.03	0.13	−0.10	0.01	−0.04	0.06	1.00												
12	LEV	0.13	0.12	0.25	0.05	0.00	0.21	0.01	0.10	0.02	0.03	0.04	1.00											
13	CLOSEHELD	−0.05	−0.02	−0.08	−0.03	−0.08	0.03	−0.13	−0.06	−0.13	−0.19	0.06	0.11	1.00										
14	BIG4	−0.01	0.19	0.02	−0.02	0.04	−0.04	0.06	−0.02	0.05	0.06	0.09	0.02	−0.12	1.00									
15	CROSSLIST	−0.02	0.08	0.06	−0.01	−0.01	0.05	−0.17	0.08	−0.05	0.00	0.05	0.04	−0.01	−0.04	1.00								
16	INVREC	−0.22	−0.09	−0.22	−0.24	−0.04	−0.25	−0.02	−0.12	0.07	−0.05	−0.05	−0.45	0.08	0.02	0.05	1.00							
17	CFO	0.10	0.06	0.16	−0.07	0.01	0.10	0.11	−0.09	−0.07	0.10	0.24	0.10	0.03	0.21	−0.02	−0.11	1.00						
18	AGE	0.18	0.27	−0.04	0.01	−0.04	0.00	−0.04	0.25	0.07	−0.02	0.01	−0.08	−0.19	0.03	0.00	0.02	−0.09	1.00					
19	US	0.33	0.06	0.58	0.12	−0.16	0.51	0.19	0.08	0.25	0.18	0.02	0.24	−0.18	0.01	−0.20	−0.21	0.14	−0.04	1.00				
20	INDCOM	0.02	0.21	0.04	0.04	−0.01	0.03	−0.20	0.07	−0.07	−0.21	0.15	0.16	0.15	0.03	0.41	−0.04	−0.05	−0.14	−0.26	1.00			
21	CGCODE	0.33	−0.03	0.39	0.00	−0.14	0.22	0.03	−0.13	0.12	0.19	0.04	0.10	−0.22	0.10	−0.15	−0.11	0.15	−0.03	0.63	−0.19	1.00		
22	FINDEV	0.12	−0.17	0.08	0.00	0.07	−0.08	0.05	−0.18	0.10	0.36	0.01	−0.12	−0.27	0.11	−0.30	−0.07	0.14	−0.01	0.19	−0.26	0.48	1.00	
23	SECLAW	0.30	−0.05	0.49	0.07	−0.07	0.43	0.19	0.06	0.21	0.23	0.05	0.19	−0.21	0.04	−0.34	−0.27	0.18	−0.06	0.85	−0.34	0.61	0.43	1.00

Note: This table presents the Pearson correlations between the variables used in the regressions. Continuous variables are winsorised at both the top and bottom 1% level. All variable definitions are summarised in Appendix 4.

Table 5. Regression results: factors associated with IAF quality.

| | (1) | | (2) | |
| | Dependent variable = IAFQ | | Dependent variable = IAFQ | |
Variables	Coefficient	Z-statistic	Coefficient	Z-statistic
Tested variables				
COMPLEX	0.0883*	(1.8675)	0.0957***	(2.7179)
BODINDE	0.5336**	(2.0312)	0.4385***	(3.1810)
BODMEET	0.0212***	(4.1322)	0.0245***	(4.0849)
BODBUSY	−0.2853***	(−3.0105)	−0.3022***	(−2.6403)
ACMEET	0.0669***	(9.6146)	0.0693***	(11.9339)
CEODUA	−0.2472***	(−3.8301)	−0.2101***	(−3.9090)
INDCOM			−0.1518*	(−1.8711)
CGCODE			0.0638**	(2.1710)
Control variables				
BODSIZE	−0.0277***	(−3.3590)	−0.0181	(−1.5529)
ACSIZE	−0.0420	(−0.9313)	−0.0440	(−1.4004)
ACINDE	−0.1473	(−1.2945)	−0.2467**	(−2.0395)
MTB	0.0239**	(2.2664)	0.0254***	(3.6422)
LEV	−0.0464	(−0.3147)	0.0737	(0.5290)
CLOSEHELD	−0.2167	(−1.5349)	−0.1116	(−0.8530)
BIG4	−0.0022	(−0.0185)	−0.0359	(−0.2731)
CROSSLIST	0.1995**	(−2.0265)	0.0461**	(2.1819)
INVREC	0.0035	(0.0106)	0.1584	(0.6126)
CFO	0.5964***	(5.3417)	0.3818	(1.3162)
AGE	0.0569***	(3.9051)	0.0454***	(3.9075)
US	0.1345***	(2.6905)	−0.0092	(−0.0800)
FINDEV			0.2278***	(5.9594)
SECLAW			0.0803*	(1.6690)
CONSTANT	0.6820***	(3.3106)	0.2558*	(1.9261)
Industry fixed effects	Yes		Yes	
Region fixed effects	Yes		Yes	
Pseudo R^2	0.0347		0.0334	
Chi-square statistic	233.05***		314.11***	
Observations	265		265	

Note: This table presents the regression results for factors that are associated with IAF quality. Model (1) includes only organisational factors and firm-level control Model (2) includes organisational and environmental factors and firm- and country-level control variables. Because the dependent variable IAFQ is bounded between 0 and 1, the Fractional Response Model is adopted for the estimation. All variable definitions are summarised in Appendix 4. Z-statistics appear in parentheses. Standard errors are clustered by region.
*Two-tailed statistical significance at the 10% level.
**Two-tailed statistical significance at the 5% level.
***Two-tailed statistical significance at the 1% level.

capable to pay for monitoring are more likely to make investments in the IAF and have a better quality IAF. Finally, the significantly positive coefficient on AGE suggests that more mature IAFs tend to have better quality.

