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Does compliance with the German Corporate Governance Code pay off?

An investigation of the implied cost of capital

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Abstract

Purpose – This paper aims to empirically investigate the relationship between the level of compliance with the German Corporate Governance Code's (GCGC) recommendations and the implied cost of equity capital (ICC). German listed companies are required by law to annually disclose their compliance with the recommendations of the GCGC. Whether the GCGC achieves its aim to promote the trust of stakeholders in the management and supervision is still an open question.

Design/methodology/approach – ICC is regressed on a score that captures compliance with the GCGC and several control variables. The dataset covers the period of 2003-2012 with declarations of compliance from 447 companies. ICC is chosen as an outcome variable, as it captures general investment risk as well as risk arising from asymmetric information and mistrust of investors in management.

Findings – The results of the empirical analysis demonstrate that a higher level of GCGC compliance is associated with lower ICC.

Research limitations/implications – It is expected that the results of this study will strengthen acceptance of the GCGC and empirically support the work of the government commission that is responsible for it. It has not been analyzed yet whether the firms cite good reasons why they do not adhere to certain items.

Originality/value – This empirical analysis is the first to provide statistically reliable evidence on how compliance with the GCGC affects ICC and whether the work of the government commission reflects good corporate governance as perceived by capital markets.

Keywords German corporate governance code, Implied cost of capital, Model-based forecasts

Paper type Research paper

Introduction

In 2001, the German Government established the *Regierungskommission Deutscher Corporate Governance Kodex*, a government commission that was tasked with developing standards of good corporate governance for German listed companies in a move to promote the trust of international and national investors in the management and supervision of listed German companies. In February 2002, the government

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commission released the first version of the German Corporate Governance Code (GCGC[1]), which consisted of several governance-related recommendations to which companies have to comply with; alternatively, they must disclose their non-compliance under a comply-or-disclose mechanism. Since its inception, the GCGC has been amended almost annually. The GCGC, therefore, potentially serves German companies as an instrument to signal domestic and transnational investors that management follows "international best practice" (Goncharov *et al.*, 2006). In particular, transnational investors have higher demand for this information due to greater geographical and cultural distance (Baik *et al.*, 2013). Thus, compliance with the recommendations of the GCGC has the potential to mitigate agency risks between transnational investors and German companies. The major objectives of the Code – transparency and an alignment of interests – serve to decrease asymmetric information, which, in turn, should decrease the risk associated with investing in a company's shares (Armstrong *et al.*, 2011; Easley and O'Hara, 2004; Kanagaretnam *et al.*, 2007). Thus, all other factors being constant, better corporate governance – which, in this study, is defined as a higher level of compliance with the GCGC – is expected to have a diminishing effect on investment risk and hence on the implied cost of equity capital (ICC).

The rationale behind the Code's comply-or-disclose mechanism is based on classic economic theory. Rather than forcing companies to adopt certain corporate governance practices, the GCGC contains a bundle of a priori recommendations whose enforcement is left to the market. However, companies' acceptance of and support for the GCGC is mixed[2]. For instance, in an interview with *Frankfurter Allgemeine Zeitung*, Kurt Bock, the chief executive officer (CEO) of Germany's largest chemical company, called for the work of the government commission to be abandoned, as, in his view, it had not prevented regulation, e.g., when it came to CEO compensation (Meck, 2013). From a scientific perspective, the prior empirical evidence for the effectiveness of this mechanism is based on relatively small samples covering only few years of data. We close this gap by investigating the relationship between GCGC compliance and ICC using a comparatively large dataset of 447 listed German companies and 2,860 observations during the period of 2003-2013.

Thus far, pioneering research by Goncharov *et al.* (2006) has provided evidence of a positive valuation effect of compliance with the GCGC. A more recent article by Tran (2014) has documented a decreasing effect of financial transparency, bonus compensation and block ownership on ICC in a German setting. We add to this stream of research by extending the sample from a two-year period as in the study by Goncharov *et al.* (2006) to a much deeper panel dataset spanning 11 years and multiple versions of the GCGC. We also use a much broader and deeper dataset than Tran (2014). The limitations in sample size in these previous studies may be due to two factors. First, there is no database that provides easy access to data on compliance with the GCGC. Second, databases for analysts' forecasts have insufficient coverage of German companies, rendering it difficult to obtain ICC estimates using samples of a size that allows for reasonable estimation. We address the first challenge by hand-collecting the necessary information from mandatory declarations of compliance in accordance with Section 161 of the Stock Corporation Act, and address the second challenge by utilizing a new statistical method proposed by Hou *et al.* (2012) to obtain earnings forecasts. This enables us to resolve the small sample size dilemma that previous researchers may have encountered and further allows us to control for endogeneity by applying a dynamic

panel data model. Therefore, this study is the first to provide statistically reliable evidence on how compliance with the GCGC affects ICC and whether the work of the government commission reflects good corporate governance as perceived by capital markets.

An empirical analysis of the relationship between GCGC compliance and ICC in the German setting has several merits. Instead of analyzing the association between arbitrarily chosen corporate governance proxies such as financial transparency, bonus compensation and ownership structures, we analyze the effect of corporate governance as defined by a regulatory authority. Thus, beyond the research question of whether good corporate governance decreases perceived investment risk, we analyze whether compliance with a set of particular governance provisions as proposed by the government commission has this effect. Our empirical results therefore have considerable regulatory implications. Furthermore, our findings for the German market should also be of interest for executives, shareholders and regulatory authorities in other countries. In the USA, for instance, there is no overarching corporate governance code on the basis of a comply-or-disclose mechanism. While the US economy is well known for its reliance on free markets, laws such as the Sarbanes–Oxley Act strictly regulate corporate governance instead of leaving enforcement to the markets. The costs and benefits of such strict legislation are highly disputed in the literature (Burks, 2011; Coates and Srinivasan, 2014; Gates and Leuschner, 2007). If the empirical results from other developed countries such as Germany, the UK, Spain or Italy indicate that the voluntary adoption of corporate governance provisions combined with mandatory disclosure is beneficial, this would lead to the conclusion that, in terms of welfare gains, strict regulation is inferior.

The results of our empirical analysis demonstrate that a higher level of GCGC compliance is associated with lower ICC. Compliance with one recommendation is associated with an incremental drop in ICC of roughly 0.17 percentage points. The relationship between GCGC compliance and ICC turns out to be particularly strong in industries with low product market competition. Applying a dynamic panel data model with a system generalized method of moment (SGMM) estimation allows us to control for the endogeneity in compliance with the GCGC. Using an alternative compliance measure that is solely built on recommendations that have existed largely unchanged over time provides less significant results, which indicates that the perception of good corporate governance is dynamic and the changes in the set of recommendations are justified.

These results also imply that the comply-or-disclose mechanism of the GCGC is effective and that the recommendations of the Code reflect good corporate governance as perceived by the capital markets. Thus, our results are in favor of the work of the government commission and call for the continuation of this regulatory body. Indirectly, the results support the work of the Intergovernmental Working Group of Experts on International Standards of Accounting and Reporting (ISAR) of the United Nations (UN), which promotes corporate governance disclosure.

Prior research

In Germany, the UK, Austria and The Netherlands, governance codes contain a mandatory disclosure requirement to encourage compliance. Boards of directors and supervisory boards of publicly traded companies are required to disclose whether they comply with the respective codes' requirements. We investigate whether capital market participants take the level of a company's compliance into account when making their

investment decisions. In doing so, we specifically contribute to existing empirical literature that investigates the impact of corporate governance on ICC and, more generally, to the literature that analyzes the relationship between corporate governance and stock market performance. There are two articles which are closely related to this study. Goncharov *et al.* (2006) analyze the impact of compliance with the GCGC on market valuation. Tran (2011, 2014), in his conceptual and empirical analyses, investigates whether certain governance-related company characteristics, such as ownership structure, disclosure scores from the German Society of Investment Professionals (DVFA) and stock-based compensation, are related to ICC.

Goncharov *et al.* (2006) rely on a sample of 61 companies with 122 observations from 2002 and 2003. Their methodological approach is based on the assumption that companies self-select into a more than median compliance level with the GCGC. The selection process is modeled as a probit regression with several ownership and other company-specific variables. The dependent variables in this value relevance study are share prices and stock market returns. Goncharov *et al.* (2006, p. 442) conclude that "firms with higher compliance are priced at an average premium of €3.23" per share and that "the stock performance of the firms with higher compliance is on average 10 percentage points higher". Our study contributes to this pioneering and particularly valuable piece of research in several ways. First, we substantially increase the sample size in terms of length and depth. Instead of restricting our sample to companies in the major German stock indices DAX30 and MDAX, which cover only 80 companies, we collect declarations of compliance from 447 CDAX companies, the stock market index that comprises all German companies that are listed in the General Standard and Prime Standard at the Frankfurt Stock Exchange. Second, we focus on the effect of GCGC compliance on ICC rather than overall value relevance. We consider this different approach useful, as it allows to measure effects of corporate governance on investment risk separately from its potential effects on future cash flows[3]. Third, we use a different and, in our opinion, more appropriate methodology to address the problem of endogeneity. Goncharov *et al.* (2006) use a Heckman selection model to account for bias in parameter estimates. The explanatory variables in the selection model, which are not included in the second stage regressions and, consequently, are labeled as exogenous by the authors, are bank ownership, block holdings, free float, leverage, board size, union members on the supervisory board, executive pay, membership of the top 100 non-financial companies list of the UN World Investment Report, takeover activities, total assets and year and stock market index dummy variables. Prior research has provided evidence of a relationship between these variables and company performance (Maury and Pajuste, 2004; Mehran, 1995; Modigliani and Miller, 1958; Morck *et al.*, 2000; Yermack, 1996); hence, for the endogeneity of these variables, we prefer a different approach to mitigating the problem of endogeneity[4]. We re-estimate our main regression in a dynamic panel data setting with lagged endogenous variables as internal instruments (Wintoki *et al.*, 2012).

Tran (2014) finds evidence that disclosure score, block ownership and bonus compensation are negatively related to ICC and cost of debt. His sample is based on 206 observations from DAX30, MDAX and SDAX[5] companies during the period from 2006 to 2008. Our research is similar to this article in terms of investigating ICC, but differs with respect to the choice of the explanatory variable. Whil Tran (2014) uses general proxies for corporate governance, we focus on the relationship between GCGC

compliance and ICC. This specific focus, as well as the considerably longer sample period (2003-2013) and the significantly broader sample selection (2,860 observations), allows us to derive our contribution to the literature. Applying compliance with the GCGC as an explanatory variable enables us to derive conclusions regarding the appropriateness of the government commission's definition of corporate governance. From a methodological perspective, we address the problem of endogeneity in more detail by invoking a dynamic panel data model and applying the SGMM estimation instead of relying on instrumental regressions with semi-endogenous variables as instruments.

