The effect of internal control and risk management regulation on earnings quality: Evidence from Germany

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ABSTRACT

We investigate the impact of mandatory internal control and risk management (ICRM) reform on earnings-based attributes of accounting quality in Germany. Although prior studies examine changes in accounting quality under SOX Sections 302 and 404, there is scant evidence of the accounting quality effects of ICRM reform in foreign jurisdictions. Such evidence is warranted given the ongoing global policy debate of ICRM reform in the post-SOX era. We extend existing research by examining changes in earnings quality following the 1998 German legislation on control and transparency (KTG). The KTG regime provides a unique setting in which the regulatory scope extends beyond internal control over financial reporting (ICFR) to include broad business and enterprise risk control. Using both a differences and difference-in-differences research design, we find that German firms experience an increase in timely loss recognition and a decrease in earnings smoothing after KTG. We also find some evidence of a decrease in loss avoidance behavior. Additional analyses show that the sensitivity of capital investment efficiency to earnings quality increases in the German market after KTG, suggesting that earnings quality effects of mandatory ICRM reform has positive consequences for capital resource allocation. Together, our results are consistent with the achievement of one of the intended outcomes of ICRM regulation—increased accounting quality through effective ICRM systems.

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2   *N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx*

1. Introduction

The implementation, assessment, and monitoring of effective internal control and risk management (ICRM) systems is a key determinant of financial reporting quality. Specifically, high-quality ICRM systems curtail the intentional manipulation of information reported to outsiders, reduce the risk of random procedural and estimation errors in reporting, and mitigate the inherent risks of business strategies and operations that may affect the quality of reported information (COSO, 1992). While the demand for ICRM quality exists in the absence of regulation, compliance with regulatory requirements can force managers to increase and/or maintain ICRM quality (Hermanson, 2000; Kinney, 2000). Accordingly, ICRM reforms such as the 1998 German legislation on control and transparency (*Gesetz zur Kontrolle und Transparenz im Unternehmensbereich*; "KTG"),[1] 2002 U.S. Sarbanes-Oxley Act ("SOX"), 2005 Canadian Securities Administrators' Multilateral Instrument 52-109 ("SOX North"), and the 2008 Japan Financial Instrument and Exchange Law ("J-SOX") have been promulgated under the principle that improving ICRM quality should increase the quality and transparency of financial information (Deutscher Bundestag, 1998a,b; Donaldson, 2005; CSA, 2005; FSA, 2006).[2]

Despite widespread global adoption of ICRM mandates (especially in the post-SOX era), there is scant evidence on accounting quality effects of mandatory ICRM reform in non-US capital markets. Prior research on the accounting quality effects of ICRM regulation focuses largely on the US setting and, in particular, the regulatory requirements of SOX Sections 302 and 404, which are limited to internal control over financial reporting (ICFR) and exclude broad business risk controls (SEC, 2003).[3] US-based studies document that firms reporting ICFR weaknesses under SOX have *ex ante* poor accounting quality (Doyle et al., 2007a; Chan et al., 2009) and that some firms experience an increase in accounting quality following improvements in ICFR quality (Bédard, 2006; Ashbaugh-Skaife et al., 2008; Goh and Li, 2011; Singer and You, 2011). However, this body of evidence is limited either to large firms (i.e., accelerated filers) or to firms that report or remediate ICFR weaknesses. Thus, results may not be generalizable to all firms subject to the regulation and even less so to firms subject to ICRM mandates in non-US regulatory regimes. As Fig. 1 depicts, current international legislation on ICRM varies greatly from the extensive management assessment and external audit of ICFR under SOX. These variations reflect the institutional framework of each country as well as regulators' attempts to improve upon the cost-benefit tradeoffs of the SOX model (FEE, 2005; Lu et al., 2011). Also, international jurisdictions continue to adopt a broad enterprise-based approach to ICRM as defined in key frameworks (Deumes and Knechel, 2008).

We extend prior research by examining the effect of ICRM reform on accounting quality in an international setting with specific focus on the 1998 German KTG legislation. The KTG reform affects all public firms (both large and small) and requires management to implement a suitable ICRM system, monitor the effectiveness of the control measures in place, and report on business risks faced by the firm (effective May 1998).[4] The KTG reform also requires external auditors to assess the implementation and effectiveness of the ICRM system and the completeness of management's risk disclosures (effective December 1998). Unlike SOX, the regulatory scope of KTG extends beyond ICFR to include broad risk management controls. However, the ICRM disclosure mandates of KTG are limited compared to SOX. Specifically, managers are not required to publicly disclose ICRM weaknesses or certify ICRM effectiveness, and the external auditors' report on ICRM effectiveness is confined internally to the supervisory

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[1] The legislation is widely referred to as KonTraG. We abbreviate this term to KTG for ease of readability.

[2] Several other jurisdictions, including Australia, China, Hong Kong, the UK, and the EU, have recently enacted major ICRM reforms (see Fig. 1 for further details).

[3] SOX 302 requires management to evaluate and certify the effectiveness of ICFR (effective August 29, 2002 for all SEC registrants). SOX 404 requires management (404a) and external auditors (404b) to assess and report on ICFR effectiveness (effective November 15, 2004 for accelerated filers). SOX 404a is effective as of December 15, 2007 for non-accelerated filers; they are exempt from SOX 404b pursuant to the 2010 Dodd-Frank Act (SEC, 2010).

[4] Under KTG, the disclosure of business risks is limited to possible future negative impacts to the firm's economic position and does not extend to ICRM weaknesses (Dobler, 2005; GAS 5). This disclosure requirement is similar, albeit broader in scope, to US-GAAP risk disclosures such as loss and gain contingencies (SFAS 5), risks relating to financial instruments (SFAS 133), and significant risks and uncertainties in accounting estimates (SOP 94).

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N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx　　　3

Country	Legislation	Effective date of internal control requirements	Mandatory?	Scope of requirements						External auditors' involvement?	External auditors' opinion?	Suggested frameworks
				Types of controls				Management Disclosure				
				Financial reporting	Compliance	Operational and strategic	Overall process	Management of specific risks	Effectiveness conclusion			
Germany	Legislation on Control and Transparency (KTG)	Dec. 1998	✓	✓	✓	✓	✓	✓	×	✓	✓ internal report to supervisory board	IDW standards (based on COSO)
U.S.A	Sarbanes-Oxley Act (SOX)	Aug. 2002[2]	✓	✓	×	×	×	×	✓	✓	✓ external report in financial statements	COSO, COCO, Turnbull, Other[3]
Austria[4]	Code of Corporate Governance	Feb. 2005	×	✓	✓	✓	✓	×	×	✓	✓ internal report to supervisory board	Not specified
France[4]	Financial Security Act	Aug. 2003	✓	✓	×	✓	✓	✓	×	✓	✓ external report in financial statements[5]	Not specified
Switzerland[4]	Swiss Code of Best Practice	July 2002	×	✓	✓	✓	×	×	×	n/a	n/a	Not specified
U.K.[4]	Combined Code on Corporate Governance	May 2000	comply-or-explain[6]	✓	×	×	×	×	✓	✓ audit review only	✓ external audit "exceptions" report in financial statements[5]	Turnbull
Canada	CSA National Instrument 52-109 (SOX North)	June 2006	✓	✓	×	×	×	×	✓ Dec. 2008	×	×	COSO, COCO, Turnbull
Australia	Corporate Law Economic Reform Program (CLERP 9)	Jul. 2004	comply-or-explain[6]	✓	✓	✓	×	×	✓	✓ audit review only	✓ external report in financial statements	Turnbull
Hong Kong	Code on Corporate Governance Practices	Jan. 2005	comply-or-explain[6]	✓	✓	✓	✓	✓	✓	×	×	COSO, Turnbull
European Union[7]	8th European Union Company Law Directive	May 2006	✓	✓	✓	✓	✓	×	×	✓	✓ internal report to audit committee or supervisory board	COSO, Turnbull
Japan	Financial Instruments and Exchange Law (J-SOX)	Apr. 2008	✓	✓	×	×	×	×	✓	✓	✓ external report in financial statements	J-SOX (based on COSO)
China	Basic Standard for Enterprise Internal Control (C-SOX)	Jan. 2011	✓	✓	×	×	✓	✓	✓	✓	✓ external report in financial statements	COSO

[1] The summary information for Germany, U.S., Austria, France, Switzerland, and the U.K. is partially adapted from FEE (2005), Appendix III to XXII. The summary information for all countries is based on the initial enactments of the respective legislation, which is likely to evolve over time.

[2] SOX 302, which requires that managers evaluate and certify the effectiveness of internal control over financial reporting (ICFR), became effective on August 29, 2002 for all SEC registrants (domestic and foreign). SOX 404, which requires the external audit and attestation report of management's ICFR assessment, became effective for large firms (accelerated filers) as of November 15, 2004. For non-accelerated filers, the external audit of management's assessment of ICFR became effective as of December 15, 2007. Non-accelerated filers are permanently exempted from the external audit requirement of SOX 404 effective September 21, 2010 (SEC, 2010).

[3] Other evaluation frameworks specific to a firm's home country may be used (SEC, 2003).

[4] Firms domiciled in Austria, France, Switzerland, and the U.K. are used as control firms in our empirical tests.

[5] In the "comply-or-explain" regimes, compliance with ICRM requirements are not mandatory, but explanation of non-compliance is mandatory.

[6] In France, the external audit report is limited to ICFR. In the U.K., the reporting of ICFR audit exceptions do not give rise to a qualified audit opinion and are typically reported under the heading "other matters" in the auditor's external report.

[7] The EU directive had to be implemented in member states by June 29, 2008. The German Accounting Law Modernization Act (BilMoG, March 2009) incorporates the ICRM provisions of the EU directive without amendment and without imposing additional reporting requirements. That is, the ICRM requirements were not changed significantly from those outlined in the KTG bill. In Austria, the Code of Corporate Governance was revised in January 2009 to include additional requirements of the EU directive. The requirements of the directive are met by existing legislation in the U.K. (Combined Code) and France (Financial Security Act).

Fig. 1. Comparison of internal control and risk management (ICRM) requirements in Germany, the US, and other international jurisdictions.

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4   *N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx*

board.[5] Hence, the disclosure costs of KTG are arguably lower than those of SOX and other SOX-like models (FEE, 2005; Bartram et al., 2006; Glaum et al., 2006).[6]

We conjecture that German firms will experience an increase in earnings quality following the KTG reform. However, this intended outcome could be diminished by poor legal and market enforcement and/or weak compliance by firms. Given the monitoring role of public disclosure (Ball, 2004), the limited external disclosure of ICRM weaknesses and the lack of managerial certification of ICRM effectiveness could provide less incentive for German managers to adequately comply with KTG. In addition, regulatory requirements could cause managers to engage in business activities that adversely impact accounting quality, but are more difficult to detect by auditors and regulators (Cohen et al., 2008). Thus, whether the KTG reform has a positive impact on earnings quality is largely an empirical question.

We employ two widely-used quasi experimental designs to examine the change in earnings quality after the KTG reform. Our first research design is a "differences" approach based solely on a broad sample of German firms ("within-country" pre-posttest). Our second design is a "difference-in-differences" (DID) approach, which tests for earnings quality changes in the German sample *relative* to a group of firms not subject to KTG. This approach controls for potential time trends in earnings quality and confounding macroeconomic shocks. Because the KTG reform affects all publicly listed firms in Germany, we face the challenge of identifying a suitable control group against which to gauge the impact of KTG on earnings quality. Following prior research (e.g., Zhang, 2007), we address this empirical issue by selecting firms domiciled in several comparable countries as our control group ("between-country" pre-posttest). We select our control countries based on four criteria: (1) location in Western Europe, (2) legal tradition (i.e., common versus code law), (3) capital market size, and (4) the non-existence of mandatory ICRM reform. We select Austria and Switzerland given the impact of German civil law tradition on their stakeholder economies. We select France as another Western European stakeholder economy and the UK because it has the largest capital market in Europe, with Germany being the second largest.

We operationalize earnings quality using multiple empirical measures that capture the concept of accounting quality (Dechow et al., 2010). We use multiple measures to ensure that our results are not due to any one measure and to mitigate the potential effects of correlated omitted variables. We focus on earnings attributes that are most applicable in evaluating accounting quality in international firms (Barth et al., 2008; Bhattacharya et al., 2003; Lang et al., 2003, 2006; Leuz et al., 2003; Wysocki, 2009) and that have positive consequences for enhancing capital resource allocation within firms (Biddle and Hilary, 2006; Biddle et al., 2009; Bushman et al., 2011). These attributes are the timeliness of loss recognition, the smoothness of earnings, and loss avoidance as proxied by the frequency of small positive earnings.[7]

We base our empirical analysis on a sample of 12,984 firm-years (2148 for German firms and 10,836 for the control group) over the 1994–2002 period. Our sample period ends in 2002 to ensure that our results are not confounded by other regulatory changes. We find that, relative to the control group, German firms experience an increase in timely loss recognition and a decrease in the smoothness of earnings following the KTG reform. The Germany-only differences test also show a decline in loss avoidance behavior; however, this result becomes insignificant when we benchmark German firms against the control group in the DID specification. In extended analyses, we find that the sensitivity of capital investment efficiency to earnings quality increases in the German market after KTG,

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[5] An important element of corporate governance and control in Germany is the two-tiered board system, comprised of the supervisory ('Aufsichtsrat') and management boards ('Vorstand'). The management board is responsible for conducting the business and preparing financial statements, while the supervisory board appoints and monitors the management board, assigns the external auditor, and approves the financial statements. The supervisory board is comprised of 51% (49%) stockholder (employee) representation. Banks typically control the majority of stockholder representation due to their large block holdings and use of proxy voting rights on behalf of actual shareholders.