Notably, the static nature of our IAF quality measure may induce an endogeneity issue because we do not know when a firm first incorporated a specific attribute or practice into its IAF. Our ability to address this endogeneity problem is limited because we do not have time-series data. Although we attempt to address this concern by adding a comprehensive set of lagged firm- and country-level control variables, our results should be interpreted as showing correlations rather than causal relationships.

5.2. *Robustness checks*

We perform several robustness checks. First, because our data include a large number of US firms, one concern is that the US firms may affect the results. Although we explicitly control for the influence of US firms in our previous analysis, we re-estimate the regression without US firms. Furthermore, because of the NYSE's strict mandatory requirement of an IAF, we also re-run the analysis after excluding firms listed and crosslisted on the NYSE. Table 6 shows that our findings do not change when US firms or NYSE firms are excluded from the regressions. Similarly, Taiwanese firms and Japanese firms also represent a relatively large portion of the sample. To address the potential bias introduced by firms from these two countries, we control for Taiwanese and Japanese firms in an additional analysis. We also re-estimate the regressions without firms from Taiwan or Japan. Our results remain unchanged in these additional analyses. Finally, certain sample countries have very few observations. Because of the possibility that our results are affected by firms that operate in these countries, we re-estimate the regressions and exclude countries with fewer than three observations. Again, our results remain unchanged.

5.3. *Additional analysis*

5.3.1. *Individual IAF attributes and practices*

In the primary analysis, we test factors that influence the overall IAF quality, which includes four desirable IAF attributes and practices. In this additional analysis, we investigate how the organisational and environmental factors are associated with each of these attributes and practices. Table 7 reports the estimation results. We find that the effects of organisational and environmental factors vary across different IAF attributes and practices, implying that the four IAF attributes and practices that are identified in our measurement model capture different aspects of IAF quality.

In terms of the specific associations, the results provided in Table 7 indicate that for the organisational factors, audit committee diligence and CEO power have relatively consistent effects across the four desirable attributes and practices. However, firm complexity primarily affects the IAFs' fieldwork and quality assurance practices rather than competence and independence. These results indicate that complicated organisational and operational structures demand process controls as manifested by more structured fieldwork practices. In contrast, board monitoring incentives significantly influence IAFs' independence, which is consistent with previous studies that a board of directors is particularly important in maintaining the independent status of an IAF. By providing incentives and fostering effective interactions, the board of directors helps internal auditors manage potential conflicts of interest and reinforce their independence. Finally, concerning environmental factors, the results indicate that industry competition primarily affects the IAF's quality assurance and improvement programmes and IAF requirements in CG codes primarily influence IAF's independence and quality assurance and improvement programmes. These results indicate that external forces, such as competition and regulation pressure, enhance firms' willingness to invest in quality reviews and improve their control systems of which the IAF is a critical component.

5.3.2. *IAF outsourcing*

A debate is ongoing about outsourcing IAF activities and the impact of outsourcing on IAF quality. Certain scholars argue that outsourcing internal audit activities leads to career concerns of in-house internal auditors, which reduces an in-house IAF's independence and IAF quality

Table 6.　Regression results: non-US firms and non-NYSE firms.

	(1)		(2)	
	Non-US firms		Non-NYSE firms	
	Dependent variable = IAFQ		Dependent variable = IAFQ	
Variables	Coefficient	Z-statistic	Coefficient	Z-statistic
Tested variables				
COMPLEX	0.0974***	(2.9538)	0.1243***	(2.7431)
BODINDE	0.4817***	(3.6847)	0.3297*	(1.6860)
BODMEET	0.0340***	(3.6198)	0.0278***	(4.8207)
BODBUSY	−0.3259*	(−1.8909)	−0.3547***	(−2.8315)
ACMEET	0.0757***	(11.1281)	0.0669***	(5.3591)
CEODUA	−0.2422**	(−2.3669)	−0.1949***	(−3.3888)
INDCOM	−0.0260*	(−0.1699)	−0.0394*	(−1.6740)
CGCODE	0.1104**	(2.4712)	0.1389*	(1.9177)
Control variables				
BODSIZE	−0.0157	(−1.0620)	−0.0177	(−1.5760)
ACSIZE	−0.0056	(−0.0797)	−0.0394	(−1.1601)
ACINDE	−0.3071*	(−1.8232)	−0.2095	(−1.2652)
MTB	0.0360***	(3.6492)	0.0164	(1.0734)
LEV	−0.2107	(−0.5542)	0.1659	(0.8689)
CLOSEHELD	−0.2039	(−1.3838)	−0.1712	(−1.1195)
BIG4	−0.0014	(−0.0075)	−0.0294	(−0.1846)
CROSSLIST	0.0036	(0.0375)	0.0099	(0.1409)
INVREC	0.2949	(1.4138)	0.1132	(0.3859)
CFO	0.1509	(0.2806)	0.3802	(0.8514)
AGE	0.0463	(1.4277)	0.0535***	(4.2475)
US			0.0823	(1.1739)
FINDEV	0.1701	(1.4937)	0.1726*	(1.6778)
SECLAW	0.0820***	(2.7993)	0.0865**	(2.1111)
CONSTANT	0.0391	(0.1168)	−0.1634	(−0.4033)
Industry fixed effects	Yes		Yes	
Region fixed effects	Yes		Yes	
Pseudo R^2	0.0440		0.0454	
Chi-square statistic	213.90***		286.04***	
Observations	154		199	