Two further studies on the German market are less closely related with respect to research design but very similar in terms of the addressed research question. Nowak *et al.* (2005) analyze abnormal returns around 145 publications of declarations of compliance. The authors conclude that GCGC compliance is irrelevant to capital markets. We consciously opt for a different research design, as event studies only capture the short-term effect of new information; also, compliance with the GCGC, although disclosed in an *ad hoc* manner, typically does not change rapidly and hence can be easily anticipated by investors. Drobetz *et al.* (2004) examine the relationship between stock returns and corporate governance. Based on a survey with 91 responses, the authors document a positive relationship between governance practices and market valuation. They also find evidence that expected stock returns are negatively correlated with firm-level corporate governance when dividend yields are used as proxies for the cost of capital. Our study goes beyond this research by measuring ICC with the more sophisticated and, in our opinion, more reliable approach outlined by Hou *et al.* (2012).

Besides providing evidence for the German market, several studies address the relationship between corporate governance and stock market performance in other markets. Gompers *et al.* (2003), for instance, show that, in the USA, companies with better corporate governance have a higher market value and lower capital expenditures. Their analysis relies on the construction of a corporate governance score through an analysis of publications by the Investor Responsibility Research Center. The authors identify a total of 24 distinct corporate governance provisions, which they split into five categories before constructing a firm index by adding one point for every provision that restricts shareholder rights or increases managerial power. Ashbaugh *et al.* (2004) use the Gompers *et al.* (2003) score as a proxy for the strength of shareholder rights regimes and find a decreasing effect of governance characteristics on ICC. Byun *et al.* (2008) address the effect of corporate governance practices on ICC with regard to agency problems and information asymmetry in an Asian context and provide consistent evidence of the negative relationship between good corporate governance and ICC, while shareholder rights protection is identified as the most important factor for a reduction in ICC. Similar results can be found in empirical studies by Zhu (2014) for international capital markets and Chen *et al.* (2009) for emerging markets.

Hypothesis development

From a theoretical perspective, good corporate governance reduces the estimation risk of future cash flows by enhancing the level of corporate disclosure, which, in turn, increases liquidity of companies' securities by attracting increased demand from large investors. Corporate disclosure is also expected to reduce information asymmetry and the cost of equity capital (Diamond and Verrecchia, 1991; Leuz and Verrecchia, 2000). In

their theoretical research model, Easley and O'Hara (2004) demonstrate that in equilibrium, the quantity and quality of information influences asset prices, resulting in cross-sectional differences in companies' required return and therefore in the cost of equity capital. Information asymmetries between informed and uninformed investors result in uninformed investors facing an information risk that stems from the better-informed investors. Thanks to their access to superior information, they are able to act in a timelier manner and shift their portfolios where necessary, while the uninformed investors are exposed to information risk. In a similar vein, Garmaise and Liu (2005) propose and empirically test a model in which the management of a company has private information and discloses this information in reports that are either honest or dishonest. If the company's corporate governance is strong, the signals sent out by the management presumably are more honest and result in an avoidance of overinvestment because shareholders have better control over the investment process. On the other hand, weak corporate governance increases problems that arise because of the principal–agent relationship between investors and management, and hence, increases the cost of equity capital. Correspondingly, the empirical literature shows that reduced information asymmetry serves to decrease companies' cost of equity capital through reduced information risk (Handa and Linn, 1993; Merton, 1987), estimation risk (Barry and Brown, 1984, 1985, Clarkson *et al.*, 1996) and transaction costs (Amihud and Mendelson, 1986; Kim and Verrecchia, 1994). In the German context, it can be hypothesized that the recommendations of the GCGC reflect good corporate governance practices. Compliance with these recommendations signals high levels of corporate governance that ought to reduce information asymmetry and ICC. Therefore, our main testable hypothesis is that the level of compliance with the recommendations of the GCGC is negatively related to ICC:

H1. A higher level of compliance with the GCGC leads to lower ICC.

Prior research on the relationship between corporate governance and company performance has shown that product market competition matters. Giroud and Mueller (2011) and Hodges *et al.* (2014) provide empirical evidence for the US market, suggesting that only in noncompetitive industries, companies with weaker corporate governance have lower equity returns, lower market value and higher cost of equity and debt. These results are based on several theories, for instance, the hypothesis of lower managerial slack, which assumes that the stronger the product market competition, the higher the price pressure and, thus, the lower the probability that managers can afford to divert or inefficiently use resources (Hart, 1983; Machlup, 1967). The thread-of-liquidation hypothesis states that an increase in competition increases the probability of a firm having to be liquidated. Managers are then disciplined by the product market, with additional governance provisions contributing less to the performance of that company (Schmidt, 1997). For Germany, Januszewski *et al.* (2002) provide empirical evidence concerning the effect of product market competition on the relationship between corporate governance and productivity growth. Accordingly, our second research hypothesis states an interaction effect between the effect of GCGC compliance on ICC and product market competition:

H2. The positive (decreasing) effect of GCGC compliance on ICC is stronger in industries with lower product market competition.

Methodology and sample

Sample selection and data sources

The initial sample comprises all non-financial[6] companies listed in the General Standard or Prime Standard of the Frankfurt Stock Exchange, i.e. all companies that are a member of CDAX and therefore have to disclose their compliance with the GCGC in an annual declaration of conformity. The final sample for the regression estimation contains all company-year observations that offer sufficient data for calculating ICC. In addition, a declaration of GCGC compliance that is no older than 365 days must be provided. Furthermore, there must be sufficient data to calculate control variables as outlined in the following subsections. Panel A in Table I shows the reduction in the initial sample due to data restrictions when the statistical model of Hou *et al.* (2012) is used to calculate earnings forecast for ICC estimations. For the specification that considers only industry and year dummies as control variables, the regression analysis is based on a sample of 2,860 observations from 447 companies during the period of 2003-2013. For the specification that also considers accounting-, market- and ownership-based control variables, 1,526 observations from 314 companies are available. Panel B shows the sample reduction when analyst forecasts from the Institutional Broker Estimate Services (I/B/E/S) database are utilized. Using analyst forecasts as inputs for ICC estimation significantly reduces the sample size, as many smaller companies are not covered by analysts.

Where possible, declarations of compliance were hand-collected from the companies' investor relations Web sites. In many cases, however, companies only provide these documents for the most recent years. We then searched for the documents in the archives of hv-info.de and ebundesanzeiger.de. In cases where the archive search failed

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total
Panel A: ICC estimates based on earnings forecast from the statistical model in Hou et al. (2012)												
CDAX constituents excl. financials	551	530	513	498	471	498	490	465	439	432	395	5,282
Thereof ICC available	441	430	421	423	432	400	381	334	368	365	348	4,343
Thereof declaration of compliance available (model with industry and time dummies only)	187	216	247	257	288	282	285	262	282	285	269	**2,860**
Observations with sufficient data to estimate equation (3) (model with company-specific controls)	17	10	17	94	181	206	186	187	216	215	197	**1,526**
Panel B: ICC estimates based on mean analyst forecast from I/B/E/S												
CDAX constituents excl. financials	551	530	513	498	471	498	490	465	439	432	395	5,282
Thereof ICC available	237	213	219	244	259	283	283	289	287	257	252	2,823
Thereof declaration of compliance available (model with industry and time dummies only)	122	124	149	169	195	214	220	235	228	213	195	**2,064**
Observations with sufficient data to estimate equation (3) (model with company-specific controls)	12	6	13	73	135	173	168	178	186	183	167	**1,294**

Table I.
Sample reduction

Note: Numbers in bold represent the final sample size

to return a result, we contacted the company or its legal successor by e-mail and requested the documents.

Compustat Global served as a data source for accounting variables, while market data were obtained from Compustat Security Daily Global and Datastream. The index constituents of CDAX were obtained from Compustat Index Constituents. Index returns of CDAX were retrieved from Yahoo!Finance. Proxy variables for the risk-free rate of return were downloaded from the Web site of Deutsche Bundesbank[7]. Osiris (Bureau van Dijk) provided the information on ownership structure.

Corporate governance scores

To measure GCGC compliance, we construct two score values, *CG* and *CGAW*, from the information provided in the declarations of compliance. *CG* is simply 1 minus the number of declared deviations divided by the total number recommendations given by the Code. Each mention of an item is counted as one deviation. Since its initial release, the CGCG has been amended annually except in 2004 and 2011, which amounts to a total of ten versions to consider in the analysis. *CGAW* is an alternative, acceptance-weighted measure of compliance with the Code. Instead of weighting each item equally as in the calculation of *CG*, each item is weighted by its overall acceptance. The acceptance score of each item is calculated by year and code version. It is defined as 1 minus the total number of deviations from this particular item of all companies divided by the maximum number of deviations, i.e. the number of companies issuing a declaration of compliance with the respective version of the Code. The weight attached to each item is the acceptance score of this item, divided by the sum of all acceptance scores referring to the respective version of the Code. By construction, both *CG* and *CGAW* range between 0 and 1, with higher score values implying higher (acceptance-weighted) levels of compliance with the GCGC. For informational purposes only, Table II shows the top five items by code version in terms of declared deviations. Table III provides descriptive statistics for both governance scores and the other regression variables defined later in this methodology section.

One issue that may arise with respect to the construction of the compliance score is that the recommendations have changed over time, but our empirical models assume a linear effect of GCGC compliance on ICC. The question that arises is whether pure changes in the set of recommendations, which may lead to different scores across time for the same company, although this company has not changed its governance provisions, are likely to affect ICC. To answer this question, one has to understand whether the capital market's perception of corporate governance changes over time and whether the changes in the recommendations reflect this potential change in perception. We address this issue by constructing two further corporate governance scores, *CG_BASE* and *CGAW_BASE*, whose calculations are based solely on 35 recommendations that so far have persisted (with slight modifications) throughout all versions of the Code. A good example of such a recommendation is that consolidated financial statements shall be publicly accessible within 90 days of the end of the financial year.