[6] The extensive external audit and management assessment requirements of SOX are widely seen as more costly than the external ICRM audit work required in Germany and the EU (FEE, 2005; Bartram et al., 2006; Glaum et al., 2006). The cost of implementing and monitoring a broad ICRM system could be greater under KTG than SOX. However, 69% of German firms cross-listed in the US view SOX as more burdensome (Bartram et al., 2006).

[7] Given data constraints, we are limited in employing time-series measures of accruals quality (e.g., Dechow and Dichev, 2002). Nonetheless, Wysocki (2009) provides evidence that traditional models of accrual quality exhibit inconsistent relations with fundamental earnings attributes for international firms.

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N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx 5

suggesting that the earnings quality effects of mandatory ICRM reform has positive consequences for capital resource allocation. Sensitivity analyses also indicate that our results are robust to alternative measures and control countries, the adoption of IFRS and US-GAAP standards, and pre-existing time trends in earnings quality. Overall, our results are consistent with the achievement of one of the main goals of ICRM regulation—increased earnings quality through the effective implementation and monitoring of ICRM systems.

Our study makes several important contributions to the extant literature. We provide the first international evidence of the impact of *mandatory* ICRM reform on earnings quality.[8] Such evidence is especially timely and relevant given the widespread global adoption of ICRM mandates (Tafara, 2006; Cox, 2007). While the KTG reform differs from internal control mandates in other jurisdictions, our results should inform regulators and standard-setters around the globe as they debate and assess the adoption and implementation of ICRM reform. In fact, KTG has served as a leading benchmark for establishing ICRM mandates in the EU (e.g., amended 8th EU Company Law Directive; effective May 2006). Moreover, as noted by SEC Chairman Cox (2007), guidance on SOX 404 has "benefited greatly from [observations] in other jurisdictions that have implemented issuer internal control standards."

Our study also contributes to the growing literature on the relation between ICRM and accounting quality, and to the literature on international accounting quality. First, our findings suggest a positive link between ICRM regulation and earnings quality, and thus, complement recent US studies on accounting quality under SOX 302 and 404. Second, our results highlight the positive impact of a broad enterprise-based view of ICRM on accounting quality, consistent with the views of financial statement users (Hermanson, 2000). These results should inform regulators as they debate policies related to effective risk controls. PCAOB (2007) AS-5 standard now emphasizes an entity-level, risk-based approach to ICFR audits and recent changes to the NYSE Corporate Governance Rules require listed firms to monitor their risk management processes, including risks beyond financial reporting (NYSE, 2003).

Third, our results further inform the ongoing debate of mandatory ICRM disclosures. Our results suggest a positive effect of the KTG reform on earnings quality, despite limited public ICRM disclosures. This evidence reflects Germany's insider-oriented framework, which places less emphasis on public disclosure as a monitoring mechanism. Economic incentives often play a complementary role in effecting major institutional reforms (Leuz and Wüstemann, 2004). Thus, our evidence of positive investment efficiency consequences of KTG suggests that capital resource allocation and other economic benefits could incentivize managers to comply with ICRM mandates in the absence of public disclosure monitoring.[9] In light of these arguments, regulators and standard-setters should continue to assess the cost-benefit trade-offs of ICRM disclosure mandates and whether such mandates are necessary to improve ICRM quality.[10] Finally, we document the role of ICRM reform in improving earnings quality in an institutional setting with less informative financial reporting (Ball et al., 2000; Leuz et al., 2003). Thus, our results shed light on the impact of major institutional reform on accounting quality.

2. Background, related literature, and research question

2.1. Institutional background

We discuss the KTG legislation and, where relevant, compare its requirements with those of SOX and other international legislations. Fig. 1 summarizes ICRM legislations in Germany and several

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[8] Deumes and Knechel (2008) and Lu et al. (2011) examine the determinants and credibility of *voluntary* ICRM disclosure in the Netherlands and Canada, respectively. However, neither study examines the effect of ICRM reform on improvements in financial reporting quality within these jurisdictions.

[9] This argument is consistent with Deumes and Kneckel (2008) who find that managers voluntarily report on internal control activities in an effort to reduce agency conflicts between shareholders and providers of debt capital.

[10] For example, regulators and standard-setters in the EU argue that SOX-like disclosure mandates are not necessary to bring about substantive improvements in ICRM quality within the legislative and regulatory frameworks of EU member states (see FEE, 2005, 2006).

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6 *N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx*

countries, namely, the US, Austria, France, Switzerland, the UK, Canada, Australia, Hong Kong, the EU, Japan, and China. In Germany, the KTG legislation represents the main regulation specifying ICRM as an integral component of corporate governance.[11] Similar to SOX, KTG was enacted after several bankruptcies and corporate scandals exposed German firms' ineffective ICRM mechanisms (Enriques and Volpin, 2007). The main goals of KTG, which amends the HGB (*Handelsgesetzbuch*, Commercial Code) and AktG (*Aktiengesetz*, Stock Corporations Act), are (1) to increase the effectiveness of ICRM systems and (2) enhance the quality and transparency of information disclosed to shareholders (Deutscher Bundestag, 1998a,b; Naumann, 2000). At the core of the KTG bill are several key provisions relating to the implementation and audit of firms' ICRM systems, and the disclosure of relevant business risks (Haller, 2003). Under KTG, experts argue that ICRM quality is the main underlying principle of improving financial reporting quality given the legislation's broad redefinition of the ICRM functions of the management and supervisory boards, and external auditors (Naumann, 2000).[12]

The KTG amendment of Section 91 II AktG (effective May 1998) requires the management board to implement an ICRM system that is able to detect developments endangering the company's existence. A two-step legal obligation is derived from this amendment (Kajüter et al., 2007). The management board must (1) take appropriate measures to identify and assess risks early (risk management system) and (2) monitor the effectiveness of these measures (internal control system). The scope of ICRM under this regulation is broader than that of SOX and other SOX-like reforms. As Fig. 1 depicts, SOX 302 and 404 are limited to ICFR (SEC, 2003), with regulations in Canada, Japan, and China adopting a similar limited approach. The KTG amendment focuses not only on ICFR but also on business risk controls and enterprise risk management (Ballwieser and Dobler, 2003). Hence, the KTG reform extends to financial reporting, compliance, operational, and strategic risks (Kajüter et al., 2007). This comprehensive approach draws upon the COSO (1992) framework, which views risk control and assessment as interrelated ICRM components that are important antecedents of reliable financial reporting.

Further, the KTG amendment of Section 315 I HGB requires management to disclose in the financial report (1) their compliance with Section 91 II AktG and (2) risks that may have a material influence on the firm's financial position.[13] While this disclosure requirement (termed "risk reporting") refers to all material risks (including financial reporting risks), the legal interpretation and guidance for risk reporting has been confined to the disclosure of business and going-concern risks (Kajüter et al., 2007). Risk reporting does not extend to the principle of proper financial reporting and as such, does not include the disclosure of ICRM weaknesses (Dobler, 2005; GASB, 2000). Risk reporting also differs from SOX 302 and similar international legislation in that managers are not required to publish an explicit conclusion on ICRM effectiveness. However, regulators argue that management's declaration of compliance with Section 91 II AktG may provide an implicit (but limited) conclusion on ICRM effectiveness (FEE, 2005).

The ICRM requirements of KTG are further complemented by its amendments to the control and monitoring mechanisms of the supervisory board. The AktG explicitly requires the supervisory board, with the support of independent external auditors, to monitor and control the management board. KTG extends this requirement to the consolidated financial statements and the management report, including management's disclosure of business risks and the implementation and monitoring of ICRM measures (Section 171 I AktG). Moreover, the supervisory board has to report the extent and results of its monitoring activities, including ICRM activities, to the annual shareholders' meeting (Section 171 II AktG).

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[11] The 8th EU Company Law Directive (effective May 2006) mandates the adoption of ICRM requirements in all EU member states. The German Accounting Law Modernization Act (BilMoG, March 2009) incorporates the ICRM provisions of the EU directive without amending or imposing additional reporting requirements.

[12] The KTG reform includes provisions regarding the control mechanisms of supervisory boards and banks as corporate insiders. These amendments are aimed at improving firms' control environments or "tone at the top" as defined by the COSO framework. However, as noted in prior studies (e.g., Naumann, 2000), the KTG legislation did not envisage fundamental changes to the corporate governance of German firms. In fact, the KTG amendments limiting the control of bank insiders had only minor effects, i.e., bank representatives continue to control the supervisory boards of most major German firms (Gourevitch and Shinn, 2005).

[13] Section 315 I HGB was extended in 2004 to include the disclosure of ICRM objectives and procedures, and the disclosure of price, credit, liquidity, and cash flow risks.

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N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx 7

KTG also modifies the auditing of ICRM systems. Effective December 1998, external auditors must assess management's implementation of a suitable ICRM system (Section 317 IV HGB), and evaluate and report on the system's effectiveness (Section 321 IV HGB).[14] The auditor's long-form report (addressed only to the supervisory board) must detail the results of the ICRM evaluation and state whether corrections of material ICRM weaknesses are required. However, specific suggestions for corrections are not required (Kajüter et al., 2007). The auditor must also issue an opinion on the completeness of management's disclosure of potential business risks in the financial report (i.e., the risk report; Section 317 II HGB). In contrast to SOX 404, the auditor's attestation of ICRM effectiveness is stated only in their long-form report to the supervisory board and is not publicly disclosed in the short-form report. However, the supervisory board should state its opinion on the audit results (including ICRM weaknesses detected by the auditor) in the board's written report to the shareholder's meeting (Section 171 II AktG). These regulatory differences reflect Germany's two-tier board system and its insider-oriented framework. Similar reporting requirements are prescribed in Austria and the EU to reflect the two-tier board system.

Although KTG details the criteria and scope of ICRM, it does not specify procedures for the implementation, assessment, and audit of ICRM systems, nor does it provide guidelines for risk reporting. To fill this gap, the German Accounting Standards Board (GASB, established by the KTG bill) and the German Institute of Public Accountants (IDW, *Institut der Wirtschaftsprüfer*) have issued standards for risk reporting and the implementation, assessment, and audit of ICRM systems. In 1998, the IDW issued RS HFA 1 which specifies disclosure rules for risk reporting. The rules in this standard were rather general but provided prompt guidance for accounting practitioners (Dobler, 2005). The GASB issued a more detailed standard (GAS 5) on risk reporting in 2001.[15] GAS 5 specifies the scope and principles for risk reporting and requires the disclosure of entity-specific and going-concern risks that could affect the decisions of outside stakeholders. To improve transparency, risk disclosures should be presented in a self-contained section of the management report (GAS 5.30) and classified within specific risk categories (GAS 5.15). GAS 5 also requires managers to describe the policies, procedures, and organization of the ICRM system (GAS 5.28-29).

The IDW PS 260 (issued 2001) and PS 340 (issued 1999) standards specify the concept, functions, and arrangement of ICRM systems as well as the scope, procedures, and reporting requirements for the external audit of these systems. PS 340 also provides detailed guidance on the external auditor's assessment of management's risk report. The IDW standards expand the scope of ICRM audits by placing greater emphasis on risk management as an integral part of ICRM and by extending the assessment of ICRM to issues beyond financial reporting (PS 260 2.5, 2.10; PS 340 3.1.7, 4.2.21). The standards also specify the reporting of ICRM weaknesses in the long-form audit report to the supervisory board (PS 260 9.81; PS 340 4.4.32). If internal control weaknesses lead to material misstatements in the financial report, then the auditor's (short-form) report should be qualified or modified; however, weaknesses may not adversely affect the auditor's report if they are remediated before year-end (PS 260 9.81). Risk assessment and risk management weaknesses do not adversely affect the audit opinion because it only confirms compliance with financial accounting rules (Section 322 HGB; PS 340 4.4.32).

KTG does not prescribe a specific framework for the assessment and audit of ICRM systems. However, the IDW standards are based on COSO. In the US, the PCAOB AS-5 standard also identifies COSO as a suitable framework for management's assessment, and thus, the audit of ICFR. The SEC (2003) and other global regulators identify COCO (1995), the Turnbull Committee (1999), and other within-country standards (including IDW) as suitable frameworks.