Note: This table presents the regression results when US firms or NYSE-listed firms are excluded. Because the dependent variable IAFQ is bounded between 0 and 1, the Fractional Response Model is adopted for the estimation. All variable definitions are summarised in Appendix 4. Z-statistics appear in parentheses. Standard errors are clustered by region.
*Two-tailed statistical significance at the 10% level.
**Two-tailed statistical significance at the 5% level.
***Two-tailed statistical significance at the 1% level.

(Abbott et al. 2016). In contrast, the knowledge spillover argument suggests that outsourcing internal audit activities can bring fresh talent into the internal audit department and enhances IAF quality (Prawitt et al. 2012).

To clarify, we examine the relationship between the degree of IAF outsourcing and our IAF quality measure. In the survey, respondents were asked to indicate the percentage of internal audit activities that are outsourced, and they were provided with six options to select from: no co-sourcing/outsourcing, 10% or less, 11–25%, 26–50%, 51–74%, and 75% or higher. We create an ordinal variable, OUTSOURCE, to reflect the extent of IAF outsourcing and assign the values of one to six to correspond to these six options. When we re-estimate the regression and add

Table 7. Tests of IAF quality component.

Variables	(1) Dependent variable = Competence		(2) Dependent variable = Independence		(3) Dependent variable = Plan_Report		(4) Dependent variable = Quality_Assure	
	Coefficient	Z-statistic	Coefficient	Z-statistic	Coefficient	Z-statistic	Coefficient	Z-statistic
COMPLEX	0.0737	(1.5809)	−0.1209	(−1.1408)	0.1788***	(10.7489)	0.2475***	(3.3104)
BODINDE	0.2514	(1.3730)	1.0415**	(2.1119)	0.1293*	(1.6671)	0.5088*	(1.7547)
BODMEET	0.0173**	(2.0687)	0.1016***	(5.3591)	−0.0082	(−0.4878)	0.0162	(1.0943)
BODBUSY	−0.1490	(−0.8788)	−0.6946*	(−1.9480)	−0.1073	(−1.2832)	−0.4110***	(−3.6844)
ACMEET	0.0660***	(4.1875)	0.1166***	(7.3688)	0.0201	(1.2175)	0.0970***	(6.1692)
CEODUA	−0.1540**	(−2.2828)	−0.2696*	(−1.7987)	−0.1595**	(−2.0354)	−0.3833***	(−6.7241)
INDCOM	−0.3207	(−1.3343)	0.5602	(−1.0158)	−0.0761	(−0.3571)	−0.6242***	(−3.1239)
CGCODE	−0.0251	(−0.7325)	0.1539*	(1.6708)	0.0116	(0.2962)	0.1331**	(2.1331)
BODSIZE	−0.0219***	(−3.7904)	−0.0419	(−0.9513)	−0.0090	(−0.6556)	−0.0082	(−0.5028)
ACSIZE	0.0061	(0.1689)	−0.1430*	(−1.7717)	−0.0091	(−0.1408)	−0.0636*	(−1.6954)
ACINDE	−0.7919***	(−11.0409)	0.0152	(0.0337)	−0.1638	(−0.7632)	−0.0801	(−0.3037)
MTB	0.0432*	(1.7541)	0.0206	(1.4862)	0.0505***	(6.1206)	0.0111	(0.8268)
LEV	0.3655**	(2.5312)	0.0126	(0.0556)	0.1187	(0.5712)	−0.0384	(−0.0981)
CLOSEHELD	0.1701	(0.7483)	−0.3179	(−0.7381)	0.3835	(1.6142)	−0.6380*	(−1.9387)
BIG4	0.0372	(0.2880)	−0.0300	(−0.1952)	−0.0520	(−0.3361)	−0.1335	(−0.4763)
CROSSLIST	0.2629	(1.5895)	0.4378***	(2.6237)	0.2170**	(2.0482)	0.0975	(0.6032)
INVREC	0.4630	(1.3424)	−0.4736	(−0.7638)	0.2801	(0.5533)	0.4262	(0.5551)
CFO	1.3259***	(7.7934)	0.1570	(0.2444)	1.1199*	(1.8972)	0.8810***	(8.0659)
AGE	0.0638**	(2.3041)	0.0582	(0.7756)	−0.0438	(−1.4288)	0.1159***	(7.0165)
US	0.2413***	(2.6781)	−0.8483**	(−2.0179)	0.6525***	(13.0491)	−0.0346	(−0.1360)
FINDEV	0.3065***	(18.3188)	0.3885*	(1.6791)	0.1380**	(2.1807)	0.1992***	(3.3701)
SECLAW	−0.0237	(−0.3710)	0.3101***	(3.8836)	0.1007	(1.6210)	−0.0151	(−0.0963)
CONSTANT	0.5131*	(1.8241)	0.3271	(0.3815)	1.5729***	(2.5836)	−1.3515***	(−3.3573)

(*Continued*)

Table 7. Continued.