Product market competition

We calculate product market competition as the Herfindahl–Hirschman Index based on the Fama–French 48 industries definition. We use this more precise definition of industries because it increases the variation of the score without affecting the degrees of freedom in the regression models. The Herfindahl–Hirschman Index is defined as the sum of the squared

Item	Description	Deviations	Declarations	(%)	Firms
2002 version					
5.4.5	Supervisory Board compensation	179	258	69.38	221
3.8	D&O suitable deductible	129	258	50.00	221
7.1.2	Audit Committee	115	258	44.57	221
5.3.2	Timely publication of Consolidated Financial Statements and interim reports	101	258	39.15	221
5.1.2	(Re-)appointment of management board (age limit)	76	258	29.46	221
2003 version					
5.4.5	Supervisory Board compensation	391	500	78.20	301
4.2.4	Disclosure of compensation of Management Board (individual basis)	328	500	65.60	301
3.8	D&O suitable deductible	266	500	53.20	301
7.1.2	Timely publication of Consolidated Financial Statements and interim reports	220	500	44.00	301
4.2.3	Management Board compensation	209	500	41.80	301
2005 version					
4.2.4	Disclosure of compensation of Management Board (individual basis)	191	295	64.75	267
5.4.7	Supervisory Board compensation	189	295	64.07	267
3.8	D&O suitable deductible	170	295	57.63	267
7.1.2	Timely publication of Consolidated Financial Statements and interim reports	131	295	44.41	267
4.2.3	Management Board compensation	130	295	44.07	267
2006 version					
5.4.7	Supervisory Board compensation	221	323	68.42	300
3.8	D&O suitable deductible	191	323	59.13	300
7.1.2	Timely publication of Consolidated Financial Statements and interim reports	139	323	43.03	300
4.2.3	Management Board compensation	130	323	40.25	300
5.1.2	(Re-)appointment of management board (age limit)	112	323	34.67	300
2007 version					
3.8	D&O suitable deductible	227	356	63.76	315
5.4.7	Supervisory Board compensation	224	356	62.92	315
7.1.2	Timely publication of Consolidated Financial Statements and interim reports	166	356	46.63	315
5.3.3	Nomination Committee	157	356	44.10	315
4.2.3	Management Board compensation	135	356	37.92	315
2008 version					
3.8	D&O suitable deductible	214	348	61.49	321
7.1.2	Timely publication of Consolidated Financial Statements and interim reports	173	348	49.71	321
4.2.3	Management Board compensation	167	348	47.99	321
5.4.6	Supervisory Board compensation	155	348	44.54	321
5.3.3	Nomination Committee	142	348	40.80	321

Table II.
Top five deviations from each version of the GCGC

(*continued*)

Item	Description	Deviations	Declarations	(%)	Firms
2009 version					
3.8	D&O suitable deductible	277	351	78.92	303
5.4.6	Supervisory Board compensation	216	351	61.54	303
4.2.3	Management Board compensation	197	351	56.13	303
5.4.1	Expert experience of Supervisory Board members/ age limit and diversity in the Supervisory Board	146	351	41.60	303
7.1.2	Timely publication of Consolidated Financial Statements and interim reports	145	351	41.31	303
2010 version					
5.4.1	Age limit, diversity, and training in the Supervisory Board/Disclosure of personal and business relations to enterprise, executive bodies and major shareholder	447	667	67.02	348
5.4.6	Supervisory Board compensation	415	667	62.22	348
3.8	D&O suitable deductible	378	667	56.67	348
4.2.3	Management Board compensation	338	667	50.67	348
5.1.2	Age limit and diversity in the Supervisory Board	332	667	49.78	348
2012 version					
5.4.1	Age limit and diversity in the Supervisory Board/ Disclosure of personal and business relations to enterprise, executive bodies and major shareholder	216	321	67.29	287
5.4.6	Supervisory Board compensation	204	321	63.55	287
3.8	D&O suitable deductible	158	321	49.22	287
4.2.3	Management Board compensation	155	321	48.29	287
7.1.2	Timely publication of Consolidated Financial Statements and interim reports	147	321	45.79	287
2013 version					
5.4.1	Age limit and diversity in the Supervisory Board/ Disclosure of personal and business relations to enterprise, executive bodies and major shareholder	160	242	66.12	236
4.2.3	Management Board compensation	141	242	58.26	236
5.4.6	Supervisory Board compensation	123	242	50.83	236
3.8	D&O suitable deductible	117	242	48.35	236
5.1.2	Age limit and diversity in the Supervisory Board	112	242	46.28	236

Table II.

market shares of all firms in the industry. We first divide the sales of one company (Compustat item SALE or REVT) by the contemporaneous sum of all companies' sales, and sum up the squared ratio. We then define a dummy variable, *HHI_HIGH*, that indicates whether product market competition in that industry is above the median in the cross-section of all industries. The Herfindahl–Hirschman Index is a measure of market concentration and a proxy for product market competition that is firmly established in the accounting and finance literature (Lang and Stulz, 1992; Giroud and Mueller, 2011).

Implied cost of equity capital

The models to estimate a company's ICC require earnings forecasts for up to three years. Recent accounting research has applied two types of methods for obtaining these

Variables	Mean	SD	Skew	Kur	Minimum	P25	Median	P75	Maximum
ICC	0.124	0.099	1.247	3.946	0.000	0.050	0.092	0.170	0.491
ICC_IBES	0.083	0.042	2.385	14.073	0.003	0.058	0.077	0.098	0.439
CG	0.875	0.081	−0.928	4.417	0.370	0.826	0.889	0.935	1.000
CGAW	0.911	0.069	−1.419	6.447	0.399	0.876	0.925	0.960	1.000
CG_BASE	0.881	0.090	−1.089	5.123	0.292	0.833	0.875	0.958	1.000
CGAW_BASE	0.913	0.077	−1.564	7.382	0.324	0.874	0.929	0.973	1.000
HIGH_HHI	0.275	0.447	1.009	2.018	0.000	0.000	0.000	1.000	1.000
SIZE	19.273	2.199	0.845	3.808	10.597	17.775	18.880	20.461	26.459
LEV	1.492	2.945	5.960	44.353	0.029	0.318	0.746	1.513	24.926
DISC	0.058	0.058	2.244	9.470	0.001	0.020	0.041	0.075	0.342
BTM	0.822	0.817	2.794	13.541	−0.541	0.368	0.614	0.995	5.182
BETA	0.926	0.568	0.369	3.043	−0.430	0.523	0.870	1.295	2.489
IDIO	0.134	0.068	1.275	4.506	0.014	0.086	0.116	0.164	0.372
FF	0.560	0.295	−0.003	1.836	0.000	0.320	0.530	0.830	1.000
FIN	−0.123	0.220	−3.417	16.444	−1.371	−0.130	−0.039	−0.009	0.000
AGE	11.796	5.211	0.461	2.516	1.000	8.000	11.000	15.000	24.000
OW_LARGEST	5.416	19.732	3.827	16.681	0.000	0.000	0.000	0.000	100.000
OW_INSIDER	0.128	1.043	11.518	154.370	0.000	0.000	0.000	0.000	18.300
OW_OUTBLK	70.213	30.393	−0.859	2.446	0.000	48.500	82.109	95.490	100.000
OW_FOREIGN	13.336	21.764	2.117	6.985	0.000	0.000	3.080	16.500	100.000

Notes: *ICC_HOU* is the implied cost of equity capital defined as a composite measure from the models described by Gebhardt *et al.* (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), Easton (2004) and Gordon and Gordon (1997), while the calculation of earnings forecasts as inputs for these models follows Hou *et al.* (2012); *ICC_IBES* is calculated analogously with the exception that analyst forecasts from the I/B/E/S database are used as earnings forecasts; *CG* is a governance score calculated as 1 minus the percentage of non-compliance with a recommendation in a given version of the Code; *CGAW* is an acceptance-weighted version of the governance score; *CG_BASE* and *CGAW_BASE* are alternate definitions of the corporate governance score that are solely based on those recommendations that are present in all versions of the GCGC; *HIGH_HHI* is a dummy variable that indicates whether a company is operating in an industry with above-median market concentration as measured by the Herfindahl–Hirschmann index; *SIZE* is the natural logarithm of total assets; *LEV* is leverage defined as total liabilities (item LT in Compustat) divided by market capitalization (item PRCCD × CSHOC); *DISC* is discretionary accruals from cross-sectional modified Jones (1991) model as described in Bartov *et al.* (2000); *BTM* is the ratio of book value of shareholder equity (item SEQ or CEQ, depending on availability) to market capitalization (item PRCCD × CSHOC); *BETA* is market beta estimated from a regression of the previous 60 months' excess equity returns on excess market returns; excess returns are continuously compounded returns less the rate of return for German Government bonds; *IDIO* is idiosyncratic volatility defined as the standard deviation of residuals from this regression model; *FF* is free float capitalization divided by total market capitalization (from Datastream); *FIN* is financial transparency defined as the negative value of the squared residual from cross-sectionally regressing returns on earnings levels and changes allowing for separate intercepts and slopes for profit and loss companies; regressions are run separately by Fama–French 12 industries; *AGE* is the number of years a company is listed in the Compustat Global database; *OW_LARGEST* is ownership of the largest shareholder in percent (total ownership from Osiris); values below 20% are set to zero; *OW_INSIDER* is ownership of management and directors in per cent (direct ownership of owners whose description in Osiris start with the strings "MANAGEMENT" or "DIRECTORS"); *OW_OUTBLK* is outside block ownership, i.e. the sum of direct ownership of all shareholder not classified as insiders with more than 5% direct ownership; *OW_FOREIGN* is direct foreign ownership in % (shareholder country in Osiris is not "DE")

Table III.
Descriptive statistics of regression variables

forecasts. The most common method uses estimates from I/B/E/S, Factset or ValueLine (Dhaliwal *et al.*, 2011; El Ghoul *et al.*, 2011). These figures are appealing, given that no statistical forecast model has to be invoked at the researcher level. However, this advantage comes at the cost of a limited sample size due to limited analyst coverage of small companies and to selection biases toward large companies, as large companies are more likely to be followed by analysts. In addition, some studies claim that there is a systematic error in the analysts' forecasting models, which implies non-representativeness with respect to overall market expectations (Easton and Sommers, 2007). The second method derives earnings expectations from statistical models based on current and past information. The advantages of this type of approach are large sample sizes, less severe selection bias and less exposure to non-representativeness if the forecast model and its data requirements are parsimonious. The only drawback is the concern that this approach does not measure market expectations appropriately or it does so with less accuracy than analysts' forecasts. We apply the statistical model of Hou *et al.* (2012) as our main method to derive earnings expectations, as analyst coverage for small- and medium-sized German companies is limited. This analysis is accompanied by an analysis with a smaller sample size based on analyst forecasts from I/B/E/S.

Following Hou *et al.* (2012), earnings E_{it} of company i in fiscal year t are defined as income before extraordinary items (item IB) as listed in the Compustat Global database. Total assets A_{it} (item AT) and dividends D_{it} (item DVT) are also from Compustat. Accruals AC_{it} are calculated using the cash flow statement method as the difference between earnings before extraordinary items from the cash flow statements (item IBC) and cash flows from operations (item OANCF minus XIODC), if available, or by using the balance sheet method, as the change in non-cash current assets (items ACT and CHE) less the change in current liabilities (item LCT) excluding the change in short-term debt (item DLC) and the change in taxes payable (item TXP) minus depreciation and amortization expense (item DP) (Hribar and Collins, 2002, p. 109; Sloan, 1996, p. 293). Hou *et al.* (2012) use the following pooled linear regression model to predict future earnings:

$$E_{it+\tau} = \alpha_0 + \alpha_1 A_{it} + \alpha_2 D_{it} + \alpha_3 DD_{it} + \alpha_4 E_{it} + \alpha_5 NegE_{it} + \alpha_6 AC_{it} + \varepsilon_{it+\tau} \quad (1)$$

where DD_{it} is a dummy variable taking the value of 1 if dividends are positive and 0 otherwise, $NegE_{it}$ is a dummy variable taking the value of 1 if earnings are negative and 0 otherwise and all other variables are denoted as previously defined. The model is used to obtain one-, two- and three-year ahead earnings forecasts (τ = 1 […], 3) from current accounting information, while the estimation of the coefficients α_0 to α_6 is based on the previous 10 years of data and thus only uses information that is available at time t. Because equation (1) is in levels, extreme observations may dominate the estimation results. Therefore, following Hou *et al.* (2012, p. 507), earnings and other level variables are winsorized each year at the 1st and 99th percentiles.

