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III. Learning from the Bad Guys – When Investors Learn from Error Announcements over Time

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Learning from the Bad Guys
– When Investors Learn from Error Announcements over Time

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ABSTRACT

This study investigates whether investors learn the characteristics of firms with erroneous financial statements over time. We assume that investors use error announcements issued by the German enforcement institution (FREP) to determine firm-specific error probabilities, which they then employ in their investment decisions. We proxy a firm's error probability via a model the FREP has recently published based on prior experiences regarding the characteristics of firms without erroneous financial statements compared to those firms receiving error announcements. Relying on an event study and multivariate regression analyses, we show that a higher ex-ante error probability of a firm is associated with lower investor surprises, i.e., a less adverse market reaction when an actual error announcement is published. Interestingly, we find a highly significant time-variation in the market reaction suggesting that investors learn about the characteristics of misreporting firms over time. Our research indicates that enforcement institutions enable investors to anticipate financial reporting quality over time. Moreover, in a broader research context, our dataset allows us to capture investors' adaptive learning process empirically, which prior studies have only predicted analytically so far given efficient capital markets.

Keywords: enforcement, accounting quality, market efficiency, adaptive markets

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I. INTRODUCTION

This paper investigates how investors learn from financial reporting-related information over time and how they anticipate this information in their investment decisions. In detail, we analyze how investors learn over time about the characteristics of firms producing erroneous financial statements based on error announcements issued by the German Enforcement Institution FREP (German Financial Reporting Enforcement Panel). Since July 2005, the FREP reviews financial statements of publicly traded companies and discloses error announcements when they find errors in firms' financial reporting.[1] By building on Fama's theory of efficient capital markets (Fama, 1970) and Lo's theory of adaptive markets (Lo, 2004), we argue that these error announcements allow investors to learn about the characteristics of misreporting firms. Thus, based on these firm characteristics, investors are enacted over time to determine firms with a higher probability of errors in their financial statements than firms with a low error probability. Consequently, when errors are actually announced for firms with an ex-ante assumed high error probability, this does not constitute new information for investors. Instead, this error announcement is anticipated by investors and thus meets investors' expectations. Therefore, there is no or only a mild capital market reaction to the error announcement of firms with a high error probability. In contrast, if investors were anticipating a low error probability and the respective firm receives an error announcement, this constitutes a surprise for investors and thus results in a more pronounced negative capital market reaction.

Our research setting is particularly interesting for the following two issues: First, we pick up the German particularity that no real enforcement system was implemented before 2005. Before implementing the FREP, the German enforcement quality was relatively weak (Leuz and Wüstemann, 2003). Thus, there is no concrete objective information available to

[1] Due to the Wirecard scandal in 2020, the German enforcement system is undergoing further restructuring and will be regulated anew with the "Finanzmarktintegritätsstärkungsgesetz" (Financial Market Integrity Strengthening Act).

investors about a firm's financial reporting quality at the starting point of our investigation. Therefore, the ongoing publications of error announcements allow us to cover investors' entire learning process about the characteristics of firms disclosing erroneous financial statements. Second, recently, the FREP published a model for estimating a firm's "error probability" (Pasch, 2017): Based on prior experiences gained during their reviews, the FREP has determined common characteristics of misreporting firms and has drawn a model that estimates the probability that a firm has disclosed erroneous financial statements. This model derives an "error probability" based on 26 factors from the four main domains often associated with reporting quality, i.e., accruals, corporate governance, capital market pressure, and blockholding controls, while all components originate from publicly available resources. This model enables us to operationalize investors' heuristics to identify misreporting firms. For instance, the firm "loginet3" had almost no abnormal capital market reaction after receiving an error announcement. In contrast, the capital market abnormally decreased by nearly 18% when the firm "TC Unterhaltungselektronik" received an error announcement, even though the error severity[2] of the latter was much lower compared to the former one. We attribute these findings to different anticipated error probabilities that investors' trading decisions were based on: Whereas the error probability of "loginet3" based on the FREP's model was extremely high with over 90%, the error probability of "TC Unterhaltungselektronik" based on the FREP's model was relatively low (< 5%). Thus, the error announcement presented new and unexpected information to capital market participants, while investors of "loginet3" have expected such an error announcement.

To the best of our knowledge, we are the first to use the FREP's model as a proxy for investors' perception of potential misstatements in the firm's financial reporting. This enables us to test (1) whether the error probability significantly affects the capital market reaction and

[2] In the light of prior research (e.g., Hitz et al., 2012), we measure error severity by using Principal Components Analysis, including number of errors, the impact on net profit and the impact on OCI.

(2) whether investors learn over time which firms are likely to disclose erroneous financial statements. To do so, we conduct an event study over the sample period from 2005 to 2021. More precisely, we assess whether the error probability significantly affects the abnormal returns and the abnormal volatilities in a multivariate regression model. Moreover, we include interaction terms with a time variable to investigate the impact of a firm's error probability on investors' market reaction over time. We conduct additional analyses by evaluating the marginal effect of the time variable on abnormal returns and abnormal volatilities for different error probabilities and create model predictions for our dependent variables (abnormal returns/abnormal volatilities) by specifying our time and error probability variables at low, average and high values via predictive margins.

Our results support our theoretical reasoning: There is a significantly negative impact of the error probability on abnormal returns on the announcement day, i.e., the higher the error probability, the less surprised is an investor when an actual error is announced. The other way around, the lower the error probability, the more surprised are the investors, resulting in a higher adverse market reaction. Moreover, there is a highly significant time-varying effect of the error probability for both abnormal returns and abnormal volatilities, suggesting that the capital market learns to recognize infringing firms over time.

Our results contribute to research and practice in several ways: With respect to research, we underline the importance of considering investors' ability to learn accounting-related issues over time when focusing on capital market reactions. In this vein, we expand the results and contributions of prior enforcement-related studies. Hitz et al. (2012) were the first to examine the effectiveness of error announcements of the German enforcement system. Conducting an event study covering data from 2005 to 2009, they analyze market reactions to error announcements. However, they do not consider how effects might change over time and how investors learn. This is where we contribute. Specifically, we shed light on investors' learning

and investors' perception of those error announcements over time. Thus, we contribute to how investors process and anticipate the information that is useful for their investment decisions. Most research argues analytically that investors learn from information dissemination over time by referring to Fama's theory of efficient capital markets and Lo's theory of adaptive markets (e.g., Fraser, 2004; Rejeb and Boughrara, 2013; Banerjee et al., 2018). Yet, it remains a challenge to demonstrate these theories on an empirical basis. However, our particular research setting allows us empirically to support this theoretical reasoning. With respect to practice, one could argue that the error announcements lose their effectiveness over time because investors do not appear to react as negatively to error announcements as in earlier years. However, our results present evidence to the contrary: Error announcements enable investors to learn characteristics of misreporting firms over time and to develop heuristics for determining firm-specific error probabilities, which then form the basis for their investment decisions. Thus, error announcements allow investors to make more informed investment decisions over the years.

The remainder of this paper is organized as follows. In Section 2, we provide an overview of the German two-tier enforcement system and develop our hypotheses. Section 3 outlines our methodology, including our sample, and describes our univariate and multivariate testing approaches. Our main empirical results and additional analyses are presented and discussed in Section 4. Section 5 finally offers a conclusion and points out the limitations of this paper and potential future research.

II. BACKGROUND & HYPOTHESES

Background: Enforcement

Research in financial accounting has shown that vigorous enforcement significantly influences accounting quality (e.g., Daske et al., 2008; Landsman et al., 2012). The stronger a country's enforcement, the lower the occurrence of earnings management (Cai et al., 2008; Leuz et al., 2003; Nagar and Petacchi, 2005), and the higher the forecast accuracy (Hope, 2003).

Therefore, it is not surprising that announcements of errors in the financial statements of a firm issued by an enforcement institution generally lead to an adverse stock price reaction (e.g., for the US: Hribar and Jenkins, 2004; Palmrose et al., 2004; Wu, 2002; for Germany: Hitz et al., 2012), an increase in the cost of capital and a loss of financial statement credibility (e.g., Chen et al., 2014; Wilson, 2008) for the respective firm.

Focusing on our German setting, various studies in earlier years classified the then prevailing German enforcement quality as rather weak (Hope, 2003; La Porta, 1998; Leuz et al., 2003; Leuz and Wüstemann, 2003). As a reaction, the German enforcement system underwent some major reforms in 2005, leading to a reorganization by introducing the German Financial Reporting Enforcement Panel (FREP) to review the audited financial statements of publicly listed companies. The panel is supported by the legal power of the Federal Financial Supervisory Authority (BaFin), who foremost step in when firms are non-cooperative. When an error in a firm's financial statements is found, this error has to be publicly disclosed in the Federal Gazette in so-called “error announcements” and at least two daily financial newspapers. These error announcements are structured in a similar style and mostly contain the same scope of detailed information. They include, i.a., the relevant information of the financial amount, the consequences, and the magnitude of errors made. Thus, instead of additionally imposing monetary, injunctive sanctions like the SEC (Karpoff et al., 2008), the German enforcement system solely relies on the market's ‘name and shame’ mechanism. Moreover, with a rising number of error announcements, investors gather a deeper understanding and develop heuristics about the characteristics of misreporting firms. As a consequence, this might influence the intensity of the market response to those error announcements.

Hypotheses

Prior research has emphasized the importance of financial reporting quality for investors. High accounting quality reduces information asymmetry and risk (e.g., Brown and

Hillegeist, 2007) and influences investors in their decision-making (e.g., IASB, 2008). However, it is difficult for investors to determine which company provides a high reporting quality (e.g., van Beest et al., 2009) compared to companies delivering low quality. Therefore, investors are always looking for characteristics and key figures to distinguish firms with a high financial reporting quality from lower ones (e.g., Beneish, 1999; Dechow et al., 2011; DeFond and Jiambalvo, 1991; Ernstberger et al., 2012). In this vein, various studies demonstrate that companies with higher accruals (e.g., Healy, 1985; Jones et al., 2008; Strohmenger, 2014), more capital market pressure (e.g., Dechow et al., 1996, 2011; Watts and Zimmerman, 1986), lower blockholder shareholdings (e.g., Boehmer and Kelley, 2009; Edmans, 2009; Shleifer and Vishny, 1997) and a comparatively poor corporate governance (e.g., Baber et al., 2012; Böcking et al., 2015; Ernstberger et al., 2012; Witzky, 2016) are more likely to publish erroneous information resulting in low financial reporting quality. These prior research findings confirm certain predictability of misreporting firms; i.e., firms with specific characteristics are more likely to provide low financial reporting quality, thus resulting in error announcements than firms with different characteristics.

Every new error announcement contributes to investors' general knowledge about the characteristics of misreporting firms and thus allows investors to learn about reporting quality. This is in line with Lo's idea of an adaptive market (Lo, 2004). Based on the theory of efficient capital markets, where stock prices "fully reflect" all relevant information available to market participants at any time (Fama, 1965; 1970, p. 383), the theory of adaptive markets takes a more dynamic approach, underlining that investors learn from and adapt to new information. In this vein, we argue that investors learn from error announcements as they provide new information not only with regard to the respective financial statement that has found to be erroneous. More importantly, error announcements also help investors to fine-tune their heuristics about which firms, in general, are more likely to produce erroneous financial statements. This explorative

learning process cannot be achieved instantaneously as it depends on the repeated issuance of error announcements over the years. For instance, in 2005, the FREP started its work with only two error announcements followed by 8 to 37 error announcements in subsequent years.

<Insert table 1 about here.>

The larger the number of error announcements that the FREP publishes, the more differentiated is the investors' understanding of misreporting firms' characteristics. Thus, the error announcements help them continuously refine their assumptions on which firms have a higher or lower probability of misreporting. Consequently, investors' assumptions about a firm's likelihood of producing erroneous financial statements are not static but instead get dynamically more accurate over time as a growing number of error announcements get published.

This implies that the capital market reaction to an error announcement is less negative when investors have already expected an error announcement based on a high error probability. In this case, the assumed low financial reporting quality has already been incorporated in their investment decisions and has already become reflected in stock prices. Therefore, we expect a less pronounced capital market reaction to error announcements of firms with a high error probability. On the contrary, we expect a more severe capital market reaction to an error announcement for a company with characteristics that point to a relatively low error probability. In this case, information about low financial reporting quality comes unexpectedly and has not been processed by the capital market until then. Moreover, we expect this divergence in reactions to become more pronounced over time because investors improve their heuristic for determining a company's error probability with each new error announcement. According to this reasoning, we stipulate the following two hypotheses:

H1a: The magnitude of the adverse market reaction to error announcements is negatively associated with a firm's error probability.

H1b: The effect of the error probability on the market reaction to error announcements becomes stronger over time.

III. METHODOLOGY

Sample Selection and Data Collection

Our dataset is compiled of firms subject to error announcements from the beginning of the new enforcement system implemented in July 2005 to May 2021. From the initial sample of 295 error announcements, 16 cases had to be dropped since they were duplicates or corrected reports of prior error announcements. To ensure comparability, 20 error announcements of foreign companies had to be eliminated as well as 20 announcements relating only to interim reports. We assume that these interim reports have different relevance for the investor than annual reports and are thus not comparable in their market effects. Furthermore, if a firm received more than one error announcement throughout the years of our analysis, the focus was laid on the first announcement, as this is the moment the market came to know about the misreporting behavior of the respective firm. We, therefore, further omitted 27 error announcements. To prevent influences from other corporate news, we checked for confounding events that might have led to a distortion of the market reaction and might have caused biased results (McWilliams and Siegel, 1997, p. 637). This led to another 49 error announcements being excluded. As the study requires a lot of data for the dependent and independent variables, and we aimed at keeping the sample consistent for each analytical step, further 81 observations had to be omitted due to missing data. Overall, these adjustments result in a final sample of 82

firm observations comparable to previous studies investigating market reactions upon enforcement actions (e.g., Beneish, 1999; Dechow et al., 1996; Hitz et al., 2012).[3]

Several sources were consulted to compile the financial and non-financial information needed for this study. Daily market data for the event study originates from Datastream. All other variables used for the multivariate regression and the compounding of the error probability were either hand-collected from error announcements, the respective financial reports, or were obtained from Datastream.

Market Reaction Tests and Univariate Analysis

An event study is an effective statistical tool in financial accounting research to evaluate the impact of a particular corporate event on a firm's market value (Brown and Warner, 1985, pp. 13-16; MacKinlay, 1997). The market reaction may be used as a metric for the scope of information provided by the enforcement system (Nourayi, 1994) when issuing an error announcement.

We assess the impact of these error announcements upon the capital market by conducting an event study based on the date of the error disclosure in the German Federal Gazette. The date of the event is defined as [0] and is easily observable on each of the official error announcements. The economic consequences are measured using financial market data regarding stock performance and stock volatility. For this, we use the respective tools, i.e., (cumulative) abnormal returns and (cumulative) abnormal volatility. We consider a short-term time window, which investigates investor reactions on the event day [0] and the following two days ([0;1], [0;2]) after the date of the error announcement to avoid that the effect is biased by other external influences when the event window is enlarged (Brown and Warner, 1985).

[3] For instance, Hitz et al. (2012) investigate the German enforcement system with a total of 40 - 51 observations. Also, Dechow et al. (1996) and Beneish (1999) conduct their analyses in the US setting with sample sizes of 92 and 64 firm observations, respectively.

Cumulative abnormal returns (CARs) result from daily abnormal returns over the particular event window. Daily abnormal returns are defined as the difference between the actual daily stock return of a firm and the return that would have been expected without any special event providing new information to the investors. We estimate the expected daily return by applying a stock-specific market model (MacKinlay, 1997), which is commonly used in contemporary capital market-based research (e.g., Lackmann et al., 2012; Lee et al., 2015; Lam et al., 2016). The model parameters in our market model are a composite of the returns of all listed German companies, for which dividend payments are explicitly incorporated. These model parameters are approximated by ordinary least squares (OLS) regressions based on an estimation period of 150 trading days before the beginning of the event window. We then compute the mean cumulative abnormal return for each event window ([0], [0; 1], [0; 2]) by averaging the CARs across the 82 firms of our sample.

Cumulative abnormal stock volatility is the difference between the observed stock volatility over the event window and the respective expectation based on an average value of said stock 150 days before the event window. The cumulative abnormal volatility and the cumulative average abnormal volatility are computed analogously to the cumulative abnormal return and the cumulative average abnormal return.

To test whether cumulative abnormal returns or cumulative abnormal stock volatilities are significantly different from zero, we apply the common t-test as well as the non-parametric Corrado Rank test, which has the advantage of being independent of symmetrically distributed abnormal returns (Corrado, 1989). Moreover, we apply the Patell test, a parametric test designed to reveal whether the (cumulative) abnormal returns are different from zero at a certain significance level (Patell, 1976). We also utilize the sign test that allows identifying even small levels of abnormal returns.

