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Board turnover and firm performance: The moderating effect of recessions

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Preface and Acknowledgements

This study explores the complex dynamics between board turnover and firm performance, with a specific focus on the moderating effect of periods of recession on this relationship. The motivation for this study arises from the observance of significant changes in corporate governance practices during and after economic downturns, particularly highlighted during the global Covid-19 pandemic. By leveraging a comprehensive dataset spanning over two decades, this research aims to shed light on how periods of economic instability influence the relationship between the composition of a company's board and its financial performance. The findings presented herein contribute to the broader discourse on corporate governance and provide practical insights for stakeholders aiming to navigate the complexities of board management in turbulent economic times.

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Abstract

This thesis studies the moderating effect of a period of recession on the relation between board turnover and future firm performance, measured as return on assets (ROA). This is researched by using an unbalanced fixed effects panel data model, with data of Western countries from the time frame between 2000 – 2023. The overall results reveal that board turnover itself has an insignificant influence on firm performance, similar to the interaction effect between recession and board turnover. However, the presence of a recession does yield a significant positive effect. This suggests that while economic downturns generally do affect ROA, they do not alter the impact of board turnover on firm performance. These findings are important for the board of directors, top management, and the firm as a whole to further understand the dynamic effects of corporate governance and board composition changes, especially in uncertain economic times.

Keywords: *Board turnover, return on assets (ROA), recession, fixed effects, panel model.*

JEL Classification: *E32, G32, G34, L25, M12.*

Chapter 1

Introduction

Board turnover refers to the rate at which members of a company's board of directors change over time, with new directors being appointed and others leaving the organization Koh et al. (2022). During the early stages of the global Covid-19 pandemic, this type of turnover decreased. At that time people and companies worldwide were navigating a new and uncertain situation, where they were craving stability. However, more recent reports show that board turnover has significantly increased again during the post-pandemic period McGregor (2022). These changes can have multiple effects on firms, including on their performance and the value they provide for shareholders, measured as Return on Assets (ROA) Koh et al. (2022). Because of that, it would be insightful to study this effect more in-depth than has been done before, to gain a better understanding on the correlation between these factors. This could in turn be useful for internal and external stakeholders.

Previous research on this topic has shown contradictory effects. When solely looking at a US sample between 2000-2015, Koh et al. (2022) discovered that there was a negative significant relationship between board turnover and firm performance. They also concluded that this negative effect is moderated by different factors such as pre-turnover board meeting frequency, board job-related diversity and board tenure. In contrast, for a similar dataset of US companies between 2003-2013, Anderson and Chun (2014) found that replacing three to four directors over a three-year period was optimal. They concluded that firms in this category outperformed their peers with higher or lower amounts of board turnover during that time frame. On the other hand, a paper by Demerjian et al. (2012) introduced managerial ability to the equation as a measure for generating revenues. The researchers saw a positive correlation between hiring an 'able' CEO and firm performance in the upcoming years. This indicates that the effects of board turnover are specific for how capable the replaced individuals are. However, the findings of this study were based on broader data than that of the other papers, namely from the 1980's until the 2000's. Lastly, Liu et al. (2013) again concluded that board turnover was negatively associated with firm performance, based on studying Taiwanese firms in the 1990's.

So, the relationship between board turnover and firm performance has been studied in multiple regions and contexts, yielding different results. Furthermore, it is widely believed that the macroeconomic environment in which a company operates affects its firm performance Hansen and Wernerfelt (1989); Issah and Antwi (2017). This also makes sense from the perspective of stakeholder theory, where an organization is viewed as being part of a broader ecosystem with different influences Harrison and Wicks (2013). On the other hand, a relationship between the macroeconomic environment and board turnover has been established as well. This can be concluded from the previous increase of board turnover during or immediately after periods of economic instability Erkens et al. (2009); McGregor (2022). When combining these findings, it seems like the missing gap in the research so far is the moderating effect of the economic environment in a country these variables. Therefore, the research question that I aim to study in this thesis is: *“What is the moderating effect of periods of recession on the relationship between board turnover and firm performance in Western countries?”*

To answer this question and test the aforementioned relationship, a fixed effects panel data model analysis will be conducted. Here, data from the BoardEx UK, NA, EU and RoW databases on director-profiles and boards as a whole will be used and merged with data on firm-year observations from Compustat. Additionally, data from Thompson Reuters Refinitiv Eikon on firm ownership will be added to the sample. The data will span a time period from 2000 to 2023, with a total of 40,403 observations on 5,180 firms. This way, multiple periods of recession in different countries can be studied. This will be shown in the form of a dummy variable, where 1 means that the period was categorized as a recession and 0 means that it was not. Furthermore, the variable for firm performance will be defined as Return on Assets (ROA) over the upcoming two years. This is a relatively simple metric for the net income of a company divided by its average total assets Koh et al. (2022). As seen in previous research, board turnover is defined as the sum of outgoing and incoming directors over the course of the past three years, divided by the size of the board at the start of $t - 2$ Koh et al. (2022). The three-year moving period is chosen since that is a common term of service for directorships in the Western world Srinivasan (2005). Lastly, relevant control variables are added on firm financial performance, individual board member characteristics, firm aggregated board statistics, company ownership, and industry level developments.