The legal enforcement of ICRM mandates in Germany is unlikely to be as strong as that of SOX given the lack of US-style shareholder litigation or SEC-like monitoring. The German regulatory system however does establish specific legal liabilities related to enforcement. If the management board does not establish a suitable ICRM system (Section 91 II AktG) or fails to adequately report on business risks

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[14] Firms listed on Germany's Neuer Markt Exchange (launched in March 1997) were exempt from these external audit requirements. These exemptions were not lifted before the closure of the exchange in 2003. As discussed below (see Section 4.1), we exclude Neuer Markt firms in our empirical tests given variations in the application of and compliance with the KTG requirements for this group of firms.

[15] The quality of risk reporting increased after the issuance of GAS 5 (Woods and Reber, 2003; Kajüter, 2006).

ARTICLE IN PRESS

8   *N.C. Brown et al. / J. Account. Public Policy xxx (2013) xxx–xxx*

(Section 315 I HGB), then the board members may be jointly and severally liable for any damages resulting from violating these duties (Section 93 II AktG). These legal liabilities extend to the ICRM duties of the supervisory board (Section 116 AktG).[16] The external auditors are also jointly and severally liable for damages resulting from violating their duties (Section 323 I HGB), but this legal liability is limited to 4 million Euros per audit for publicly traded firms (Section 323 II HGB). The HGB also provides punitive measures for the violation of reporting requirements. The management and supervisory board members may be subject to prison sentences of up to three years or personal fines if the financial statements (including the risk report) are misstated or conceals material information (Section 331 HGB). Similar punitive measures may be imposed on external auditors if the audit report conceals material facts or includes a substantively incorrect opinion (Section 332 HGB).

2.2. Related literature

2.2.1. ICRM reform and accounting quality

The existing literature on the accounting quality effects of ICRM regulation is limited to studies of ICFR given the narrow focus of SOX and other SOX-like reforms. Prior studies examine whether firms reporting ICFR weaknesses under SOX 302 and 404 have *ex ante* poor accounting quality. Chan et al. (2009) provide weak evidence that firms reporting SOX 404 weaknesses have more income-increasing discretionary accruals during the prior two years. Doyle et al. (2007a) find that SOX 302 weaknesses are associated with poor accruals quality in years preceding disclosure, but they find no such association for disclosure of SOX 404 weaknesses. Ogneva et al. (2007) also find no relation between SOX 404 weaknesses and accruals quality preceding disclosure. In contrast, Lu et al. (2011) find a negative association between ex ante accruals quality and *voluntary* unaudited disclosures of ICFR weaknesses in the Canadian setting (SOX North). The conflicting evidence across the SOX 302, 404, and SOX North regimes may be attributed to differences in (1) the materiality thresholds for ICFR weaknesses detected by managers versus auditors, (2) the characteristics of firms subject to the regulation, and (3) managerial incentives to maintain ICFR quality in voluntary versus mandatory regimes.

The above studies provide limited insights into an intended outcome of ICRM regulation—improvements in accounting quality. A few studies address this issue with respect to SOX 302 and 404.[17] Bédard (2006) documents an increase in absolute abnormal accruals in the disclosure year for firms reporting ICFR weaknesses under SOX 302, but not under SOX 404. However, it is unclear whether this increase reflects a reversal of prior earnings management, current period earnings management, or some other cause. Gordon et al. (2006) find a post-SOX increase in the voluntary disclosure of information security activities in annual reports. This result provides evidence, albeit indirect, that firms have increased their focus on information technology controls. Ashbaugh-Skaife et al. (2008) and Goh and Li (2011) find that firms experience an increase in accruals quality and timely loss recognition, respectively, upon remediation of SOX 404 weaknesses. These results suggest that changes in ICFR effectiveness are accompanied by predictable changes in accounting quality. Singer and You (2011) find that accelerated filers experience a post-SOX increase in earnings quality relative to non-accelerated filers, which are exempt from the external audit provision of SOX 404.

Despite extensive research on ICFR and accounting quality, few studies address the association between risk management and accounting quality. According to the COSO framework, the principles of risk management include the assessment and monitoring of (1) risks to achieving the entity's objectives, (2) the risk of potential fraud, and (3) business changes that could significantly impact the ICRM system. These principles highlight the inherent relation between risk controls and accounting quality. For instance, business risk controls can reduce false or misleading reporting due to fraud or in response to unexpected deviations in operational and strategic plans (Kinney et al., 1990). Business risk controls can also affect accounting quality independent of managers' (intentional or unintentional)

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[16] Recently, the management and supervisory boards of several firms have faced litigation for failure to implement suitable ICRM systems and failure to disclose ICRM activities (see e.g., LG München I, Case No. 15 964 5 HK O/6).

[17] Altamuro and Beatty (2010) investigate improvements in earnings quality following ICFR reforms under the 1991 Federal Deposit Insurance Corporation Improvement Act (FDICIA). The FDICIA requirements were limited to large banks (assets greater than $500M), and thus, their findings are confined to large firms in the banking industry.

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N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx   9

financial reporting choices. For example, risk controls can mitigate the effect of business changes (e.g., risks associated with entering new markets) on ICRM quality, and in turn, accounting quality (COSO, 1992).

Consistent with these arguments, Klamm and Watson (2009) find that risk assessment weaknesses related to ICFR are positively correlated with financial accounting misstatements.[18] Hermanson (2000) also provide survey evidence that expanding ICRM standards to include broad risk controls enhances stakeholders' view that mandatory ICRM requirements serve to improve accounting quality. While academics and regulators support the notion that risk controls positively impact accounting quality, prior evidence implies that many US companies do not implement and effectively monitor risk controls in the SOX regime. Using 2004 survey data, Beasley et al. (2005) find that US firms have less-developed risk management processes than non-US firms. Bedard and Graham (2011) also report that risk assessment weaknesses are infrequently detected under SOX and are less likely to be classified as severe.

Although prior research suggests an increase in accounting quality following ICFR reform under SOX, this evidence is limited either to large firms (accelerated filers) or to firms that detect and report ICFR weaknesses. Prior research suggests that firms that detect and disclose ICFR weaknesses may be systematically different (Ashbaugh-Skaife et al., 2008; Doyle et al., 2007b). Also, most ICFR deficiencies identified under SOX 404 are not publicly disclosed because they are either remediated before year-end or not judged as material weaknesses (Bedard and Graham, 2011).[19] Therefore, SOX-based evidence may not be generalizable to all firms subject to the regulation and thus, whether ICFR regulation under SOX has led to a general improvement in accounting quality is unclear. The SOX-based evidence also lacks insight on the relation between risk management mandates and accounting quality.

2.2.2. International accounting quality

Our study also relates to prior research on international accounting quality. Germany is a stakeholder economy with a less-developed stock market, concentrated ownership, and weak investor protection (La Porta et al., 1997, 1998; Leuz et al., 2003). German accounting standards (GGAAP) are codified in the HGB, wherein applicable financial reporting and auditing rules depend on legal form rather than listing status. In addition, individual (or parent-only) financial statements are prepared using historical cost only and serve as a basis for tax accounting and dividend distributions. Relative to shareholder-oriented regimes, GGAAP rules for creating and estimating accruals and reserves are more liberal, and thus, provide greater managerial discretion in obfuscating reported performance (Ball, 2004; Bartov et al., 2005). Given these institutional factors, several studies document poor accounting quality in Germany relative to shareholder economies. For instance, Alford et al. (1993) and Ball et al. (2000) find that earnings in Germany are less timely and less sensitive to economic losses, while Bhattacharya et al. (2003) and Leuz et al. (2003) find higher levels of earnings smoothing and earnings management in Germany. We extend this area of research by examining the role of ICRM regulation in improving accounting quality in an institutional setting with well-documented financial reporting deficiencies.

2.3. Research question

There are several channels through which compliance with the ICRM mandates of KTG can improve earnings quality. First, the mandatory implementation and monitoring of high-quality ICRM controls can curb insiders' opportunities and incentives to intentionally misstate or misrepresent reported income. Second, compliance with ICRM mandates can reduce the effects of unintentional omissions and

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[18] Klamm and Watson (2009) map a sample of ICFR weaknesses disclosed under SOX 302 and 404 to each component of the COSO framework. ICFR risk assessment weaknesses include foreign/subsidiary issues, acquisition/merger or reorganization issues, and information technology failures.

[19] Using proprietary data from audit firm engagements, Bedard and Graham (2011) report that significant deficiencies account for 11.6% of detected ICFR deficiencies, while material weaknesses account for 3.8%. They also find that 25.7% of detected ICFR deficiencies are remediated before year-end. These statistics imply that fewer than 4% of detected deficiencies are publicly disclosed as material weaknesses and that many companies with "clean" Section 404 reports have at least one significant deficiency. Prior research also finds lower disclosure rates of ICFR deficiencies under SOX 302. For instance, Hoitash et al. (2008) report that 2.7% (1.8%) of their sample firms publicly disclose a material weakness (significant deficiency) under SOX 302.

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10   *N.C. Brown et al. / J. Account. Public Policy xxx (2013) xxx–xxx*

procedural errors on reported information (Doyle et al., 2007a; Ashbaugh-Skaife et al., 2008). Third, mandatory risk assessment and monitoring can mitigate inherent business risks and the (direct and indirect) impact of these risks on firms' reporting choices and the transparency of financial reports (Kinney et al., 1990; COSO, 1992). Lastly, ICRM audit and reporting obligations can improve the transparency and information flow regarding ICRM quality among the management and supervisory boards and external auditors, which in turn, can mitigate the negative effect of ICRM weaknesses on accounting quality.

Based on the above discussion, we conjecture that ICRM reform under KTG will lead to an improvement in accounting quality across German firms. Nevertheless, poor legal and market enforcement, and weak compliance by firms could diminish this intended outcome. Prior studies find variations in the quality of risk reporting and the ICRM systems implemented by German firms. Berger and Gleißner (2006) find that the ICRM processes adopted by some companies are below the requirements set forth in GAS 5. Linsley et al. (2007) also report that some firms (especially small firms) tend to make boilerplate risk disclosures. Also, given the monitoring role of public disclosure (Ball, 2004), the limited external disclosure of ICRM weaknesses (and the negative consequences of such disclosures) and the lack of managerial certification of ICRM effectiveness may provide less incentive for German managers to adequately comply with the KTG mandates. While the supervisory board's report to the annual shareholder's meeting should discuss ICRM weaknesses detected by external auditors, anecdotal evidence suggests that supervisory boards are reluctant to report on weaknesses if the overall audit opinion is unqualified or if the weaknesses are remediated before the fiscal year-end.[20] More generally, ICRM mandates could cause managers to engage in business activities that adversely affect reporting quality, but are more difficult to detect by auditors and regulators (Cohen et al., 2008). Given these conflicting arguments, we cannot, predict ex ante whether the KTG reform had a positive impact on earnings quality. We therefore examine the following research question:

RQ1: *Do German firms experience an increase in earnings quality following the 1998 KTG internal control and risk management (ICRM) reform?*

3. Research design and empirical measures of earnings quality

3.1. Research design

To investigate the effect of the KTG reform, we apply two quasi-experimental research designs commonly used in the economics literature (see Meyer, 1995). Our first approach is a "differences" test of the change in the earnings quality of German firms after KTG (i.e., a within-country pre-post-design). To conduct these tests, we use an indicator variable (*KTG*) to define the pre- and post-KTG periods. *KTG* equals one for all fiscal years ending after December 1998; zero otherwise. Although the ICRM implementation requirement is effective May 1998, we use the December 1998 effective date of the ICRM audit requirements as the cut-off date to ensure that German firms are subject to *all* of the ICRM provisions in the post-KTG period.[21]

We control for several firm-level factors (denoted *Controls*) that could be correlated with both earnings and ICRM quality (Lang et al., 2003, 2006; Barth et al., 2008; Doyle et al., 2007a,b; Ashbaugh-Skaife et al., 2008, 2009). Prior research argues that large, mature firms have greater resources to develop and implement high-quality ICRM systems. We therefore control for firm size (*SIZE*) and the firm's life cycle stage (*LIFECYCLE*). We control for one-year sales growth (*GROWTH*) since rapidly growing firms tend to have noisier estimation of accruals and may outgrow any ICRM systems in place. The complexity of business operations and transactions can affect the quality of firms' financial reporting and internal control processes. We control for firm complexity based on the existence of complex foreign transactions (*FOREIGN*). Since the raising of capital may influence firms' financial reporting choices, we control for firm leverage (*LEVERAGE*) and the issuance of common equity shares

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[20] This argument is based on discussions with several local German auditors. The reluctance of German firms to report on ICRM weaknesses is also consistent with the SOX-based evidence in Bédard and Graham (2011), which indicates that many U.S. firms with unqualified SOX 404 opinions have at least one significant ICFR deficiency.