Multivariate Regression Model

We run a multivariate regression model on (cumulative) abnormal rates of return (CAR) to test our hypotheses. In addition, as a robustness check, we also use (cumulative) stock market volatility surrounding an error announcement as an alternative dependent variable since high cumulative abnormal volatility (CAV) indicates whether investors actually trade the firm's share during the event window. To test H1a in isolation, these two dependent variables are regressed on ERROR PROBABILITY in the first step. Further, we include several company-specific and economic control variables resulting in the following model (1):

$$CAR_i/CAV_i = \beta_0 + \beta_1 \cdot ERROR\ PROBABILITY_i + contols + \varepsilon_i \quad (1)$$

In a second step, we extend our regression model by incorporating an interaction term to investigate the time-varying effect of ERROR PROBABILITY as predicted in H1b, resulting in the following model (2):

$$\frac{CAR_i}{CAV_i} = \beta_0 + \beta_1 \cdot ERROR\ PROBABILITY_i + \beta_2 \cdot TIME_i\ \#ERROR\ PROBABILITY_i + contols + \varepsilon_i \quad (2)$$

Independent Variable

We proxy investors' assumptions regarding a firm's ERROR PROBABILITY based on the model the FREP has published based on their prior experiences about characteristics of firms that did not get an error announcement compared to firms that got an error announcement. We apply the respective estimation model, as shown in formula (3), to our sample of misreporting firms to determine the error probability of each of these firms. The predicted value

MISST is obtained by plugging in the firm-specific factor values of the year when the error was actually made into the model and multiplying them with the respective coefficient.

$$\begin{aligned} MISST = {} & -3.93 - 0.026 \cdot C\_WC\_ACC\_AVTOAS - 0.232 \cdot \\ & C\_RECEIV\_AVTOAS + 3.284 \cdot INVENT\_AVTOAS + 1.179 \cdot \\ & SOFT\_TOAS + 0.351 \cdot MJ\_ACC\_ABS + 5.842 \cdot \\ & C\_GOODWN\_AVTOAS + 2.313 \cdot DTAXA\_TOAS + 0.858 \cdot \\ & FINN - 1.843 \cdot ISSUE\_AVTOAS - 0.069 \cdot FIEX\_AVDB + \\ & 2.256 \cdot LEV - 0.961 \cdot INST\_SH + 0.098 \cdot CORP\_SH - \\ & 4.984 \cdot FAM\_SH + 1.462 \cdot SB\_SH - 0.767 \cdot SB\_IND + \\ & 9.777 \cdot SB\_COMP\_TOAS + 0.091 \cdot SB\_VARIABLE\_COMP + \\ & 0.066 \cdot SB\_NO\_MEETINGS - 0.302 \cdot AC + 0.72 \cdot SGI - \\ & 2.007 \cdot ROA + 0.031 \cdot LN\_MARTCAP + 0.794 \cdot EB\_SH - \\ & 0.607 \cdot BIG\_5 + 0.343 \cdot AUD\_CHANGE + \varepsilon \end{aligned} \quad (3)$$

It should be noted that the FREP model calculates the error probability based on four main factors (Pasch, 2017): ***accruals***, ***corporate governance, capital market pressure*** and ***blockholdings control***.[4] These are proxied by various financial and non-financial company characteristics and key figures from the fiscal year of the financial reporting violation explained below. Changes (C_) in variables refer to the difference from the year prior to the misstatement by subtracting the values of the erroneous year from values of the respective previous year.

The ***accruals*** policy of a company is proxied by changes in working capital accruals (C_WC_ACC_AVTOAS), receivables (C_RECEIV_AVTOAS), inventories (C_INVENT_AVTOAS) and goodwill (C_GOODWN_AVTOAS), as well as the absolute amount of soft assets (SOFT_TOAS), deferred tax assets (DTAXA_TOAS) and earnings management (MJ_ACC_ABS) all scaled by total assets. Soft assets are considered as the percentage of assets that are neither cash nor "property, plant and equipment". Furthermore, we calculate earnings management using the adjusted modified Jones (1991) model.

[4] For a more detailed explanation of the parameters of the error probability, see Pasch (2017), pp. 16-22.

The evaluation of ***corporate governance*** structures are represented by various characteristics of a firm's supervisory board, which have an impact on a company's susceptibility to errors (e.g., Abbott et al., 2004; Campbell et al., 2014; Dechow et al., 1996; Keune and Johnstone, 2015; Peasnell et al., 2001; Vafeas, 1999): The percentage of supervisory board shareholdings (SB_SH), the supervisory board compensation (SB_COMP_TOAS) scaled by total assets and the number of supervisory board meetings (SB_NO_MEETINGS) that measures the extent of monitoring activities. These components are supplemented by three dummy variables indicating if the firm states that the supervisory board was independent (SB_IND), if the supervisory board received a performance-based compensation (SB_VARIABLE_COMP), and if an audit committee (AC) was established.

Regarding existing market-related incentives, four further different variables are consulted to measure a firm's ***capital market pressure.*** A company's financing needs (FINN) is included as a dummy variable coded one, if the net cash flow from operating activities minus the three-year average capital expenditures proportioned by current assets was smaller than -0.5. The sum of long-term borrowings and equity issuance is divided by total assets to measure capital issuance (ISSUE_AVTOS). In cases with no issuance, we insert zero. Financial expenses (FIEX_AVDB) are compounded by dividing interest expenses on debt by the average debt. Leverage (LEV) is the value of long-term debt per total assets.

To take the influence of ***blockholders*** and their implied scope and incentive of control into account, the percentages of shares held by the largest institutional (INST_SH), corporate (CORP_SH) or family (FAM_SH) shareholder are applied.

The FREP's model is supplemented by several ***control variables:*** A firm's growth is proxied by its sales growth (SGI), which is calculated on the net sales of the error year compared to the previous year. The performance of a firm is measured by its return on assets (ROA). To control for size, the natural logarithm of the company's market capitalization (LN_MARTCAP)

is used as a reflection of its market value. Another control is the percentage of a company's shares that are owned by executive board members (EB_SH). Additionally, two dummy variables are applied to control whether a BIG 5 auditor (i.e., BDO, Deloitte, EY, KMPG or PwC) had audited the misstatement (coded 1) and whether there was a change of the audit firm (AUD_CHANGE) in the year prior to the erroneous statement (coded 1).[5]

Following Dechow et al. (2011, p. 60) from this predicted value, MISST, the variable ERROR PROBABILITY is calculated as in formula (4):

$$ERROR\ PROBABILITY = \frac{e^{(MISST)}}{(1 + e^{(MISST)})} \quad (4)$$

Regarding our hypothesis H1b, we supplement the dependent variable ERROR PROBABILITY by adding interaction time effects (TIME), reflecting investors' learning process. We operationalize the time effect in two alternative ways: First, the variable TIME equals the number of days the market learned from the FREP's actions, starting from the first error finding in 2005 as a baseline and counting the days up to the respective error announcement. Second, as a robustness test, we proxy the time effect by counting the number of announcements of the FREP up to the respective error finding (i.e., ANNOUCEMENTS COUNT) to factor in the non-linear distribution of error announcement publications.

Control Variables

To enhance the explanatory power and avoid variable bias, we control for numerous factors that could influence the market reaction to error announcements in our models presented

[5] The original model also includes a firm's willingness to cooperate with the FREP. As this information does not stem from public sources, we exclude it from our calculation. This is in line with the objective of this study, namely to analyze the impact of the error probability estimated by an external investor.

in the equations (1) and (2).[6] First, we control for the magnitude of the errors (ERROR SEVERITY). We measure ERROR SEVERITY by aggregating three variables using Principal Components Analysis (PCA). We measure severity by the errors' impact on the annual net profit and the impact on other comprehensive income (OCI), both scaled by total assets of the fiscal year prior to the error announcement. In addition, similar to the approach of Hitz et al. (2012), we take the number of errors into account as displayed in the error announcement. BAFIN is a binary variable taking the value of 1, if the BaFin was involved. It serves as a proxy for a firm's willingness to cooperate voluntarily. Additionally, to capture the effect of the timeliness of the error finding, we control for the number of days between the balance sheet date of the erroneous financial statement and the respective error announcement of a firm (TIMELAG). LISTING YEARS represents the number of years a firm had been listed on the stock market at the time of its error finding and refers to a firm's experience with accounting issues.

Other control variables are SIZE, which we measure as the natural logarithm of market capitalization (in a million Euros). We also assume that companies with a high OWNERSHIP concentration react less profoundly to the adverse disclosure, as company insiders already have access to more information. This is measured by the proportion of closely held shares in the previous year of the error disclosure. We measure stock LIQUIDITY by the proportion of non-zero return trading days in the year of announcement. We capture a day as "non-trading" whenever the stock price did not change from one day to another. We further capture the portion of unexpected firm earnings that could influence market reaction by creating the variable EPS_SURPRISE as a difference between forecasted and realized earnings per share. The forecasted earnings per share are created by an aggregate of different analyst forecasts provided

[6] For some variables, e.g., earnings management, we do not additionally control, as they are already contained within the variable of ERROR PROBABILITY. We do not deem it useful to further inflate our regression model by double capturing several variables.

by the I/B/E/S database. We use the firm's beta (COM_BETA) as a proxy to measure the systemic risk of a firm's equity compared to the overall market to control for different risk profiles and differences in the cost of capital between firms. To make sure that our results are not primarily driven by the market turbulence during the financial crisis in 2007 and 2008 that saw heightened general stock volatility (Schwert, 2011) as well as the Covid-19 pandemic in 2020, we create a dummy variable (CRISIS_DUMMY) to capture the effects that can be attributed to these three years. Additionally, we include two variables to capture the general economic situation during the error announcements and control for the effects attributed to the different business cycle stages that potentially influence investors' market reaction. BND_1Y is used as a proxy for the risk-free rate measured by the 1-year German government bond yield, while GDP_GROWTH is the annual growth rate of the German gross domestic product measured conventionally by a combination of labor force, capital and factor productivity growth.

IV. EMPIRICAL RESULTS

Descriptive Results

Table 3, Panel A presents the descriptive statistics of the independent variables for all observations of the multivariate regression model. On average, an error announcement consists of 3.4 single errors. The average impact of errors on OCI (Other Comprehensive Income) is -2.9% of the total assets of the fiscal year prior to the error announcement, whereas the average impact of errors on the annual net profit is -2.3% compared to the total assets of the fiscal year prior to the error announcement. Furthermore, 20.7% of the investigations were forwarded to the BaFin. The time period between the balance sheet day of the misstatement and the error announcement is almost two years (709 days) on average. The error probability has a mean of 14.7%, with a lower quartile of 4.4% and an upper quartile of 19.3%.

Panel B of Table 3 displays a pairwise correlation matrix for both Pearson's and Spearman's measures. Our variable of interest shows no moderate or strong correlation with any of the control variables in both measures. For our control variables, we find a strong Spearman correlation between SIZE and LIQUIDITY and a strong negative Spearman correlation for LIQUIDITY and our variable that measures the unexpected part of the earnings per share of a firm (EPS SURPRISE). Since the BaFin usually takes over the investigations when the firm refuses to cooperate with the FREP, it is not surprising that our variable BAFIN is positively correlated with the variable TIMELAG. As expected, we find a strong positive correlation between our proxy for the risk-free interest rate (BND 1Y) and our CRISIS DUMMY that captures the impact of the Covid-19 pandemic in 2020, as well as the financial crisis in 2008 and 2007. The latter are characterized by sharply rising government bond yield spreads (Antonakakis and Vergos, 2013). Aside from the correlations mentioned, the other connotations are below the threshold of 0.5, so collinearity is not deemed a concern for our data set.

< Insert table 3 about here.>

Univariate Results: Market Reaction Findings

Table 4 depicts the results of the market reactions upon error announcements for the three different event windows [0; 0, 1; 0, 2]. Panel A shows the results for the (cumulative) abnormal returns (CAR) and Panel B for the (cumulative) abnormal volatilities (CAV).

<Insert table 4 about here.>

First, we examine whether there is an adverse market reaction upon error announcements. Focusing on Panel A consistent with the general results of Hitz et al. (2012), we find weak significant cumulative abnormal returns around the date of the error announcement. CARs are negative with a mean of -1.01% on the event day on the 5% level for

the conventional t-test and the 1% level for the Corrado Rank test.[7] The two-day window [0; 1] shows on average cumulative abnormal returns of -0.86% with a 0.1 significance level for the Patell test and a 0.05 significance level for the Corrado Rank test. For the three-days window [0; 2], we find average cumulative abnormal returns of -0.84% with a Corrado Rank test on the 10% level.

Focusing on the (cumulative) abnormal volatilities (CAV) in Panel B, the CAVs are on average positive for all three event windows with a mean of 9.17% for the event day, hinting at an increasing trading frequency to error announcements. The positive effect remains in the latter event windows. Both, the conventional t-test and the Patell test, show that these results are significant at the 1% level for all of the three event windows. In sum, these results confirm that there is indeed an adverse market reaction to the error announcements. However, – on average – abnormal capital market reaction is with - 1% on the event day rather weak. For some error announcements of our sample, we find hardly any (adverse) market response, which is also demonstrated by the sign test of our event study. For instance, 28 of our observations (total sample: 82) do not exhibit a negative abnormal return on the event day [0]. This supports our reasoning that investors have already expected error announcements for some firms and are, thus, not surprised when those announcements actually occur.

Overall, we attribute this weak response to the assumption that not all error announcements came as a surprise to the investor, hence, representing *no actual* new information and consequently leading to an only weak market reaction. We take this as a first indication that the capital market reaction is influenced by investors' anticipation of errors based on similar characteristics of misreporting firms, which will be next analyzed in the multivariate context.

[7] We consider the results for the event day [0] as the most relevant since the standardized publication mechanism of error announcement allows us to determine when the information is available for the market unambiguously.

Multivariate Regression Findings

The market reaction to the new information provided by an error announcement should be primarily concentrated on the respective announcement day, the day when the error announcement has actually been published in the Federal Gazette (i.e., our event day [0]). In the following, we concentrate our descriptions of the results on the event day [0].[8]

<Insert table 5 about here.>

Table 5 displays the results of the multivariate regression analyses. To generally illustrate the importance of integrating time effects, we first show the regressions for our model 1 without the time effect in panel A and panel B, as it is state of the art in current research (e.g., Hitz et al., 2012). Particularly, we consider ERROR PROBABILITY and all our control variables to test the impact of the ERROR PROBABILITY on capital market reaction as posited in hypothesis H1a. In this model, our variable of interest ERROR PROBABILITY has a negative impact on abnormal returns, which is significant on the 10% level (Panel A). This supports our hypothesis H1a, even though a significant impact of the ERROR PROBABILITY on abnormal volatility cannot be determined (Panel B). In terms of control variables, we observe a highly significant effect ($p<0.01$) of SIZE on abnormal returns on the event day. Furthermore, TIMELAG possesses a significantly negative effect ($p<0.1$) on the abnormal returns hinting that investors interpret a longer time period between the balance sheet day and the error announcement as a lack of willingness to cooperate with the enforcement institution. For our regression model that examines the determinants for abnormal volatilities (Panel B), SIZE and LEVERAGE, however, lose all significance.

In contrast to previous studies (Hitz et al., 2012), we find no empirical support that ERROR SEVERITY has a significantly negative effect on abnormal returns (Panel A) or a

[8] Table 5 shows the abnormal returns for the event day. However, with regard to our hypotheses results remain mostly stable for the two-day event window [0; 1] and the three-day event window [0; 2].

significantly positive effect on abnormal trading volume (Panel B).[9] This might be explained by differences in the observation periods. Whereas Hitz et al. (2012) focus on a time period between 2005 and 2009, we investigate the years from 2005 to 2021.

With respect to our model (2) (Panel C and Panel D), we now add an interaction term to measure the effect of error probability over time (TIME#ERROR PROBABILITY). This enables us to additionally analyze whether investors learn about characteristics of misreporting firms over time and to test our hypothesis H1b. Overall, the time effect mainly contributes to the quality of the models. Whereat R-squared equals 24.22% (15.87%) in the model without time effect presented in Panel A (Panel B), R-squared increases to 29.27% (22.27%) when time effects are considered in Panel C (Panel D). The rising explanatory power of our model (2) emphasizes the necessity of including the time dimension when investigating capital market reactions to error announcements. Again, our variable of interest ERROR PROBABILITY has a significant negative impact on abnormal returns (Panel C), which is highly significant on the 10% level and on the 1% level, respectively. This supports our hypothesis H1a, even though a significant impact of the error probability on abnormal volatility cannot be determined (Panel D).

Focusing on the time-varying effect "TIME#ERROR PROBABILITY" predicted in H1b, we find a significant effect at the 5% level for both abnormal returns and abnormal volatilities, meaning that the positive (negative) effect on the abnormal returns (volatilities) by a higher ERROR PROBABILITY becomes more pronounced over time. More precisely, the positive impact of "TIME#ERROR PROBABILITY" on abnormal returns illustrates that market reactions to error announcements become less severe over time for those firms with a high error probability. Focusing on volatility, investors' expectation of an error announcement

[9] Additionally, we find similarly no significant results for the individual components of ERROR SEVERITY (i.e., (1) number of errors, (2) impact on profit and (3) impact on OCI). While our main effect regarding the influence of error probability on abnormal returns remains unchanged.

leads to a negative impact on trading volume over time, meaning that investors over time sell shares less often when they have already expected an error announcement for the respective firm. Overall, these results strongly support hypothesis H1b and suggest that the capital market has gradually learnt the characteristics of firms with a higher error probability. Thus, as the market has already priced in the low accounting quality in the share prices for those firms, the market reaction is generally weaker when the enforcer reveals its error findings.

Regarding our control variables, the results in the multivariate regression model with abnormal returns as the dependent variable and including time effects of ERROR PROBABILITY (Panel C) are largely consistent with our findings in Panel A as here again SIZE and TIMELAG are significant. Regarding abnormal volatility, in the model depicted in Panel D, the variable OWNERSHIP gains significance compared to the model without time effects (Panel B).

Additional Analysis

We perform three additional analyses to test the robustness of our results with respect to investors' learning over time. First, we use an alternative operationalization for the time effect. So far, we proxied the learning process of investors based on the number of days between the first error announcement in 2005 and the error announcement of our respective observation (TIME). Now, we operationalize the time effect based on the number of error announcements prior to respective error announcements (ANNOUCEMENTS COUNT). In this way, the alternative operationalization of the time effect reflects the exact quantity of error announcements, from which the capital market was able to learn and to adapt its heuristics. Results of this alternative model are in line with our former findings (see Table 5, Panel E and F). The time-varying effect of ERROR PROBABILITY – this time depicted by the number of previous error announcements – is again significant at the 5% level for abnormal returns and significant at the 10% level for abnormal volatilities. Focusing on the main effect of ERROR

PROBABILITY abnormal returns remain highly significant at the 1% level (Panel E), while we find – again – no significant main effect of error probability on abnormal volatilities (Panel F).