Variables	(1) Dependent variable = Competence		(2) Dependent variable = Independence		(3) Dependent variable = Plan_Report		(4) Dependent variable = Quality_Assure	
	Coefficient	Z-statistic	Coefficient	Z-statistic	Coefficient	Z-statistic	Coefficient	Z-statistic
Industry fixed effects	Yes		Yes		Yes		Yes	
Region fixed effects	Yes		Yes		Yes		Yes	
Pseudo R^2	0.0308		0.1360		0.0234		0.0844	
Chi-square statistic	108.36***		123.62***		111.67***		90.45***	
Observations	265		265		265		265	

Note: This table presents the regression results for factors that are associated with each of the IAF attributes and practices, including competence (*Competence*), independence (*Independence*), fieldwork practices (*Plan_Report*), and quality assurance and improvement programmes (*Quality_Assure*). Because the dependent variables (i.e. each of the IAF quality components) are bounded between 0 and 1, the Fractional Response Model is adopted for the estimation. All variable definitions are summarised in Appendix 4. Z-statistics appear in parentheses. Standard errors are clustered by region.
*Two-tailed statistical significance at the 10% level.
**Two-tailed statistical significance at the 5% level.
***Two-tailed statistical significance at the 1% level.

the variable OUTSOURCE, we do not find a statistically significant relation between OUT-SOURCE and IAFQ. Furthermore, adding OUTSOURCE into the regressions does not change our primary findings discussed in the prior section.

6. Conclusion

Using a unique matched sample of data that were obtained from the CBOK 2010 survey and the Worldscope database, we explore organisational and environmental factors that are associated with firms' incentives to establish a high-quality IAF. First, we document that IAF quality is related to a firm's operating environment, which determines the firm's monitoring and advisory needs. The results suggest that managers and directors of more complex firms are likely to benefit more from the information gathering and assurance services that high-quality IAFs provide.

Furthermore, board monitoring incentives and audit committee diligence are positively associated with IAF quality, but CEO power is negatively related to IAF quality. Scholars argue that different corporate governance mechanisms are inter-related and that the nature of these relationships is complex, which is particularly true for an IAF, as it is expected to serve two masters, the board of directors and management (IIA 2003, Abbott et al. 2010, Hoos et al. 2014). Quality boards and audit committees understand the benefits of a high-quality IAF to support their monitoring and advisory roles and demand for a high-quality IAF when the need for monitoring increases (Laux and Laux 2009); however, entrenched CEOs may limit this additional level of control that potentially constrains their ability to behave opportunistically.

Finally, we demonstrate that characteristics of the external environment, particularly environmental uncertainty induced by industry competition and regulatory requirements, affect IAF quality. While previous literature documents that a high-quality IAF brings benefits to firms in internal control and financial reporting (e.g. Prawitt et al. 2009, Lin et al. 2011, Ege 2015), our results imply that companies in highly competitive settings are more likely to benefit from the independent assurance and advisory services of an IAF that ensure the effectiveness of risk management, governance, and control processes (Khandwalla 1972). Furthermore, regulators can play an important role by encouraging the establishment of a high-quality IAF, and the results based on our unique self-constructed national corporate governance index highlight the potential influence of regulators. The index may be used by future research as an additional control for country-level differences in an institutional accounting or auditing setting.

This study's results have implications for practitioners. Specifically, firms that seek to develop an IAF or improve the quality of their IAF should consider the internal organisational structure and the external environment. Furthermore, multiple stakeholders, such as directors, managers, competitors, and regulators, are likely to influence the IAF's attributes and practices. Our results highlight the importance of the interactions between a board of directors and top managers in shaping the IAF attributes and practices.

This study does include caveats. First, the use of survey responses to develop our IAF quality measure implicitly assumes that the survey respondents have provided accurate information regarding their IAF characteristics and practices. However, we assume that inaccurate information is most likely to introduce noise rather than bias in the analysis, readers should be aware of this potential shortcoming.

Second, our IAF quality measurement model does not specify whether the IAF is used as a management training tool because the survey did not ask questions on this subject. However, because recent studies (e.g. Messier et al. 2011) determine that participating in a management training programme affects internal auditors' objectivity and independence, future research should consider this aspect if data are available.

Third, because of the high proportion of sample firms audited by Big 4 auditors, we do not specifically test the relationship between IAF quality and external auditor characteristics. Future research could test how external auditor characteristics influence firms' incentives to establish a high-quality IAF because prior studies are inconclusive regarding whether internal audits and external audits are complements or substitutes (DeFond and Zhang 2014).

Fourth, the 2010 CBOK was the most up-to-date international IAF dataset at the time that we initiated this study; however, the IIA launched a new global internal auditor survey in 2015. Future research could examine the evolution of IAF since 2010 by analysing both the 2010 and 2015 surveys. Given the increasing involvement of IAFs in risk management and enhanced public awareness of the importance of managing risks after the global financial crisis, the IAF's role in enterprise risk management and the resulting demand for better quality IAFs would be an interesting and timely research question.

Finally, we explore the factors that potentially influence firms' incentives to develop a high-quality IAF without tackling the consequences of better quality IAFs. Prior literature suggests that a high-quality IAF contributes to more effective internal control and higher quality financial reporting (e.g. Prawitt et al. 2009, Lin et al. 2011, Ege 2015). In recent years, the scope of IAFs' work is expanding and the IAFs are more extensively involved in providing consulting services that are business-oriented. Meanwhile, directors and managers have enhanced expectations for the value added by internal auditors (PricewaterhouseCoopers 2009, 2014). This trend suggests that investigating non-financial reporting consequences of a high-quality IAF is another promising avenue for future research.