Panel A in Table IV shows the time series averages of the descriptive statistics of sample variables. Panel B contains the average coefficient estimates, t-statistics and adjusted R^2s for the pooled regression model using the previous 10 years of data.

	Mean	1%	25%	Median	75%	99%	SD
Panel A: Summary statistics of the variables in the cross-sectional earnings model							
E_t	91.96	−274.36	−1.27	2.67	16.84	3234.95	437.71
A_t	3,281.59	1.13	35.65	119.15	496.51	120,918.40	15,328.93
D_t	35.99	0.00	0.00	0.00	2.76	1,458.63	179.94
DD_t	0.34	0.00	0.00	0.00	1.00	1.00	0.47
$NegE_t$	0.31	0.00	0.00	0.00	0.70	1.00	0.45
AC_t	−125.54	−5089.52	−20.92	−3.29	0.58	370.97	641.91

	Constant	A_t	D_t	DD_t	E_t	$NegE_t$	AC_t	Adjusted R^2	Average no. of observation
Panel B: Coefficient estimates of the cross-sectional earnings model									
E_t+1	0.2671	0.0103***	−0.0693**	12.2088***	0.5126***	2.1888***	0.0028	0.7023	4,296.25
	0.65	*46.85*	*−2.04*	*6.13*	*44.57*	*3.75*	*0.73*		
E_t+2	7.7047***	0.0136***	−0.0671	14.9689***	0.2803***	−3.4344***	0.0055	0.6022	3,885.74
	18.36	*18.18*	*−1.61*	*6.12*	*34.76*	*−4.78*	*0.57*		
E_t+3	23.9512***	0.0147***	0.2581***	4.2168	0.04278***	−26.3338***	0.0010	0.5406	3,463.21
	10.66	*19.60*	*5.13*	*1.06*	*2.72*	*−8.49*	*0.10*		

Notes: This table is a replica of Table I in Hou *et al.* (2012, p. 509) for the German sample of this study; Panel A presents summary statistics (the time-series averages of the cross-sectional mean, median, standard deviation and selected percentiles) of the variables used in the cross-sectional earnings model; all variables except DD_{it} and $NegE_{it}$ are expressed in millions of euros; Panel B of this table reports the average coefficients and their time-series Newey–West *t-statistics (in italics) from pooled regressions estimated each year from 2003 to 2013 using the previous 10 years of data;* E_{it+1}, E_{it+2} and E_{it+3} are the one-, two- and three-year-ahead earnings (income before extraordinary items), respectively; A_t is total assets; D_t is the dividend payment; DD_t is a dummy variable that equals 1 for dividend payers and 0 otherwise; $NegE_t$ is a dummy variable that equals 1 for companies with negative earnings and 0 otherwise; AC_t is accruals; *, **and ***indicate significance at the 10, 5 and 1% levels

Table IV.
Summary statistics and coefficient estimates for the cross-sectional earnings forecast model

Earnings forecasts from the linear pooled regression model are used to calculate a composite measure of implied cost of equity capital, which is the equal-weighted average of the implied cost of equity estimates from five models proposed by Gebhardt *et al.* (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), Easton (2004) and Gordon and Gordon (1997). At the end of June of each year during the period of 2003-2013, model-based earnings forecasts for companies with fiscal year-ends from April of the previous year to March of the current year are calculated on the basis of the accounting information from the most recent fiscal year-end. Then, the internal rate of return that equates current stock price (as of 30 June) to the present value of expected future earnings is calculated. The same procedure is applied with I/B/E/S earnings forecasts to check for robustness with respect to the choice of earnings forecast model. If an industry classification is necessary for the model calculation, for instance, in the approach suggested by Gebhardt *et al.* (2001), we apply the Fama–French 12 industry classification based on Standard Industrial Classification (SIC) codes. Summary statistics of the ICC estimates are available in Table III.

Control variables

The natural logarithm of total assets (Compustat item AT) is included as a proxy for size (*SIZE*). Larger companies typically have a higher level of disclosure and analyst coverage and therefore fewer information asymmetries (Bowen *et al.*, 2008). Therefore, ICC is expected to decrease with size. We also control for leverage, *LEV*, defined as the debt-to-market equity ratio (Compustat item LT divided by PRCCD × CSHOC). Because leverage increases volatility of return on equity, it is expected to increase investment risk and hence ICC (El Ghoul *et al.*, 2011; Fama and French, 1992). Additional control variables that are rooted in accounting and finance theory and are therefore included in the empirical analysis are the absolute amount of discretionary accruals, *DISC*, from the cross-sectional modified Jones (1991) model as described by Bartov *et al.* (2000); the book-to-market ratio, *BTM*, which is the book value of shareholder equity (item SEQ or CEQ, depending on availability) divided by the market value of equity (item PRCCD × CSHOC); market beta, *BETA*, estimated from a regression of the previous 60 months' excess equity returns on excess market returns from the CDAX index; and idiosyncratic volatility *IDIO*, defined as the standard deviation of residuals from this regression model. Excess returns in the regressions of equity returns on market returns are continuously compounded returns less the rate of return for German Government bonds (*Umlaufrenditen*). Discretionary accruals are expected to have an increasing effect on ICC, as higher values of *DISC* imply lower accounting disclosure quality (Francis *et al.*, 2005). Companies with higher book-to-market equity are expected to earn higher *ex post* returns and are therefore expected to have higher ICC (El Ghoul *et al.*, 2011; Fama and French, 1992). Market beta is expected to be positively correlated with ICC estimates, as classic finance theory suggests a positive linear relationship (Lintner, 1965; Sharpe, 1965). More recent empirical research has shown that idiosyncratic volatility has an impact on the cost of capital. However, the measured direction of the impact varies between studies (Ang *et al.*, 2006; Malkiel and Xu, 2006). Free float (*FF*), defined as a percentage of total market capitalization as taken from Datastream, is included as an additional control for ownership dispersion. A higher level of ownership dispersion is expected to have a positive effect on company disclosure and hence a decreasing effect on ICC (Leuz and Verrecchia, 2000). Following Ashbaugh *et al.* (2004, p. 17), a market-based measure for financial information quality, *FIN*, is also included. This variable is defined as the negative value of the squared residual from cross-sectionally regressing returns on earnings levels and changes allowing for separate intercepts and slopes for profit and loss companies. Regressions are run separately by Fama–French 12 industries. Financial transparency is expected to decrease ICC. We include the age of a company, *AGE*, as a control variable, as the maturity of a company is likely to have an effect on investment risk and/or future growth opportunities that may be reflected in ICC. This variable is the number of years a company is present in the Compustat Global database, which starts in 1987. As argued by Pastor and Veronesi (2003), older firms have lower valuation multiples due to less uncertainty in equity growth. This implies a positive relationship between age and ICC. On the other hand, older firms may be perceived as less risky because of their strong position in the market. Therefore, we make no prediction with respect to the sign of the correlation between *AGE* and ICC.

Because prior research has shown that ownership structure is related to cost of capital, variables from the Osiris database are included to capture these effects. *OW_LARGEST* is ownership concentration measured by the total ownership of the

largest shareholder listed in Osiris while values below 20 per cent are coded as zero (John *et al.*, 2008, p. 1,691). Large owners may serve a monitoring function and, in this way, reduce information asymmetries and ICC (Shleifer and Vishny, 1997). *OW_INSIDER* is ownership of management and directors in per cent, i.e. direct ownership by owners whose description in Osiris starts with the strings "MANAGEMENT" or "DIRECTORS". Inside ownership is assumed to align the interests of management and shareholders and is therefore expected to be negatively related to ICC (McConnell and Servaes, 1990). *OW_OUTBLK* is a control variable that is defined as the proportion of equity held by outside blockholders, i.e. shareholders with an ownership above 5 per cent. Following Singh and Davidson (2003, pp. 799-800), this variable is expected to have a negative effect on ICC, as outside blockholders, like other large blockholders, serve as monitoring institutions. The variable *OW_FOREIGN* represents the percentage of foreign ownership. Empirical results by Dahlquist and Robertsson (2001) have shown that foreign ownership is associated with lower systematic and idiosyncratic risk, and positively related to firm size. Although we separately control for the effect of these variables, foreign ownership is expected to have a decreasing effect on ICC.

Because *BETA* and *BTM* can take extreme values, they are winsorized at the 1st/99th percentiles. *LEV*, *DISC* and *IDIO* by construction can only take extreme positive values and therefore are winsorized at the 99th percentile. *FIN* can only take extreme negative values and consequently is winsorized at the 1st percentile. Descriptive statistics are displayed in Table III. A correlation matrix is shown in Table V.

Regression models

To analyze the relationship between GCGC compliance and ICC (*H1*), we regress the compound measures of ICC on the compliance scores *CG* and *CGAW*, respectively, and control variables. For each compound measure of ICC and compliance with the GCGC, we apply two specifications. The first specification is an ordinary least squares (OLS) estimation with year and industry dummies based on Fama–French 12 industry definitions and with standard errors clustered by firm. The second specification considers additional control variables including ownership. The regression models used to test the hypothesis of lower ICC for companies with higher compliance levels are:

$$ICC_{it} = \beta_0 + \beta_1 CG_{it} + \sum \beta_y YEAR_t + \sum \beta_{ind} INDUSTRY_i + \varepsilon_{it} \quad (2)$$

$$\begin{aligned} ICC_{it} = {} & \beta_0 + \beta_1 CG_{it} + \beta_2 SIZE_{it} + \beta_3 LEV_{it} + \beta_4 DISC_{it} + \beta_5 BTM_{it} + \beta_6 BETA_{it} \\ & + \beta_7 IDIO_{it} + \beta_8 FF_{it} + \beta_9 FIN_{it} + \beta_{10} AGE_{it} + \beta_{11} OW\_LARGEST_{it} \\ & + \beta_{12} OW\_INSIDER_{it} + \beta_{13} OW\_OUTBLK_{it} + \beta_{14} OW\_FOREIGN_{it} \\ & + \sum \beta_y YEAR_t + \sum \beta_{ind} INDUSTRY_i + \varepsilon_{it} \end{aligned} \quad (3)$$

CG is substituted in equations (2) and (3) by *CGAW* to test the effect of acceptance-weighted GCGC compliance on ICC, and by *CG_BASE* and *CGAW_BASE* to test whether changes in the set of recommendations affect our results. Estimation of ICC is either based on the statistical model outlined in Hou *et al.* (2012) or based an analyst forecasts from I/B/E/S. The coefficient estimates on *CG* or *CGAW* are expected to be