Second, to further illustrate the interaction between an adverse market reaction upon error announcements and the probability of an erroneous financial statement over time, we capture the effect on our dependent variables for firms with different error probabilities. We do this by increasing our independent variable TIME (measured by days) by one unit while keeping all other independent variables at observed values, i.e., we consider the marginal effect. In Table 6, the marginal effects of the time variable on the abnormal returns (Panel A) and abnormal volatilities (Panel B) for firms with different error probabilities are displayed. As postulated by hypothesis H1b, Table 6 Panel A (Panel B) shows a clear relationship between the positive (negative) marginal effects on abnormal returns (volatilities) over time on the one hand and the error probability of a firm on the other hand. More precisely, a positive (negative) change of abnormal returns (volatilities) from the mean is most profound for firms with a higher probability of errors in their financial statements. For firms with an error probability of 90% there is the strongest positive (negative) marginal effect on abnormal returns (volatilities) over time with a coefficient of 0.075 (-0.247), which additionally is statistically significant at the 5% level. This means that the abnormal rate of return for companies with a high error probability is significantly lower than the average abnormal rate of return, i.e., there is a less negative capital market reaction for firms with a high error probability compared to the average market reaction. In contrast, for firms with a low error probability of 0% the change in abnormal returns (volatilities) over time is negative (positive) with a coefficient of -0.024 (0.13) and is highly significantly different from zero ($p<0.01$ for returns; $p>0.05$ for volatilities). Thus, the most pronounced difference to the average abnormal capital market reaction exists for firms with

lower error probabilities, i.e., when the capital market is most surprised by an error announcement.

<Insert table 6 about here.>

Third, we compute the predictive margins by specifying our variable of interest ERROR PROBABILITY and our continuous TIME variable at low, average and high values while keeping all other independent variables at observed values. To do this, we transform our observation period from the first error announcement, when the enforcement institutions started to review the firm's financial statements, to the last error announcement of our sample into the absolute amount of days (4807 days). Then, we set our specific error probabilities to 5% and 15%, corresponding approximately to our lower and upper quantile of the error probability of our whole sample. We then compare the respective abnormal returns (volatilities) with our entire sample's abnormal return (volatility). The results of these predictive margins are graphically depicted in Figure 1 for the abnormal returns and Figure 2 for the abnormal volatilities. For a better overview, only the slopes at three different points in time (i.e., 377 days, 1714 days and 4807 days after the first error announcement of the enforcement system) for our two error probabilities of 5% and 15% are presented. The graphics underline our reasoning that a lower error probability derives in more negative (more positive) abnormal returns (abnormal volatilities) compared to the average capital market reaction after an error announcement and that these effects accelerate over time: Focusing on abnormal returns the gradient is steeper (in a negative direction) for firms with a lower error probability (5%) while the slope is less steep as the probability of an error increases (15%). For abnormal volatilities, Figure 2 provides similar results, with a steeper (positive) gradient for firms with a lower error probability, which indicates that trading was higher then. These illustrations support our prior findings that the magnitude of the adverse market reaction is not only determined by the probability of an error

but also by the time variable. Thus, time is a critical component when analyzing market reactions upon error announcements.

< Insert Figure 1 and Figure 2 about here.>

V. CONCLUSION

This paper shows how investors learn about the characteristics of misreporting firms from error announcements issued by an enforcement institution over time. Building on Fama's (1970) theory of efficient capital markets and Lo's (2004) theory of adaptive markets, we provide empirical evidence that capital markets learn over time how to estimate and anticipate financial reporting quality. First, we show that a lower ex-ante error probability is associated with a higher investor surprise. More explicitly, an error announcement leads to a more profound adverse market reaction when investors did not expect an erroneous annual report and vice versa. Second, and more importantly, we find a highly significant time-varying effect of error probability, suggesting the capital market has taken some time to learn to anticipate (low) reporting quality. Over the last years, the FREP has published a growing number of error findings. These ongoing publications allow investors to learn about the characteristics of misreporting firms over time. Overall, our results confirm our hypotheses that (1) error probability impacts investors' market reaction to error announcements and (2) that investors are subject to an adaptive learning process to distinguish firms with a higher error probability from those with a lower error probability.

In an enforcement context, our study adds to the understanding how the 'name and shame' mechanism of an enforcement system works over time. Explicitly, one could argue that this mechanism has lost its effectiveness over time as in some cases no abnormal (or only mild) capital market reactions were observable upon error announcements so that the work of an enforcement institution may be seen to have become meaningless to investors. Our study, in contrast, reveals that investors' reactions to error announcements depend on their prior

assumptions about the error probability of a firm. Moreover, our results provide evidence that investors actively use and rely on the work of enforcement institutions to adjust their own expectations with regard to the evaluation of a firm's financial reporting quality. Thus, these error announcements are not just a sanctioning tool to penalize misreporting firms but are also a mechanism that enables the capital market to actually learn about reporting quality. Indeed, only ongoing error announcements by enforcement institutions enable investors to keep their estimated error probabilities up to date. Thus, overall error announcements by enforcement institutions constitute a value-relevant information for markets as they enable investors to make more comprehensive investment decisions by anticipating erroneous financial reports and identifying firms with low financial reporting quality. In a broader context, we can provide empirical evidence for analytical models on how investors learn over time and may thus anticipate new information in their investment decisions.

Despite careful efforts to ensure robustness, our study must nevertheless acknowledge some limitations. First, even though we have checked extensively for confounding events, previous information leakage cannot be ruled out. Second, even though we control for various firm-specific and economic issues, there might still be several other unobservable factors on which investors base their investment decisions. Third, even though the composition of the ERROR PROBABILITY model considers four main domains that are attributed to accounting quality in acknowledged research, there might be further aspects investors rely on to adjust their heuristics about reporting quality. Especially, one must keep in mind that investors have personal preferences and will weigh these potential "low quality" characteristics differently and consider them beyond their individual risk aversion. Finally, the study was carried out on the German market: The quality of financial reporting is, i.a., determined by country-specific parameters such as governance systems, degree of investor protection, litigation environment or the enforcement mechanism in place (Holthausen, 2009; Leuz et al., 2003). Thus, the results

of this paper may not be transferable to publicly traded companies in other countries. For example, the SEC does not solely rely on the 'name and shame' mechanism but instead imposes additional monetary injunctive sanctions on infringing firms that might explain the stronger adverse market reactions upon error announcements in the US setting. However, the underlying learning and adaption process of accounting-related information should not be impeded by the additional penalties and, therefore, still be applicable to this different setting. The incentive for investors to anticipate errors in firms' financial statements and, thus, to identify firms possessing low accounting quality should indeed not be subject to the design of the specific sanction mechanism. On the contrary, the incentive for all investors should be to improve their decision-making.

APPENDIX

Table 1. Examinations completed and error announcements by the enforcement bodies

	Calendar year																	
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	**TOTAL**	[Prop.]
Examinations by the FREP																		
Total	7	109	135	138	118	118	110	113	110	104	81	96	99	84	86	74	**1582**	[100%]
Random Sampling	4	98	118	118	103	106	90	110	98	99	71	87	91	80	79	67	**1419**	[89.7%]
Indication based	3	10	15	19	14	8	6	2	6	3	6	7	3	3	6	3	**114**	[7.2%]
At mandatory request of BaFin	0	1	2	1	1	1	0	14	1	6	2	4	5	1	1	4	**44**	[2.8%]
Error announcements																		
Total	2	19	35	37	23	31	27	18	14	10	8	13	13	13	17	11	**291**	[18.4%]
Proportion	28,6%	17,4%	25,9%	26,8%	19,5%	26,3%	24,5%	15,9%	12,7%	9,6%	9,9%	13,5%	13,1%	15,5%	19,8%	14,9%		

Notes: This table displays the number of examinations and error findings as reported in the FREP's annual activity reports (FREP, 2005-2020). Error announcements are disclosed timely delayed and therefore do not regularly correspond with investigations completed in the respective calendar year. At the present time of this paper draft, this kind of data is not yet available for calendar year 2021.

Table 2. Definitions of variables and data source

	Definition	Data Source
Dependent variable		
Cumulative abnormal returns	Calculated with the stock-specific market model (MacKinlay, 1997) using an equally weighted portfolio of all publicly traded German firms, as well as an estimation window of 150 trading days prior to the beginning of the event windows ([0], [0;1], [0;2]).	Datastream
Cumulative abnormal volatilities	Abnormal stock volatility is characterized as the difference between the observed stock volatility at the event window and the respective expectation based on an average value of 150 days before the event window.	Datastream
Variable of interest		
ERROR PROBABILITY	Calculated using the estimation model of Pasch (2017, p. 32-35).	Handcollected and Datastream
Controls		
Components of ERROR SEVERITY	An aggregated measure by Principal Components Analysis, including number of errors, the impact on net profit and the impact on OCI.	Handcollected
Number of errors	The number of single errors within an error announcement.	Handcollected
Impact on net profit	The impact of errors on the annual net profit scaled by total assets of the year prior to the misstatement.	Handcollected
Impact on OCI	The impact of errors on the Other Comprehensive Income (OCI) scaled by total assets of the year prior to the misstatement.	Handcollected
TIME	The number of days between the first published error finding in 2005 and the respective error announcement of a firm.	Handcollected
ANNOUCEMENTS COUNT	The quantity of error announcements disclosed by the FREP starting from the first published error finding in 2005 and the respective error announcement of a firm.	Handcollected

SIZE	The natural logarithm of market capitalization at the beginning of the year of the error finding.	Datastream
TIMELAG	The number of days between the balance sheet date of the erroneous financial statement and the respective error announcement of a firm.	Handcollected
LIQUIDITY	The proportion of non-zero return trading days over the calendar year of the error finding.	Datastream
BAFIN	A dummy variable coded 1 if the BaFin has conducted the investigation; 0 otherwise.	Handcollected
LISTING YEARS	The number of years the company has been listed on the stock market at the time of the error announcement.	Handcollected
OWNERSHIP	The proportion of closely held shares at the end of the year prior to the error finding.	Datastream
EPS SURPRISE	The difference between forecasted and realized earnings per share. The forecasted earnings per share are created by an aggregate of different analyst forecasts provided by the I/B/E/S database accessed via Datastream.	Datastream
COM BETA	Measure of the systemic risk of a firm's equity compared to the overall market via regression of the firm's return against the market return.	Datastream
BND 1Y	Used as a proxy for the risk-free rate measured by the 1-year German government bond yield.	Datastream
CRISIS DUMMY	A dummy variable to capture the effects of the financial crisis of 2007-2008 and the Covid-19 pandemic in 2020. Coded 1 if the year of the error announcement is 2007, 2008 or 2020, and 0 otherwise.	Handcollected
GDP GROWTH	Annual growth rate of the German gross domestic product measured conventionally by a combination of labor force, capital and factor productivity growth.	Datastream

Notes: This table provides variable definitions for all variables as used in our regression analyses.

Table 3. Descriptive statistics and correlations

Panel A: Descriptive statistics	Mean [Prop.]	Standard deviation	Lower Quartile	Median	Upper Quartile	Number of observations
ERROR PROBABILITY	0.147	0.152	0.044	0.0997	0.193	82
Components of ERROR SEVERITY						
Number of errors	3.39	2.827	1.00	2.00	4.00	82
Impact on net profit	-0.023	0.109	-0.015	0.000	0.000	82
Impact on OCI	-0.029	0.126	-0.005	0.000	0.000	82
BAFIN	[0.207]					82
LISTING YEARS	17.805	13.798	10.00	14.00	20.00	82
SIZE	12.015	2.063	10.587	11.920	13.340	82
TIMELAG	709.05	270.78	512.00	620.00	845.00	82
OWNERSHIP	0.465	0.266	0.250	0.488	0.696	82
LIQUIDITY	0.859	0.139	0.808	0.908	0.962	82
EPS_SURPRISE	0.708	13.091	-0.277	0.000	0.298	82
COM BETA	0.794	0.563	0.503	0.729	1.00	82
CRISIS_DUMMY	[0.268]					82
BND_1Y	1.365	1.89	-0.247	0.754	3.782	82
GDP_GROWTH	1.532	2.901	0.816	2.180	3.500	82

Note: Table 3 continues on the next page.

Panel B: Correlations

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
ERROR PROBABILITY	(1)		0.06	-0.22	-0.22	-0.01	-0.08	-0.01	-0.06	0.03	0.03	0.09	0.03	0.04
ERROR SEVERITY	(2)	0.05		-0.12	-0.18	-0.05	-0.20	0.00	0.06	0.16	0.04	0.13	0.02	0.02
SIZE	(3)	-0.15	-0.12		**0.62**	0.22	0.10	0.05	-0.19	0.24	0.15	0.15	0.09	-0.02
LIQUIDITY	(4)	-0.06	-0.10	0.41		-0.03	0.03	-0.31	**-0.51**	0.29	-0.12	-0.18	0.02	-0.01
BAFIN	(5)	-0.07	-0.07	0.26	-0.12		0.04	-0.02	0.10	-0.03	-0.11	-0.04	0.49	0.00
LISTING YEARS	(6)	-0.15	0.16	0.15	-0.15	-0.01		0.31	0.24	-0.29	-0.28	-0.40	0.17	0.02
OWNERSHIP	(7)	-0.05	-0.02	0.06	-0.36	-0.02	0.23		0.19	-0.29	-0.12	0.05	0.12	0.10
EPS SURPRISE	(8)	-0.03	0.02	-0.11	-0.46	0.01	0.31	0.25		-0.28	0.15	0.14	0.12	-0.09
COM_BETA	(9)	0.02	0.17	0.27	0.34	-0.04	-0.16	-0.27	-0.25		0.06	0.12	0.02	-0.09
CRISIS DUMMY	(10)	0.11	0.15	0.15	-0.14	-0.11	-0.13	-0.12	-0.12	0.11		**0.77**	-0.08	0.04
BND_1Y	(11)	0.22	0.21	0.13	-0.19	-0.09	-0.18	-0.06	-0.04	0.15	**0.89**		-0.23	0.18
TIMELAG	(12)	-0.07	0.01	0.09	-0.03	**0.59**	0.02	0.12	0.00	-0.04	-0.14	-0.24		-0.26
GDP_GROWTH	(13)	0.05	-0.17	0.03	-0.09	-0.07	0.07	-0.03	0.04	-0.15	0.19	0.16	-0.26	

Notes: Panel A illustrates descriptive statistics and Panel B shows Pearson (below the diagonal) and Spearman correlations (above the diagonal) for all independent variables included in the multivariate regressions. In Panel B, numbers in bold indicate a correlation above 0,5. Variables are defined in Table 2 and Section 4 of this paper.

Table 4. Capital market reactions upon error announcements

Panel A

	TOTAL (Cumulative) abnormal **returns** (in %)		
Event Window	**[0]**	**[0; 1]**	**[0; 2]**
Mean	-1.01	-0.86	-0.84
(t-statistic)	(-2.3981)**	(-1.4519)	(-1.1604)
Patell-Z	-2.067**	-1.8362*	-1.1685
Corrado Rank Test	-2.8539***	-2.4205**	-1.8247*
Sign Test	-2.1814**	-1.2954	-1.0739
Pos : Neg	28 : 54	32 : 50	33 : 49
Observations	82	82	82

Panel B

	TOTAL (Cumulative) abnormal **volatilities** (in %)		
Event Window	**[0]**	**[0; 1]**	**[0; 2]**
Mean	9.17	19.77	29.59
(t-statistic)	(3.4575)***	(5.2693)***	(6.4406)***
Patell-Z	3.6701***	5.5223***	6.7959***
Corrado Rank Test	1.7941*	2.9957***	3.7387***
Sign Test	1.7345*	2.1806**	1.5114
Pos : Neg	43 : 39	45 : 37	42 : 40
Observations	82	82	82

Notes: This table shows descriptive statistics for (cumulative) abnormal returns (CARs) and (cumulative) abnormal volatilities (CAV) upon error announcements of our sample until May 2021. Statistics are provided for the event day [0] as well as for the two-day [0;1], three-day [0;2] window following the event day of the error announcement in the Federal Gazette. *, **, and *** indicate two-tailed significance at the 10%, 5%, and 1% level, respectively.

Table 5: Multivariate Regression				
	Panel A: Abnormal returns excluding the time effect		*Panel B: Abnormal volatilities excluding the time effect*	
	Eventday [0]		Eventday [0]	
Variables	Coef.	t-stat.	Coef.	t-stat.
Intercept	-0.01200	(-0.28)	0.07603	(0.21)
Variable of Interest				
ERROR PROBABILITY	0.06205*	(1.98)	0.00682	(0.03)
Control Variables				
ERROR SEVERITY	0.00078	(0.16)	-0.03815	(-0.94)
SIZE	0.00851***	(2.73)	-0.03506	(-1.33)
TIMELAG	-0.00005*	(-1.96)	0.00009	(0.45)
LIQUIDITY	-0.06099	(-1.21)	0.29800	(0.70)
BAFIN	-0.01103	(-0.68)	-0.10323	(-0.75)
LISTING YEARS	-0.00019	(-0.53)	-0.00169	(-0.55)
OWNERSHIP	-0.00022	(-1.06)	0.00290	(1.64)
EPS SURPRISE	-0.00006	(-0.15)	0.00405	(1.16)
COM BETA	-0.00356	(-0.39)	0.02046	(0.26)
CRISIS DUMMY	-0.01562	(-0.61)	0.10741	(0.49)
BND 1Y	0.00174	(0.28)	-0.03408	(-0.64)
GDP GROWTH	-0.00242	(-1.45)	0.02007	(1.42)
R^2	0.24220		0.15870	
F-statistic	1.67158		0.9865209	
Number of observations	82		82	

Note: Table 5 continues on the next page.