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Notes

1. CBOK includes global internal auditor surveys conducted by the Institute of Internal Auditors IIA in 2006, 2010, and 2015. The 2010 survey was the most current survey at the time this research was initiated.
2. These studies include Prawitt et al. (2009), Lin et al. (2011), Zipfel and Eulerich (2013), Lenz et al. (2014), Christ et al. (2015), Ege (2015), and Abbott et al. (2016).
3. For example, Carey et al. (2000), Davidson et al. (2005), and Goodwin-Stewart and Kent (2006) for Australia; Wallace and Kreutzfeldt (1991), Felix et al. (2001), Carcello et al. (2005a), Carcello et al.

(2005b), Abbott et al. (2007), Prawitt et al. (2009), Barua et al. (2010), Lin et al. (2011), Anderson et al. (2012), and Ege (2015) for the US; Zain et al. (2006) for Malaysia; and Sarens and Abdolmohammadi (2011) for Belgium.

4. In this study, we do not test the relationship between external auditor characteristics and internal audit quality because of a lack of variation of external auditor features. In all, 84% of our sample firms were audited by one of the Big 4 auditors. We recognize that this is a limitation of this study. According to Simunic (1980), when determining audit fees charged to a client, an external auditor considers the client's internal accounting system of which the IAF is an important element. A better IAF improves the quality of the client's internal accounting system and decreases the audit risk faced by the external auditor who in turn lowers the audit fees. While some studies provide supporting evidence that better quality IAFs are associated with lower external audit fees (e.g. Felix et al. 2001, Messier et al. 2011), other studies report that internal audit and external audit fees have a positive rather than negative relationship (Hay et al. 2006). As such, current findings are mixed regarding whether a high-quality IAF acts as a complement or substitute to an external audit (DeFond and Zhang 2014).

5. Although we focus on audit committee diligence, we realize that other audit committee characteristics, such as audit committee independence, can also influence IAF quality. We do not explicitly investigate audit committee independence in this study because of a lack of variation of this variable. In all, 85% of our sample firms claims to have entirely independent audit committees. Instead, we add audit committee independence as a control variable in our empirical analysis.

6. We acknowledge that CEO power is only one of the CEO characteristics that can influence IAF quality. Prior studies have identified several other CEO characteristics, such as CEO risk-taking preference, overconfidence, and narcissism that affect CEOs' decisions and behaviours (e.g. Malmendier and Tate 2005, Zhu and Chen 2015, Cain and McKeon 2016). In addition, given the significant role played by the IAF in internal control and financial reporting, the characteristics of CFO could potentially influence the IAF quality as well. In fact, in our sample, 20% of the CAEs indicated that they report directly to the CFOs or vice president of finance in their organizations. Due to data constraint, we only examine the relation between CEO power and IAF quality. Future studies can explore the effects of other CEO characteristics on the IAF quality as well as the effects of CFO characteristics on the IAF quality.

7. According to Aguilera and Cuervo-Cazurra (2009), 64 countries had issued 196 separate CG codes by mid-2008.

8. The CBOK 2010 global internal auditor survey was conducted by the IIA in early 2010. The survey questionnaire, which includes a wide range of questions, was sent to internal auditors working in a variety of organizations, including publicly listed companies, private companies, governments, and non-profit organizations. This study uses only the responses from publicly listed companies. The matching of CBOK 2010 and Worldscope data was authorized by the IIARF.

9. We require an exact match between the domain name of a firm's website and the domain name in the email address provided by the respondent. For example, if the email address is aaa@xyz.com, it is matched with the firm whose website domain ends with xyz.com. We delete responses whose email addresses contain Gmail, Hotmail, or Yahoo because these email addresses are not useful for identifying firms and confound the matched results. We subsequently checked the matches by ensuring that the assets and revenues disclosed by the respondents matched firms' actual financial data. Specifically, in the CBOK survey, the questions about total assets and total sales asked respondents to choose a range of values rather than providing exact numbers. Consequently, we consider a match to be acceptable if the value of the corresponding variable from Worldscope falls into the range indicated in the survey response. If, for example, a survey respondent stated that a firm's assets are worth between \$1bn and \$5bn, we consider the match acceptable if the 2009 year-end total assets of the firm in Worldscope is anywhere between \$1bn and \$5bn.

10. The missing values are primarily due to unavailable information about board and CEO characteristics. Certain non-US companies did not provide annual reports in 2008 on their websites, or they provided incomplete information on board directors and CEOs in the annual reports.

11. We note that our data are 6 years old and therefore may not reflect the most recent practices regarding internal audits. For example, aligning internal audits to business objectives has emerged as a key area for the internal audit profession in recent years (IIA 2015). Hence, the services demanded by directors and CEOs from internal auditors may be changing, which in turn affects the desired competency and skill set of internal auditors. In addition, the emerging concept of 'combined assurance' indicates that internal auditors, which are internal assurance providers, are expected to coordinate more with other parties in the corporate governance structure (Huibers 2015).