Previously, I hypothesized that an economic downturn strengthens the effect of board turnover on firm performance for Western companies. This belief is strengthened by earlier papers on the interaction between firm performance and macroeconomic environments, as well as firm performance and board turnover. However, the findings contradict this hypothesis, showing a strongly significant positive result of 1.13%. Besides, I believed that a negative correlation would be found for the relationship between board turnover and firm performance. Again, this idea came from the majority of the conclusions drawn

on earlier research on the topic, but was not substantiated by the results, since only a statistically insignificant effect of close to zero was found. These conclusions could guide internal and external stakeholders of firms in their decisions on whether board members should be replaced and in what time frame, especially in economic uncertainty. Despite these results, previous research has not yet been able to provide uniform outcomes on the topic, so even with the results of this thesis, indicating that there remains room for debate on the definitive conclusions.

Chapter 2

Theoretical Framework

2.1 Topics of the study

2.1.1 Definitions

For the purpose of this paper, it is crucial to clearly define board turnover and firm performance. Firstly, board turnover refers to the rate at which the composition of a company's board of directors changes over a given period. It encompasses both the appointment of new directors and the departure of existing ones from the firm (Koh et al., 2022). Consequently, it is an aspect of corporate governance dynamics, due to its effects on decision making and accountability (Liu et al., 2013; Marcel et al., 2013). Because of that, board turnover is studied at company level in this study. On the other hand, firm performance is a relevant metric, which is defined as industry median-adjusted return on assets (ROA), calculated by dividing the net income of a firm by its total assets at a certain point in time (Koh et al., 2022). This metric falls within the scope of financial performance because it analyses how efficient assets are utilized to generate profit (Heikal et al., 2014). Again, these attributes result firm performance being measured on company level.

2.1.2 Previous research

Board turnover in the context of schools has been researched since the late '60's of the past century, but the definition of board turnover in those papers was different from what it is considered in current times (Steltzer, 1971; Walden, 1966). The effects of board turnover as they have been defined in this thesis have only been studied for approximately 40 years at this point. Seemingly, the first mention of 'directorial turnover' was in a paper by Sharma (1985), who focused on the relationship between board turnover and firm performance. He hypothesized that firms with either very high or very low board turnover would underperform when comparing to firms with more moderate ranges of

turnover. This hypothesis is ultimately confirmed in the results of the study, highlighting the importance of balanced turnover within organizations. According to the author, these results were important to ‘*provide lessons to potential entrepreneurs*’ (Sharma, 1985).

Besides turnover of the board of directors, executive officer turnover is widely researched, but these should not be confused with each other. Even though executive officers (usually the CEO) are sometimes part of the board of directors (Brunello et al., 2003; Koh et al., 2022), their roles remain different. Executive officers are the central part of the firms upper management, which means that they hold the main accountability for the performance of said firm (Ag, 2009). The board of directors, however, is responsible for overseeing these executive officers. As a form of corporate governance, this board usually consists of a mixture between people from inside the company and outside ‘independent’ directors. They provide accountability to the shareholders only, whilst the overall management must also provide accountability to the board of directors (Davies, 2000). Because of this, turnover of both groups impacts firm performance in different ways, namely operational performance and governance respectively (Koh et al., 2022).

Firm performance, on the other hand, has been studied for centuries at this point. Smith (1776) famously spoke about the effects of competition, market mechanisms and the division of labor on firm performance, by which he meant profit. However, it took until the early 20th century for firm performance to be qualified as efficiency metrics such as Return on Assets. This was popularized by Graham and Dodd (1934) and later by Fama (1970), both of whom argued that for investors to gain better understanding of which organizations would outperform others, they would have to look broader than simple profitability. Hence, new metrics such as ROA were used and compared across firms. Even later, during the 1980’s, these financial performance metrics became more and more common in research, resulting better understanding on how to use and calculate ROA. For example, an important study of Dess and Richard B. Robinson (1984) on the topic provided suggestions for calculating it in the absence of certain objective measurements, to extend the metric to private firms.