	Panel C: Abnormal returns including the time effect (TIME)		*Panel D: Abnormal volatilities including the time effect (TIME)*	
	Eventday [0]		Eventday [0]	
Variables	Coef.	t-stat.	Coef.	t-stat.
Intercept	0.00707	(-0.17)	0.07603	(0.01)
Variable of Interest				
ERROR PROBABILITY	0.11101***	(2.91)	-0.43506	(-1.35)
Interaction effect				
TIME # ERROR PROBABILITY	0.00006**	(2.14)	-0.00050**	(-2.18)
Control Variables				
TIME	0.00000	(0.14)	0.00002	(0.31)
ERROR SEVERITY	0.00035	(0.08)	-0.03615	(-0.91)
SIZE	0.00843***	(2.76)	-0.03447	(-1.34)
TIMELAG	-0.00004*	(-1.93)	0.00007	(0.34)
LIQUIDITY	-0.06715	(-1.34)	0.32315	(0.76)
BAFIN	-0.01302	(-0.81)	-0.07755	(-0.57)
LISTING YEARS	-0.00015	(-0.41)	-0.00230	(-0.75)
OWNERSHIP	-0.00029	(-1.38)	0.00354**	(2.02)
EPS SURPRISE	-0.00008	(-0.19)	0.00396	(1.15)
COM BETA	-0.00219	(-0.24)	0.00831	(0.11)
CRISIS DUMMY	-0.02312	(-0.72)	0.09853	(0.36)
BND 1Y	0.00323	(0.29)	-0.01103	(-0.12)
GDP GROWTH	-0.00213	(-1.21)	0.01512	(1.02)
R^2	0.2927		0.2227	
F-statistic	1.820665		1.260302	
Number of observations	82		82	

Note: Table 5 continues on the next page.

	Panel E: Abnormal returns including the time effect (ANNOUNCEMENTS COUNT)		*Panel F: Abnormal volatilities including the time effect (ANNOUNCEMENTS COUNT)*	
	Eventday [0]		Eventday [0]	
Variables	Coef.	t-stat.	Coef.	t-stat.
Intercept	0.00738	(0.18)	0.01648	(0.05)
Variable of Interest				
ERROR PROBABILITY	0.116523***	(3.09)	-0.34520	(-1.06)
Interaction effect				
ANNOUNCEMENTS COUNT # ERROR PROBABILITY	0.001389**	(2.45)	-0.00867*	(-1.77)
Control Variables				
ANNOUNCEMENTS COUNT	0.00003	(0.12)	0.00052	(0.26)
ERROR SEVERITY	0.000047	(0.01)	-0.03337	(-0.83)
SIZE	0.008854***	(2.92)	-0.03751	(-1.43)
TIMELAG	-0.0000429*	(-1.88)	0.00007	(0.34)
LIQUIDITY	-0.07315	(-1.47)	0.35318	(0.82)
BAFIN	-0.01506	(-0.95)	-0.07711	(-0.56)
LISTING YEARS	-0.00015	(-0.43)	-0.00205	(-0.66)
OWNERSHIP	-0.00031	(-1.53)	0.003489*	(1.95)
EPS SURPRISE	-0.00008	(-0.19)	0.00389	(1.10)
COM BETA	-0.00142	(-0.16)	0.00622	(0.08)
CRISIS DUMMY	-0.02782	(-0.89)	0.13085	(0.49)
BND 1Y	0.00422	(0.34)	-0.01727	(-0.16)
GDP GROWTH	-0.00208	(-1.19)	0.01598	(1.06)
R^2	0.3058		0.1997	
F-statistic	1.937978		1.098066	
Number of observations	82		82	

Note: This table shows results from regressing cumulative abnormal returns (CARs) and cumulative abnormal volatilities (CAVs) of the eventday [0] on our variable of interest and control variables. *, **, and *** indicate two-tailed significance at the 10%, 5%, and 1% level, respectively. Variables are defined in Table 2.

Table 6: Marginal Effects

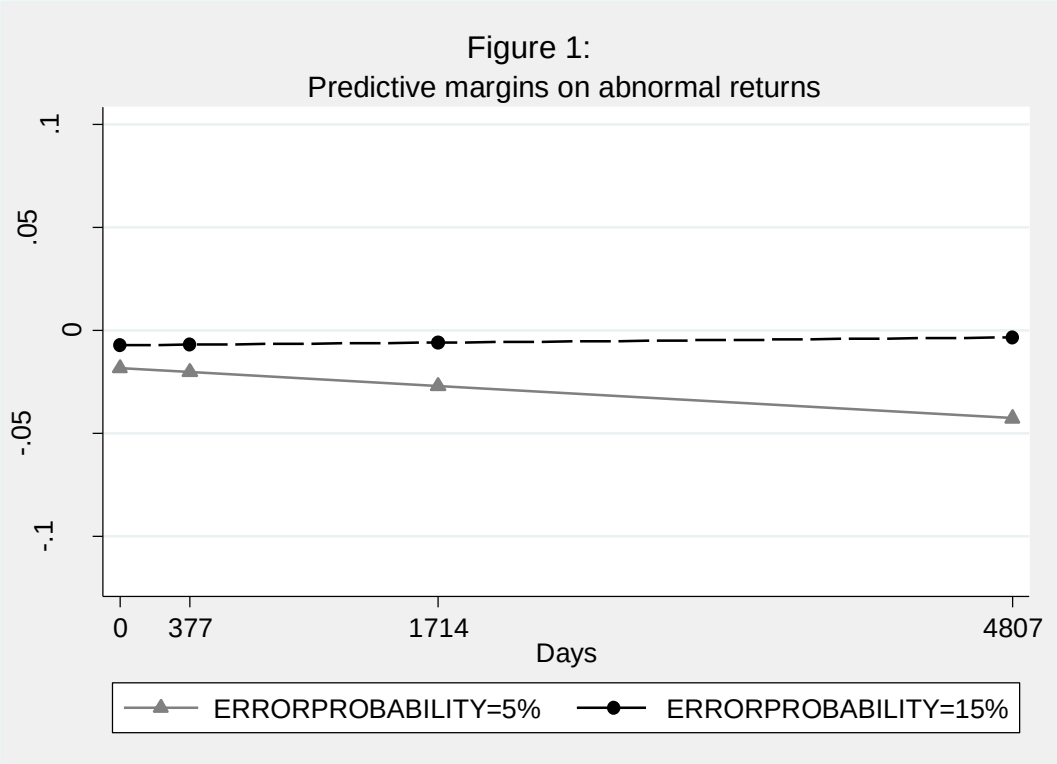
Panel A: Marginal effects on abnormal returns

at	(1) Margins	(2) SE	(3) t-statistics	(4) p-value
ERROR PROBABILITY				
0%	-0.024***	0.007	-3.600	0.001
10%	-0.013***	0.005	-2.810	0.007
20%	-0.002	0.005	-0.350	0.729
30%	0.009	0.008	1.180	0.244
40%	0.020*	0.011	1.810	0.075
50%	0.031**	0.015	2.120	0.038
60%	0.042**	0.018	2.300	0.025
70%	0.053**	0.022	2.410	0.019
80%	0.064**	0.026	2.490	0.015
90%	0.075**	0.029	2.550	0.013
Observations	82			

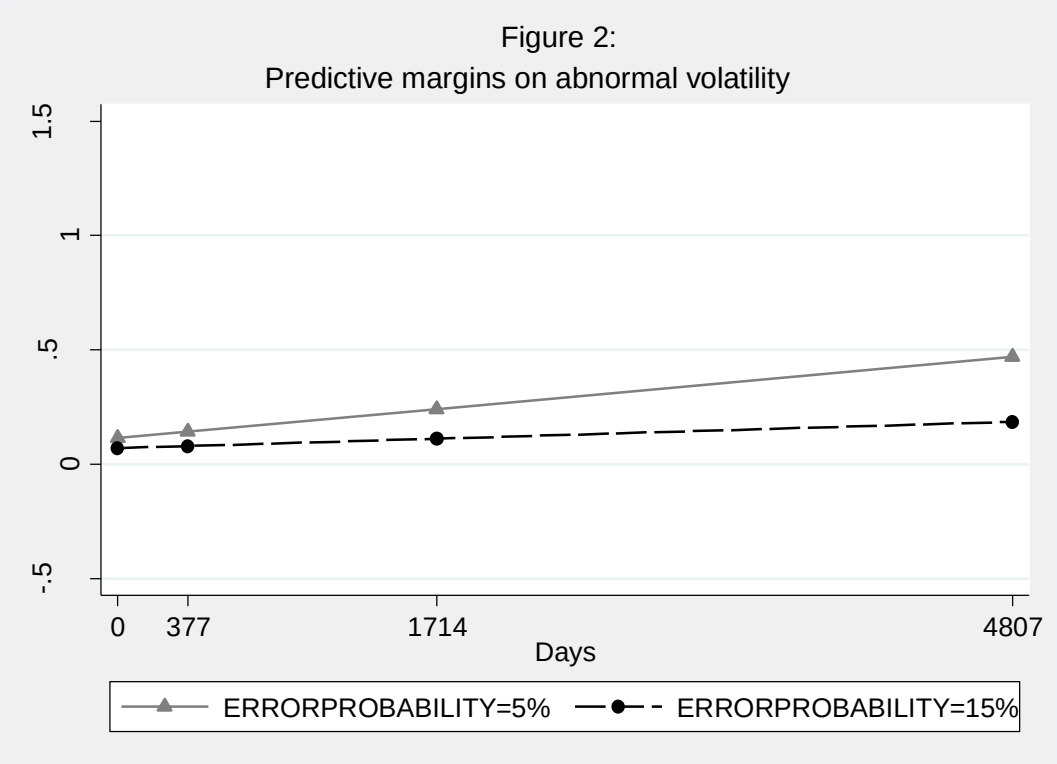
Panel B: Marginal effects on abnormal volatilities

at	(1) Margins	(2) SE	(3) t-statistics	(4) p-value
ERROR PROBABILITY				
0%	0.133**	0.056	2.390	0.022
10%	0.091**	0.038	2.360	0.021
20%	0.048	0.043	1.120	0.269
30%	0.006	0.066	0.090	0.926
40%	-0.036	0.094	-0.390	0.701
50%	-0.078	0.124	-0.630	0.528
60%	-0.121	0.154	-0.780	0.437
70%	-0.163	0.185	-0.880	0.383
80%	-0.205	0.217	-0.950	0.347
90%	-0.247	0.248	-1.000	0.323
Observations	82			

Note: This table shows the marginal effects of our variable of interest on abnormal returns (Panel A) and on abnormal volatilities (Panel B) at different error probabilities. The marginal effect is obtained by increasing our independent variable TIME by one unit while all other independent variables are kept at observed values. *, **, and *** indicate two-tailed significance at the 10%, 5%, and 1% level, respectively. Variables are defined in Table 2.



Note: This Figure displays predictive margins on abnormal returns by specifying our variable of interest ERROR PROBABILITY at 5% and 15% and our continuous TIME variable at low (377 days), average (1714 days) and high (4807 days) values while keeping all other independent variables at observed values.



Note: This figure displays predictive margins on abnormal volatility by specifying our variable of interest ERROR PROBABILITY at 5% and 15% and our continuous TIME variable at low (377 days), average (1714 days) and high (4807 days) values while keeping all other independent variables at observed values.

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IV. The Influence of Director Incentives on Directorship Portfolios

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Own share: 45%

The Influence of Director Incentives on Directorship Portfolios

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ABSTRACT

Due to the changes of the Sarbanes-Oxley Act (SOX) in 2002 to the director labor market, researchers started to examine the interplay of outside directors' incentives (e.g., reputation, risk and workload related concerns) and directors' decision to leave their existing board positions (e.g., Boivie et al. 2012; Masulis and Mobbs 2014; Ormazabal 2018). Besides applying an adjusted relative reputation measure of a specific directorship (by considering all directorships of a director portfolio), we also examine the impact of risk and workload-related incentives on the composition of director portfolios. We show that directors are more likely to relinquish a directorship if the respective firm has a relatively lower reputation than the rest of the portfolio and requires more working hours from the director. Moreover, we analyze the interplay of director incentives and directors accepting additional board seats and leaving existing board seats. Our results show that accepting an additional seat or leaving an existing seat significantly increases the director's reputational growth compared to non-adjusters. We also show that gaining additional directorships leads to more reputational growth than relinquishing a directorship. Furthermore, we show that accepting additional directorships positively impacts reputation growth but does not impact risk and workload incentives. Taking on a firm perspective, we also find a positive association between the average portfolio reputation of all outside directors of a given firm on firm performance.

Keywords: corporate governance, director incentives, reputation, portfolio approach

JEL Classification: G30, G34, K22

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INTRODUCTION

The introduction of the Sarbanes-Oxley Act (SOX) in 2002 reshaped the labor market for outside directors substantially. Enacted by the Securities and Exchange Commission (SEC) as a reaction to fraudulent financial activities by large publicly traded firms like Enron or WorldCom (Ribstein, 2002), SOX mandated firms to – among other things – increased board meetings and minimal levels of independence for their board committees (Chen and Moers, 2018; Linck et al., 2009). In turn, these new corporate governance mandates led to an increased demand for outside directors[1] as firms sought to elevate the number of nominally independent members of their boards to conform with the new regulations. Indeed, the percentage of outside directors and the total number of available independent directorships for boards of S&P 1500 firms remained relatively stable pre-SOX but recorded a substantial rise since the introduction of SOX in 2002 (Chen and Moers 2018). Apart from an increase in the demand for their services, outside directors were also subjected to higher workloads and risks when serving on boards due to a SOX-induced increase of board meetings and changes in the personal liability of directors (Linck et al., 2009).

However, it is unclear how outside directors manage their portfolio of all existing and potential new directorships to deal with the aforementioned challenges in times of dynamic labor markets. Furthermore, it is unclear what incentivizes outside directors to adjust the composition of their directorship portfolios by accepting additional seats or relinquishing existing seats. Finally, it is unclear how specific director portfolio compositions affect firm decisions and their performance.

Alchian and Demsetz (1972) identify the value of reputation as a credible signal for reliable information in economic transactions. Diamond (1989) formulates a theoretical model

[1] Outside directors (or "independent directors") assume a primarily role as monitors and advisors on the board of directors of firms and are nominally independent from the management (Boyd, 1990).

that postulates the importance for economic agents to maintain their reputation. Fama and Jensen (1983) emphasize the importance of outside directors expanding their reputation to signal their competence as "experts on decision control" for internal and external labor markets. The credibility of such a signal is especially crucial for outside directors as they are generally inside directors of other organizations and thus regularly face complex decision situations (Fama and Jensen, 1983). Following a similar notion, Yermack (2004) outlines that the reputational gain that outside directors acquire through effective monitoring duties can increase their labor market opportunities. Mace (1986) deconstructs the reputational gain from outside directorships into an increased visibility and greater access to wider networks for the respective director.

Consequently, Masulis and Mobbs (2014) show that outside directors factor in these reputational concerns by allocating more time and effort to monitor and advise their more prestigious directorships. They also find that the likelihood of outside directors resigning from their directorships due to poor firm performance is higher for their lower reputation directorships. Hence, a director's relative reputational ranking of all their directorships is incorporated when adjusting their directorship portfolio. In this context, Fahlenbrach et al. (2017) and Gao et al. (2017) provide evidence that outside directors potentially anticipate weak stock and operating performance or financial fraud by resigning from the affected directorships to protect their reputational capital.

In a similar vein, Ormazabal (2018) shows that directors are more likely to depart from their "riskiest" directorship after the financial crisis in 2008 since their riskiest directorships possess the largest potential for adverse events that could harm their reputation. Lastly, Boivie et al. (2012) find that higher workload increases directors' tendency to relinquish a board seat. Thus, there is ample evidence in the literature that reputational, risk and workload concerns influence outside directors in their decision to relinquish existing directorships. However, it remains to be determined whether and to what extent reputational, risk and workload-related

incentives influence the composition of directorship portfolios of outside directors. This is where our study aims to provide additional insight.

First, we analyze the effect of the different incentives on a director's decision to relinquish a directorship. We borrow from the reputation hypothesis by Fama and Jensen (1983) that postulates that the primary incentive for outside directors is establishing, expanding and preserving their personal reputational capital. Therefore, we calculate relative incentive measures by comparing a director's firm to all other firms in the director's portfolio. We use a sample containing 22,460 outside directors serving on boards of 11,347 firms between 1999 and 2019. We find that directors are more likely to relinquish a directorship if the respective firm has a relatively lower reputation than the rest of his portfolio and requires more working hours from the director.

Second, prior literature largely focuses on director decisions to exit a board. Ghannam et al. (2019) assume that directors are also likely consider a portfolio of incentives when joining a firm. However, the decision to join a board and its consequences have not been studied yet. Thus, we investigate how changes in a director portfolio (by gaining an additional seat or leaving an existing seat) impact director incentives compared to directors who do not change their directorship portfolio composition. In case of accepting another directorship, we assume that a potential negative impact of a decrease in monitoring efficacy due to increased workload (Bar-Hava et al., 2020) is outweighed by two positive aspects: (1) nomination boards could tend to select more successful directors in the first place (Booth and Deli, 1996; Brickley et al., 1999), and (2) directors could gain additional information and expertise by holding multiple directorships.

We predict that directors who relinquish an outside directorship achieve less reputation growth than directors who accept additional directorships without exiting an existing directorship. Here we argue that the potential information and expertise synergies are lost when a directorship is relinquished. We use a generalized difference-in-difference design to compare

directors who gained (relinquished) a directorship with directors who do not adjust their directorship portfolio. We find that adjusting a director's portfolio increases the director's reputational growth significantly compared to non-adjusters. Our results show that gaining additional directorships leads to more reputational growth than relinquishing directorships. Moreover, we show that accepting additional directorships has a positive impact on reputation growth, but not on the risk and workload incentive.