Table V. Correlation matrix of regression variables

No.	Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
(1)	*ICC_HOU*	1.00																			
(2)	*ICC_IBES*	0.26***	1.00																		
(3)	*CG*	−0.22***	−0.05**	1.00																	
(4)	*CGAW*	−0.21***	−0.06**	0.98***	1.00																
(5)	*CG_BASE*	−0.23***	−0.03	0.91***	0.90***	1.00															
(6)	*CGAW_BASE*	−0.22***	−0.04	0.89***	0.91***	0.98***	1.00														
(7)	*HIGHHHI*	−0.02	0.07***	0.02	0.00	0.02	0.02	1.00													
(8)	*SIZE*	−0.33***	0.11***	0.42***	0.38***	0.42***	0.40***	0.17***	1.00												
(9)	*LEV*	0.11***	0.23***	0.03	0.01	0.04**	0.03*	0.05**	0.25***	1.00											
(10)	*DISC*	0.00	−0.09***	−0.06***	−0.06***	−0.08***	−0.07***	−0.12***	−0.16***	−0.05**	1.00										
(11)	*BTM*	0.21***	0.23***	0.02	0.01	0.02	0.01	0.01	0.12***	0.60***	−0.04*	1.00									
(12)	*BETA*	−0.08***	0.05**	0.16***	0.15***	0.15***	0.13***	−0.17***	0.02	0.02	0.05**	0.03	1.00								
(13)	*IDIO*	0.12***	−0.05**	−0.17***	−0.18***	−0.19***	−0.20***	−0.16***	−0.44***	0.00	0.18***	0.00	0.33***	1.00							
(14)	*FF*	0.00	0.10***	0.18***	0.16***	0.13***	0.11***	0.00	0.16***	0.09***	−0.05**	0.15***	0.22***	−0.01	1.00						
(15)	*FIN*	−0.02	−0.06**	0.04*	0.04**	0.04**	0.05**	0.08***	0.09***	−0.10***	−0.07***	−0.06***	−0.13***	−0.27***	−0.01	1.00					
(16)	*AGE*	0.01	0.22***	0.13***	0.11***	0.16***	0.15***	0.06***	0.46***	0.12***	−0.19***	0.05**	−0.19***	−0.33***	0.06***	0.07***	1.00				
(17)	*OW_LARGEST*	−0.05**	−0.10***	−0.07***	−0.07**	−0.07**	−0.05**	0.11***	0.04*	−0.01	0.03	−0.03	−0.19***	−0.06**	−0.19***	0.00	0.06**	1.00			
(18)	*OW_INSIDER*	0.04	0.01	0.03	0.03	0.05*	0.03	0.00	−0.04*	−0.03	0.00	−0.03	0.04	0.02	0.01	0.04	−0.05**	−0.01	1.00		
(19)	*OW_OUTBLK*	0.05**	0.02	−0.14***	−0.12***	−0.12***	−0.11***	0.00	−0.09***	−0.03	0.00	−0.02	−0.14***	−0.06**	−0.27***	0.00	0.07**	0.09***	0.00	1.00	
(20)	*OW_FOREIGN*	−0.01	0.06**	−0.03	−0.03	−0.01	−0.01	0.00	0.02	−0.01	−0.02	0.05**	−0.06**	−0.04	−0.10***	0.00	0.00	0.12***	0.01	0.15	1.00

Note: *, ** and *** indicate correlations and significance at the 10, 5 and 1% levels; variables are as previously defined (see Table III)

negative. Industry dummies are based on Fama–French 12 industries and year dummies are included to control for time-fixed effects.

To test the interaction between the effect of GCGC compliance on ICC and product market competition, in equations (4) and (5), we interact the corporate governance scores with the dummy variable *HIGH_HHI* that indicates whether product market competition in that industry is above the median in the cross-section of all industries.

$$ICC_{it} = \beta_0 + \beta_1 CG_{it} + \beta_2 HIGH\_HHI_{it} + \beta_3 HIGH\_HHI_{it} \times CG_{it} + \sum \beta_y YEAR_t + \sum \beta_{ind} INDUSTRY_i + \varepsilon_{it} \quad (4)$$

$$\begin{aligned} ICC_{it} = {} & \beta_0 + \beta_1 CG_{it} + \beta_2 HIGH\_HHI_{it} + \beta_3 HIGH\_HHI_{it} \times CG_{it} \\ & + \beta_4 SIZE_{it} + \beta_5 LEV_{it} + \beta_6 DISC_{it} + \beta_7 BTM_{it} + \beta_8 BETA_{it} \\ & + \beta_9 IDIO_{it} + \beta_{10} FF_{it} + \beta_{11} FIN_{it} + \beta_{12} OW\_LARGEST_{it} \\ & + \beta_{13} OW\_INSIDER_{it} + \beta_{14} OW\_OUTBLK_{it} + \beta_{15} OW\_FOREIGN_{it} \\ & + \sum \beta_y YEAR_t + \sum \beta_{ind} INDUSTRY_i + \varepsilon_{it} \end{aligned} \quad (5)$$

According to *H2*, we expect the coefficient β_3 to be negative, as the decreasing effect of high levels of corporate governance on ICC are expected to be stronger in concentrated industries.

Addressing endogeneity

The previously outlined OLS models do not take endogeneity into account. Possible sources of endogeneity are measurement error in variables, omitted variables that are related to both ICC and corporate governance scores and simultaneity between the dependent variable and the regressors. These models are thus likely to be misspecified, as the level of compliance with the GCGC is clearly a company-level choice, as are related disclosures (Chenhall and Moers, 2007; Wintoki *et al.*, 2012). We mitigate the measurement error in ICC variables by using a composite measure from five models proposed by Gebhardt *et al.* (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), Easton (2004) and Gordon and Gordon (1997). Using a composite measure is expected to exhibit lower measurement error than any of the five individual measures (Larcker and Rusticus, 2010). The standard solution to minimize the risk of omitted variables bias is to use company-level fixed effects or a change analysis. These approaches, however, would come at a cost that would clearly outweigh their benefits. In our sample, but also in corporate governance research in general, using these methods deletes all information in the data that is constant across time. Because compliance with the GCGC is relatively time-invariant, applying these panel data approaches would wipe out most of the information in these variables (Mazotta and Veltri, 2012). Thus, to mitigate omitted variable bias as much as possible, we include industry-fixed and as many control variables as possible that do not lead to a substantial decrease in sample size. Simultaneity arises in our research design because managers may choose a level of GCGC compliance to decrease the cost of equity. In this case, *ICC* would affect *CG* or *CGAW* and the coefficients in equation (2) to (5) would be biased. As Larcker and Rusticus (2010, p. 195) and Chenhall and Moers (2007, p. 190) emphasize, it

is important to assess the sign of potential bias due to endogeneity. If managers or shareholders counteract the high cost of equity capital with improved corporate governance provisions, the reverse causality running from *ICC* to *CG* or *CGAW* would exhibit a positive sign. Our research hypothesis, however, predicts a negative relationship between these variables. Thus, ignoring simultaneity in our setting would lead to statistical tests that are too conservative, which would only pose a threat to the validity of our results if we find, contrary to *H1*, a positive (increasing) relationship between compliance with the GCGC and ICC or none at all.

Despite the conservative character of our main OLS analysis, as a robustness test we apply a dynamic panel SGMM model to control for endogeneity of compliance with the GCGC. This method, originally proposed by Blundell and Bond (1998), is based on a system of equations in first differences and in levels. To address potential endogeneity in the regressors, lagged first differences are used as instruments in the level equations and lagged levels are used as instruments in the first difference equations. The estimation technique is based on an algorithm that minimizes an objective function, which is a function of the parameters and underlying data. The form of this objective function is determined by the moment condition, i.e. the conditions that the mean of the error term is zero, as are the correlations between the instruments and the error terms. Wintoki *et al.* (2012) convincingly argue that this method is the only appropriate way to control for endogeneity of various sources in market-based corporate governance research because OLS/instrumental variable regressions do not take into account the dynamic relationship between company-level performance measures and corporate governance. This dynamic relationship, according to Hermalin and Weisbach (1998), exists because poor performance lowers the board's assessment of the CEO's ability. In turn, the CEO will be forced to accept stricter corporate governance provisions. In our case, high investment risk as expressed by ICC may lead to pressure from the supervisory board or other shareholder representatives to strengthen corporate governance.

A further argument in favor of SGMM and against using the "standard" approach involving a two-stage instrumental variable regression with external instruments is that it is difficult or almost impossible to find relevant and valid instruments, i.e. variables that strongly correlate with the endogenous regressor but are not correlated with the error term in the second-stage regression (Chenhall and Moers, 2007; Gassen, 2014). Semi-endogenous instruments may introduce more bias than OLS estimates if their correlation with the endogenous regressor is not substantially larger than their correlation with the unobservable error term in the structural equation. Larcker and Rusticus (2010) use the case of regressing cost of capital on voluntary disclosures as an example in a two-stage least squares context and show that commonly used instruments in the disclosure literature lead to more biased estimates than OLS.

Our specification of the SGMM model includes one-period-lagged ICC and uses three- to six-period-lagged variables as instruments[8]. This method of estimation controls for the dynamic relationship between ICC and compliance with the GCGC. As outlined above, past realizations of ICC may influence the management's and shareholders' decisions toward a more appropriate level of compliance with the GCGC. Ignoring this relationship and assuming that current observations of corporate governance scores are completely independent of past values of ICC is not realistic and biases the coefficient estimates (Wintoki *et al.*, 2012, p. 582). Applying an SGMM estimation with lagged

variables as instruments, however, does not come at zero cost. Most importantly, it assumes weak rational expectations and that future unexpected changes in ICC are purely an expectational error (Wintoki *et al.*, 2012, p. 583). However, our study is unable to test whether the actors in the firm's nexus of contracts predict future developments in ICC rationally. Further, if the autoregressive parameter approaches unity, which is the case in our setting with almost time-invariant regressors, the estimator may suffer from weak instruments. Increasing the number of internal instruments may alleviate this problem but invokes another, namely, instrument proliferation, which results in biased coefficients and standard errors or weakened specification tests (Roodman, 2009, p. 144). As a consequence, we acknowledge that even a dynamic panel data model with SGMM estimation is not a perfect remedy for endogeneity, and we apply this approach only as a robustness test to our main OLS analysis.