These changes could reinforce the relationship between IAF quality and other corporate governance cornerstones. We acknowledge that the age of our data is a limitation of this study. We acknowledge that the sample used in our study is relatively small, which can potentially reduce the power of the empirical tests and bias the results. To address this issue, we adopt a bootstrap approach and replicate the regression 500 times with random samples of 200 observations. Our findings remain unchanged based on the bootstrap estimations.

12. For example, compared with respondents from other countries, respondents from the US have a longer membership with the IIA and a higher likelihood of obtaining professional certificates, such as the Certified Internal Auditor. In addition, IAFs in the US are more likely to adopt advanced audit tools and techniques, such as risk-based audit planning, electronic communication, and analytical review.

13. The Standards include Attribute Standards and Performance Standards, which collectively describe the desirable 'attributes of organizations and individuals who perform internal auditing' and indicate the 'quality criteria against which the performance of these services can be measured' (IIA 2012, p. 1).

14. As previously mentioned, because survey questions and corresponding answers about internal auditors' competence relate to personal information regarding individual respondents, we use the CAE's competence as a proxy for the IAF's competence. We acknowledge this as a caveat in this study. However, relying on the CAE's competence to measure the IAF's competence is acceptable because prior research demonstrates that the CAE is an essential factor in determining the overall quality of the IAF (e.g. Sarens and De Beelde 2006). In addition, recent studies (e.g. Ellul and Yerramilli 2013) also use the characteristics of the Chief Risk Officer to measure the quality of the risk management function.

15. Prior studies generally use objectivity instead of independence and consider that objectivity and independence are interchangeable. However, the Standards state that independence and objectivity are two separate constructs. Independence refers to 'freedom from conditions that threaten the ability of the internal audit activity to carry out internal audit responsibilities in an unbiased manner', and objectivity refers to 'an unbiased mental attitude that allows internal auditors to perform engagements in such a manner that they believe in their work product and that no quality compromises are made' (IIA 2012, pp. 3–4). We include independence rather than objectivity in our IAF quality measure for two reasons. First, the survey questions in the CBOK 2010 survey, such as those concerning reporting lines and hiring practices, relate more to internal auditors' independence than their objectivity. Second, objectivity is a mental attitude that is very difficult to measure based on the survey data.

16. As an alternative, we use Partial Least Squares-Path Modeling (PLS-PM) to estimate a hierarchical measurement model of IAF quality; the attributes and practices are treated as the first-order latent variables, and the overall IAF quality is specified as the second-order latent variable. The PLS-PM estimation process generates the weights of the measurement items, which are used to compute the scores of the attributes and practices and the overall IAF quality. The IAF quality score obtained from the PLS-PM approach is highly correlated with the IAF quality score used in our primary analysis (correlation = 0.94). As a robustness check, we re-run all the tests using the IAF quality derived from the PLS-PM approach. Our empirical results remain unchanged.

17. As a robustness check, instead of using the composite measure of complexity, we include LogAT, SEG, and FORSALE into the regression. The results indicate that the coefficients on LogAT and SEG are significantly positive, but the coefficient on FORSALE is not statistically significant.

18. In the primary analysis, we do not aggregate the three variables to form a composite variable of board monitoring and advising incentives because the three variables are likely to capture different aspects of the board's monitoring and advising needs from the IAF. Nevertheless, in an additional analysis, we construct a composite variable of board monitoring incentives that aggregates the individual variables of board monitoring incentives listed above. To do so, we dichotomize each individual variable by its respective sample median and use the sum of the four dummy variables as the composite variable (BODMONI). We take the opposite order to BODBUSY when constructing the composite variable because BODBUSY is an inverse measure for board monitoring incentives (i.e. busy directors have less incentives to monitor). Our results remain qualitatively similar if we use the aggregated variable instead of the individual variables for board monitoring incentives.

19. Available at http://www.ecgi.org/codes/all_codes.php.

20. The unweighted Kappa statistic indicates an agreement rate of 79%. However, we believe that the weighted Kappa statistic is more appropriate in our context because there is a difference between two raters disagreeing on whether a corporate governance code mandates or strongly recommends having an IAF and two raters disagreeing on whether a corporate governance code mandates an IAF or does not mention the IAF.

21. Because IAF is mandated by the NYSE but remains voluntary for the NASDAQ, we differentiate the requirements by coding the variable CGCODE as 5 for US firms listed on the NYSE but 4 for US firms listed on the NASDAQ.
22. We acknowledge that there is a limitation of adding an indicator variable *US* to the model. It is possible that the marginal effects of tested variables on IAF quality vary across US and non-US firms, but the slope coefficients of our tested variables will not be influenced by adding the US indicator variable into the model.
23. The sample countries are classified into seven different economic blocks based on MSCI indexes: Asian-Developed, Europe-Developed, America-Developed, Asian-Emerging, Europe-Emerging, Middle-East-Emerging and Africa-Emerging, and America-Emerging.
24. The IAFQ can be considered a proportion (i.e. the desirable attributes and practices observed in an IAF) and is calculated as a percentage of the total desirable attributes and practices identified from the Standards. Because the dependent variable is bounded between zero and one, an OLS regression is not appropriate because predicted values from the OLS regression can be below zero or above one. Furthermore, because the dependent variable is between zero and one, the effect of any independent variable on the dependent variable is most likely non-linear. The Fractional Response Model is an extension of the generalized linear model to a class of functional forms, which circumvents most of the known issues with the traditional econometric models for bounded variables (Gallani et al. 2015). In our primary analysis, we use the logit link function, but our results remain unchanged when we use the probit link function. Certain scholars also suggest an alternative method to address fractional responses, under the assumption that the dependent variable follows a beta distribution. Our results remain unchanged when we follow this approach.