Lastly, taking on a firm perspective, we investigate the effect of average portfolio characteristics of all outside directors serving on a board on firm outcomes. We find that a higher average portfolio reputation of independent board members is associated with better firm performance. Furthermore, we observe that a higher average risk level in the portfolios of outside directors is positively associated with increases in earnings management.

Our paper contributes in several ways. First, we investigate if reputational concerns govern the composition of directorship portfolios. Contrary to previous studies (Masulis and Mobbs, 2014; Ormazabal, 2018), we do not limit our investigation to the highest and/or lowest ranked directorship in terms of reputation. Instead, we expand the scope of the investigation to include all directorships of a director's portfolio. Our investigation only pertains to the directorship portfolios of outside directors as inside and grey directors generally possess different reputational incentives that obstruct a direct comparison (Masulis and Mobbs, 2014). Consequently, we distinguish ourselves from previous studies investigating inside and outside directors (Ormazabal, 2018).

Furthermore, we follow previous studies by considering directorship portfolios as a whole (Masulis and Mobbs, 2014; Ormazabal, 2018; Sila et al., 2017). We argue that the reputational incentives of a directorship have to be considered in the context of all other directorships in a directorship portfolio as a director's time and effort is limited and thus necessitating an allocation of a director's attention by implicitly ranking and prioritizing directorships (Masulis and Mobbs, 2014). This is related to Ormazabal (2018), who notes that

investigations in the relative attributes of directorships in a given portfolio, instead of the absolute characteristics of a given directorship, are still marginal in the current empirical literature. Here, we also expand the literature by analyzing the impact of several different relative director incentives (reputation, risk, and workload) conjointly.

We further contribute to the literature regarding the relationship between director reputation and the composition of directorship portfolios by investigating the effect of acquisitions of new directorships and losses of existing directorships on director incentives. To our best knowledge, prior literature largely focuses only on the determinants that lead to decreases in director portfolios. Consequently, we add to the literature by examining the effects of accepting additional directorships on director incentives. By doing so, we examine how effective restructuring directorship portfolios is in terms of increasing a director's reputation over time. Moreover, we find that gaining additional directorships is a better strategy to increase director reputation compared to reducing the number of directorships in a portfolio or not making any changes at all.

Lastly, Sila et al. (2017) investigate outside director's reputational incentives from a firm perspective by examining how the informativeness of stock prices is influenced by the relative reputational ranking of the firm by its outside directors. We expand this research by including several other key incentives (i.e., risk and workload) to examine the effect of directorship portfolio attributes on key firm-specific characteristics like performance and earnings management.

In conclusion, we expand the still marginal literature on the effect of incentives of outside directors (reputation, risk and workload) on the composition of directorship portfolios and the consequences of the attributes of such directorship portfolios for the firms the directors serve. The remainder of the paper is structured as follows. In the following section we derive our hypotheses. Subsquently we present our data and our descriptive statistics, followed by a presentation of our results. Concluding remarks are provided in the final section.

HYPOTHESES DEVELOPMENT

H1 - Director Reputation and Relinquish Decisions

Acquiring additional outside directorships involves – besides financial benefits – increased opportunities in the labor market (Shivdasani, 1993) as a large number of board seats constitutes a signal for a director's competence (Peyer and Perry, 2003). Nevertheless, the number of directorships a director can realistically hold is restricted by time and effort limitations. Outside directors are thus constantly confronted with the decision on how to allocate their time and effort efficiently among their existing directorships to fulfill their monitoring duties (Ferris et al., 2003). Additionally, the same rationale should extend to the decision to depart/retain existing directorships.

Ghannam et al. (2019) argue that outside directors evaluate new and existing directorships based on a variety of incentives. Yermack (2004) identifies the directors' compensation as one of these incentives. Thus, outside directors might structure the composition of their directorship portfolios based on maximizing their financial benefits – i.e., they replace directorships that provide a lower compensation with directorships that provide higher compensation. Ormazabal (2018) provides evidence that risk might be another important determinant for a director to depart or acquire directorships. Specifically, Ormazabal (2018) finds a higher likelihood for outside directors to leave their "riskiest" directorships after the financial crisis. In this sense, the risk of a directorship portfolio might constitute a cost for outside directors that must be maintained at an acceptable level based on institutional and legislative factors and the personal level of risk tolerance.

Fahlenbrach et al. (2010) provide evidence that time and effort constraints govern the decision-making process regarding the composition of directorship portfolios, as directors are interested in limiting their maximum workload. Specifically, they find that outside directors are more likely to depart from a directorship in anticipation of events that would substantially

increase the workload necessary to fulfill their duties serving on the respective boards. However, Ghannam et al. (2019) find that outside directors are more willing to join fraudulent firms despite the increased effort and workload necessary to monitor such firms.

Another incentive for outside directors is personal reputation. The literature widely considers reputational benefits a central motivational factor for outside directors to serve on boards and acquire directorships. For example, Yermack (2004), Fich (2005), Ryan and Wiggins (2004), Fich and Shivdasani (2004), Adams and Ferreira (2008), Ormazabal (2018) each control for director reputation incentives (measured by firm size) in their studies regarding outside directors. Fama and Jensen (1983) outline that reputational concerns are central to outside directors as it constitutes a signal of a director's competence. In this context, larger firms are associated with larger reputational benefits as the affiliation to such firms increases directors' visibility and prestige (Fama and Jensen, 1983). Furthermore, the firm's size constitutes an important avenue for directors to increase their reputational capital (Masulis and Mobbs, 2014). Being part of the board of a larger firm represents a signal for higher personal status and leads to higher visibility, increasing the opportunities on the labor market for directors (Shivdasani, 1993). Consequently, Adams and Ferreira (2008) link larger - and thus more visible - firms with a higher reputational value for outside directors. Yermack (2004) and Fich (2005) support this by noting that outside directors of larger firms are subsequently more likely to gain additional directorships.

Masulis and Mobbs (2014) expand on this research and find that directors with multiple directorships distribute their time and effort unequally based on the directorship's relative reputation (i.e., the relative size of the directorship). They find that a director displays a lower absence rate on board meetings when the directorship is the highest-reputation-ranked directorship in a director's portfolio. Masulis and Mobbs (2014) additionally find that the likelihood that outside directors resign from their directorships due to poor firm performance is higher for their lower reputation directorships. Thus, it can be concluded that a director's

reputation – measured by firm size – is a powerful determinant for the behavior and the decision-making process of outside directors.

Furthermore, it can be argued that other incentives – like compensation, risk or workload – are implicitly affected by reputational concerns. For example, outside directors may depart from "risky" firms more often in order to protect their reputational capital as adverse circumstances (e.g., financial fraud or poor firm performance) might cast doubt regarding the monitoring performance of an outside director (Boivie et al., 2012). Moreover, outside directors potentially want to limit the workload of their directorships because overly "busy" directors are assessed as less capable with regards to monitoring and risk oversight (Fich and Shivdasani, 2004). This is supported by Fahlenbrach et al. (2010), who note that the resignation by outside directors from boards as an anticipation of higher workload can also be interpreted as a mechanism to preserve their reputation. Higher workloads for the board of directors are often a direct consequence of a firm's worsening financial situation that potentially adversely affects the director's reputation. Consequently, a "busy" outside director cannot appropriately monitor the firm's executives.

In conclusion, we argue that reputational concerns constitute the dominant incentive for outside directors confronted with the decision to retain or depart from a directorship. Involuntary departures of outside directors (e.g., due to poor performance) are exceedingly uncommon (Boivie et al., 2012; Cowen and Marcel, 2011). Thus, it is reasonable to assume that most resignations from directorships are voluntary and, therefore, at the discretion of the respective outside director. Finally, we state H1 as follows:

H1: Outside directors are more likely to relinquish a directorship that possesses a lower reputation than the average reputational value of the directorship portfolio.

H2 - Changes in the Composition of Directorship Portfolios and Reputation Growth

Nearly half of independent directors within S&P 1500 firms hold multiple directorships (Masulis and Mobbs, 2014). Many of these outside directors change the composition of their directorship portfolio by joining new boards and leaving existing boards. Contrary, the other half of S&P 1500 outside directors hold only one directorship, of which many do not join any other board. Thus, a large proportion of directors keeps the composition of their directorship portfolio unchanged over time. In H1, we hypothesize that directors strategically relinquish independent board seats to increase their portfolio reputation. However, it is unclear whether adjustments to outside directorship portfolios lead to an overall increase in director reputation in the periods after portfolio adjustments are made.

The composition of a directorship portfolio is affected by decisions to join a new board or leave an existing board. Directors' decisions to join boards should be entirely voluntary. However, director exits could be either voluntary or forced (Boivie et al., 2012; Ormazabal, 2018). Thus, we expect different impacts on director reputation based on their decisions to change their directorship portfolio, depending on whether they join new boards or leave existing boards.

Since gaining an additional outside directorship is a voluntary decision, we predict that gaining an additional independent board seat increases directors' reputation growth due to two reasons. First, an outside director needs to be considered and elected by a firm's nomination committee to get the possibility of gaining an additional seat (Callahan et al., 2003; Duchin et al., 2010). Nomination committees could consider candidates who do not hold an active outside directorship position. Alternatively, they could nominate a director already holding at least one other outside directorship, whose success as an outside director is potentially observable. Consequently, nomination committees generally might consider more successful director candidates – who are already active as an outside director – for a potential nomination. Firms with more experienced and compensated outside directors generally have a higher market

performance (Shiah-Hou and Cheng, 2012). Furthermore, firms with directors holding multiple board appointments generally perform better (Booth and Deli, 1996; Brickley et al., 1999). Lastly, Yermack (2004) and Fich (2005) find that outside directors of larger firms are more likely to gain additional directorships. Therefore, we argue that successful outside directors potentially get more offers to join an additional board in the first place, which positively influences the director's reputation growth afterward. Furthermore, directors might strategically accept nominations from growing companies and avoid nominations from stagnating companies, which positively influences their overall reputation growth.

Second, we argue that serving on multiple boards leads to information synergies and increases in industry-specific and firm-specific expertise of the respective outside director. Kor and Sundaramurthy (2009) find that increased industry-specific and firm-specific outside director experience increases firms' sales growth. Consequently, by simultaneously serving on multiple boards, outside directors can gain additional information and increase their industry- and firm-specific expertise. The director's gained information and expertise could potentially increase the effectiveness of the outside director's decisions, which would positively affect her firm's growth potential. Outside directors with only one active outside directorship potentially miss out on the opportunity to gain additional information and expertise by serving on an additional board.

Nevertheless, serving on multiple boards as an outside director could also have disadvantages. By accepting an additional directorship, outside directors face a potential trade-off between reputational and financial benefits and increases in their workload (Ghannam et al., 2019). Additionally, holding multiple directorships potentially limits the director's attention for each directorship (Bar-Hava et al., 2020). Moreover, directors with multiple directorships might put their effort into retaining their directorships instead of closely monitoring firm's executives (Mace, 1986). However, Masulis and Mobbs (2014) find that outside directors have strong incentives to be viewed as careful monitors by the external labor market. Overall, prior research

finds mixed evidence on the relationship between director busyness and firm performance (Bar-Hava et al., 2020; Ferris et al., 2003; Fich and Shivdasani, 2004). Finally, we assume that a potential negative impact of decreased monitoring efficacy due to increased workload is outweighed by nomination boards selecting more successful directors and the information and knowledge synergies from holding multiple directorships. We state H2a in the alternative form:

H2a: Outside directors, who accept at least one additional outside directorship, achieve higher reputation growth.

Besides accepting a new directorship position and the directors' decisions to relinquish an existing position, the directorship portfolio composition is also impacted by directors' decisions. Director exits could be either voluntary or forced (Boivie et al., 2012; Ormazabal, 2018). Boivie et al. (2012) assume that most exit decisions are voluntary based on director interviews and news reports. Combining this assumption with our predicted positive effect on director reputation of relinquishing an existing outside directorship (H1), we hypothesize that (the voluntary) decision to leave an existing seat also increases future reputation growth. Even though having multiple directorships does not seem to decrease monitoring effectiveness (Masulis and Mobbs, 2014), relinquishing an existing directorship has a decreasing impact on a director's workload. Therefore, exiting a directorship could lead to an increased monitoring effort put into the remaining directorships, which potentially positively affects firm performance.

Furthermore, directorship exits sometimes happen in distressed firms, e.g., after lawsuits or restatements occur (Arthaud-Day et al., 2006; Cowen and Marcel, 2011). Thus, leaving distressed firms could also increase future growth of the remaining firms in the director's portfolio. However, the potential positive effects of simultaneously having multiple directorships are (partially) lost after exiting from a directorship. Relinquishing a firm's board potentially leads to the loss of information and knowledge synergies. Moreover, Bar-Hava et

al. (2020) find that directors generally do not truthfully state their reason for departure. Thus, the assumption can be made that at least some directors forcefully leave a directorship, potentially due to underperformance of a director. Forcefully exiting a well-performing firm would lower the director's portfolio reputation growth. Finally, we predict that directors, who relinquish an outside directorship, achieve less reputation growth than directors who accept additional directorships without exiting an existing directorship. We state H2b in the alternative form:

H2b: Outside directors, who relinquish at least one outside directorship, achieve less reputation growth than those, who accept at least one additional outside directorship.

H3 - Board of Director Reputation and Risk

A primary role of a public firm's board is the protection of shareholder interests by monitoring and advising the management with regard to the corporate decision-making process (Shiah-Hou and Cheng, 2012). Monitoring the management is crucial for firms that possess a separation between ownership and control to inhibit potential agency conflicts. As managers are motivated to maximize their personal utility (e.g., maximize their compensation), this potentially leads to management decisions that might stand contrary to the shareholders' best interest (i.e., maximizing shareholder wealth) (Jensen and Meckling, 1976).

In this context, characteristics like the experience and expertise of independent board members become increasingly important to effectively monitor and advise the management in their decision-making process to safeguard shareholders' interests (Ghannam et al., 2019). For example, McDonald et al. (2008) outline that prior M&A experience of outside directors is associated with an improved performance with regards to firm acquisitions. Shiah-Hou and Cheng (2012) find a general increase in market performance for firms with more experienced

and compensated outside directors. Kor and Sundaramurthy (2009) identify the social and human capital as an important determinant for outside directors' ability to effectively monitor. Specifically, they note a positive association between industry-specific and firm-specific outside director experience on sales growth through specialized insight into the governance related challenges of a firm an outside director acquires over time (Kor and Sundaramurthy, 2009). In a similar vein, Larcker et al. (2013) focus on the influence of directors' social capital on firm performance. They find that firms with well-connected directors (i.e., with larger networks) serving on their boards display higher profitability and a larger growth rate (Larcker et al. 2013).

Masulis et al. (2012) add to this stream of research by outlining that demographic factors might influence the monitoring performance of outside directors. In detail, they find that a higher share of foreign outside directors is associated with a decrease in financial reporting quality and firm performance while increasing the acquisition performance if the acquired firm is from the region of the foreign outside directors (Masulis et al. 2012).

Sila et al. (2017) are the first to link portfolio-based reputational incentives to firm-specific outcomes. They find that a firm's voluntary disclosure and stock price informativeness increases if its directors rank the firm reputationally higher compared to their other directorships. Sila et al. (2017) explain their findings with heightened demand for reliable public information and greater distrust of private information provided by the management as outside directors' desire to protect their reputation as effective advisors and monitors increases. Sila et al. (2017) provide evidence that not just the mere presence of outside directors or their human and social characteristics are potentially influential regarding firm-specific outcomes, but that the properties and the composition of their directorship portfolios might constitute important determinants. In this regard, not just the relative reputational ranking of a single directorship compared to the remaining directorships might affect firm-specific outcomes, but also the total average reputation of a directorship portfolio (i.e., the total reputational capital of

a director). This is because of two reasons: First, higher reputation directors might have more to lose from potentially reputation harming circumstances as they suffer greater damage to their reputation and incur greater financial penalties (Chou and Feng, 2019).

Fredriksson et al. (2020) support this notion by finding that directors with higher reputational capital are more likely to select higher quality auditors and are generally associated with better audit quality. The authors explain their findings with the increased need for higher reputation directors to protect their reputation from adverse events like misstatements in the financial reports or fraudulent activities by the management (Fredriksson et al., 2020). Thus, directors with an overall higher reputation possess a greater incentive to effectively monitor and advise their directorships to protect their reputational capital. As prior studies outline the influence of effective board monitoring on firm performance by reducing agency costs (Fama, 1980; Hillman and Dalziel, 2003), directors with higher reputational capital should, thus, positively affect firm performance of their directorships.

Secondly, prior research notes that higher reputation directors are rewarded for their effective monitoring by increased labor market opportunities and are therefore able to acquire additional directorships (Fama and Jensen, 1983; Fich and Shivdasani, 2007). In this regard, the higher reputational capital of outside directors can be understood as a signal for their monitoring ability and experience, leading to a greater alignment of management decisions with shareholders' interests. Similarly, outside directors with higher reputational capital might also be more trusted advisors and possess a greater influence on the management of a firm. The expectation that more reputable outside directors are more effective monitors and advisors is supported by the findings of Fich (2005), that identifies a more positive share price reaction to the announcement of a director appointment with a higher reputation.