Results

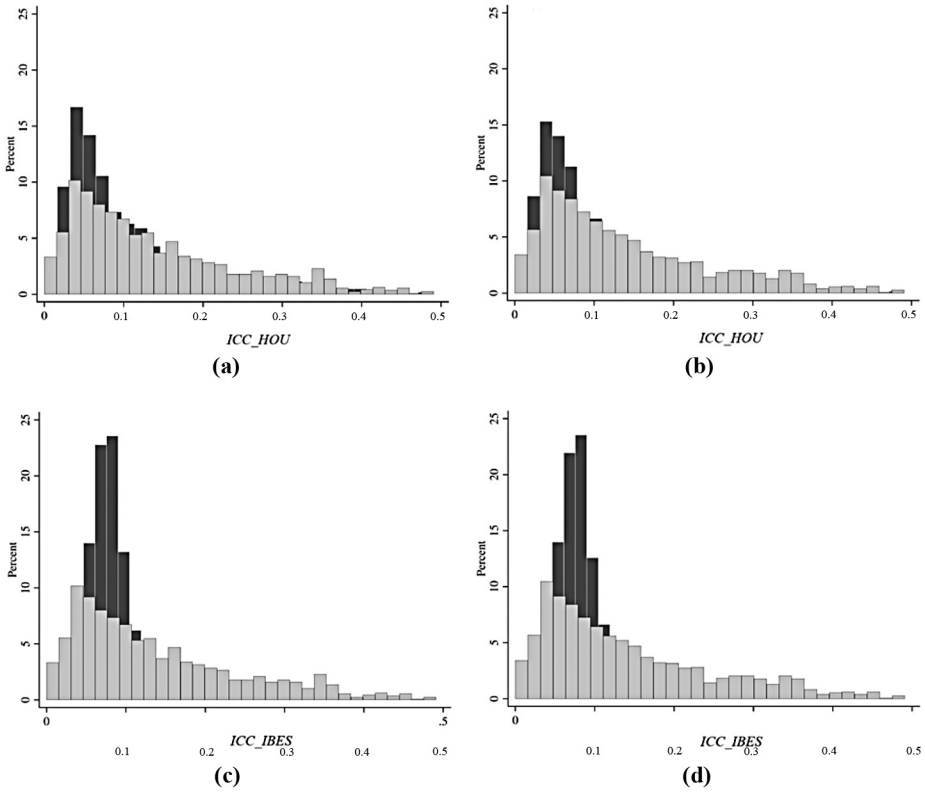
Univariate results

Figure 1 shows the frequency distribution of ICC estimates. For observations with above-median compliance scores, calculated by industry and year, the distribution is more right-skewed with a higher frequency of lower values than for the below-median observations. This result is also consistent with a highly significant negative correlation between the variables *ICC_HOU/ICC_IBES* and *CG/CGAW* already displayed in Table III. Although this analysis does not control for any other factors, it does provide an initial insight into the relationship between GCGC compliance and ICC. For the model-based ICC estimates, the difference in mean ICC between below- and above-median compliance score observations is 302 basis points (13.72 per cent minus 10.70 per cent). For analyst-based ICC estimates, this difference is considerably lower but still statistically significant (Table VI).

Regression results

Table VII shows the regression results for equations (2) and (3). From all regressions, regardless of whether model- or analyst forecast-based ICC estimates are used as dependent variables, it becomes evident that a higher compliance score is significantly negatively related to ICC. We interpret this as evidence supporting the hypothesis that compliance with the GCGC is negatively related to ICC (*H1*). Besides statistical significance, this result is also economically significant. An increase of 1 percentage point in *CG* is associated with a decrease in *ICC_HOU* of 13.69 basis points in the model that controls for various company-level variables. If one takes into account that the GCGC contains approximately 80 recommendations, compliance with one additional recommendation is associated with a drop in *ICC_HOU* of roughly 0.17 percentage points. For the ICC estimates based on analyst forecasts, these figures are 8.05 basis points and 0.10 percentage points, respectively. The model fit ranges between 8.40 and 25.25 per cent, which we consider sufficient. All *F*-statistics (not tabulated) are highly significant. The control variables, if statistically significant, exhibit the expected sign in most cases.

The results for testing the interaction of product market competition with the effect of GCGC compliance on ICC are displayed in Table VIII. In the specifications that use *ICC_HOU* as the dependent variable, the coefficients on the dummy variable *HIGH_HHI* are significantly positive at conventional levels. In the same specifications,



Notes: This figure displays frequency distributions of ICC estimates for below-median (light gray) and above-median compliance scores (dark gray); median compliance scores are calculated by industry and year; the distribution in (a) Is based on ICC estimates relying on model-based earnings forecasts, and compliance scores CG; the distribution in (b) is based on ICC estimates relying on model-based earnings forecasts, and acceptance-weighted compliance scores CGAW; the distribution in (c) is based on ICC estimates relying on analyst forecasts from I/B/E/S and compliance scores CG; the distribution in (d) is based on ICC estimates relying on analyst forecasts from I/B/E/S and acceptance-weighted compliance scores CGAW

Figure 1. Frequency distribution of ICC estimates

the coefficients on the interaction terms are significantly negative, which support *H2* that corporate governance has a stronger decreasing effect on ICC in industries with low product market competition because it acts as a substitute for the disciplining mechanism of price pressure. Wald tests of the joint significance of the coefficients on *CG*/*CGAW* and the interaction terms indicate that the effect of GCGC compliance on ICC, conditional on operating in an industry with low product market competition, is also statistically significant. The results are less significant when ICC is calculated based on analyst forecasts. In the specifications that do not include company-specific controls, neither the coefficients on *CG*/*CGAW* nor the interaction terms are statistically different

Statistic	*CG* Below median	*CG* Above median	*CGAW* Below median	*CGAW* Above median
Panel A: ICC_HOU				
Observations	1,621	1,239	1,462	1,398
Mean *ICC*	0.1372***	0.1070***	0.1398***	0.1077***
Standard error	0.0026	0.0025	0.0028	0.0026
Lower 95% confidence interval	0.1321	0.1020	0.1344	0.1031
Upper 95% confidence interval	0.1423	0.1192	0.1452	0.1123
Difference in means	0.0302***		0.0321***	
t-statistic of difference in means	8.3606		8.8228	
Panel B: ICC_IBES				
Observations	1,001	1,015	886	1,130
Mean *ICC*	0.0855***	0.0814***	0.0864***	0.0810***
Standard error	0.0015	0.0012	0.0016	0.0011
Lower 95% confidence interval	0.0826	0.0791	0.0833	0.0895
Upper 95% confidence interval	0.0883	0.0837	0.0789	0.0832
Difference in means	0.0041***		0.0054***	
t-statistic of difference in means	2.1595		2.7712	

Table VI.
Comparison of mean ICC values for above- and below-median compliance score observations

Notes: This table shows differences in mean ICC estimates for companies with above- and below-median compliance scores; median compliance scores are calculated by industry and year; ICC estimates are either based on statistical model forecasts (*ICC_HOU*) or analyst forecasts (*ICC_IBES*); *, ** and *** indicate correlations and significance at the 10, 5 and 1% levels

from zero. The Wald tests, however, again indicate that if a company operates in a market of low competition, compliance with the GCGC decreases ICC, which strengthens the empirical evidence for *H2*.

Because the recommendations have changed over time, but our empirical models assume a linear effect of GCGC compliance on ICC, we repeat the main analysis with *CG_BASE* and *CGAW_BASE* as regressors. These compliance scores are solely based on recommendations that have persisted throughout all versions of the GCGC between 2002 and 2013. As displayed in Table XI, the results do not change materially, although statistical significance is impaired when *ICC_IBES* is used as an independent variable. We conclude from these results that corporate governance scores based on a changing set of recommendations exhibit more significant correlations with ICC than a static definition. This supports, although not strictly proves, the notion that good corporate governance as dynamically defined by the government commission has higher relevance to capital market participants (Table IX).

The results reported in Tables VII and VIII are based on an OLS estimation that does not account for unobserved individual heterogeneity and endogeneity. Therefore, following the suggestion by Wintoki *et al.* (2012), we repeat the analysis with a dynamic panel data approach. First, lagged ICC is included as an additional explanatory variable. Second, we use three- to six-period-lagged variables as instruments in an SGMM estimation to determine the causal effect of GCGC compliance on ICC. As can be seen from Table X, a negative significant effect of GCCG compliance on ICC can be observed for the model specifications with *ICC_HOU* as the dependent variable if company-specific controls are included. For

Table VII.
Regression results for OLS estimation

Variables	Exp.	*ICC_HOU*				*ICC_IBES*			
CG	−	−0.2323*** (0.0420)	−0.1368** (0.0649)			−0.0454** (0.0200)	−0.0805*** (0.0261)		
CGAW	−			−0.2527*** (0.0512)	−0.1655** (0.0796)			−0.0533** (0.0243)	−0.0868*** (0.0315)
SIZE	−		−0.0216*** (0.0026)		−0.0218*** (0.0025)		−0.0009 (0.0012)		−0.0012 (0.0012)
LEV	+		0.0015 (0.0019)		0.0015 (0.0019)		0.0017 (0.0020)		0.0017 (0.0020)
DISC	+		−0.0488 (0.0440)		−0.0493 (0.0439)		−0.0205 (0.0262)		−0.0207 (0.0263)
BTM	+		0.0252*** (0.0056)		0.0253*** (0.0056)		0.0053 (0.0067)		0.0054 (0.0068)
BETA	+		0.0052 (0.0069)		0.0049 (0.0069)		0.0090**(0.0035)		0.0087**(0.0035)
IDIO	+		−0.1109 (0.0690)		−0.1127 (0.0691)		0.0282 (0.0377)		0.0276 (0.0380)
FF	+		0.0025 (0.0126)		0.0020 (0.0126)		0.0050 (0.0057)		0.0046 (0.0057)
FIN	−		0.0126 (0.0091)		0.0126 (0.0091)		−0.0186* (0.0099)		−0.0188* (0.0100)
AGE	?		0.0037*** (0.0009)		0.0037*** (0.0009)		0.0014*** (0.0005)		0.0014*** (0.0005)
OW_LARGEST	−		−0.0002 (0.0002)		−0.0002 (0.0002)		−0.0002*** (0.0001)		−0.0002*** (0.0001)
OW_INSIDER	−		0.0029 (0.0025)		0.0029 (0.0025)		0.0004 (0.0010)		0.0004 (0.0011)
OW_OUTBLK	−		0.0000 (0.0001)		0.0000 (0.0001)		0.0000 (0.0000)		0.0000 (0.0000)
OW_FOREIGN	−		−0.0000 (0.0002)		−0.0000 (0.0002)		0.0002* (0.0001)		0.0002* (0.0001)
Constant		0.2963*** (0.0387)	0.6126*** (0.0713)	0.3233*** (0.0486)	0.6494*** (0.0839)	0.1360*** (0.0224)	0.1407*** (0.0319)	0.1440*** (0.0261)	0.1558*** (0.0349)
YEAR		YES	YES	YES	YES	YES	YES	YES	YES
INDUSTRY		YES	YES	YES	YES	YES	YES	YES	YES
Observations		2,860	1,526	2,860	1,526	2,064	1,294	2,064	1,294
Companies		447	314	447	314	362	273	362	273
Adjusted R^2		0.0893	0.2523	0.0840	0.2525	0.0982	0.1522	0.0979	0.1496

Notes: This table shows regression results from estimating equations (2) and (3); the dependent variable in each regression is *ICC_HOU* or *ICC_IBES*, the implied cost of equity capital defined as a composite measure from the models described by Gebhardt *et al.* (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), Easton (2004) and Gordon and Gordon (1997); *CG* is a governance score calculated as 1 minus the percentage of non-compliance with the recommendations of a given version of the Code; *CGAW* is an acceptance-weighted version of the governance score; all other control variables are as previously defined (see Table III); heteroskedasticity consistent standard errors that are clustered on company level are displayed in parentheses; *, ** and *** indicate correlations and significance at the 10, 5 and 1% levels

Table VIII.
Regression results for OLS estimation with interaction of corporate governance scores with market concentration