[21] Our results do not change when we use May 1998 as the cut-off date for the pre- and post-KTG periods.
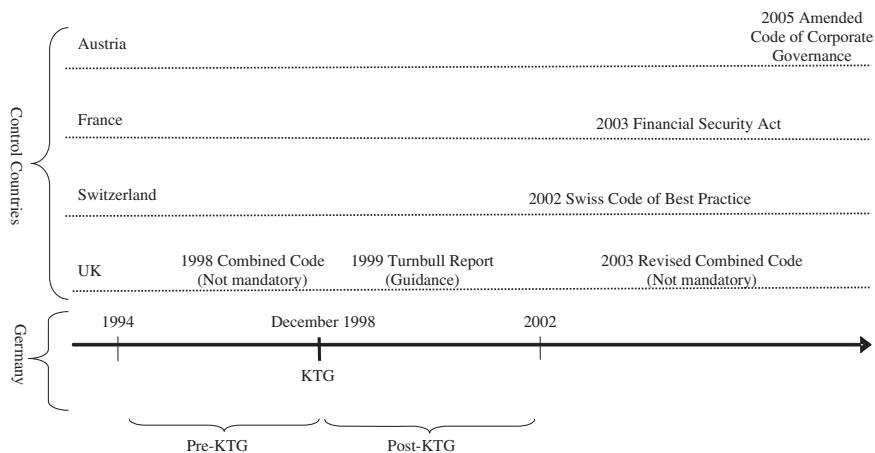
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N.C. Brown et al. / J. Account. Public Policy xxx (2013) xxx–xxx   11

Fig. 2. Timeline of internal control reform in Germany and the control countries.

(*EISSUE*). The level of audit quality is likely to affect firms' earnings and ICRM quality. We include an indicator variable for those firm-years audited by non-Big N audit firms to proxy for low audit quality (*NONBIGN*). We also include an indicator variable (*XLIST*) to identify firms cross-listed on US stock exchanges to control for differential regulatory enforcement and legal environment. Finally, we include fixed effects for fiscal year (*T*) and 2-digit SIC industry (*I*), and cluster standard errors by firm to control for unobserved time, industry, and firm factors (Petersen, 2009). Appendix A summarizes the definition of the aforementioned variables and those discussed below.

The Germany-only differences design does not control for time trends in earnings quality or the effects of concurrent macroeconomic shocks (Ball et al., 2000; Land and Lang, 2002). To control for these potential biases, we use a "difference-in-differences" (DID) design to examine the change in earnings quality for German firms after KTG *relative* to a group of firms not subject to the regulation (between-country pre-post-design). Since KTG affects all publicly listed firms in Germany, we face the challenge of identifying a suitable control group for benchmarking the earnings quality effects of KTG. We follow prior research (see Zhang, 2007) and address this issue empirically by selecting all firms domiciled in several comparative countries as our control group. First, we focus on Western European countries with similar legal traditions and sizable capital markets (based on the market capitalization of listed domestic firms) to ensure that relevant macroeconomic shocks commonly affect Germany and the control group. Next, we identify countries that did not implement mandatory ICRM reforms during our test period (1994–2002). Based on these criteria, we select firms domiciled in Austria, France, Switzerland, and the UK as our control group.

We select Austria and Switzerland given the impact of German civil law tradition on their stakeholder economies. France is selected as another Western European stakeholder economy. Although the UK is a shareholder economy, we include it as a control country because it has the largest capital market in Europe, with Germany being the second largest. Also, Ball et al. (2000) argue that, similar to stakeholder economies, there is less demand for high-quality accounting information in the UK due to lower regulatory and litigation costs and the predominant use of private debt. Consistent with this notion, Ball et al. (2000) find that earnings quality in the UK is closer to that of stakeholder countries. Fig. 2 presents a timeline of ICRM reforms in Germany and the control countries for the period 1994–2002. The UK enacted ICRM requirements during this period; however, compliance is *voluntary*.[22]

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[22] The 1998 UK Combined Code on Corporate Governance states that corporate boards should maintain "sound" internal control systems. Specific guidance on compliance with this provision was published in the 1999 Turnbull Report and later appended to the 2003 revision of the Combined Code. As Fig. 1 notes, compliance is voluntary, but firms must report their compliance or reasons for non-compliance. In robustness tests, we find similar results when we exclude firms domiciled in the U.K, suggesting our results are not affected by internal control reform in the UK. We also draw similar inferences when we expand our control group to include firms domiciled in countries with either German legal origin or civil law tradition (see Section 5.4.3 for further details).

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12   *N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx*

Our DID tests use the following two indicator variables: *KTG* (defined above) and *GER*, which equals one for German firms and zero for firms in the control group. The interaction of these variables (*KTG × GER*) is the DID estimate and isolates the post-KTG change in earnings quality for German firms *relative* to the control group. In our DID tests, we further control for the effect of country-level legal institutional factors (denoted *Legal*) on earnings and ICRM quality. Our legal institutional measures are based on La Porta et al. (1997, 1998) and include: (1) the level of legal enforcement (*LEGAL_ENF*), measured as the average score across three country indices—the rule of law, the level of corruption, and legal system efficiency; (2) the importance of equity markets (*IMP_EQMKT*), constructed by Leuz et al. (2003) as the country's average rank across three measures—the aggregate stock market held by minority shareholders and the number of IPOs and listed domestic stocks; and (3) outside investor rights (*INVESTOR_RIGHTS*), an anti-director rights index that captures minority shareholder rights.

3.2. Empirical measures of earnings quality

Given the inherent difficulty in measuring accounting quality, we follow prior research (e.g., Barth et al., 2008; Lang et al., 2003, 2006) and conduct our analyses using several empirical measures of earnings-based attributes of accounting quality. The use of multiple measures ensures that our results are not driven by any particular measure and helps mitigate the potential effect of correlated omitted variables. We focus on earnings-based attributes that are most applicable in assessing the quality of international financial reports (e.g., Barth et al., 2008; Bhattacharya et al., 2003; Leuz et al., 2003; Wysocki, 2009). More importantly, we focus on accounting characteristics that have positive consequences for reducing information asymmetry between managers and external suppliers of capital, which in turn, enhances the allocation of capital resources (see e.g., Biddle and Hilary, 2006; Biddle et al., 2009; Bushman et al., 2011). Our selected measures are the timeliness of loss recognition, the level of earnings smoothing, and loss avoidance, proxied by the tendency to report small positive earnings.

3.2.1. Timeliness of loss recognition

Following Basu (1997), we define timely loss recognition (also termed conditional conservatism) as the extent to which current-period accounting earnings asymmetrically incorporate economic losses relative to economic gains.[23] Consistent with Goh and Li (2011), the implementation and monitoring of effective ICRM systems under KTG should curtail incentives and opportunities for insiders to defer or smooth economic losses over multiple periods rather than recognize them as they occur. Furthermore, mandatory ICRM quality should increase internal transparency of business risks and the use of reliable accounting information in contracts, which in turn, should increase the ability and incentives for managers to identify and account for loss-making investments in a timely manner (Ball and Shivakumar, 2005; Bushman et al., 2011; Goh and Li, 2011). We therefore examine whether German firms experience an increase in timely loss recognition following the KTG reform. We use the following differences and DID returns-based models based on Basu (1997) to estimate post-KTG changes in the incremental sensitivity of accounting earnings to economic losses:

$$EPS = \beta_0 + \beta_1 RET + \beta_2 DNEG + \beta_3(DNEG \times RET) + \beta_4 KTG + \beta_5(KTG \times RET)$$

$$+ \beta_6(KTG \times DNEG) + \beta_7(KTG \times DNEG \times RET) + \sum_{k=8}^{K}[\beta_k(Controls + T + I)] + \varepsilon, \tag{1a}$$

$$\begin{aligned} EPS = & \alpha_0 + \alpha_1 RET + \alpha_2 DNEG + \alpha_3(DNEG \times RET) + \alpha_4 KTG + \alpha_5(KTG \times RET) + \\ & \alpha_6(KTG \times DNEG) + \alpha_7(KTG \times DNEG \times RET) + \alpha_8 GER + \alpha_9(GER \times RET) + \\ & \alpha_{10}(GER \times DNEG) + \alpha_{11}(GER \times DNEG \times RET) + \alpha_{12}(GER \times KTG) + \\ & \alpha_{13}(GER \times KTG \times RET) + \alpha_{14}(GER \times KTG \times DNEG) + \\ & \alpha_{15}(GER \times KTG \times DNEG \times RET) + \sum_{k=16}^{K}[\alpha_k(Controls + Legal + T + I)] + \varepsilon \end{aligned} \tag{1b}$$

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[23] Conditional conservatism is distinct from unconditional conservatism, wherein predetermined aspects of the accounting process result in an understatement of the book value of net assets.

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N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx 13

where *EPS* is net income before extraordinary items per share scaled by beginning-of-year price per share. *RET* is the market-adjusted buy-and-hold return including dividends over fiscal year *t*, calculated as each firm's raw buy-and-hold return minus the comparable return in fiscal year *t* on a value-weighted portfolio of the sample firms domiciled in the same country. *DNEG* is an indicator variable for economic losses and equals one for negative values of *RET*, zero otherwise.

The coefficient β_1 in Eq. (1a) measures the sensitivity of earnings to economic gains for German firms in the pre-KTG period, while the coefficient β_3 captures the *incremental* sensitivity of earnings to economic losses. If German firms recognize losses in a more timely manner than gains before KTG, then we expect $\beta_3 > 0$ and $(\beta_1 + \beta_3) > 0$. The coefficient β_7 indicates the *change* in the *incremental* sensitivity of earnings to economic losses for German firms after KTG; therefore, the sum of β_5 and β_7 represents the *change* in timely loss recognition after KTG. If the KTG reform had a positive effect on timely loss recognition in Germany, then we expect $\beta_7 > 0$ and $(\beta_5 + \beta_7) > 0$. In Eq. (1b), the sum of α_1 and α_3 measures the sensitivity of earnings to economic losses for the control firms in the pre-KTG period. Similarly, the sum of α_1, α_3, α_9, and α_{11} represents the timely loss recognition of German firms before KTG. If German firms recognize losses in a more timely manner before KTG, then we expect $(\alpha_1 + \alpha_3 + \alpha_9 + \alpha_{11}) > 0$. The coefficient α_{15} indicates the *change* in the *incremental* sensitivity of earnings to economic losses for German firms *relative* to the control group after KTG. Thus, the sum of α_{13} and α_{15} measures the post-KTG *change* in timely loss recognition for German firms *relative* to the control group. If KTG had a positive effect on timely loss recognition, then we expect $\alpha_{15} > 0$ and $(\alpha_{13} + \alpha_{15}) > 0$.

The differences and DID of the timely loss recognition coefficients in Eqs. (1a) and (1b) are as follows:

	Pre-KTG (KTG = 0)	Post-KTG (KTG = 1)	**Difference in coefficients**
Equation (1a) Germany	$\beta_1 + \beta_3$	$\beta_1 + \beta_3 + \beta_5 + \beta_7$	$\boldsymbol{\beta_5 + \beta_7}$
Equation (1b) Germany (GER = 1)	$\alpha_1 + \alpha_3 + \alpha_9 + \alpha_{11}$	$\alpha_1 + \alpha_3 + \alpha_5 + \alpha_7 + \alpha_9 + \alpha_{11} + \alpha_{13} + \alpha_{15}$	$\alpha_5 + \alpha_7 + \alpha_{13} + \alpha_{15}$
Control Group (GER = 0)	$\alpha_1 + \alpha_3$	$\alpha_1 + \alpha_3 + \alpha_5 + \alpha_7$	$\alpha_5 + \alpha_7$
Difference in coefficients	$\alpha_9 + \alpha_{11}$	$\alpha_9 + \alpha_{11} + \alpha_{13} + \alpha_{15}$	$\boldsymbol{\alpha_{13} + \alpha_{15}}$

3.2.2. The level of earnings smoothing

We argue that ICRM requirements should curb the (intentional and unintentional) manipulation of earnings through accruals and in turn, improve the quality of reported income. Also, effective risk monitoring processes should reduce fraud risk and the manipulation of earnings to conceal unexpected deviations in firm performance due to poor risk assessments. We therefore examine whether German firms engage in fewer earnings-smoothing activities and exhibit greater variability in earnings relative to cash flows after the KTG reform.[24] Following prior studies (e.g., Barth et al., 2008; Lang et al., 2003, 2006; Leuz et al., 2003), we define earnings smoothing as the ratio of the firm-level standard deviation of changes in net income before extraordinary items (scaled by lagged total assets) to the firm-level standard deviation of changes in cash flows from operations (scaled by lagged total assets), denoted $\sigma\Delta NI/\sigma\Delta CFO$. Higher values of $\sigma\Delta NI/\sigma\Delta CFO$ indicate less earnings smoothing. We control for firm- and country-level differences in earnings and cash flow volatility by estimating pooled regressions of ΔNI and ΔCFO on our firm-specific controls, the country-level legal institutional factors, and on time and industry

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[24] High-quality risk management processes could also reduce the volatility of firms' earnings performance. Therefore, we acknowledge that evidence of an increase in the smoothness of earnings after the KTG reform could reflect an improvement in firms' risk assessment and monitoring activities.