Another firm outcome that is potentially influenced by the monitoring activity of outside directors is the propensity of accrual-based earnings management. Accrual-based earnings management via abnormal accruals can be used to alter financial reports regarding

earnings (Beneish, 2001). For example, income-increasing earnings management might be facilitated to obscure investors regarding a firm's economic situation. Alternatively, the management can initiate income-increasing earnings management to maximize its performance-based compensation (Healy and Wahlen, 1999). Thus, it is not surprising that prior studies identify a significant litigation risk for firms engaged in accruals-based earnings management (Ibrahim et al., 2011; Lo, 2008; Palmrose et al., 2004). Furthermore, there is evidence that less risk averse and less conservative individuals are more likely to utilize accrual-based earnings management that is income-increasing (Deng et al., 2018; Kanagaretnam et al., 2015). It is reasonable to assume that negative firm outcomes (i.e., increase in litigation cost) and positive firm outcomes (i.e., meeting earnings targets or generally reporting higher earnings) affect not only a single individual but all board members associated with the firm. Therefore, the propensity of earnings management might not just be influenced by top-management positions (i.e., CEO/CFO) but by all board members – including outside directors. Indeed, Xie et al. (2003) discover that not just the percentage of outside directors is associated with fewer earnings management but that the financial expertise these directors possess while serving on audit committees reduces abnormal discretionary accruals of their firms. Fredriksson et al. (2020) additionally note that less risk averse entities might be incentivized to tolerate more accrual-based earnings management. The overall risk outside directors accept in their directorship portfolio can be interpreted as a proxy for their personal risk tolerance and might thus be related to the level of earnings management the respective director is ready to tolerate. Consequently, outside directors that possess more risky directorships in their directorship portfolio might be more inclined to accept earnings management in firms.

In conclusion, we argue that firm performance of a directorship might be positively associated with the average reputation of its outside directors. On the other hand, the overall extent of accrual-based earnings management on a firm-level is positively affected by the

average level of risk in the directorship portfolios of its outside directors. We state the hypotheses as follows:

H3a: The average reputation of outside directors on a firm's board is positively associated with firm performance.

H3b: The average level of risk in the directorship portfolios of outside directors on a firm's board is positively associated with accrual-based earnings management.

SAMPLE SELECTION

Our sample contains 22,460 outside directors serving on boards of 11,347 firms between 1999 and 2019. Director data is obtained from the database BoardEx, which provides biographical and relationship data on the boards of public and private companies since 1999. Our sample is restricted to public companies with relevant accounting data available. In general, the BoardEx sample includes directors with private and public company directorships. Due to sparse information on private company directorships, we restrict our sample to directorships of public companies. Lastly, our sample is restricted to outside directors by excluding observations with executive directors. Firm-specific data is obtained from Thomson Reuters Refinitv.

Descriptive Statistics

Table 1 shows the descriptive statistics for our model concerning director-firm-year observations (H1).[2] Our dummy variable *Relinquished* captures the loss of directorships and has a mean of 0.065, indicating that around 6.5% of all director-firm-year observations are related to a loss of a director position. This is in line with Ormazabal (2018), who finds that around 8% of observations include a loss event. The mean of 0.55 for our reputation dummy (*ReputationDummy*) in our sample indicates that in most cases (55%) the observation firm

[2] For a detailed list and description of all our variables see the variables definitions in our Appendix.

possesses a larger market capitalization than the remaining directorship portfolio. The same is only valid for our firm beta dummy (*RiskDummy*) in 26% of the cases, while the compensation (*CompensationDummy*) and the number of board meetings (*MeetingsDummy*) are both in around 40% of the cases higher for our observation firm (0.424 and 0.416, respectively). A gain happened in 26% of all observations in our sample (*GainDummy*).

The age of the directors in our sample (*Age*) ranges from 31 years for the youngest director to 94 years for the oldest director, with a mean age of 62. On average, a director in our sample has 2.8 directorships. This is in accordance with Ormazabal (2018), who notes 2.9 average appointments for a director (*Directorships_Count)*, while slightly higher than the 1.74 average directorships Masulis and Mobbs (2014) find. This might be explained by the fact that we only include directors with at least two directorships. Thus, directors in our sample hold a larger number of directorships. The average *tenure* of our directors in our sample amounts to 5.7 years, while the average firm size – as captured by market capitalization – equals $20.5 bn (*Size*).

On average, firms in our sample have a profitability measured by return on assets of 4.1% yearly (*ROA*) and an asset growth rate of 10.4% (*Growth*).[3] Around 10% of all shares are on average defined as being closely held (*Closely_Held_Shares*), indicating substantial ownership by individuals with a close relationship to the issuing firm. Lastly, the firm boards in our sample displayed a yearly attendance rate of 82% (*Board_Attendance*).

[Insert Table 1 about here]

Table 2 displays the descriptive statistics for our director-portfolio perspective (H2). The mean for our dependent variable *ReputationGrowth* is 0.26, indicating an average 26% rise in relative market capitalization over our sample period. Our two variables of interest, *PostGain*

[3] We winsorize all financial variables (except variables that are bound to a 0 to 100 range) at the 1st and 99th percentile to mitigate the effect of outliers.

and *PostRelinquish,* have means of 0.62 and 0.5, respectively. This indicates that we have slightly more observations of directors, who at least joined one additional board than directors, who relinquished one seat. On average, over 90% (0.93) of our directors serve on at least one committee in at least one of their directorships (*Is_comittee_member).* Furthermore, the average level of independence of the boards in the portfolios of our directors lies relatively high at 77.5% (*Independence_level_avg*), while on average 10.6 directors are serving on these boards (*Board_size_avg*).

[Insert Table 2 about here]

The descriptive statistics for our model that takes on the firm-perspective (H3) are found in Table 3. In brief, we find our firms' average return on assets (*ROA*) to be around 3.2%. The average company beta (*Beta_avg*) for the portfolios of all directors of a firm is 1.25. The share of outside directors with higher education (master's degree or above) lies on average at 59% (*HighEducation_Share*), while network size for all independent directors in a firm equals on average 595 connections (*Network_Size_avg*). Lastly, 2.9 outside directors served on average on a board of a firm in our sample (*NumberofDirectors*) with an average portfolio reputation of $20.2 bn (*Director_Reputation_avg*)

[Insert Table 3 about here]

TESTS OF H1 – DIRECTOR-FIRM-LEVEL ANALYSIS: DIRECTOR REPUTATION AND RELINQUISH DECISIONS

Identification Strategy

To identify the effect of a director's relative reputation on the decision to relinquish a directorship, we apply the following two-way fixed effects regression models:

$$Relinquished_{i,t} = \alpha + \beta_1 RelativeReputation_{i,t} + \sum \beta_k Controls_{i,t} + \gamma_i + \delta_t + \varepsilon_{i,t} \quad (1)$$

where *i* indexes the director-firm unit and *t* indexes the year. Our dependent variable is relinquished, which is an indicator variable that equals one if the outside director leaves the firm's board in a given year, and zero if she has an active position in the firm's board of directors (similar to Masulis and Mobbs, 2014; Ormazabal, 2018).[4]

Our main independent variable – *ReputationDummy* – is based on Masulis and Mobbs (2014), who calculate the relative size of equity market capitalization in each firm compared to the other firms' market capitalizations in the director's portfolio. Masulis and Mobbs (2014) classify a directorship as high (low) ranked if the firm is 10% larger (smaller) than the director's smallest (largest) directorship, based on market capitalization. The reputation measurement based on being larger (smaller) than the smallest (largest) directorship has the disadvantage of losing relevant information. Especially if a director holds more than two seats, then information of the other directorships is ignored. For example, if a director has a portfolio with four board seats, whereof the 2nd and 3rd firm (ranked in market cap) deviate significantly from the smallest and largest observation, then the 2nd and 3rd are ignored when calculating a high and low ranked indicator variable.

Therefore, we include all firms of a director's portfolio for our *ReputationDummy* measurement. To do this, we calculate a dummy variable that takes the value one if the firm's market capitalization is larger than the average market capitalization of all other portfolio firms, and zero if its smaller (or equal). Consequently, we consider all firms of a directorship portfolio instead of just the extreme cases (largest and smallest firms). Following the same logic, we

[4] BoardEx reports the exact join and end date of a directorship if available. Since our models use yearly observations, we round start and end dates based on the actual reported month. If the reported month lies in the second half of the year (July till December), then the date is moved forward to the 31st of December of the same year. If the reported month lies in the first half of the year (January till June), then the date is moved backwards to the 31st of December of the previous year. The other option of always setting the reported date to the 31st of December of the given year would lead to larger offsets for reported dates in the first half of the year. Consequently, shifting the reported date up to +/- 6 months reduces the potential offset. In case of missing exact dates, we set the 31st of December as the date.

calculate *RelativeReputation*, where the market capitalization of a firm *i* in year *t* of director *j* is divided by the average market capitalization of all director's other firms:

$$RelativeReputation = MarketCap_{i,t} \Big/ \frac{(Total\ Market\ Cap_{j,t} - Market\ Cap_{i,t})}{(Directorships_{j,t} - 1)} \quad (2)$$

Similar to Ormazabal (2018), we apply two-way fixed effects regression models. First, we implement director-level fixed effects controlling for time-invariant director characteristics. Second, we implement industry-year-level fixed effects to control for industry shocks affecting the probability of a director's exit from a given industry in a given year. γ_i represent director fixed effects and δ_t represent industry-year fixed effects. Controls are a vector of director, director-firm and firm controls. Standard errors are robust to heteroskedasticity and serial correlations within industry-year-level clusters.

For H1, we predict that directors are more likely to relinquish an existing board position if the respective board seat yields a lower director reputation than the other firms in the director's portfolio. Thus, the impact of *ReputationDummy* and *RelativeReputation* on *Relinquished* (β_1) should be negative and significant.

Control Variables

Similar to Yermack (2004), Masulis and Mobbs (2014) and Ormazabal (2018), we include several control variables in our regression models, which potentially influence director turnover.[5] We capture director-specific turnover determinants, including director-portfolio (e.g., relative reputation) and director controls (e.g., age and number of directorships held),

[5] Masulis and Mobbs (2014) and Ormazabal (2018) move their dependent variable (dummy variable indicating when a director left a firm in a given year) one year forward. Since we shift the reported start and end dates of a directorship by up to +/- 6 months, most observations already include time-lagged control variables. For example, if a directorship actually starts on the 1st of April 2015, we shift the starting date to the 31st of December 2014. Consequently, we use control variables from 2014 for start dates ranging from January to June 2015. In case of starting dates ranging from July to December, we set the starting date to the 31st of December of that year and use control variables from that year. Nevertheless, lagging all firm controls by one year does not change our main results.

director-firm-specific controls (e.g., tenure of the director in the firm) and firm-specific controls (e.g., size and return on assets):

i. Director-Portfolio-Controls

Ormazabal (2018) finds that (inside and outside) directors tend to relinquish their riskiest directorships in the years after the financial crisis. Therefore, to our portfolio incentive controls, we add the measure for firm risk (similar to reputation as a dummy and as a relative value), with firms' beta as a proxy. Boivie et al. (2012) and Masulis and Mobbs (2014) find that increased director workload (approximated by board meetings) and director compensation (approximated by average board compensation) increase the likelihood of a director exit. Thus, we add *relative workload* and *relative compensation* to our portfolio incentive controls.

ii. Director-Controls

We control for potential director retirements by including the natural logarithm of their age. Further, we control appointments to another firm's board of directors since appointments could impact their decision to leave an existing board seat (Linck et al., 2008). We also control the number of directorships held since leaving a seat makes less impact if the director portfolio consists of multiple directorships.

iii. Director-Firm-Controls

We include the director's tenure in the firm since a higher tenure makes retirement more likely. Being an active member or the chairman on a committee could reduce the likelihood of leaving a directorship (Yermack, 2004). Therefore, we include whether the director was active in the compensation, audit, finance, governance or risk committee and whether she was a chairman in at least one of the committees. The different committees are listed separately due to their

different potential impacts on leaving a board. For example, Masulis and Mobbs (2014) state that the audit and compensation committee are regarded as more time-consuming.

iv. Firm-Controls

Since the firm's absolute size is a potential proxy for the firm's reputation and thus might influence a director's decision to leave a board seat, we include the absolute market capitalization to control for any absolute reputation and size impact of the firm.[6] Prior research shows that poorer performance increases director turnover (Ormazabal, 2018; Yermack, 2004). Hence, we include ROA, total asset growth and Tobin's q as further firm controls. Furthermore, director turnover decreases for firms with a smaller board of directors (Masulis and Mobbs, 2014). Thus, we include a firm's board size as a control variable.

Results

The multivariate regression results for our first hypothesis are presented in Table 4 Model 1. For both models, our dependent variable that measures if a director relinquished the directorship is included as a dummy variable. Starting with the control variables, we find a significantly negative coefficient for *GainDummy*, indicating that simultaneous gain and loss events are rather uncommon. We find a strong negative effect of age (*Age_ln)* on the propensity to relinquish a directorship. This might be explained by older directors being more risk-averse and therefore prefer more stable directorship portfolios. Furthermore, the strongly significant positive coefficient of *Directorships_Count* indicates that directors with larger directorship portfolios are more likely to relinquish a directorship. As the director's time and effort are

[6] We use the natural logarithm of the market capitalization to reduce the effect of outliers and to decrease the magnitude of its coefficient. Similar to Ormazabal (2018), we also use the natural logarithm for age. Lastly, in all analyses we winsorize firm-variables at the 1st and 99th percentile (except for variables bound to the 0 – 100 range) to mitigate the impact of outliers.

limited, too many directorships that divert the director's attention might hurt the ability to be an effective monitor. Thus, overly "busy" directors lead to more adverse firm outcomes (Fich and Shivdasani, 2006) and might be incentivized to reduce the number of their directorships.

Additionally, we observe that longer tenure is positively associated with relinquishing the directorship and that better firm performance (*ROA*) reduces the likelihood that the director will drop the firm from the portfolio. This is reasonable as prior research notes a strong relationship between badly performing firms and the loss of outside directors (Yermack, 2014). On the other hand, well-performing firms might enhance the director's reputation by acting as a signal for effective monitoring and advisory by the board's independent members.

[Insert Table 4 about here]

Moving on to our variables of interest, our first hypothesis outlines our expectation that directors are more likely to relinquish a directorship that possesses a lower reputation than the average reputation of the remaining portfolio. The results of our multivariate regression support this. We find a significant negative coefficient ($p = 0.002$) for our independent variable *ReputationDummy,* indicating that directors pursue a portfolio approach by taking the relative reputation of their directorships into consideration. Thus, they are more likely to relinquish those directorships that provide a lower share to their overall reputational capital than the other directorships.

The coefficients for our other dummy variables capturing the other director incentives risk (*RiskDummy*) and compensation (*CompensationDummy*) are not significant. At the same time, we find a strong positive association between the relative number of board meetings (*MeetingsDummy*) and the likelihood of relinquishing a directorship. Hence, directorships that require an above-average number of meetings relative to the remaining directorship portfolio are more likely to be relinquished by a director. As the director's time and effort are limited, outside directors that serve on multiple boards might resign from their more workload-intensive

director duties to prioritize their remaining directorships. In conclusion, these findings demonstrate that considering the entire directorship portfolio when investigating outside director incentives is crucial as the relative difference of a directorship compared to the remaining directorship seems to influence the decision regarding the composition of director portfolios.

Our base model includes our main independent variables regarding the different director incentives as dummy variables. This approach indicates the direction of the difference between the directorship in question and the remaining director portfolio but ignores the size of that difference. As a robustness test, we substitute in Table 4 Model 2 our variables that capture the reputation, risk, compensation and workload incentives with continuous variables that capture the relative difference of a directorship compared to the average of the remaining portfolio. Again, we find a highly significant and negative coefficient for our variable that captures reputation incentives (*RelativeReputation*) and a highly significant and positive coefficient regarding our measure for relative workload differences (*RelativeMeetings*). Therefore, we maintain support for our first hypothesis.

TESTS OF H2 – DIRECTOR-LEVEL ANALYSIS: DIRECTOR PORTFOLIO COMPOSITION AND REPUTATION GROWTH

Identification Strategy

To identify the impact of adjustments to a director's portfolio composition (gains and relinquishments of directorships), we use generalized difference-in-difference regressions with staggered treatments (similar to Bertrand and Mullainathan, 2003; Dube and Zhu, 2021). The generalized difference-in-difference model's unit and time fixed effects replace the post and treatment effect variables of a traditional difference-in-difference model (Goodman-Bacon,

2021). The generalized difference-in-difference estimator equals a weighted average of all possible standard difference-in-difference estimates between a treated and a control group.

Our sample, which covers director portfolios from 1999 to 2019, includes three types of director portfolio adjustments, which are covered in our treatment variable: (1) directors who never gain or lose any directorships, (2) directors who gain at least one directorship (with the period after the event termed *PostGain*), or (3) directors who relinquish at least one directorship (with the period after the event termed *PostRelinquish*).[7] Directors who make at least one adjustment to their portfolio make their first additional gain or loss decision at different times. Consequently, our treatment (directors being "exposed" to a portfolio adjustment) is staggered. The control group includes directors who never make any adjustments to their portfolio (never-treated), and directors who have not yet made any adjustments but are about to gain (relinquish) a directorship in the future (later-treated).[8] We use the following generalized difference-in-difference-model to test whether adjusting a director's portfolio composition impacts future reputation growth:

$$ReputationGrowth_{i,t} = \alpha + \beta_1 PostGain_{i,t} + \sum \beta_k Controls_{i,t} + \gamma_i + \delta_t + \varepsilon_{i,t} \qquad (3)$$

where *i* indexes the director and *t* indexes the year. The dependent variable, *reputation growth*, is the relative change from the director's average reputation (average of the total market capitalization of all the firms the outside director holds an active seat) from the current year to

[7] There also can be a combined case of directors who initially gain (relinquish) a directorship and afterwards relinquish (gain) another directorship. We control for these mixed cases in our analyses by excluding observations in the PostGain (PostRelinquish) model, where a director relinquished (gained) a position before the gain (relinquish) event happened. As another robustness check, we exclude all observations in which at least one position was relinquished (gained), which excludes mixed cases in our analyses. Results remain unchanged (untabulated). Furthermore, we run another analysis comparing directors, who only relinquished a position and never gained an additional position, and directors, who only gained at least one additional board seat while never relinquishing one position (see Table 5, Model 3).