Variables	Exp.	*ICC_HOU*				*ICC_IBES*			
CG	−	−0.1720*** (0.0437)	−0.0489 (0.0549)			−0.0273 (0.0201)	−0.0729*** (0.0267)		
CGAW	−			−0.1919*** (0.0531)	−0.0605 (0.0670)			−0.0352 (0.0248)	−0.0842** (0.0331)
HIGH_HHI	+	0.1637** (0.0704)	0.2693** (0.1070)	0.1611* (0.0857)	0.3160** (0.1367)	0.0550 (0.0379)	0.0282 (0.0418)	0.0529 (0.0480)	0.0119 (0.0510)
HIGH_HHI × *CG*	−	−0.1838** (0.0783)	−0.3014*** (0.1149)			−0.0556 (0.0411)	−0.0242 (0.0455)		
HIGH_HHI × *CGAW*	−			−0.1734* (0.0922)	−0.3419** (0.1433)			−0.0515 (0.0507)	−0.0058 (0.0540)
SIZE	−		−0.0213*** (0.0026)		−0.0217*** (0.0025)		−0.0009 (0.0012)		−0.0012 (0.0012)
LEV	+		0.0012 (0.0018)		0.0013 (0.0018)		0.0017 (0.0020)		0.0017 (0.0020)
DISC	+		−0.0444 (0.0445)		−0.0451 (0.0444)		−0.0204 (0.0260)		−0.0210 (0.0262)
BTM	+		0.0259*** (0.0053)		0.0258*** (0.0054)		0.0056 (0.0067)		0.0056 (0.0067)
BETA	+		0.0027 (0.0069)		0.0026 (0.0069)		0.0092** (0.0036)		0.0091** (0.0036)
IDIO	+		−0.0994 (0.0685)		−0.1019 (0.0689)		0.0308 (0.0381)		0.0294 (0.0385)
FF	+		−0.0004 (0.0124)		−0.0003 (0.0124)		0.0050 (0.0057)		0.0048 (0.0057)
FIN	−		0.0113 (0.0090)		0.0112 (0.0090)		−0.0187* (0.0099)		−0.0187* (0.0099)
AGE	?		0.0037*** (0.0009)		0.0037*** (0.0009)		0.0014*** (0.0005)		0.0014*** (0.0005)
OW_LARGEST	−		−0.0002 (0.0002)		−0.0002 (0.0002)		−0.0002*** (0.0001)		−0.0002*** (0.0001)
OW_INSIDER	−		0.0027 (0.0024)		0.0027 (0.0024)		0.0002 (0.0011)		0.0002 (0.0011)
OW_OUTBLK	−		0.0000 (0.0001)		0.0000 (0.0001)		0.0000 (0.0000)		0.0000 (0.0000)
OW_FOREIGN	−		−0.0000 (0.0002)		−0.0000 (0.0002)		0.0002* (0.0001)		0.0002* (0.0001)
Constant		0.2449*** (0.0406)	0.5338*** (0.0650)	0.2680*** (0.0505)	0.5535*** (0.0741)	0.1168*** (0.0224)	0.1262*** (0.0332)	0.1233*** (0.0263)	0.1447*** (0.0371)
YEAR		YES	YES	YES	YES	YES	YES	YES	YES
INDUSTRY		YES	YES	YES	YES	YES	YES	YES	YES
Observations		2,860	1,526	2,860	1,526	2,064	1,294	2,064	1,294
Companies		447	314	447	314	362	273	362	273
Wald		23.22***	8.94***	17.31***	7.75***	4.42**	4.40**	3.27*	2.81*
Adjusted R^2		0.0936	0.2631	0.0867	0.2618	0.1001	0.1526	0.0992	0.1498

Notes: This table shows regression results from estimating equations (4) and (5); the dependent variable in each regression is *ICC_HOU* or *ICC_IBES*, the implied cost of equity capital defined as a composite measure from the models described by Gebhardt *et al.* (2001), Claus and Thomas (2001), Ohlson and Juettner−Nauroth (2005), Easton (2004) and Gordon and Gordon (1997); *CG* is a governance score calculated as 1 minus the percentage of non-compliance with the recommendations of a given version of the Code; *CGAW* is an acceptance-weighted version of the governance score; *HHI_HIGH* is a dummy variable that indicates whether the market concentration is above the median market concentration; all other control variables are as previously defined (see Table III); Wald is the *F*-statistic for the null hypothesis that the sum of the coefficients on *CG* or *CGAW* and their interactions with *HHI_HIGH* are different from zero; heteroskedasticity-consistent standard errors that are clustered on company level are displayed in parentheses; *, **and ***indicate correlations and significance at the 10, 5 and 1% levels

Table IX. Regression results for OLS estimation with alternative definitions of corporate governance scores

Variables	Exp.	ICC_HOU				ICC_IBES			
CG_BASE	–	−0.2176*** (0.0390)	−0.1119* (0.0628)			−0.0253 (0.0176)	−0.0470* (0.0251)		
CGAW_BASE	–			−0.2402*** (0.0469)	−0.1336* (0.0768)			−0.0296 (0.0214)	−0.0485 (0.0316)
SIZE	–		−0.0218*** (0.0026)		−0.0219*** (0.0026)		−0.0014 (0.0013)		−0.0015 (0.0013)
LEV	+		0.0015 (0.0019)		0.0015 (0.0019)		0.0018 (0.0021)		0.0018 (0.0021)
DISC	+		−0.0479 (0.0439)		−0.0474 (0.0440)		−0.0184 (0.0263)		−0.0183 (0.0264)
BTM	+		0.0251*** (0.0057)		0.0252*** (0.0057)		0.0054 (0.0068)		0.0054 (0.0069)
BETA	+		0.0049 (0.0069)		0.0046 (0.0068)		0.0086** (0.0035)		0.0084** (0.0035)
IDIO	+		−0.1086 (0.0696)		−0.1089 (0.0696)		0.0300 (0.0384)		0.0297 (0.0386)
FF	+		0.0009 (0.0124)		0.0002 (0.0123)		0.0040 (0.0058)		0.0037 (0.0058)
FIN	–		0.0121 (0.0091)		0.0122 (0.0091)		−0.0193* (0.0101)		−0.0194* (0.0101)
AGE	?		0.0037*** (0.0009)		0.0037*** (0.0009)		0.0014*** (0.0005)		0.0014*** (0.0005)
OW_LARGEST	–		−0.0002 (0.0001)		−0.0002 (0.0002)		−0.0002*** (0.0001)		−0.0002*** (0.0001)
OW_INSIDER	–		0.0030 (0.0026)		0.0028 (0.0025)		0.0006 (0.0011)		0.0005 (0.0011)
OW_OUTBLK	–		0.0000 (0.0001)		0.0000 (0.0001)		0.0000 (0.0000)		0.0000 (0.0000)
OW_FOREIGN	–		−0.0000 (0.0002)		−0.0000 (0.0002)		0.0002* (0.0001)		0.0002* (0.0001)
Constant		0.2800*** (0.0360)	0.5924*** (0.0675)	0.3081*** (0.0442)	0.6189*** (0.0779)	0.1163*** (0.0201)	0.1207*** (0.0303)	0.1207*** (0.0233)	0.1274*** (0.0329)
YEAR		YES	YES	YES	YES	YES	YES	YES	YES
INDUSTRY		YES	YES	YES	YES	YES	YES	YES	YES
Observations		2,860	1,526	2,860	1,526	2,064	1,294	2,064	1,294
Companies		447	314	447	314	362	273	362	273
Adjusted R^2		0.0916	0.2509	0.0874	0.2510	0.0948	0.1448	0.0948	0.1433

Notes: This table shows regression results from estimating equations (2) and (3); the dependent variable in each regression is *ICC_HOU* or *ICC_IBES*, the implied cost of equity capital defined as a composite measure from the models described by Gebhardt *et al.* (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), Easton (2004) and Gordon and Gordon (1997); *CG_BASE* and *CGAW_BASE* are alternate definitions of the corporate governance score that are solely based on those recommendations that are present in all versions of the GCGC; all other control variables are as previously defined (see Table III); heteroskedasticity-consistent standard errors that are clustered on company level are displayed in parentheses; *, ** and *** indicate correlations and significance at the 10, 5 and 1% levels

Table X.
Regression results for SGMM estimation

Variables	Exp.	*ICC_HOU*				*ICC_IBES*			
ICC_{t-1}	+	0.3182** (0.1361)	0.218*** (0.0589)	0.3129** (0.1342)	0.2194*** (0.0553)	−0.0947 (0.1347)	0.2356** (0.1142)	−0.0661 (0.1342)	0.2391* (0.1256)
CG	−	−0.1302 (0.1712)	−0.2568** (0.1085)			−0.0577 (0.0842)	−0.0694* (0.0377)		
CGAW	−			−0.2336 (0.2428)	−0.3186** (0.1281)			−0.0261 (0.1166)	−0.0593 (0.0480)
SIZE	−		−0.0067 (0.0043)		−0.0086** (0.0036)		0.0020 (0.0018)		0.0018 (0.0019)
LEV	+		−0.0009 (0.0022)		−0.0006 (0.0022)		0.0007 (0.0016)		0.0007 (0.0016)
DISC	+		−0.0122 (0.0583)		−0.0081 (0.0584)		−0.0165 (0.0325)		−0.0122 (0.0341)
BTM	+		0.0145* (0.0084)		0.0144* (0.0078)		0.0018 (0.0060)		0.0020 (0.0058)
BETA	+		0.0076 (0.0086)		0.0078 (0.0092)		0.0119** (0.0052)		0.0107** (0.0053)
IDIO	+		−0.0966 (0.0976)		−0.0973 (0.0922)		0.0033 (0.0520)		0.0016 (0.0507)
FF	+		−0.0255 (0.0195)		−0.0241 (0.0181)		0.0090 (0.0074)		0.0081 (0.0073)
FIN	−		−0.0051 (0.0133)		−0.0045 (0.0134)		−0.0052 (0.0108)		−0.0052 (0.0107)
AGE	?		0.0044*** (0.0015)		0.0046*** (0.0015)		0.0005 (0.0007)		0.0004 (0.0008)
OW_LARGEST	−		−0.0001 (0.0002)		−0.0001 (0.0002)		−0.0002 (0.0001)		−0.0002* (0.0001)
OW_INSIDER	−		0.0031* (0.0016)		0.003* (0.0017)		0.0002 (0.0015)		0.0004 (0.0014)
OW_OUTBLK	−		−0.0001 (0.0001)		−0.0001 (0.0001)		0.0000 (0.0001)		0.0000 (0.0001)
OW_FOREIGN	−		0.0004 (0.0003)		0.0004* (0.0003)		0.0001 (0.0001)		0.0001 (0.0001)
Constant		0.1956 (0.1524)	0.3863*** (0.0815)	0.2948 (0.2244)	0.4833*** (0.1034)	0.1541* (0.0791)	0.0593* (0.0335)	0.1228 (0.1109)	0.0579 (0.0430)
YEAR		YES	YES	YES	YES	YES	YES	YES	YES
INDUSTRY		YES	YES	YES	YES	YES	YES	YES	YES
Observations		2,539	1,453	2,539	1,453	1,747	1,194	1,747	1,194
Companies		437	306	437	306	334	262	334	262
m_2		0.891	0.383	0.856	0.429	−0.517	1.396	−0.288	1.405
Hansen-J		80.16	276.90	80.38	279.20	60.50	230.50	60.63	226.08

Notes: This table shows regression results from estimating equations (2) and (3); the dependent variable in each regression is *ICC_HOU* or *ICC_IBES*, the implied cost of equity capital defined as a composite measure from the models described by Gebhardt *et al.* (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), Easton (2004) and Gordon and Gordon (1997); *CG* is a governance score calculated as 1 minus percentage of non-compliance with the recommendations of a given version of the Code; *CGAW* is an acceptance-weighted version of the governance score; all other control variables are as previously defined (see Table III); SGMM with three- to six-period lagged variables as instruments is applied as the method of estimation; standard errors in parentheses are calculated using the finite-sample correction as proposed by Windmeijer (2005); m_2 is the statistic developed by Arellano and Bond (1991) to test for no-second-order autocorrelation of the residuals; Hansen-J is a test of the over-identifying restrictions (Hansen, 1982); *, **and ***indicate correlations and significance at the 10, 5 and 1% levels

the specification that uses *ICC_HOU* as dependent variable and CG as explanatory variable, a negative relationship is observable at the 10 per cent significance level. In all other specifications, the coefficients have negative point estimates but lack statistical significance. In total, we consider these results as affirmative to our main regression analysis. Although the significance of some of the coefficients may be impaired by the additional data requirements of the dynamic panel SGMM estimation and by controlling for the dynamic relationship, in the central regression models that include all company controls, we still find a significant negative relationship between compliance with the GCGC and ICC.