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14   *N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx*

fixed effects. Using the residual values (denoted ΔNI^* and ΔCFO^*), we calculate $\sigma\Delta NI^*/\sigma\Delta CFO^*$ separately for German firms and the control group before and after KTG, and then examine the differences and DID of the mean ratios. We use the regression model below to assess the DID of the mean ratios, where λ_3 is the DID estimate:

$$\sigma\Delta NI^*/\sigma\Delta CFO^* = \lambda_0 + \lambda_1 KTG + \lambda_2 GER + \lambda_3(KTG \times GER) + \varepsilon \qquad (2)$$

Accruals and operating cash flows have an inherent negative correlation (Dechow, 1994). However, all else equal, a more negative correlation indicates the smoothing of earnings that does not reflect a firm's underlying performance. We therefore follow prior research (e.g., Barth et al., 2008; Leuz et al., 2003) and alternatively define earnings smoothing as the Spearman rank correlation between changes in accruals and changes in operating cash flows both scaled by lagged total assets, denoted $\rho(\Delta ACC^*/\Delta CFO^*)$, where *ACC* is measured as net income before extraordinary items (*NI*) minus cash flow from operations (*CFO*). We again measure ΔACC^* and ΔCFO^* as the residual values of ΔACC and ΔCFO from a pooled regression of each variable on firm- and country-level controls and on time and industry fixed effects. We calculate separate correlation coefficients for Germany and the control group before and after KTG, and then examine the differences and DID of the coefficients.

3.2.3. Frequency of small positive earnings

Prior studies document that positive earnings (or loss avoidance) is a common strategic benchmark for managers (see, e.g., Graham et al., 2005). Hence, prior studies argue that a high frequency of small positive earnings is an indication of earnings management to avoid reporting losses or to conceal negative business developments (Burgstahler and Dichev, 1997; Degeorge et al., 1999). If ICRM mandates curtail the intentional manipulation of earnings and improve the transparency of business risks, then we should find a decrease in the frequency of small positive earnings after KTG. To test this conjecture, we follow Barth et al. (2008) and Lang et al. (2003, 2006) and estimate the regression models below:

$$SMALL\_POS = \gamma_0 + \gamma_1 KTG + \sum_{k=2}^{K}[\gamma_k(Controls + T + I)] + \varepsilon, \qquad (3a)$$

$$SMALL\_POS = \mu_0 + \mu_1 KTG + \mu_2 GER + \mu_3(KTG \times GER) + \sum_{k=4}^{K}[\mu_k(Controls + Legal + T + I)] + \varepsilon \qquad (3b)$$

where *SMALL_POS* equals one if *NI* scaled by total assets is between 0 and 0.01, zero otherwise. Negative estimates for γ_1 and μ_3 suggest a post-KTG decline in loss avoidance by German firms.

4. Data, sample selection, and descriptive evidence

4.1. Data and sample selection

We compile our sample from the intersection of the Compustat Global Industrial/Commercial and the Compustat Global Issues databases. We use the ISO country of incorporation code to determine a firm's home country. We begin our analyses in fiscal year 1994 since Compustat's coverage of German firms is low for prior years. We end the test period in 2002 to ensure that our results are not confounded by other regulatory reforms in our sample countries. This results in a relatively equal time frame before and after KTG. Specifically, the pre-KTG period spans calendar years 1994–1998 and the post-KTG period spans 1999–2002.[25]

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[25] In robustness tests, we examine the sensitivity of our results to the use of shorter test periods to further control for structural shifts in our test countries over time. Our results are qualitatively similar when we exclude the 1998–1999 transitional KTG period. We also find similar evidence for our tests of timely loss recognition and the frequency of small positive earnings when we narrow our test period to 1996–2000 (i.e., 2 years before and 2 years after the KTG reform). However, our earnings smoothing tests are weaker due to limited observations in the German sample to reliably compute the standard deviation of ΔNI^* and ΔCFO^*, and the correlation of ΔACC^* and ΔCFO^*.

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N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx 15

Table 1
Sample distribution by year and country.[a]

	1994	1995	1996	1997	1998	1999	2000	2001	2002	Total
Germany	165	181	209	251	261	266	293	255	267	2148
Control group										
Austria	22	29	32	51	50	46	45	50	45	370
France	98	166	219	315	313	324	360	455	420	2670
Switzerland	47	57	63	83	93	97	107	116	127	790
UK	561	603	650	902	943	880	830	862	775	7006
Total control group	728	855	964	1351	1399	1347	1342	1483	1367	10,836
Total test sample (total German firms + control group)	893	1036	1173	1602	1660	1613	1635	1738	1634	12,984

  [a] All fiscal years ending after December 1998 are classified as the post-KTG period (*KTG* = 1). The control group consists of all firms with available data domiciled in Austria, France, Switzerland, and the UK.

We exclude all German firm-years without 12-month fully consolidated financial statements. We do not exclude consolidated information prepared according to IFRS or US-GAAP since all firms are subject to the KTG mandates, irrespective of the accounting standard used. In addition, firms providing IFRS or US-GAAP consolidated statements are still required to prepare individual statements using GGAAP. We however exclude observations for those fiscal years when a company switches to IFRS/US-GAAP reporting. This procedure ensures that our change variables (e.g., ΔACC, ΔCFO) are not confounded by changes in reporting standards.

We delete firms listed on the German Neuer Markt Exchange, which was launched in March 1997 and geared towards young, innovative firms in high-growth industries (Leuz, 2003). We identify these firms based on a list of Neuer Markt IPOs from the German Stock Institute. As we note earlier, Neuer Markt firms were initially exempt from the ICRM audit requirements of KTG and regulatory steps to remove this exemption were not undertaken before the closure of the exchange in 2003. Also, while Neuer Markt firms were still required to implement a suitable ICRM system and disclose relevant business risks, prior studies document weak compliance with these mandates across Neuer Markt firms.[26] We therefore exclude these firms from our empirical tests given the variations in the application of and compliance with the KTG requirements.[27]

Next, we exclude all German firm-years with missing data for the calculation of our test variables. To mitigate the loss of potentially informative observations and possible selection bias, we do not delete firm-years with missing cash flow data when conducting tests that do not rely on cash flow information. Lastly, we exclude financial institutions (SIC 6000–6999) and observations with negative book-to-market ratios. These criteria result in a final unbalanced data panel of 2148 firm-years for 436 German firms. Using the same criteria, we complete our data panel by adding all control firms with available data for our regressions analyses. This brings our final pooled sample to 12,984 firm-years (2679 firms).[28] To control for US cross-listing status, we match our sample to a list of active and inactive sponsored US cross-listings on the NYSE, NASDAQ, and AMEX from Citibank, JP Morgan, Bank of New York, and Deutsche Bank.

Table 1 reports the sample distribution by year for firms domiciled in Germany (Panel A) and our control countries (Panel B). The increase in the number of firms over the sample period reflects the increased coverage of Compustat Global and the listing of young, growth firms on "new market" exchanges in Europe (see Leuz, 2003). In untabulated results, we analyze the industry composition of the German and control samples. The most represented industries in both samples are Food and Kindred Products (SIC 20), comprising 6.38% (5.24%) of the German (control) sample; and Electronic and Other

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  [26] Henking (2002) finds that only 55% of Neuer Markt firms discuss ICRM implementations in their annual reports.

  [27] Our inferences are unchanged when we include Neuer Markt firms in our empirical analyses.

  [28] The sample reduces to 10,512 firm-years (1316 for German firms and 9196 for the control group) when we delete observations with missing data to calculate ΔACC and ΔCFO. As discussed in Section 5.4.7, we find similar results when we use a larger data sample based on two alternative balance sheet definitions of *ACC* and *CFO*.

Table 2
Summary statistics for Germany and control countries.[a]

	Germany		Austria		France		Switzerland		UK	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Panel A: Firm-level variables										
Primary variables										
RET	−0.1858	−0.2554	**−0.1123**	**−0.1006**	−0.1609	−0.1982	−0.1304	**−0.3536**	**−0.1344**	**−0.1929**
EPS	0.0336	0.0485	**0.2327**	**0.0622**	0.0361	0.0504	**0.0711**	**0.0651**	0.0213	**0.0606**
ΔNI	−0.0008	0.0013	−0.0048	0.0018	−0.0036	0.0017	0.0032	0.0034	0.0024	**0.0079**
ΔACC	−0.0036	−0.0019	−0.0104	−0.0044	−0.0051	−0.0029	−0.0028	−0.0065	**−0.0097**	**−0.0100**
ΔCFO	−0.0009	0.0007	0.0072	0.0053	−0.0028	−0.0007	0.0046	0.0040	**0.0117**	**0.0098**
SMALL_POS	0.1075	0.0000	0.1297	0.0000	**0.0760**	**0.0000**	**0.0747**	**0.0000**	**0.0334**	**0.0000**
Control variables										
SIZE	6.4870	6.3336	**7.2010**	**7.3307**	6.5062	6.4150	6.5274	6.3238	**4.7182**	**4.4762**
LEVERAGE	0.6889	0.7175	**0.6520**	**0.6712**	0.6308	0.6408	0.5584	0.5690	**0.5265**	**0.5340**
GROWTH	0.0108	0.0251	−0.0056	0.0312	−0.0358	0.0408	**0.0914**	**0.0466**	**0.1617**	**0.0751**
NONBIGN	0.5228	1.0000	**0.6108**	**1.0000**	**0.5891**	**1.0000**	**0.2658**	**0.0000**	**0.1933**	**0.0000**
BM	0.9493	0.5982	**7.2734**	**0.8886**	**1.7080**	**0.7521**	**1.1007**	**0.7550**	**0.6920**	**0.4858**
LIFECYCLE	0.1832	0.1586	**0.2153**	0.1447	**0.0124**	**0.0000**	**0.2905**	**0.2480**	**0.1350**	**0.4198**
EISSUE	0.1321	0.0000	**0.0306**	**0.0000**	**0.0445**	**0.0000**	**0.0678**	**0.0000**	**0.0653**	**0.0030**
XLIST	0.0489	0.0000	**0.0054**	**0.0000**	**0.0240**	**0.0000**	0.0367	0.0000	**0.0390**	**0.0000**
FOREIGN	0.1620	0.0000	**0.2486**	**0.0000**	**0.4715**	**0.0000**	**0.4557**	**0.0000**	**0.0458**	**0.0000**
Panel B: Country-level legal institutional variables										
LEGAL_ENF		9.1		9.4		8.7		10.0		9.2
IMP_EQMKT		5.0		7.0		9.3		24.8		25.0
INVESTOR_RIGHTS		1		2		3		2		5

All continuous variables are winsorized at the 1% and 99% levels in each country sample.

All variables are defined in Appendix A.

[a] We test for significant differences in the mean (*t*-test) and median (Wilcoxon rank sum test) of each variable between firms domiciled in Germany and each of the control countries. The summary statistics in bold are statistically different relative to German firms at the 10% level or higher (two-tailed).

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N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx   17

Table 3
Correlation table for primary variables.[a]

	RET	EPS	ΔNI	ΔACC	ΔCFO	SMALL_POS
RET	–	**0.1258**	**0.1757**	**0.0908**	**0.0929**	−0.0393
EPS	**0.3843**	–	**0.1864**	**0.1728**	0.0526	−0.0007
ΔNI	**0.2808**	**0.4343**	–	**0.6386**	**0.2977**	−0.0060
ΔACC	**0.0909**	**0.2202**	**0.4014**	–	**−0.4984**	−0.0080
ΔCFO	**0.1227**	**0.1177**	**0.3163**	**−0.6078**	–	0.0039
SMALL_POS	**−0.0464**	**−0.1497**	**−0.0575**	−0.0124	0.0024	–

All continuous variables are winsorized at the 1% and 99% levels in each country sample.
All variables are defined in Appendix A.
 [a] Pearson (Spearman) correlation coefficients are shown above (below) the diagonal. The coefficients in bold are statistically significant at the 10% level or higher.

Electrical Equipment (SIC 36), comprising 4.98% (4.70%) of the German (control) sample. The German sample has higher proportions of firms in Chemicals and Allied Products (SIC 28), comprising 7.45% (5.19%) of the German (control) sample; Industrial Machinery and Equipment (SIC 35), comprising 14.39% (5.43%) of the German (control) sample; and Transportation Equipment (SIC 37), comprising 4.89% (2.53%) of the German (control sample). Lastly, the control group has a higher proportion of firms operating in Business Services (SIC 73), comprising 10.64% (3.91%) of the control (German) sample. These differences are statistically significant at the 10% level or higher.