[8] Our BoardEx records (which start in 1999) potentially include directors, who already adjusted their directorship portfolio before 1999. If these directors do not adjust their portfolio composition after 1999, these "already-adjusted" directors are considered as part of the control group, which might add bias to the treatment effect in case of a varying treatment effect (Baker et al., 2021; Goodman-Bacon, 2021). Removing directors, who were already active in 1999 and thus might be "already-adjusted", does not change our results, although the sample size decreases from 30,259 to 21,045 (untabulated).

the prior year.[9] *PostGain* is an indicator variable equal to one in the calendar year in which a director makes the first additional gain of a directorship. Compliant with the generalized difference-in-difference approach, γ_i represent director fixed effects and δ_t represent year fixed effects.

Controls are a vector of director-specific controls. We aggregate all controls on director-year levels by using the yearly mean of each control. We use controls established in the literature to explain variations in the market capitalization of firms (Akbas et al., 2017; Fauver et al. 2017; Kajüter et al. 2019). Thus, we control (lagged by one period) for the firm's size (market capitalization), performance (ROA, total asset growth and Tobin's q), leverage (debt to capital), ownership structure (proportion of closely held shares to total shares) and whether the firm is navigating through any issues (approximated by earnings restatements). Furthermore, we control for the independence level of a firm's board and its board size (Coles et al., 2008). Lastly, we control for director-specific characteristics that could potentially impact *ReputationGrowth*. Therefore, we include the director's age (applying the natural logarithm) and the director's average tenure of all her board seats in a given year, since they influence director experience but could also reduce productivity (Fedaseyeu et al., 2018). Lastly, we control for the total amount of directorships held and whether she was active on any committee of all her portfolio firms.

For H2a, we predict that directors, who gain at least one additional outside directorship, can achieve higher growth in their reputation than directors who do not make any adjustments to the composition of their directorship portfolio. Thus, the impact of *PostGain* on *ReputationGrowth* (β_1) should be positive and significant. For the impact of relinquishing at least one directorship, we do not make a clear prediction of the impact of *PostRelinquish* on *ReputationGrowth*. H2b predicts that outside directors who relinquish at least one outside

[9] To reduce the economic magnitude of outliers, we winsorize the *reputation growth* variable (and all firm-specific variables that are not bound between 0 and 100) on the 1st and 99th percentile.

directorship achieve less reputation growth than outside directors who accept one additional outside directorship. To test H2b, we replace the *PostGain* treatment variable with a dummy (*GainVsRelinquish*), which equals zero for directors who relinquish at least one directorship and never gain any directorships. *GainVsRelinquish* equals one for directors, who gain at least one directorship and never relinquish any directorship. We expect that the impact of *GainVsRelinquish* on *ReputationGrowth* (β_1) should be positive and significant, indicating that "gain" directors can achieve more reputation growth than "relinquish" directors.

Results

Table 5 shows the results of our generalized difference-in-difference models, which include the impact of *PostGain* (Model 1), *PostRelinquish* (Model 2) and *GainVsRelinquish* (Model 3) on *ReputationGrowth.* The control variables influencing outside directors who decided to join an additional board (Model 1) show that the director's age is unrelated to *ReputationGrowth*. However, the average tenure of a director has a significant negative relation with future reputation growth. Furthermore, being an active committee member has a significant positive effect on *ReputationGrowth*, whereas a firm's proportion of independent directors does not affect *ReputationGrowth*. Lastly, we find that firms with larger boards tend to have an increased market capitalization growth, which is partially in accordance with the findings of Coles et al. (2008).

[Insert Table 5 about here]

The coefficient of *PostGain* (Model 1) is significantly different from zero (t = 7.25, p = 0.000), indicating that outside directors who gain at least one additional directorship position are able to achieve higher reputation growth than directors who have not (yet) gained an additional directorship. Consequently, H2a is supported.

The coefficient of *PostRelinquish* (Model 2) is also significantly different from zero (t = 5.30, p = 0.000). Directors who relinquish at least one directorship position can achieve higher reputation growth than directors who have not (yet) relinquished a directorship. Next, *GainVsRelinquish* (Model 3) coefficient is also positively significant, indicating that directors who only gained one or more additional outside board seats while never relinquishing a seat can generate significantly higher reputation growth than directors who relinquish a seat while never gaining an additional seat.[10] Thus, H2b is supported.

Director Incentives and Directorship Gains

Prior research examines the relation between director incentives and the likelihood of relinquishing a directorship. Masulis and Mobbs (2014) find that if an outside director's firm is the lowest-ranked firm (compared to the director's highest-ranked firm), then the director is more likely to leave the firm in case of poor firm performance. Besides the reputation incentive, Ormazabal (2018) finds that directors are more likely to resign from their riskiest directorships. Furthermore, Boivie et al. (2012) find that increased workload (approximated by a firm's board meetings) increases the likelihood of directorship exit. Additionally, Adams and Ferreira (2008) show that directors perform better when their compensation increases.

In the following analysis, we reverse the causality of prior research and show the relation between changes in the composition of a director portfolio and its impact on their growth after the portfolio changed. Ghannam et al. (2019) assume that directors are likely influenced by a variety of incentives when deciding to join firm. For this purpose, we iterate through the three mentioned incentives and use each of them as the main independent variable in our generalized difference-in-difference model (Table 6). For the four incentives, we use *ReputationGrowth*,

[10] Model 3 is subject to a reduced sample size. This is due to the relatively small amount directors, who only gain (relinquish) one position while never relinquishing (gaining) another position. However, a sample size of more than 1,000 observations should still be sufficient to make causal interferences with adequate statistical power.

RiskGrowth (approximated by changes in the director's average firm beta from the prior to the current year) and *WorkloadGrowth* (approximated by changes in the director's average board meetings from the prior to the current year).

Table 6 shows the result of directors' portfolio shifts on changes in their incentives. Column 1 of Table 6 shows the same regression output as Model 1 of Table 5, displaying that gaining an additional directorship increases *ReputationGrowth* (t = 7.25, p = 0.000). On the contrary, gaining an additional directorship has no statistically significant impact on the other incentives *RiskGrowth* (Column 2, t = 1.00, p = 0.329) and *WorkloadGrowth* (Column 3, t = 0.34, p = 0.741). Consequently, being a director who gains at least one additional directorship positively impacts growth in reputation, but not on the growth of the other two incentives.

[Insert Table 6 about here]

TESTS OF H3 – FIRM-LEVEL ANALYSIS: BOARD OF DIRECTOR REPUTATION AND RISK

Identification Strategy

To examine the effect of average reputation of all outside directors in a given firm on firm outcomes (e.g., firm performance), we estimate two-way fixed effects regression models:

$$ROA_{i,t} = \alpha + \beta_1 BoardReputation\_avg_{i,t} + \sum \beta_k Controls_{i,t} + \gamma_i + \delta_t + \varepsilon_{i,t} \quad (4)$$

where *i* indexes the firm and *t* indexes the year. As our first model investigates the effect of the average attributes of all director portfolios of a given firm on firm performance, we use *ROA* (net income divided by total assets) as a dependent variable. In our second model, we use earnings management as our dependent variable. We calculate earnings management based on the modified Jones Model (Dechow et al., 1995), where the firm-specific discretionary accruals

are estimated from the total accruals. Our main independent variable for our first model is *BoardReputation_avg*, which captures the average portfolio market capitalization of all outside directors in a given firm. In the second model, our main independent variable of interest is *BoardRisk_avg*, which is calculated based on the average firm beta in the directorship portfolios of all outside directors in a given firm. Again, we apply two-way fixed effects regression models, with firm-level fixed effects controlling for time-invariant firm characteristics. We include industry-year-level fixed effects on the second level to control for industry characteristics that could potentially determine firm outcomes. Standard errors are robust to heteroskedasticity and serial correlations within industry-year-level clusters.

Control Variables

We use several board-level and firm-level control variables that could potentially determine the firm performance or the propensity of earnings management. Starting with board-level control, we use the share of outside directors on a board that serve on audit committees in any of their directorships (*BoardAuditCom_Share*) as a proxy for audit and financial expertise. Outside directors that have the necessary experience to be appointed to serve on audit committees might be more effective in detecting and preventing accrual-based earnings management. Similarly, we control for the share of directors with higher education (*BoardHighEducation_Share*) and the average network size (*BoardNetworkSize_avg*) to proxy for the ability and resources of the outside directors of a given firm. Additionally, we control for the average level of governance in the directorship portfolios of all independent board members (*BoardGovernance_avg*).

On the firm level, we control for the change in other accruals as those might be associated with the magnitude of earnings management. We control for the number of outside directors that serve on the board (*Director_Count*) as the independent board size might influence the monitoring effectiveness of its outside directors. Additionally, we include several

other firm level controls, including the shareholder structure with our measure for closely held shares (*Closelyheldshares*).

Results

In Table 7 Column 1, our results regarding our model with the firm performance (*ROA*) as the dependent variable are displayed. Starting with our control variables, we find several significant effects. We find a significantly negative coefficient for age (*LnAge_avg*), indicating that firms with younger outside directors on boards are associated with a higher return on assets. Interestingly, the number of directors a firm possesses is also negatively associated with firm performance. Thus, smaller boards perform better than larger boards in our sample.

Furthermore, we find significant negative coefficients for closely held shares (*Closelyheldshares*), amortization of intangibles (*Amort_Intangibles*) and total assets (*TotalAssets*), while a change in accruals (*ChangeOtherAccruals*) is positively associated with firm performance. Moving on to our variables of interest, we find a strongly significant negative coefficient for our director portfolio risk measure (*BoardRisk_avg*). Firms whose outside directors possess more risk in their directorship portfolios perform on average worse.

Furthermore, – and in accordance with our H3a – a strong positive coefficient for *BoardReputation_avg* is observable. Thus, firms whose outside directors are more reputable (based on the average reputation of their directorship portfolios) display on average a higher performance. A potential explanation for this finding is that more reputable outside directors are on average more incentivized to protect their (higher) reputational capital and are, thus, more inclined to monitor and advise their directorships effectively. On the other hand, a higher average director portfolio reputation might also be a sign of the ability and the experience that

these directors can apply to their directorships, leading to generally more favorable firm outcomes.[11]

Table 7 Column 2 displays the results for our model with earnings management as the dependent variable (*Earningsmanagement*). Starting again with our control variables, we find only a few significant results. In detail, the average age (*LnAge_avg*) of the outside directors serving on a firm's board displays a positive but weak association with earnings management. Similarly, we find a significant positive coefficient at the 10%-level for firm performance as measured by return on assets (*ROA*). Examining our variables of interest, we find no significant effect of average director portfolio reputation on earnings management.

Based on our hypothesis H3b, we do not expect reputation but the average risk level of director portfolios to influence the propensity of earnings management. We find evidence to support this hypothesis as the coefficient for our measure that captures portfolio risk (*BoardRisk_avg*) is significant and positive. This might be explained by the fact that firms whose outside directors tolerate more risk in their directorship portfolios are also more inclined to accept potentially income-increasing earnings management to meet earnings targets or generally present the firm's financial situation more positively in the financial statements. Consequently, the possibility of increased litigation risks through accrual-based earnings management might be less of a deterrent for such boards compared to more risk averse outside directors.

In conclusion, we find evidence to support both our hypotheses as our results corroborate the notion that the portfolio characteristics of all outside directors serving on a firm's board are important to consider when investigating the influence of outside directors on firm outcome.

[11] In order to alleviate potential endogeneity problems arising from a reverse casualty where – for example – increased performance leads to firms acquiring higher reputation directors, we follow prior research (e.g., Barnett and Salomon, 2012) by including a lagged dependent variable as an additional independent variable in our regression Models 1 and 2. Our main results in this untabulated additional analysis remain entirely unchanged.

CONCLUSION

Due to the changes of the Sarbanes-Oxley Act (SOX) in 2002 to the director labor market, researchers started to examine the interplay of outside directors' incentives (e.g., reputation, risk and workload related concerns) and directors' decision to leave their existing board positions (e.g., Boivie et al., 2012; Masulis and Mobbs, 2014; Ormazabal, 2018). We expand the relative incentive measurements of previous studies, which rank a specific directorship in relation to the director's highest or lowest directorship, by considering all directorships in a director's portfolio. Besides the relative reputation of a specific directorship, we also include risk and workload-related incentives. We show that directors are more likely to relinquish a directorship if the respective firm has a relatively lower reputation than the rest of the portfolio and requires more working hours from the director.

Expanding on prior research, we also analyze the interplay of director incentives and directors accepting additional board seats or leaving existing board seats. Our results show that accepting an additional seat or leaving an existing seat significantly increases the director's reputational growth compared to non-adjusters. We also show that gaining additional directorships leads to more reputational growth than relinquishing directorships. Additionally, we show that accepting additional directorships positively impacts reputation growth, but not risk and workload incentives.

By taking on a firm perspective, we also examine the influence of the average portfolio characteristics of all outside directors of a board on firm outcomes. We find that a higher average portfolio reputation of independent board members is associated with better firm performance. Furthermore, we observe that a higher average firm risk in the portfolios of outside directors is positively associated with an increased level of earnings management.

Several practical conclusions can be derived from our findings. First, we provide evidence that workload and reputational concerns govern a directors' decision to relinquish a

directorship, while the compensation and risk seem to be a less important factors. Firms may use this information to restructure their board incentives (e.g., reducing the overall workload instead of increasing the compensation) in order to retain competent outside directors. Second, we show that adjusting the composition of directorship portfolio is advantageous with regards to increasing outside director reputation compared to non-adjusting. Outside director may find this information useful in order to derive a suitable portfolio strategy to increase their reputational capital more efficiently. Third, our findings regarding the significant effect of director portfolio attributes on firm outcomes can inform firms during the nomination process of new outside directors. For example, firms that are concerned about heightened levels of earnings management might consider evaluating the average firm risk that potential new outside director are tolerating in their directorship portfolios.

There are also several conceivable avenues for further empirical studies. For example, future research could examine whether outside director incentives have any influence on the respective internal directorship of the director. Do increases in outsider reputation lead to career advancements or better performance of the internal directorship? Lastly, it could be of interest to examine why adjusting one's outside director portfolio increases reputation growth afterward. One possible explanation is information and expertise synergies induced by holding multiple directorships, which network effects of the respective director could moderate.

Table 1 – Descriptive statistics: Director-firm-level analysis

Variable	Mean	Std. Dev.	Min	Max
Relinquished	.065	.247	0	1
ReputationDummy	.552	.497	0	1
RiskDummy	.255	.436	0	1
CompensationDummy	.424	.494	0	1
MeetingsDummy	.416	.493	0	1
GainDummy	.255	.436	0	1
Age	61.910	6.873	31	94
Directorships_Count	2.756	.987	2	14
Tenure	5.67	3.991	0	20
Committee_Nomination	.414	.493	0	1
Committee_Comp	.481	.5	0	1
Committee_Audit	.547	.498	0	1
Committee_Finance	.169	.375	0	1
Committee_Governance	.467	.499	0	1
Committee_Risk	.079	.269	0	1
Committee_Chairman	.555	.497	0	1
Size	2.05e+07	3.41e+07	6359	1.65e+08
ROA	4.153	13.199	-119.38	34.61
Board_Attendance	81.873	10.064	0	100
Debt	43.252	51.242	-4304.07	1669.37
Closely_Held_Shares	9.715	16.678	0	99.15
Growth	10.354	34.147	-52.2	451.46
TobinsQ	2.084	1.53	.467	15.667

Notes: Sample of 32,970 observations for the period of 1999 to 2019. Data obtained from Refinitiv (Thomson Reuters) and BoardEx (Euromoney Institutional Investor PLC). A detailed description of all used variables can be found in the appendix.

Table 2 – Descriptive statistics: Director-level analysis

Variable	Mean	Std. Dev.	Min	Max
ReputationGrowth	.263	.989	-.895	7.013
PostGain	.62	.485	0	1
PostRelinquish	.504	.5	0	1
Age_ln	4.095	.139	3.401	4.564
Tenure_avg	5.432	3.515	0	20
Directorships_count	2.013	1.143	1	24
Is_committee_member	.93	.256	0	1
Size_avg	15.589	1.586	8.921	19.304
ROA_avg	4.118	11.034	-91.04	29.64
Growth_avg	12.52	33.405	-45.18	309.212
TobinsQ_avg	1.986	1.159	.624	9.864
Debt_to_capital_avg_lagged	38.905	311.138	-48898.879	5741.113
Earnings_Restatement_avg	.035	.185	0	1
Closely_held_shares_avg	13.787	16.326	0	99.8
Independence_level_avg	77.542	15.458	0	100
Board_size_avg	10.661	2.368	1	35

Notes: Sample of 31,279 observations for the period of 1999 to 2019. Data obtained from Refinitiv (Thomson Reuters) and BoardEx (Euromoney Institutional Investor PLC). A detailed description of all used variables can be found in the appendix.

Table 3: Descriptive statistics: Firm-level analysis

Variable	Mean	Std. Dev.	Min	Max
ROA	3.172	17.132	-463.22	289.2
Earningsmanagement	.124	1.009	-24.197	15.27
BoardReputation_avg	20225299	51020187	5	8.967e+08
BoardRisk_avg	1.246	.728	-2.824	21.505
BoardAuditCom_Share	.544	.362	0	1
BoardHighEducation_Share	.586	.356	0	1
BoardNetworkSize_avg	595.027	1175.256	0	17528
BoardExec_Share	.152	.275	0	1
BoardGovernance_avg	23.521	26.145	0	96.75
BoardDebt_avg	27.955	322.846	-19522.078	2113.33
LnAge_avg	4.056	.137	3.332	4.511
BoardGrowth _avg	41.157	1084.835	-98.65	65080.759
NetIncomeGrowth	58.138	1956.761	-99.93	182891.67
ChangeOtherAccruals	10560.03	160924.9	-2091000	7781000
Director_Count	2.879	1.81	1	14
Closelyheldshares	18.981	20.378	0	100
Amort_Intangibles	42483.409	185121.08	-17262	7231000
TotalAssets	5147943.8	16772485	535	4.072e+08

Notes: Sample of 9013 observations for the period of 1999 to 2019. Data obtained from Refinitiv (Thomson Reuters) and BoardEx (Euromoney Institutional Investor PLC). A detailed description of all used variables can be found in the appendix.