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Appendix 1. IAF quality measurement items

IAF quality components	Key desirable attributes and practices	Relevant standards	Measurement item	Definition of measurement item	CBOK	Specific relevant standards
Internal auditor	*Competence*	Standard #1200 – proficiency and due professional care	yearexp	This variable measures the CAE's experience in the position. Because four options were provided to the respondents, this variable assumes the value of 0.25 if the CAE has 3 years or less experience in the position, 0.5 if the CAE has 3–6 years of experience in the position, 0.75 if the CAE has 7–9 years of experience in the position, and 1 if the CAE has 10 years or more experience in the position.	Q8	#1210
			education	This variable reflects the CAE's number of years of undergraduate and graduate education, based on the highest qualification received. It takes the value of 0 if the CAE's highest qualification is secondary or high school level, 0.25 if a CAE has an associate degree, 0.5 if a CAE has a bachelor's degree, 0.75 if a CAE has a master's degree, and 1 if a CAE has PhD	Q3	#1210
			training	This variable measures internal auditors' training and assumes the value of 1 if at least 40 hours of training is provided per year in an internal audit department, and 0 otherwise.	Q10	#1230
			IIAmemb	This variable indicates the number of years that the CAE has been a member of the IIA and assumes the value of 0 if the CAE is not a member of the IIA, 0.25 if the CAE has been a member for 1 year or less, 0.5 if the CAE has been a member for 2–5 years, 0.75 if the CAE has been a member for 6–9 years, and 1 if the CAE has been a member for 10 years or more.	Q1	#1230
	Independence	Standard #1100 –	reportline	This variable measures the reporting line of IAF and assumes the value of 1 if the IAF reports	Q9	#1110

		independence and objectivity			directly to the audit committee and 0 otherwise.		
			AC_employ	This variable measures the involvement of audit committee in employment decision-making and assumes the value of 1 if the audit committee is involved in making the decision to engage the CAE and 0 otherwise.	Q17	#1110
			AC_evalu	This variable measures the involvement of the audit committee in performance evaluations and assumes the value of 1 if the audit committee is involved in the evaluation of the IAF's performance and 0 otherwise.	Q18	#1110
Internal audit process	Fieldwork practices (*Plan_Report*)	Standard #2000–2500 – performance standards	risk_plan	This variable measures the adoption of a risk-based audit plan and assumes the value of 1 if the IAF has a risk-based audit plan and 0 otherwise.	Q43	#2010
			technique	This variable indicates the number of audit tools or techniques that the IAF uses. Because 15 tools/techniques (excluding risk-based audit plans) are listed in the question, this variable is calculated as the number of tools/techniques chosen by the respondent divided by 16.	Q43	#1220 & #2310
			rating	This variable measures the IAF's reporting of findings and assumes the value of 1 if the IAF provides an opinion or a rating in internal audit reports and 0 otherwise.	Q40	#2410
			follow	This variable measures whether internal auditors are involved in monitoring corrective actions and assumes the value of 1 if internal auditors are involved and 0 otherwise.	Q42	#2500
			update	This variable measures how often an IAF updates the audit plan. Because five options are presented to the respondents, this variable assumes the value of 0 if there is no audit plan, 0.25 if the audit plan is updated every two years or longer, 0.5 if the audit plan is updated every two years, 0.75 if the audit plan is	Q23	#2010

Continued.

IAF quality components	Key desirable attributes and practices	Relevant standards	Measurement item	Definition of measurement item	CBOK	Specific relevant standards
				updated every year, and 1 if the audit plan is updated multiple times per year.		
Internal audit quality review	Quality Assurance and Improvement Program (*Quality_Assure*)	Standard #1300 – Quality Assurance and Improvement Program	qa	This variable measures the existence of quality assurance and improvement programmes and assumes the value of 1 if the firm has a quality assurance and improvement programme and 0 otherwise.	Q36	#1300
			qa_recent	This variable measures of frequency of external quality assessments and assumes the value of 1 if internal audit activities have undergone a formal external quality assessment in the last five years and 0 otherwise.	Q37	#1312
			coverage	This variable measures the number of internal audit activities subject to the quality assessment and improvement programme. Because 10 areas are listed in the question (option 'Other' is excluded), this variable is calculated as the number of areas chosen by the respondent divided by 10. If the respondent chose 'Not applicable', this variable is assigned the value of 0.	Q38	#1300
			compliance	This variable measures the degree to which the IAF is in compliance with the Standards and assumes the value of 0 if the IAF is not in compliance with the Standards, 0.5 if the IAF is in partial compliance with the Standards, and 1 if the IAF is in full compliance with the Standards.	Q32	#1321

Note: This appendix presents the three founding components of IAF quality and the corresponding key desirable attributes and practices identified in the Standards. 'The Standards' refer to the International Standards for the Professional Practice of Internal Auditing issued by the Institute of Internal Auditors IIA (2012). For the key attributes and practices, *Competence* indicates the CAE's competence; *Independence* indicates the independent status of the IAF; *Plan_Report* indicates the fieldwork practices of the IAF; *Quality_Assure* indicates the quality assurance and improvement programmes of the IAF. This appendix also presents the definitions of the measurement items used to measure each attribute or practice, the data resource (i.e. the survey question number) for each measurement item in the CBOK 2010 survey, and corresponding Standards for each measurement item.