4.2. Descriptive evidence

Table 2 presents summary statistics for our firm-level (Panel A) and country-level variables (Panel B) by country. To mitigate the influence of extreme outliers, we winsorize all continuous variables at the 1% and 99% levels in each country sample. We test for significant differences in the mean (*t*-test) and median (Wilcoxon rank sum test) of each firm-level variable between Germany and each of the control countries. The summary statistics in bold are statistically different at the 10% level or higher (two-tailed). Consistent with asymmetric loss recognition, we observe that *EPS* is negatively skewed for German firms, while *RET* is positively skewed. We find a similar pattern in our control countries except in Austria. We find significant differences in some of our test variables between Germany and the control countries, thereby underscoring the importance of controlling for firm-specific characteristics in our DID tests (Meyer, 1995). Specifically, we find that German firms, on average, have lower *EPS* than firms operating in Austria and Switzerland. However, one-year changes in *NI*, *ACC*, and *CFO* are similar across countries except the UK. We note that Germany has a higher frequency of *SMALL_POS* than most of our control countries, consistent with Leuz et al. (2003). The summary statistics also indicate that German firms are smaller (*SIZE*) than firms domiciled in Austria but larger than UK firms. Finally, we find that German firms are at earlier lifecycle stages (*LIFECYCLE*) than firms operating in Austria and Switzerland, and that Germany has a higher proportion of US cross-listed firms (*XLIST*) than Austria, France, and the UK.

Table 3 presents pairwise correlation coefficients for our primary regression variables. Pearson (Spearman) coefficients are presented above (below) the diagonal. Consistent with the noise-mitigating role of accruals, there is a strong negative association between ΔACC and ΔCFO (Spearman ρ = −0.6078, *p*-value < 0.00). The correlations for *SMALL_POS* suggest that loss avoidance increases with lower return and earnings performance.

5. Empirical results

5.1. Timeliness of loss recognition

Panel A of Table 4 presents the estimated results for Eq. (1a) and Panel B presents *F*-test statistics of the timely loss recognition coefficients before and after KTG. The *t*-statistics (in parentheses) for these and all subsequent regressions are calculated using standard errors clustered by firm to correct for

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18 N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx

Table 4
Tests of changes in timely loss recognition: Basu (1997) model.[a]

Dependent variable: EPS	Parameter	Model 1
Panel A: Germany-only – differences regression		
Intercept	β_0	0.1809
		(3.26)***
RET	β_1	0.0126
		(0.53)
DNEG	β_2	−0.0027
		(−0.12)
DNEG × RET	β_3	0.1178
		(2.72)***
KTG	β_4	0.3099
		(3.74)***
KTG × RET	$\boldsymbol{\beta_5}$	**−0.0053**
		(−0.09)
KTG × DNEG	β_6	−0.0116
		(−0.29)
KTG × DNEG × RET	$\boldsymbol{\beta_7}$	**0.2758**
		(2.69)*
SIZE	β_8	0.0238
		(4.44)***
LEVERAGE	β_9	−0.5255
		(−6.82)***
GROWTH	β_{10}	0.0591
		(1.83)*
NONBIGN	β_{11}	0.0138
		(0.92)
BM	β_{12}	0.0210
		(1.04)
LIFECYCLE	β_{13}	−0.0066
		(−0.20)
EISSUE	β_{14}	−0.0066
		(−0.81)
XLIST	β_{15}	−0.0624
		(−2.41)**
FOREIGN	β_{16}	0.0079
		(0.35)
Fixed time effects		Included
Fixed industry effects		Included
Adjusted *R*-squared		0.218
No. of observations		2148

	Pre-KTG (KTG = 0)	Post-KTG (KTG = 1)	Difference in coefficients
Panel B: Difference in timely loss recognition coefficients			
Germany-only	0.1304	0.4009	**0.2705**
F-test	p = 0.00	p = 0.00	**p = 0.00**

Dependent variable: EPS	Parameter	Model 1
Panel C: Germany vs control group – difference-in-differences regression		
Intercept	α_0	−0.4055
		(−0.32)
RET	α_1	0.0163
		(1.41)
DNEG	α_2	0.0261
		(1.45)
DNEG × RET	α_3	0.1750
		(4.83)***

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N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx 19

Table 4 (*continued*)

Dependent variable: EPS	Parameter	Model 1
KTG	α_4	0.0417 (2.05)[**]
KTG × RET	α_5	−0.0210 (−1.08)
KTG × DNEG	α_6	−0.0278 (−1.22)
KTG × DNEG × RET	α_7	0.0457 (1.06)
GER	α_8	−0.0160 (−0.49)
GER × RET	α_9	0.0336 (1.05)
GER × DNEG	α_{10}	−0.0202 (−0.68)
GER × DNEG × RET	α_{11}	−0.0827 (−1.45)
GER × KTG	α_{12}	0.0357 (1.04)
GER × KTG × RET	**α_{13}**	**−0.0011 (−0.01)**
GER × KTG × DNEG	α_{14}	0.0207 (0.44)
GER × KTG × DNEG × RET	**α_{15}**	**0.2250 (2.11)[**]**
SIZE	α_{16}	0.0169 (6.05)[***]
LEVERAGE	α_{17}	−0.2482 (−11.20)[***]
GROWTH	α_{18}	0.0487 (3.31)[***]
NONBIGN	α_{19}	0.0013 (0.15)
BM	α_{20}	0.0189 (1.61)
LIFECYLE	α_{21}	0.0283 (8.41)[***]
EISSUE	α_{22}	−0.0198 (−2.23)[**]
XLIST	α_{23}	−0.0298 (−2.47)[**]
FOREIGN	α_{24}	−0.0038 (−0.38)
LEGAL_ENF	α_{26}	0.0605 (0.43)
IMP_EQMKT	α_{27}	−0.0030 (−0.31)
INVESTOR_RIGHTS	α_{28}	0.0012 (0.03)
Fixed time effects		Included
Fixed industry effects		Included
Adjusted R-squared		0.101
No. of observations		12,984

	Pre-KTG (KTG = 0)	Post-KTG (KTG = 1)	Difference in coefficients
Panel D: Difference-in-differences of timely loss recognition coefficients			
Germany (GER = 1)	0.1422	0.3908	0.2486
F-test	p = 0.00	p = 0.00	p = 0.00
Control group (GER = 0)	0.1913	0.2160	0.0247

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20 N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx

Table 4 (continued)

	Pre-KTG (KTG = 0)	Post-KTG (KTG = 1)	Difference in coefficients
F-test	p = 0.00	p = 0.00	p = 0.50
Difference in coefficients	−0.0491	0.1748	**0.2239**
F-test	p = 0.31	p = 0.00	**p = 0.00**
			DID in coefficients

All continuous variables are winsorized at the 1% and 99% levels in each country sample.
All variables are defined in Appendix A.
[a] Robust t-statistics clustered by firm are in parentheses. The estimated coefficients for the differences and DID variables are in bold.
* Significant at 10%, ** significant at 5%, *** significant at 1% (two-tailed).

unobserved within-firm correlations (Petersen, 2009). In Panel A, the incremental sensitivity of earnings to negative returns is significantly positive for German firms in the pre-KTG period ($\beta_3 = 0.1178$, t-statistic = 2.72), consistent with an asymmetry in timely loss recognition. The estimated coefficient on $KTG \times RET$ indicates no significant increase in timely gain recognition after KTG, whereas the estimated coefficient on $KTG \times DNEG \times RET$ is significantly positive ($\beta_7 = 0.2758$, t-statistic = 2.69), suggesting an increase in the incremental sensitivity of earnings to negative returns after the KTG reform. In Panel B, F-tests show that the recognition of losses by German firms is significantly more timely in the post-KTG regime compared to the pre-KTG period ($\beta_5 + \beta_7 = 0.2705$, F-test p-value = 0.00).

Panel C of Table 4 presents the results of Eq. (1b) that benchmark German firms against the control group. Panel D also presents F-test statistics of the differences and DID of the timely loss recognition coefficients. During the pre-KTG period, we find no significant difference in the sensitivity of earnings to gains and losses between the German and control firms (i.e., α_9 and α_{11} are not significantly different from zero). We also find no significant change in timely loss recognition for the control group after KTG ($\alpha_5 + \alpha_7 = 0.0247$, F-test p-value = 0.50). The DID in the loss recognition coefficients is significantly positive ($\alpha_{13} + \alpha_{15} = 0.2239$, F-test p-value = 0.00), suggesting a post-KTG increase in the timely loss recognition for German firms relative to the control group. In unreported tests, we find similar evidence when we control for the interactive effect of firm characteristics on timely loss recognition and when we use an alternative accruals-based loss recognition model (see Sections 5.4.4 and 5.4.5, respectively, for further details).

5.2. The level of earnings smoothing

Table 5 presents the results of our earnings smoothing tests. Panel A examines firm-level differences and DID in the ratio of $\sigma\Delta NI^*/\sigma\Delta CFO^*$ between the pre- and post-KTG periods. To calculate $\sigma\Delta NI^*/\sigma\Delta CFO^*$, we require each firm to have non-missing values of ΔNI^* and ΔCFO^* for at least three years in either period. We present t-statistics clustered by firm and the 95% confidence intervals for tests of the differences and DID of the mean ratios. In Panel A, we observe that German firms experience an increase in the mean of $\sigma\Delta NI^*/\sigma\Delta CFO^*$ following the KTG reform (1.1126 versus 0.5374, t-statistic = 4.73), while the control group experiences a marginal (but statistically insignificant) increase (1.3091 versus 1.2122, t-statistic = 1.09). We find similar results using the Wilcoxon rank sum test (not tabulated), indicating that this result is not driven by extreme observations. In the DID test, we find that the post-KTG increase in $\sigma\Delta NI^*/\sigma\Delta CFO^*$ for the German sample remains statistically significant after adjusting for the corresponding increase for the control group (0.5752 versus 0.0969, t-statistic = 3.18).

Panel B of Table 5 examines changes in the correlation between the residuals of ΔACC and ΔCFO, denoted $\rho(\Delta ACC^*, \Delta CFO^*)$. The differences in the correlation coefficients are tested using Fisher (1921) z-transformation (see Sheskin, 2004). We find a significant increase in $\rho(\Delta ACC^*, \Delta CFO^*)$ for the German sample (−0.6767 versus −0.8183, z-statistic = 5.39), indicating a decrease in earnings

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N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx 21

Table 5
Tests of changes in earnings smoothing.

Test variable: $(\sigma\Delta NI^*/\sigma\Delta CFO^*)$	Pre-KTG	Post-KTG	Difference in mean ratios
Panel A: Mean ratio of std. dev. of change in earnings to std. dev. of change in operating cash flows[a,b]			
Germany (N = 272)	0.5374	1.1126	0.5752
95% Confidence interval	[0.4069, 0.6679]	[0.9069, 1.3184]	[0.3356, 0.8148]
t-Statistic (clustered by firm)	(8.22)[***]	(10.66)[***]	(4.73)[***]
Control group (N = 1788)	1.2122	1.3091	0.0969
95% Confidence interval	[1.0759, 1.3484]	[1.1868, 1.4314]	[−0.0773, 0.2712]
t-Statistic (clustered by firm)	(17.47)***	(21.01)***	(1.09)
Difference-in-differences:			0.4783
95% Confidence interval			[0.1835, 0.7730]
t-Statistic (clustered by firm)			(3.18)[***]
Test variable: $\rho(\Delta ACC^*, \Delta CFO^*)$	Pre-KTG	Post-KTG	Difference in coefficients[c]
Panel B: Spearman rank correlation of changes in accruals and cash flows[a]			
Germany	−0.8183	−0.6767	0.1416
(N = 1316)			(5.39)[***]
Control group	−0.6938	−0.5698	0.1240
(N = 9196)			(9.82)[***]
Difference-in-differences of correlation coefficients:			0.0176
(Test of significance not available)			n/a

All continuous variables are winsorized at the 1% and 99% levels in each country sample.
All variables are defined in Appendix A. [*] significant at 10%, [**] significant at 5%, [***] significant at 1% (two-tailed).

[a] Higher values of $\sigma\Delta NI^*/\sigma\Delta CFO^*$ and $\rho(\Delta ACC^*, \Delta CFO^*)$ represent lower levels of earnings smoothing. To calculate $\sigma\Delta NI^*/\sigma\Delta CFO^*$, we require firms to have at least three years of data in either the pre- or post-KTG periods. To calculate $\rho(\Delta ACC^*, \Delta CFO^*)$, we require firms to have data for at least two consecutive years to calculate ΔACC and ΔCFO. We compute ΔNI^*, ΔCFO^*, and ΔACC^* as the residuals from regressions of ΔNI, ΔCFO, and ΔACC on the control variables—SIZE, LEVERAGE, GROWTH, NONBIGN, BM, LIFECYCLE, EISSUE, and XLIST—and on time and industry fixed effects, and the country-level legal institutional variables (LEGAL_ENF, IMP_EQMKT, and INVESTOR RIGHTS).