2.2 Relationships in the study

2.2.1 Board turnover and firm performance

Over the years, a few studies have attempted to analyse the relationship of board turnover on firm performance, with different outcomes as a result. Recently, Koh et al. (2022) found through a fixed effects regression that higher board turnover in a sample of public organisations located in the United States, measured from 2003 – 2015, resulted in a decrease in subsequent return on assets. This is a less nuanced view than the one presented by Anderson and Chun (2014), who found that for a similar sample of S&P500 companies

from 2003 – 2013, a medium amount of board turnover was beneficial for shareholder returns. Both relatively low and high board turnover were found to have a negative impact however. Thus, a difference between the effect of board turnover on ROA versus shareholder returns can be observed.

Furthermore, Bolton and Park (2021) found a negative, but not statistically significant relationship between turnover on the board of directors with firm performance measured as Earnings before Interest and Taxes (EBIT). Specifically, the researchers looked at turnover of the chairman in this paper. Again, their study was based on a comparable sample of US firms present in the S&P SuperComposite 1500 between 2001 – 2018. Earlier research, particularly on the Costa Rican banking industry between 1999 – 2004, shows the same outcome, namely a negative effect of board turnover on return of assets in the upcoming years (Lafuente and García-Cestona, 2007). Interestingly, this effect is not amplified in companies in which more than 50% of directors leave during the given period (Lafuente and García-Cestona, 2007), contrary to the research of Anderson and Chun (2014).

As observed, the causal relationship between board turnover and firm performance has not been extensively studied yet. However, to gain more insight to how this relationship could possibly work, another similar relation is observed, namely the effect that management turnover has on firm performance. Furtado and Karan (1990) and Kesner (1994) tried to provide a systematic overview of the research on the topic. Their studies classify firm performance as the stock market returns after a management turnover. Here Mahajan and Lummer (1993) and Sant (1988) reported overall negative effects. This was later supported by research from Khanna and Poulsen (1995). Furthermore, Warner et al. (1988) did not find significant effects on stock price returns as a result of management turnover. Lastly, Johnson et al. (1985) found positive effects for CEO turnover after the death of said CEO. That was later confirmed by research of Borokhovich et al. (1996) on appointing new outsider CEOs, though it must be noted that they mainly looked at forced management turnover.

When specifically examining operating performance measured as ROA, instead of abnormal returns, Hotchkiss (1995) found that the lack of management turnover in US firms after a bankruptcy correlated with a poor post-bankruptcy performance. On the other hand, Denis and Denis (1995) discovered that forced turnover of the top management layer resulted in better financial operating results for organizations. Huson et al. (2004) corroborated this with their research, although this is only true for the first period of the sample (from 1983 – 1994), which in turn aligns with the time frames from the other studies. The only other paper that supports these findings for another period of time is the one of Perez-Gonzalez (2006), which reported a statistically significant increase in adjusted ROA after CEO turnover.

Table 2.1: Overview of studies on board turnover and firm performance

Authors	Dependent & Independent Variables	Moderators	Results	Sample
George M. Anderson, David Chun (2014)	Shareholder Returns, Board Turnover	n.a.	Optimal board turnover improves shareholder returns, too much or too little turnover harms	S&P 500 firms from U.S.A
Brian Jung (2021)	Firm Performance (EBIT growth), Board Turnover	Chair turnover, director turnover	Chair turnover alone leads to lower EBIT growth; combined chair and director turnover leads to higher EBIT growth	20304 firms from U.S.A
Esteban Lafuente, Miguel A. García-Cestona (2007)	Firm Performance (ROA, ROE), CEO Turnover, Board Turnover	Forced vs. natural turnover, internally promoted vs. external replacements	Forced chairman and board turnover negatively impact firm performance; external CEO replacements positively impact performance	275 firms from Costa Rica
Wei Qiang, Sze-Sze Wong, Kevin Koh, Yen H. Tong (2022)	Firm Performance (ROA), Board Turnover	Pre-turnover board characteristics (meeting frequency, job-related diversity, CEO power, board tenure)	High board turnover negatively impacts firm performance; pre-turnover characteristics moderate this impact	3890 firms from U.S.A

More recent studies found a significant negative effect of executive director deaths on the sales of a firm, specifically in the period from 1995 – 2006 in Denmark (Gjerløv-Juel, 2019). Similar findings are reported by Conyon and He (2008), who studied CEO turnover and performance within Chinese listed firms during the same time frame. For a later period between 2010 – 2015, similar negative results were found for CEO turnover at Korean firms (Kim et al., 2020). Again, this result was confirmed by other papers on the topic (Sun et al., 2022). For Indonesian firms, this negative correlation is also present, but it is important to know that here ROA in the turnover year was specifically measured (Setiawan et al., 2017). This result was similar for Slovenian firms that were researched in another study (Knezevic and Pahor, 2004).

Overall, these inconclusive results provide only a slight indication for the relationship between board turnover and firm performance. The limited studies done on this topic suggested a negative correlation between the two. However, broader research on management turnover provides different results. Mainly the older and US centered studies found a positive effect, whilst the more recent and European/Asian centered papers found a negative effect in most cases. This is specifically the case for the research that measured firm performance as ROA, as I will do in this paper as well. So concluding, my first hypothesis is that board turnover has a negative effect on firm performance in the future.