TABLE 4

DIRECTOR REPUTATION AND RELINQUISH DECISIONS

Variables	(1) Relinquished	(2) Relinquished
ReputationDummy	-0.014***	
	(-3.120)	
RiskDummy	0.000	
	(0.110)	
CompensationDummy	-0.004	
	(-1.210)	
MeetingsDummy	0.013***	
	(3.540)	
RelativeReputation		-0.000***
		(-2.690)
RelativeRisk		-0.004
		(-1.300)
RelativeCompensation		-0.002
		(-0.890)
RelativeMeetings		0.014***
		(4.680)
GainDummy	-0.009**	-0.005
	(-2.330)	(-1.310)
Age_ln	-2.366***	-2.602***
	(-6.320)	(-6.210)
Directorships_Count	0.019***	0.019***
	(6.160)	(5.790)
Tenure	0.008***	0.007***
	(11.820)	(11.000)
Committee_Nomination	0.009	0.011*
	(-1.370)	(1.770)
Committee_Comp	-0.026***	-0.022***
	(-5.300)	(-4.690)
Committee_Audit	-0.011**	-0.013***
	(-2.250)	(-2.850)
Committee_Finance	-0.003	-0.003
	(-0.450)	(-0.390)
Committee_Governance	-0.030***	-0.034***
	(-4.820)	(-5.710)
Committee_Risk	-0.014	-0.010
	(-1.580)	(-1.120)
Committee_Chairman	-0.031***	-0.030***
	(-6.540)	(-6.270)
Size	-0.004	-0.008***
	(-1.430)	(-3.210)

ROA	-0.001***	-0.000*
	(-2.960)	(-1.690)
Board_Attendance	-0.000	0.000
	(-1.080)	(1.080)
Debt	-0.000	-0.000
	(-1.270)	(-1.070)
Closely_Held_Shares	0.000	0.000
	(0.950)	(1.510)
Growth	-0.000	-0.000
	(-0.170)	(-0.290)
TobinsQ	-0.001	-0.001
	(-0.850)	(-1.050)
_cons	9.857***	10.890***
	(6.390)	(6.300)
Director FE	Yes	Yes
Industry-Year FE	Yes	Yes
Observations	32,970	29,617
Adjusted R-squared	0.0869	0.0935

This table presents the effect of directorship reputation on the relinquish decision. The dependent variable in both columns (*Relinquished*) is a dummy variable that is set to one if the outside director leaves the firm's board in a given year and zero if she has an active position in the firm's board of directors. The main independent variable *ReputationDummy* in column (1) is a dummy variable that is set to one if the market capitalization of the relinquished firm is larger than the average market capitalization of the director portfolio and zero otherwise. The main independent variable *RelativeReputation* in column (2) is a continuous variable that measures the relative difference from the relinquished directorship market capitalization to the average market capitalization of the remaining director portfolio. The continuous independent variables in column (2) and all financial variables are winsorized at the 1st and 99th percentile. In both columns (1) and (2), we include director and industry-year fixed effects. We cluster standard errors at the industry-year level. t-statistics are reported in parentheses. *, **, *** denote statistical significance at the 0.10, 0.05, and 0.01 levels (two-tailed tests).

TABLE 5

DIRECTOR PORTFOLIO COMPOSITION AND REPUTATION GROWTH

Variables	(1) ReputationGrowth	(2) ReputationGrowth	(3) ReputationGrowth
PostGain	0.311***	-	-
	(7.250)		
PostRelinquish	-	0.177***	-
		(5.300)	
GainVsRelinquish	-	-	0.167**
			(2.690)
Age_ln	0.454	1.262	-0.005
	(0.610)	(1.420)	(-0.050)
Tenure_avg	-0.022***	-0.019***	-0.008*
	(-4.220)	(-4.150)	(-1.960)
Directorships_count	0.010	-0.006	0.024
	(0.720)	(-0.500)	(1.340)
Is_committee_member	0.190***	0.101**	0.103**
	(4.540)	(2.560)	(2.550)
Size_avg	-0.641***	-0.435***	-0.135***
	(-14.750)	(-9.160)	(-4.090)
ROA_avg	-0.003*	-0.006***	0.002
	(-1.990)	(-4.700)	(0.870)
Growth_avg	-0.000	-0.001***	0.001
	(-1.350)	(-3.260)	(0.640)
TobinsQ_avg	0.036**	0.005	0.001
	(2.540)	(0.340)	(0.030)
Debt_to_capital_avg_lagged	0.000	0.000**	0.000
	(1.030)	(2.700)	(0.020)
Earnings_Restatement_avg	-0.014	-0.004	0.029
	(-0.460)	(-0.190)	(0.410)
Closely_held_shares_avg	-0.000	-0.000	-0.000
	(-0.250)	(-0.280)	(-0.090)
Independence_level_avg	0.000	0.001**	-0.002**
	(0.190)	(2.190)	(-2.180)
Board_size_avg	0.065***	0.038***	0.018
	(11.790)	(7.690)	(1.080)
Director FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	30,259	22,874	1529
Adjusted R-squared	0.2935	0.3762	0.1258

This table presents the effect of changes on directors' portfolio composition. The dependent variable measures the relative change from directors' average market capitalization prior to the current year. The treatment variable *PostGain* is set to one as soon as a director gains one additional directorship. The treatment variable *PostRelinquish* is set to one as soon as a director relinquishes a directorship. *GainVsRelinquish* is set to one (zero) for directors who gained (relinquished) at least one additional directorship and never relinquished (gained) a directorship. The dependent variables and all financial variables are winsorized at the 1st and 99th percentile. Firm-level variables are lagged by one year. In all generalized difference-in-difference-regressions, we include director and year fixed effects. We cluster standard errors at the director-level. t-statistics are reported in parentheses. *, **, *** denote statistical significance at the 0.10, 0.05, and 0.01 levels (two-tailed tests).

TABLE 6

DIRECTOR INCENTIVES AND DIRECTORSHIP GAINS

Variables	(1) Reputation-Growth	(2) Risk-Growth	(3) Workload-Growth
PostGain	0.311***	0.023	0.009
	(7.250)	(1.000)	(0.340)
Age_ln	0.454	2.354***	2.601***
	(0.610)	(3.730)	(3.840)
Tenure_avg	-0.022***	-0.014***	-0.006**
	(-4.220)	(-4.530)	(-1.940)
Directorships_count	0.010	-0.152***	-0.163***
	(0.720)	(-17.910)	(-14.480)
Is_committee_member	0.190***	-0.114***	-0.019
	(4.540)	(-4.230)	(-0.520)
Size_avg	-0.641***	0.033***	0.035***
	(-14.750)	(4.390)	(4.350)
ROA_avg	-0.003*	-0.002***	-0.002***
	(-1.990)	(-2.980)	(-3.580)
Growth_avg	-0.000	0.000***	-0.000
	(-1.350)	(2.630)	(-1.170)
TobinsQ_avg	0.036**	0.001	-0.004
	(2.540)	(0.180)	(-0.650)
Debt_to_capital_avg	0.000	0.000	0.000**
	(1.030)	(1.160)	(2.680)
Earnings_Restatement_avg	-0.014	0.009	0.008
	(-0.460)	(0.550)	(0.210)
Closely_held_shares_avg	-0.000	0.001***	0.002***
	(-0.250)	(3.230)	(5.370)
Independence_level_avg	0.000	0.000	-0.001*
	(0.190)	(0.580)	(-1.860)
Board_size_avg	0.065***	-0.008***	-0.018***
	(11.790)	(-3.070)	(-4.340)
Director FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	30,259	27,429	27,429
R-squared	0.4024	0.2019	0.1572

This table presents the effect of changes on directors' portfolio composition. The first (second; third) dependent variable measures the relative change from directors' average market capitalization (beta; the amount of board meetings) prior to the current year. The treatment variable *PostGain* is set to one as soon as a director gains one additional directorship. In all generalized difference-in-difference-regressions, we include director and year fixed effects. The dependent variables and all financial variables are winsorized at the 1st and 99th percentile. Firm-level variables are lagged by one year. We cluster standard errors at the director-level. t-statistics are reported in parentheses. *, **, *** denote statistical significance at the 0.10, 0.05, and 0.01 levels (two-tailed tests).

TABLE 7

BOARD OF DIRECTOR REPUTATION AND RISK

Variables	(1) ROA	(2) Earnings Management
BoardReputation_avg	0.000***	0.000
	(3.440)	(0.900)
BoardRisk_avg	-1.903***	0.037**
	(-2.900)	(2.340)
BoardAuditCom_Share	1.434**	0.029
	(1.910)	(0.910)
BoardHighEducation_Share	-0.046	-0.019
	(-0.050)	(-0.390)
BoardNetworkSize_avg	-0.000	-0.000
	(-1.320)	(-1.540)
BoardExec_Share	-1.262	-0.027
	(-1.240)	(-0.780)
BoardGovernance_avg	-0.003	-0.000
	(-0.260)	(-0.590)
BoardDebt_avg	0.000	0.000
	(0.310)	(0.320)
LnAge_avg	-7.399***	0.209*
	(-3.110)	(1.730)
BoardGrowth_avg	0.000	0.000
	(1.610)	(1.370)
NetIncomeGrowth	-0.000	-0.000
	(-1.620)	(-0.950)
ChangeOtherAccruals	0.000**	-0.000
	(1.960)	(-0.770)
Director_Count	-2. 254**	-0.007
	(-1.820)	(-0.950)
Closelyheldshares	-0.063***	0.000
	(-3.150)	(0.660)
Amort_Intangibles	-0.000***	0.000
	(-2.850)	(0.820)
TotalAssets	-0.000***	-0.000
	(-3.280)	(-1.080)
Earningsmanagement	0.622	
	(1.550)	
ROA		0.002*
		(1.760)
_cons	37.327***	-0747
	(3.850)	(-1.510)
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	9013	9013
Adjusted R-squared	0.3575	0.4841

This table presents the effect of board of directors' portfolio reputation and risk on firm outcomes. The dependent variable in column (1) is the return on assets (ROA). The dependent variable in column (2) is accrual-based earnings management. The main independent variables *BoardReputation_avg* and *BoardRisk_avg* in both columns capture the average portfolio market capitalization and the average portfolio firm beta of all outside directors for a given firm. In both columns (1) and (2), we include firm and industry-year fixed effects. We cluster standard errors at the industry-year level. t-statistics are reported in parentheses. *, **, *** denote statistical significance at the 0.10, 0.05, and 0.01 levels (two-tailed tests).

APPENDIX

Variable Definitions

Director Portfolio Changes	
Relinquished	Indicator variable that equals one if the outside director leaves the firm's board of directors in a given year, and zero if she has an active position in the firm's board of directors.
PostGain	Indicator variable that is set to one in the calendar year and all subsequent years, in which the director joins at least one additional board, and zero otherwise.
PostRelinquish	Indicator variable that is set to one in the calendar year and all subsequent years, in which the director leaves at least one board, and zero otherwise.
GainVsRelinquish	Indicator variable that is set to one (zero) for directors who gained (relinquished) at least one additional directorship and never relinquished (gained) a directorship.
Director-Portfolio (Director Incentives)	
Market capitalization (as reputation proxy)	Common shares outstanding multiplied with the stock price
Beta (as risk proxy)	Month-end price percent changes and their relativity to the local market index.
Compensation (as compensation proxy)	The average compensation of the board members in US dollars.
Meetings (as workload proxy)	The number of board meetings during the year.
H1	
RelativeReputation	The firm's market capitalization in relation to the average total market capitalization of the director's board of director portfolio excluding the firm.
RelativeRisk	same as above with beta instead of market cap.
RelativeCompensation	same as above with compensation instead of market cap.
RelativeMeetings	same as above with meetings instead of market cap.
ReputationDummy	Dummy variable that equals one if the firm's market capitalization is larger than the average market capitalization of the director's board of director portfolio excluding the firm.
RiskDummy	same as above with beta instead of market cap.
CompensationDummy	same as above with compensation instead of market cap.
MeetingsDummy	same as above with meetings instead of market cap.
H2	
ReputationGrowth	The relative change of the director's portfolio average market capitalization from the previous to the current year.
RiskGrowth	same as above with beta instead of market cap.
CompensationGrowth	same as above with compensation instead of market cap.
MeetingsGrowth	same as above with meetings instead of market cap.

H3	
BoardReputation_avg	Average market capitalization of the directorship portfolios of all outside directors that serve a given firm.
BoardRisk_avg	same as above with firm beta instead of market cap.
Director Controls	
GainDummy	Dummy variable that equals one if the director gained at least one board of director position during the respective year.
Age_ln	Natural logarithm of the director's age in the respective year.
Directorships_Count	Amount of board of director positions a director holds in the respective year.
Tenure	The director's tenure in the firm measured in years.
Committee_Chairman	Indicator variable that equals one if the director was active as the chairman of the firm in a given year and zero otherwise.
Committee_Nomination	Indicator variable that equals one if the director was active in the nomination committee of the firm in a given year and zero otherwise.
Committee_Comp	Indicator variable that equals one if the director was active in the compensation committee of the firm in a given year and zero otherwise.
Committee_Audit	Indicator variable that equals one if the director was active in the audit committee of the firm in a given year and zero otherwise.
Committee_Finance	Indicator variable that equals one if the director was active in the finance committee of the firm in a given year and zero otherwise.
Committee_Governance	Indicator variable that equals one if the director was active in the governance committee of the firm in a given year and zero otherwise.
Committee_Risk	Indicator variable that equals one if the director was active in the risk committee of the firm in a given year and zero otherwise.
Firm Controls	
Size	The firm's market capitalization (market cap)
ROA	(Net Income – Bottom Line + ((Interest Expense on Debt-Interest Capitalized) * (1-Tax Rate))) / Average of Last Year's and Current Year's Total Assets * 100
Growth	(Current Year's Total Assets / Last Year's Total Assets - 1) * 100
TobinsQ	(Total Assets – Book Equity + Market Value of Equity) / Total Assets
Board_attendance	The average overall attendance percentage of board meetings as reported by the company.
Debt	(Long Term Debt + Short Term Debt & Current Portion of Long-Term Debt) / (Total Capital + Short Term Debt & Current Portion of Long-Term Debt) * 100
Closely_held_shares	Percentage of shares held by insiders.
Independence_level	Percentage of independent board members as reported by the company.
Board_size	The total number of board members.
NetIncomeGrowth	Yearly total growth of net income by a firm.

ChangeOtherAccruals	Yearly total change of other accruals disclosed in cash flow statements.
Amort_Intangibles	Total amount of amortization of intangible assets (e.g., patents) by year.
Earningsmanagement	Estimation of earnings management by discretionary accruals. Computed via the modified Jones Model (Dechow et al. 1995).

Director Portfolio Controls

tenure_avg	The average of the director's tenure of her portfolio directorships measured in years.
is_committee_member	Dummy variable that equals one if the director was active in at least one committee of one of her portfolio firms in a given year.
ROA_avg	Average of the ROA-variable of all the director's firms in a given year.
Debt_to_capital_avg	Average of the Debt-variable of all the director's firms in a given year.
Earnings_restatement_avg	Indicator variable that equals one if the company is in the process of a material earnings restatement. Average of all director firms
Growth_avg	Average of the Growth-variable of all the director's firms in a given year.
closely_held_shares_avg	Average of the Closely_held_shares-variable of all the director's firms in a given year.
tobinsQ_avg	Average of the TobinsQ-variable of all the director's firms in a given year.
independence_level_avg	Average of the Independence_level-variable of all the director's firms in a given year.
board_size_avg	Average of the ROA-variable of all the director's firms in a given year.

Board-level Controls

BoardAuditCom_Share	Share of all outside directors of a given firm that serve on an audit committee in any of their other directorships.
BoardHighEducation_Share	Share of all outside directors of a given firm that possess a higher education (masters or above).
BoardNetworkSize_avg	Average number of network size of all outside directors that serve on the board of a given firm.
BoardExec_Share	Share of all outside directors of a given firm that are simultaneously inside (i.e., executive) directors of other firms.
BoardGovernance_avg	Average governance score of firms in the directorship portfolios of all outside directors that serve a given firm. The governance score is acquired from Refinitv and measures the quality (from 0 to 100) of the corporate governance of a firm.
BoardDebt_avg	Average level of the Debt-variable of firms in the directorship portfolios of all outside directors that serve a given firm.
LnAge_avg	Average age of all outside directors that serve a given firm.
BoardGrowth_avg	Average of the Growth-variable of firms in the directorship portfolios of all outside directors that serve a given firm.
Director_Count	Number of independent directors that serve on a board of a given firm.

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Affidavit

Ich erkläre hiermit, dass ich die vorgelegten und nachfolgend aufgelisteten Aufsätze selbstständig und nur mit den Hilfen angefertigt habe, die im jeweiligen Aufsatz angegeben oder zusätzlich in der nachfolgenden Liste aufgeführt sind. In der Zusammenarbeit mit den angeführten Koautoren war ich mindestens anteilig beteiligt. Bei den von mir durchgeführten und in den Aufsätzen erwähnten Untersuchungen habe ich die Grundsätze guter wissenschaftlicher Praxis, wie sie in der Satzung der Justus-Liebig-Universität Gießen zur Sicherung guter wissenschaftlicher Praxis niedergelegt sind, eingehalten.

Khaled

Mohamed Amin Khaled

Gießen, den 25. Februar 2022

Aufsätze

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