[b] Robust *t*-statistics clustered by firm are in parentheses. The 95% confidence intervals are in brackets. The significance of the difference-in-differences of the mean ratios is tested using the following equation: $\sigma\Delta NI^*/\sigma\Delta CFO^* = \lambda_0 + \lambda_1 KTG + \lambda_2 GER + \lambda_3(KTG \times GER) + \varepsilon$, where λ_3 represents the estimated DID coefficient.

[c] *z*-statistics in parentheses. The test statistic for the differences in the Spearman correlation coefficients is calculated using Fisher's (1921) *z*-transformation (see Sheskin, 2004).

smoothing after KTG. Although we are unaware of any statistical test for the DID of correlation coefficients, we note that the increase in $\rho(\Delta ACC^*, \Delta CFO^*)$ for German firms remains sizable after adjusting for the corresponding increase for the control group (0.1416 versus 0.1240). In sum, the results in Table 6 suggest that the KTG reform had a positive impact on the earnings smoothing behavior of German firms.

5.3. The frequency of small positive earnings

Table 6 presents the estimated results for the differences (column 1) and DID regressions (column 2). Following Barth et al. (2008) and Lang et al. (2006), we report results using OLS instead of logit estimation since logit models are highly sensitive to heteroscedasticity (Greene, 2003). For brevity, we do not report the estimated coefficients for the control variables. In column 1, the estimated coefficient on the *KTG* variable is significantly negative, suggesting a post-KTG decrease in loss avoidance in Germany. In column 2, the estimated DID coefficient on *GER × KTG* remains negative, but is not statistically significant at conventional levels. Overall, we find some evidence of a reduction in loss avoidance by German firms after KTG.

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22   *N.C. Brown et al. / J. Account. Public Policy xxx (2013) xxx–xxx*

Table 6
Tests of changes in the frequency of small positive earnings (*SMALL_POS*).[a]

Dependent variable: *SMALL_POS*	Parameter	Germany (1)	Parameter	Germany vs control group (2)
Intercept	γ_0	−0.0981	μ_0	−0.3128
		(−1.97)[*]		(−0.83)
KTG	γ_1	−0.0904	μ_1	0.0012
		(−2.32)[**]		(0.11)
GER		–	μ_2	0.0049
				(0.30)
GER × *KTG*		–	μ_3	−0.0169
				(−1.14)
Control variables[b]		Included		Included
Legal institutions variables[c]		–		Included
Fixed time effects		Included		Included
Fixed industry effects		Included		Included
Adjusted *R*-squared		0.040		0.032
No. of observations		2148		12,984

All continuous variables are winsorized at the 1% and 99% levels in each country sample.
All variables are defined in Appendix A.
[*] significant at 10%, [**] significant at 5%, [***] Significant at 1% (two-tailed).
[a] Following Barth et al. (2008) and Lang et al. (2006), we report results using OLS instead of logit estimations since logit models are highly sensitive to heteroscedasticity (Greene, 2003). Robust *t*-statistics clustered by firm are in parentheses.
[b] For brevity, we do not report the coefficients on the control variables. The control variables are *SIZE*, *LEVERAGE*, *GROWTH*, *NONBIGN*, *BM*, *LIFECYCLE*, *EISSUE*, *XLIST*, and time and industry fixed effects.
[c] The country-level legal institutional variables are *LEGAL_ENF*, *IMP_EQMKT*, and *INVESTOR_ RIGHTS*.

5.4. Extensions and Robustness tests

5.4.1. The KTG reform and capital investment efficiency

Our results suggest an improvement in earnings quality in Germany after KTG. However, it is still an open question whether this improvement led to positive capital market consequences. We address this issue by examining the change (if any) in the association between accounting quality and capital investment efficiency in Germany after the KTG reform. Prior studies posit and find that accounting quality enhances capital investment efficiency by reducing information asymmetry between managers and outside suppliers of capital. Biddle and Hilary (2006) find that accounting quality—proxied by measures of earnings smoothing, accounting timeliness, the level of accruals, and loss avoidance—reduces capital rationing frictions between managers and outside investors. Biddle et al. (2009) find that accounting quality is associated with lower over- and under-investment, while Bushman et al. (2011) find that timely loss recognition disciplines the capital allocation decisions of firms faced with declining investment opportunities.

To conduct our analyses, we follow Biddle and Hilary (2006) and construct a country-year summary index of earnings quality (*EQ*) based on the earnings attributes examined in our study: timely loss recognition, earnings smoothing, and loss avoidance.[29] We create country-year estimates of timely loss recognition by estimating the Basu (1997) returns model by country and year using pooled cross-sectional data, while controlling for firm-specific factors and fixed industry effects. We create estimates of timely loss recognition by summing the coefficients on *RET* and *DNEG* × *RET* for each country and year. Similarly, we create country-year measures of earnings smoothing by computing $\sigma\Delta NI^*/\sigma\Delta CFO^*$ and $\rho(\Delta ACC^*, \Delta CFO^*)$ for each country and year. We compute the country-year level of loss avoidance by averaging *SMALL_POS* within each country and year. We aggregate these four measures into a summary index (*EQ*) by first creating binary variables for the timely loss recognition and earnings smoothing measures based on whether the country-year value is greater than the median country value, and for

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[29] We use a country-year index instead of a firm-level index since our sample lacks sufficient time-series data to reliably estimate timely loss recognition practices at the firm-level before and after the KTG reform.

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N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx

23

Table 7
Tests of changes in the sensitivity of investment efficiency to earnings quality.[a]

Dependent variable: *INVEFF*	Parameter	Germany vs control group
Intercept	δ_0	0.8823
		(4.12)***
EQ	δ_1	0.0032
		(1.80)*
KTG	δ_2	0.0017
		(0.52)
KTG × EQ	δ_3	−0.0011
		(−0.56)
GER	δ_4	0.0015
		(0.31)
GER × EQ	δ_5	−0.0161
		(−3.74)***
GER × KTG	δ_6	0.0049
		(0.65)
GER × KTG × EQ	δ_7	0.0160
		(2.75)***
AVGSIZE	δ_8	−0.0097
		(−5.33)***
GDP	δ_9	−0.0344
		(−1.87)*
Legal institutions variables[b]		Included
Adjusted *R*-squared		0.647
No. of observations		44

All variables are defined in Appendix A.
* significant at 10%, ** Significant at 5%, *** significant at 1% (two-tailed).
[a] Robust *t*-statistics are in parentheses.
[b] The country-level legal institutional variables are *LEGAL_ENF*, *IMP_EQMKT*, and *INVESTOR_ RIGHTS*.

SMALL_POS based on whether the country-year average is less than the country median. We then sum the four binary variables to create *EQ* which ranges from 0 to 4.

We estimate capital investment efficiency by country-year using the model below:

$$I = \theta_0 + \theta_1 MB + \varepsilon \qquad (4)$$

where *I* is the additions to fixed assets scaled by lagged total assets; *MB* is the beginning-of-year market-to-book equity ratio, which proxies for the Tobin's Q measure of investment opportunities; and θ_1 is our measure of investment efficiency (*INVEFF*), which captures the sensitivity of investment to the firm's investment opportunity set. Following Biddle and Hilary (2006), we take the log transformation of *MB* and the arctangent transformation (which logs negative values) of *I* to control for outlier effects. We estimate Eq. (4) for each country-year using pooled cross-sectional data and define *INVEFF* as the estimated value of θ_1.

To examine the post-KTG change in the association between earnings quality and capital investment efficiency, we employ the following DID model using country-year observations:

$$INVEFF = \delta_0 + \delta_1 EQ + \delta_2 KTG + \delta_3(KTG \times EQ) + \delta_4 GER + \delta_5(GER \times EQ) + \delta_6(GER$$
$$\times KTG)\delta_7(GER \times KTG \times EQ) + \delta_8 AVGSIZE + \delta_9 GDP + \sum_{k=10}^{K} \delta_k(Legal) + \varepsilon \qquad (5)$$

Consistent with Biddle and Hilary (2006), we control for the average firm size (*AVGSIZE*), measured as the log of the sum of total assets in each country-year, the log of GDP per capita (*GDP*), and legal institutional features (*Legal*) as previously defined.

Table 7 presents the estimated results for Eq. (5) with *t*-statistics calculated using robust standard errors. Our sample consists of 44 country-year observations over the 1994–2002 period; the 1994

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24 N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx

Table 8
Differences and DID tests excluding firms entering the sample after 1998.

Test variable	Timely loss recognition	Earnings smoothing		Loss avoidance
	Basu Model[a]	$(\sigma\Delta NI^*/\sigma\Delta CFO^*)$[a]	$\rho(\Delta ACC^*, \Delta CFO^*)$[b]	SMALL_POS[a]
$KTG \times DNEG \times RET$	0.2901 (2.36)** N = 1871			
$GER \times KTG \times DNEG \times RET$	0.2618 (1.97)** N = 11,179			
Germany-only		0.5880 (4.22)*** N = 232	0.1234 (4.73)*** N = 1076	
Germany vs control group		0.4465 (2.47)** N = 1801	0.0270 (n/a) N = 8896	
KTG				−0.1093 (−2.39)** N = 1871
$GER \times KTG$				−0.0233 (−1.48) N = 11,179

All continuous variables are winsorized at the 1% and 99% levels in each country sample.
All variables are defined in Appendix A.
* significant at 10%, ** significant at 5%, *** significant at 1% (two-tailed).
[a] Robust t-statistics clustered by firm are in parentheses. The significance of the difference-in-differences of $\sigma\Delta NI^*/\sigma\Delta CFO^*$ is tested using the following equation: $\sigma\Delta NI^*/\sigma\Delta CFO^* = \lambda_0 + \lambda_1 KTG + \lambda_2 GER + \lambda_3(KTG \times GER) + \varepsilon$, where λ_3 represents the estimated DID coefficient.
[b] z-statistics in parentheses. The test statistic for the differences in the Spearman correlation coefficients is calculated using Fisher's (1921) z-transformation (see Sheskin, 2004).

observation for Austria is missing due to insufficient data. The coefficient on EQ is significantly positive ($\delta_1 = 0.0032$, t-statistic = 1.80), suggesting a positive association between earnings quality and capital investment efficiency, consistent with prior research. We find a significantly negative coefficient on $GER \times EQ$ ($\delta_5 = -0.0161$, t-statistic = −3.74), indicating that the association between EQ and INVEFF is lower for German firms before KTG. More interestingly, the coefficient on $GER \times KTG \times EQ$ is significantly positive ($\delta_7 = 0.0160$, t-statistic = 2.75), suggesting a post-KTG increase in the relation between EQ and INVEFF in the German market. We also find similar evidence (not reported) when we re-estimate INVEFF after controlling for the sensitivity of investment to operating cash flows (CFO), indicating that our results are robust to capital rationing frictions between managers and outside investors. In sum, our evidence suggests that the earnings quality effects of the KTG reform have positive consequences for enhancing capital investment efficiency in the German market.

5.4.2. Alternative sample construction

Our main findings are based on an unbalanced data panel with a higher number of sample firms in the post-KTG period. This increase is primarily due to additional coverage by Compustat Global and the opening of "new market" exchanges in our test countries. To examine whether our results are sensitive to sample construction, we eliminate all firms that enter the sample after 1998. We do not delete firms that exit our sample after KTG in order to minimize the potential effects of survivorship bias. We present the results from this analysis in Table 8. For brevity, we only tabulate the differences and DID coefficients (or ratios) for each of our tests. We find that the re-estimated results are consistent with our main inferences.

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N.C. Brown et al. / J. Account. Public Policy xxx (2013) xxx–xxx 25

5.4.3. Alternative control countries

We examine whether our results are robust to the selection of our control countries. The implementation of voluntary ICRM requirements in the UK during our test period as well as the shareholder-oriented nature of the UK's capital market could bias our results. Further, our other control countries may not be suitable benchmarks for the German market. To alleviate these concerns, we replicate our DID tests excluding all UK firms. Our DID results continue to show a post-KTG increase in timely loss recognition and a decrease in earnings smoothing for German firms relative to firms domiciled in Austria, Switzerland, and France. However, our DID test of changes in *SMALL_POS* remains insignificant. We also re-estimate our tests using the following alternative control groups: (1) all countries with German legal origin and (2) all countries with civil law traditions.[30] To ensure reliable estimations of our measures, we require countries to have at least 100 firm-years in each of the pre- and post-KTG periods. Our results and inferences based on each alternative control group are qualitatively similar to our reported results.