Appendix 2. Descriptive statistics for IAF quality measurement items

Variable	N	Mean	Median	STD	Min	Max
Competence						
yearexp	265	0.56	0.50	0.28	0.25	1.00
education	265	0.59	0.50	0.16	0.00	1.00
training	265	0.77	1.00	0.42	0.00	1.00
IIAmemb	265	0.69	0.75	0.29	0.00	1.00
Independence						
reportline	265	0.42	0.00	0.49	0.00	1.00
AC_appoint	265	0.87	1.00	0.34	0.00	1.00
AC_evalu	265	0.71	1.00	0.45	0.00	1.00
Plan_Report						
risk_plan	265	0.87	1.00	0.34	0.00	1.00
technique	265	0.39	0.40	0.20	0.00	1.00
rating	265	0.63	1.00	0.48	0.00	1.00
follow	265	0.85	1.00	0.36	0.00	1.00
update	265	0.84	0.75	0.16	0.00	1.00
Quality_Assure						
qa	265	0.26	0.00	0.44	0.00	1.00
qa_recent	265	0.28	0.00	0.45	0.00	1.00
coverage	265	0.46	0.50	0.31	0.00	1.00
compliance	265	0.58	0.50	0.40	0.00	1.00

Note: This appendix presents the descriptive statistics for the measurement items used in the IAF quality measure. The definitions of the measurement items are presented in Appendix 1. All measurement items are coded to allow for values that range from 0 to 1, except for yearexp which ranges from 0.25 to 1.

Appendix 3. Examples of IAF requirements in corporate governance codes

CG code type	Example	Value assigned
An IAF is required for listed companies.	The amendments spell out … [that] the IAFs are now required in all PLCs and the reporting line for internal auditors is clarified. (Malaysia Code on Corporate Governance 2007)	5
An IAF is strongly recommended. If an IAF is not established, the audit committee should annually review the need for one.	An independent IAF should be established, with resources and skills adapted to the company's nature, size and complexity. If the company does not have an IAF, the need for one should be reviewed at least annually (The 2009 Belgian Code on Corporate Governance 2009).	4
An IAF is explicitly recommended. Certain detailed information regarding an IAF appears in the requirements for audit committees/boards of directors/managers.	The company shall describe the manner in which the IAF of the company is organised (Finnish Corporate Governance Code 2008).	3
An IAF is not explicitly recommended, but certain information regarding an IAF appears in the requirements for audit committees/boards of directors/managers.	The number and structure of the committees are determined by each Board. However, it is recommended that … the monitoring the internal audit … should be subject to preparatory work by specialised committees of the Board of directors (French Corporate Governance Code of Listed Corporations 2008)	2
No mention is made of the IAF in the code.	N/A	1

Appendix 4. Variable definitions

Variable	Definition
IAFQ	Composite score of overall IAF quality
LogAT	Natural logarithm of total assets in USD
SEG	Number of business segments
FORSALE	Percentage of foreign sales to total sales
COMPLEX	Composite measure of firm complexity derived from a factor analysis of LogAT, SEG, and FORSALE
BODSIZE	Board size, measured as the total number of board members
BODINDE	Board independence, measured as the number of independent board members to the total number of board members
BODMEET	Number of meetings held by a board of director per year
BODBUSY	Busy board members, measured as the percentage of board members who hold at least three additional directorships in other companies
ACSIZE	Audit committee size, measured as the number of audit committee members
ACMEET	Number of meetings held by the audit committee per year
ACINDE	An indicator variable that measures audit committee independence, equal to 1 if all audit committee members are independent and 0 otherwise.
CEODUA	An indicator variable for CEO duality, equal to 1 if the CEO is also the chairman of the board and 0 otherwise
MTB	Market to book ratio, calculated as the year-end market value of equity divided by book value of equity
LEV	Leverage ratio, calculated as total debt to total assets
CLOSEHELD	Closely held shares, calculated as the percentage of shares owned by insiders
BIG4	An indicator variable for Big 4 auditors, equal to 1 if a firm is audited by a Big 4 audit firm and 0 otherwise
CROSSLIST	An indicator variable measuring crosslisting status, equal to 1 if a non-US firm is crosslisted in the US stock markets (NASDAQ and NYSE) and 0 otherwise
INVREC	Total inventory and receivables to total assets
CFO	Cash flow from operating to total assets
AGE	Age of IAF, ranging from 1 to 7 based on seven options provided to the respondents in the CBOK survey question No.6.
US	An indicator variable for US firms, equal to 1 if a firm is a U.S. firm and 0 otherwise
INDCOM	Industry competition, calculated as the average annual Herfindahl indices for each country-industry from 2006 to 2008
CGCODE	A self-structured index that measures the intensity of IAF requirements in the corporate governance codes. The values of this variable range from 1 to 5, with higher values indicating stricter IAF requirements. See Appendix 3 for details of the coding.
FINDEV	Financial market development of a country, calculated as the standardised mean rank of two variables: the ratio of domestic listed companies to the total population from 2006 to 2008 and the market capitalisation to total GDP from 2006 to 2008.
SECLAW	Quality of securities regulation of a country, calculated as the mean of the standardised values of three indices developed in La Porta et al. (2006) and used in Leuz (2010): disclosure quality index, liability standard index, and public enforcement index.