With respect to *H2*, the results are very similar. As displayed in Table XI, in the models that include all controls and use *ICC_HOU* as the dependent variable, the interaction effects are still present and statistically significant at the 5 per cent level. When *ICC_IBES* is the dependent variable, there are no significant results for the coefficients on interaction terms.

Robustness tests

As can be observed by re-examining Table I, in the earlier years, more observations had to be deleted because declarations of compliance were fraudulently not issued or are simply no longer available due to the companies having merged or become bankrupt. This may introduce sample selection bias in our analysis. As a robustness check, we re-estimate equations (2) and (3) with a two-step Heckman (1979) correction. The selection function is estimated using a probit regression with all control variables. The results are not qualitatively different to those reported in Table VII. In fact, the significance of coefficients even increases.

For the period prior to 2007, there are only a small number of observations with full data. The panel is thus severely unbalanced. Because the SGMM model works with gaps and does not necessarily remove observations with missing data, missing data could introduce bias. We test our results to sensitivity of excluding observations prior to 2007 and conclude that the results remain largely unchanged.

Conclusion

Based on a hand-collected sample of 2,860 observations from 447 companies during the period of 2003-2013, we analyze how the level of compliance with the recommendations of the GCGC is related to the ICC of German firms. Our analysis provides empirical evidence that compliance with GCGC recommendations is associated with lower ICC. We contribute to current literature by providing the first empirical evidence to document this relationship, which supports the work of the government commission. Our research extends and confirms prior studies for the German market that are either based on relatively small sample sizes and/or focus on more general corporate governance attributes (Drobetz *et al.*, 2004; Goncharov *et al.*, 2006; Nowak *et al.*, 2005; Tran, 2014). We further find evidence that the decreasing effect of GCGC compliance on ICC is stronger in industries with comparatively low product market competition.

So far, our analysis is based solely on counting deviations from the catalog of recommendations provided by the GCGC. We have not yet analyzed whether the firms cite good reasons why they do not adhere to certain items. It seems reasonable to assume that in some circumstances deviations from the Code even indicate good rather than bad

Table XI.
Regression results for SGMM estimation with interaction of corporate governance scores with market concentration

Variables	Exp.	*ICC_HOU*						*ICC_IBES*	
ICC_{t-1}	+	0.2919*** (0.1059)	0.2204*** (0.0544)	0.2931*** (0.1083)	0.2206*** (0.0535)	0.0388 (0.1194)	0.2354* (0.1270)	0.0550 (0.1181)	0.2334** (0.1127)
CG	−	−0.0422 (0.1368)	−0.1316 (0.0983)			0.0270 (0.0857)	−0.065* (0.0349)		
CGAW	−			−0.0985 (0.2026)	−0.1726 (0.1225)			0.0590 (0.1192)	−0.0647 (0.0407)
HIGH_HHI	+	0.1596 (0.1714)	0.2483** (0.1166)	0.1237 (0.2569)	0.3266** (0.1555)	0.0848 (0.0958)	0.0168 (0.0497)	0.1101 (0.1240)	−0.0012 (0.0764)
HIGH_HHI × *CG*	−	−0.1663 (0.1913)	−0.2735** (0.1268)			−0.0840 (0.1062)	−0.0060 (0.0549)		
HIGH_HHI × *CGAW*	−			−0.1210 (0.2766)	−0.3496** (0.1654)			−0.1081 (0.1330)	0.0140 (0.0806)
SIZE	−		−0.007* (0.0038)		−0.0082** (0.0035)		0.0024 (0.0019)		0.0019 (0.0020)
LEV	+		−0.0008 (0.0021)		−0.0007 (0.0022)		0.0005 (0.0017)		0.0006 (0.0016)
DISC	+		−0.0010 (0.0613)		0.0057 (0.0654)		−0.0114 (0.0323)		−0.0113 (0.0399)
BTM	+		0.0151* (0.0077)		0.0157** (0.0080)		0.0030 (0.0062)		0.0028 (0.0056)
BETA	+		0.0068 (0.0098)		0.0062 (0.0090)		0.0125** (0.0056)		0.0115** (0.0058)
IDIO	+		−0.0868 (0.0998)		−0.0766 (0.0897)		0.0116 (0.0533)		0.0078 (0.0515)
FF	+		−0.0286 (0.0180)		−0.0252 (0.0180)		0.0105 (0.0076)		0.0107 (0.0086)
FIN	−		−0.0034 (0.0132)		−0.0036 (0.0132)		−0.0038 (0.0103)		−0.0044 (0.0108)
AGE	?		0.0043*** (0.0013)		0.004*** (0.0013)		0.0004 (0.0007)		0.0004 (0.0007)
OW_LARGEST	−		−0.0001 (0.0003)		−0.0001 (0.0003)		−0.0001 (0.0001)		-0.0001 (0.0001)
OW_INSIDER	−		0.0027* (0.0016)		0.0022 (0.0019)		−0.0002 (0.0010)		−0.0003 (0.0012)
OW_OUTBLK	−		−0.0001 (0.0001)		−0.0001 (0.0001)		0.0000 (0.0001)		0.0001 (0.0001)
OW_FOREIGN	−		0.0004* (0.0003)		0.0005* (0.0003)		0.0001 (0.0001)		0.0001 (0.0001)
Constant		0.1196 (0.1231)	0.2799*** (0.0757)	0.1722 (0.1878)	0.3443*** (0.0944)	0.0647 (0.0805)	0.0475 (0.0370)	0.0319 (0.1145)	0.0605 (0.0490)
YEAR		YES	YES	YES	YES	YES	YES	YES	YES
INDUSTRY		YES	YES	YES	YES	YES	YES	YES	YES
Observations		2,539	1,453	2,539	1,453	1,747	1,194	1,747	1,194
Companies		437	306	437	306	334	262	334	262
m_2		0.966	0.435	0.944	0.474	0.354	1.381	0.478	1.437
Hansen-J		97.21	277.81	100.7	275.31	103.75	226.45	102.92	223.75
Wald		1.23	8.39***	0.78	9.72***	0.34	1.89	0.17	0.51

Notes: This table shows regression results from estimating equations (4) and (5); the dependent variable in each regression is *ICC_HOU* or *ICC_IBES*, the implied cost of equity capital defined as a composite measure from the models described by Gebhardt *et al.* (2001), Claus and Thomas (2001), Ohlson and Juettner-Nauroth (2005), Easton (2004) and Gordon and Gordon (1997); *CG* is a governance score calculated as 1 minus the percentage of non-compliance with the recommendations of a given version of the Code; *CGAW* is an acceptance-weighted version of the governance score; *HHI_HIGH* is a dummy variable that indicates whether the market concentration is above the median market concentration; all other control variables are as previously defined (see Table III); Wald is the *F*-statistic for the null hypothesis that the sum of the coefficients on *CG* or *CGAW* and their interactions with *HHI_HIGH* are different from zero. SGMM with three- to six-period lagged variables as instruments is applied as the method of estimation; standard errors in parentheses are calculated using the finite-sample correction as proposed by Windmeijer (2005); m_2 is the statistic developed by Arellano and Bond (1991) to test for no-second-order autocorrelation of the residuals; Hansen-J is a test of the over-identifying restrictions (Hansen, 1982); *, **and ***indicate correlations and significance at the 10, 5 and 1% levels

corporate governance, as also expressed in the preamble of the most recent version of the Code (2013):

> Companies can deviate from them [the recommendations], but are then obliged to disclose this annually and to justify the deviations (comply or explain). This enables companies to reflect sector and enterprise-specific requirements. A well-justified deviation from a Code recommendation may be in the interest of good corporate governance.

We encourage future research that aims at investigating whether reasonable explanations of deviations from the Code are (less) relevant to capital markets.

Notes

1. All versions of the GCGC and its history are accessible via the Web site of the government commission: www.corporate-governance-code.de
2. Statistical summaries of acceptance rates are regularly provided by the Berlin Center of Corporate Governance. For the latest report, Werder and Bartz (2013).
3. In fact, relating GCGC compliance to the overall market valuation or returns as in Goncharov *et al.* (2006) is not without conceptual problems. Under simple equilibrium conditions, companies are expected to choose the level of compliance that maximizes their market value; hence, it becomes difficult to state a relationship between the level of compliance and market valuation (Chenhall and Moers, 2007; Hermalin, 2010; Parigi *et al.*, 2014). This problem does not exist in analyses that are restricted to investment risk, which is not an ultimate performance measure.
4. Also in the Heckman selection model, variables in the first-stage regression (selection process) must be exogenous, i.e., not correlated with the error term in the second stage (Bushway *et al.*, 2007; Angrist, 2001).
5. The stock market indices DAX30, MDAX and SDAX cover the 130 most important listed German companies in terms of market capitalization and revenue.
6. In line with previous market-based corporate governance research, we exclude financial companies, i.e. all companies with SIC codes starting with digit 6 (Fama–French industry 11).
7. www.bundesbank.de/Navigation/DE/Statistiken/Zeitreihen_Datenbanken/Makrooekonomische_Zeitreihen/its_details_value_node.html?tsId=BBK01.WT0115 (accessed 11 November 2013).
8. Using more than two-period-lagged variables increases the likelihood that the instruments are valid, i.e., uncorrelated with current realizations of ICC. At the same time, lower correlations of further lagged variables decrease the empirical power of the estimation. Limiting the instruments to the sixth lag avoids instrument proliferation due to a too high instrument count (Roodman, 2009). Our results are robust to using different lag structures, although, for some of the specifications, the tests of over-identifying restrictions are rejected.

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