5.4.4. Controlling for cross-sectional differences in timely loss recognition

The main variables in Eqs. (1a) and (1b) should be fully interactive with the firm-level control variables to properly adjust for cross-sectional differences in timely loss recognition. Given the number of high-order interactions in our models, we take the approach of estimating Eqs. (1a) and (1b) separately for firm-years with high versus low values of each of our firm controls. This approach mitigates multicollinearity biases arising from the use of high-order multiplicative interaction terms and also increases the ease of interpretation. For the continuous control variables, we separate the sample based on whether the value of the variable is above or below the median value within each country-year. For binary variables, we separate the sample based on whether the variable is equal to one or zero. We estimate both models separately for each cross-section of the sample and then test for differences in our variables of interest.

Our results show that non-cross-listed German firms and firms with foreign transactions experience a greater increase in timely loss recognition after KTG relative to the control group. This evidence suggests that the KTG reform had a stronger positive effect on the loss recognition practices of German firms without US regulatory oversight and those firms engaged in complex transactions, which are argued to have higher ICRM risks (Ashbaugh-Skaife et al., 2008; Doyle et al., 2007a,b). We do not find significant differences for the rest of our controls.[31]

5.4.5. Accruals-based model of timely loss recognition

The Basu (1997) returns-based model implicitly assumes that stock returns efficiently incorporate firms' economic performance. To the extent that this assumption is invalid across countries, results from a returns-based model could be biased. Moreover, the significant stock market run-up and decline during our sample period could confound our results. To mitigate these concerns, we employ an accruals-based model that is not dependent on stock returns. We re-estimate our timely loss recognition differences and DID regressions using the Ball and Shivakumar (2005, 2006) cash flow model with *ACC* as the dependent variable and *CFO* as our proxy for economic performance. To identify firm-years with economic losses, we interact *CFO* with an indicator variable, *DNEGCFO*, that equals one for negative values of *CFO* and zero otherwise. Similar to the Basu (1997) model, the results from the accruals-based models provide strong evidence of a post-KTG increase in timely loss recognition, even after adjusting for the corresponding change in the control group. We also find a greater post-KTG increase in accruals-based timely loss recognition for firms with low leverage, suggesting that firms with less debt monitoring experience a greater increase in accruals-based loss recognition after KTG.

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[30] The countries with German legal origin include Austria, Switzerland, Japan, and Taiwan, while countries with civil law traditions include Austria, Belgium, Brazil, Switzerland, Denmark, Spain, Finland, France, Japan, The Netherlands, Norway, Philippines, Sweden, and Taiwan.

[31] We also find no significance difference based on the *BM* ratio, which proxies for unconditional conservatism and the scope to account for economic losses (Beaver and Ryan, 2005; Roychowdhury and Watts, 2007).

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26   N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx

5.4.6. Adoption of IFRS and US-GAAP accounting standards

In April 1998, Germany passed the *Law to Facilitate the Raising of Capital* (KapAEG), allowing firms to prepare consolidated financial statements solely under internationally accepted accounting standards, primarily IFRS or US-GAAP. Before KapAEG, firms voluntarily adopting IFRS or US-GAAP were still required to prepare consolidated statements in accordance with GGAAP. Given this change in the accounting regime, one concern is whether the observed post-KTG increase in earnings quality is attributable to the adoption of IFRS or US-GAAP reporting. We control for the adoption of international accounting standards using two alternative approaches. First, we eliminate all observations for those German and control firms that switched to IFRS or US-GAAP from fiscal 1997 onwards, to coincide with the anticipated and actual passage of KapAEG. Second, we include an indicator variable in all our regressions to control for those firms that switched to IFRS or US-GAAP in or after fiscal 1997. Our re-estimated results for each approach (not tabulated) are largely consistent with our reported evidence.

5.4.7. Pre-existing differences in time trends

Our DID tests implicitly assume that pre-existing time trends in earnings quality are common to Germany and the control group, but this assumption could be invalid due to differences in earnings attributes across countries and over time. Also, unobserved differences in the evolution of accounting regimes across countries could lead to pre-existing differences in the earning quality trends of our treatment and control groups. To test the validity of this assumption, we replicate our tests in the pre-KTG period and examine whether there is a significant difference in the earnings quality trends of the two groups. We create a time trend variable (*TREND*) for the years 1994–1998 and then interact *TREND* with our variables of interest. We find no significant difference in earnings quality trends between the two groups.

5.4.8. Alternative measures of accruals and operating cash flows

As noted earlier, cash flow information is missing for many observations in our German sample, especially during the pre-KTG period. We examine the sensitivity of our results to this data limitation by replicating our tests using a larger sample based on two alternative balance sheet definitions of *ACC* and *CFO*. The first balance sheet method computes *ACC* as the change in non-cash working capital plus depreciation expense (Hribar and Collins, 2002). The second method uses a more comprehensive approach and defines *ACC* as the sum of the change in non-cash working capital, change in net non-current operating assets, and the change in net financial assets (Richardson et al., 2005). Using each balance sheet measure of *ACC*, we then compute *CFO* as *NI* minus *ACC*, both scaled by lagged total assets. We find that the results for our earnings smoothing tests and the accruals-based tests of timely loss recognition continue to hold when we use a larger sample based on these two alternative measures of *ACC* and *CFO*.

6. Conclusion, limitations, and implications

We investigate the impact of the 1998 German ICRM reform (KTG) on earnings-based attributes of accounting quality. We find that German firms exhibit more timely loss recognition and lower levels of earnings smoothing after the KTG reform. We also find some evidence of a decrease in loss avoidance behavior by German firms. Together, these results are consistent with increased accounting quality as an intended outcome of ICRM reform. This study contributes to prior research by providing evidence of the accounting quality effects of broad risk-based ICRM regulation in a unique international setting. Our study also extends prior work by documenting the role of ICRM reform in improving earnings quality in an international capital market.

Although our results are largely consistent across all our analyses, we are cautious in drawing inferences about causality. We note that the lack of a within-Germany control group limits our ability to control for time trends in earnings quality or concurrent macroeconomic shocks. We however find that our results are robust to the use of alternative control groups and the inclusion of firm- and country-specific controls. Given the limited public disclosure of ICRM weaknesses in Germany, we are also

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N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx 27

unable to identify firm-specific changes in ICRM quality after KTG. Lastly, given the broad scope of internal control under KTG, we acknowledge that internal controls aimed at monitoring or insuring against business risks could affect earnings quality independent of managers' (intentional or unintentional) financial reporting choices. Therefore, our evidence of an increase in earnings quality following the KTG reform cannot be solely attributable to changes in managers' reporting choices.

Despite these limitations, our study provides several interesting implications for regulators and standard-setters. First, our findings suggest that the German regulatory approach to ICRM improves earnings-based attributes of accounting quality and has positive consequences for capital investment efficiency. Thus, the KTG reform can serve as a useful basis for defining ICRM mandates in other jurisdictions (Dobler, 2005). Indeed, the KTG legislation has become a leading basis for ICRM regulation in the EU. Second, our evidence implies that the broad risk-based approach to ICRM provides a suitable system for improving earnings quality, consistent with the views of financial statement users (Hermanson, 2000). As such, our results should inform regulators as they debate the cost-benefit tradeoffs of expanding the scope of ICRM mandates and other policies related to risk controls. For example, PCAOB (2007) AS-5 standard now emphasizes an entity-level, risk-based approach to ICFR audits and recent changes to the NYSE Corporate Governance Rules require listed firms to monitor their risk assessment and risk management processes, including risks beyond financial reporting (NYSE, 2003).

Finally, our results should inform the ongoing debate of mandatory ICRM disclosure requirements. Our results suggest a positive effect of the KTG reform on earnings quality despite limited public disclosure of ICRM effectiveness. This evidence likely reflects Germany's insider-oriented framework, which places less emphasis on public disclosure as a monitoring mechanism. Our evidence also suggests that economic benefits such as capital investment efficiencies could incentivize managers to comply with ICRM mandates in the absence of public disclosure monitoring. Hence, regulators and standard-setters should continue to assess the cost-benefit trade-offs of ICRM disclosure mandates and whether such mandates are necessary to bring about changes in ICRM quality within the jurisdiction's institutional framework.

Acknowledgments

Appendix A

Variable definitions.

Primary variables	Definition [Compustat Global data code]
KTG	Equals "1" for all fiscal years ending after December 1998, "0" otherwise. *KTG* distinguishes the pre-KTG period from the post-KTG period
GER	Equals "1" for firms domiciled in Germany [LOC], "0" otherwise
RET	Market-adjusted buy-and-hold stock return inclusive of dividends over the fiscal year. Each firm's raw buy-and-hold return for fiscal year *t* is measured

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28   *N.C. Brown et al./J. Account. Public Policy xxx (2013) xxx–xxx*

Appendix A (*continued*)

Primary variables	Definition [Compustat Global data code]
	as $[(ADJPRC_t - ADJPRC_{t-1}) + DIV]/ADJPRC_{t-1}$, where *ADJPRC* is closing price from the Compustat Global Issues file [prccd] adjusted for stock splits and stock dividends [ajexdi], and *DIV* is dividends per share [div]. We market-adjust the raw returns by subtracting the comparable buy-and-hold return in fiscal year *t* on a value-weighted portfolio of the sample firms domiciled in the same country
EPS	Net income before extraordinary items per share scaled by beginning-of-year price measured as $(NI/ADJSHO)$–$ADJPRC_{t-1}$, where *NI* is net income before extraordinary items [IB] and *ADJSHO* is common shares outstanding from the Compustat Global Issues file [cshoc] adjusted for stock splits and stock dividends [ajexdi]
DNEG	Equals "1" for negative values of *RET*, "0" otherwise
Δ*NI*	Change in net income before extraordinary items [IB] scaled by lagged total assets [AT]
Δ*CFO*	Change in cash flow from operations [OANCF] scaled by lagged total assets [AT]
Δ*ACC*	Change in accruals scaled by lagged total assets [AT], where accruals is measured as net income before extraordinary items [IB] minus cash flow from operations [OANCF]
Δ*NI** Δ*CFO** Δ*ACC**	Residual values of Δ*NI*, Δ*CFO*, and Δ*ACC*, respectively, from regressions of each variable on firm-level controls, country-level legal institutional factors, and on time and industry fixed effects
SMALL_POS	Equals "1" if net income before extraordinary items [IB] scaled by total assets [AT] is between 0 and 0.01, "0" otherwise
Firm-level control variables	
SIZE	Log of total assets [AT]
LEVERAGE	Total liabilities [LT] divided by total assets [AT]
GROWTH	One-year sales [SALE] growth in percentage
NONBIGN	Equals "1" if the firm is audited by a non-Big N audit firm [AUOP] in year *t*, "0" otherwise
BM	Ratio of beginning-of-year book value of common equity [CEQ] to market value of equity $(ADJSHO \times ADJPRC)$
LIFECYCLE	Ratio of retained earnings [RE] to common equity [CEQ]
EISSUE	Percentage change in common shares outstanding adjusted for stock splits and stock dividends (*ADJSHO*)
XLIST	Equals "1" for firms with sponsored cross-listings in the US on the NYSE, NASDAQ, or AMEX, "0" otherwise
FOREIGN	Equals "1" for all firm-years with non-zero cumulative foreign translation adjustment [FCA], "0" otherwise
Legal institutional factors	
LEGAL_ENF	Legal enforcement, measured as the average score across three country indices: rule of law, level of corruption, and the legal system's efficiency (see La Porta et al., 1998)
IMP_EQMKT	Importance of equity markets, constructed by Leuz et al. (2003) as the average rank across three country measures: aggregate stock market held by minority shareholders, number of listed domestic stocks, and the number of IPOs (see La Porta et al., 1997)
INVESTOR_RIGHTS	Outside investor rights, which is the La Porta et al. (1998) anti-director rights

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N.C. Brown et al. / J. Account. Public Policy xxx (2013) xxx–xxx   29

Appendix A (*continued*)

Primary variables	Definition [Compustat Global data code]
	index that captures the rights of minority shareholders
Investment efficiency variables	
EQ	Summary index of earnings quality ranging from 0 to 4 based on country-year estimates of timely loss recognition, the ratio of the standard deviation of ΔNI^* to the standard deviation of ΔCFO^*, the Spearman rank correlation between ΔACC^* and ΔCFO^*, and the average of *SMALL_POS*
I	Arctangent transformation of additions to fixed assets [AFXA] scaled by lagged total assets [AT]
MB	Log of ratio of beginning-of-year market value ($ADJSHR \times ADJPRC$) to book value of common equity [CEQ]
INVEFF	Investment efficiency at the country-year level measured as the estimated coefficient of θ_1 from the following investment model: $I = \theta_0 + \theta_1 MB + \varepsilon$
AVGSIZE	Average firm size in each country-year measured as the log of the sum of total assets [AT]
GDP	Log of GDP per capita

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30   *N.C. Brown et al. / J. Account. Public Policy xxx (2013) xxx–xxx*

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31

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