H1: Board turnover in a firm has a negative effect on future firm performance (ROA).

2.2.2 Board turnover, firm performance and recession

Now that the relationship between the independent and dependent variable is better understood, it is important to gain an understanding of the moderating variable (recession) in the context of this research. This way, the expected effects will be clearer and can be put into perspective. A period of recession is defined as “...a significant decline in the economic activity spread across the country, lasting more than a few months, normally visible in real gross domestic product (GDP) growth, real personal income, employment (non-farm payrolls), industrial production, and wholesale-retail sales” (National Bureau of Economic Research, nd). However, a more simplified definition is often used in research and also in this paper, which is a period of at least two successive quarters where a country’s GDP declines (Abberger and Nierhaus, 2008; Mazurek and Mielcová, 2013). Thus, a recession is a type of economic state in which a country can exist.

Firstly, looking at the relationship between recession and firm performance, previous studies found a clear connection between decreased firm performance and the presence of an economic downturn. Grusky et al. (2011) found negative effects on US-based companies during all recorded recession periods from the 1930s onwards. These findings are supported by the paper of Danziger (2013). Other papers that found similar results were

one paper by Grusky et al. (2011) that looked at US firms in the restaurant industry, for which they compared their financial ratios from 2008 (a recession year) with those of 2006 (a non-recession year) and found a clear negative correlation. The same was found for Italian firms from 2004 – 2012 by Pittiglio et al. (2014) and for Central and Eastern European firms during that same time frame (Burger et al., 2017). Overall, the empirical evidence provides enough basis to suggest that there is a negative effect of a period of recession on firm performance.

Secondly, it is important to take a look at the relationship between board turnover and the presence of a recession, specifically in what way this is affecting the other relationship between board turnover and firm performance. There seems to be no previous research on this topic, possibly due to the little research there has been on board turnover and firm performance as a whole. However, it is logical to assume that a period of economic downturn will amplify the negative effect that board turnover has on ROA. Especially since previous research has shown that faster strategic decision-making results in increased firm profit and growth (Baum and Wally, 2003). It seems probable that high board turnover slows the decision-making process, since new board members have to get acquainted with the company before they can take important decisions. In conclusion, the presence of a period of recession likely amplifies the negative correlation between board turnover and return on assets.

H2: The presence of a recession period amplifies the negative correlation between board turnover and return on assets (ROA).

Chapter 3

Data

3.1 Sample description and statistics

3.1.1 Data overview

587,076 observations from listed companies in the Western world are used from 2000 – 2023. By using this time frame, it allows for the comparison of different periods of recession, such as the financial crisis of 2008 and the European sovereign debt crisis (Bocola and Dovis, 2019), in different countries that are considered Western. For the purpose of this research, and in line with existing literature, I consider the countries in the Western world to be: The United States, Canada, Australia, New Zealand, and all of Europe, but leaving out Russia and Turkey (Korpi and Palme, 1998; Lefranc et al., 2008). A full list of these countries can be found in Table A.1. The total sample of this data was collected by April 2024 and processed in R. For that collection I combined multiple databases with data on company financial data, their directors and ownership.

3.1.2 Description of data gathering

Firstly, director data on board positions, including start and ending dates, is extracted from BoardEx North America, BoardEx United Kingdom, BoardEx Europe and BoardEx Rest of World, with a total of 8,172,021 observations from companies between 2000 – 2023. By adjusting for non-listed firms, roles that are not considered board functions and data from countries outside of the Western world, 6,813,755 observations are removed from the dataset. A further 758,370 data points are removed when checking for duplicates in the data. This leaves a total of 599,896 observations for director data.

Secondly, more data on the boards aggregated on company level is extracted from BoardEx North America, BoardEx United Kingdom, BoardEx Europe and BoardEx Rest of World. This process results in a total of 2,932,815 observations from listed companies. When accounting for countries outside the earlier defined Western world, 658,261 data

points are removed. This leaves a total of 2,274,554 observations for company board data. Thirdly, more data on the company ownership is extracted from Thompson Reuters Eikon Refinitiv. This dataset consists of 1,120,983 observations of listed companies.

Lastly, information on the financial data of listed companies is taken from Compustat. This dataset includes 799,706 unique observations. After extracting all data, the datasets from BoardEx, Thompson Reuters Refinitiv Eikon and Compustat are merged, which results in a bundled set with 1,452,072 data points. When accounting for duplicates 144,488 of these observations are removed. A further 95,378 entries are excluded due to unavailability of the independent variable. Another 208,501 are omitted because they do not include data on the dependent variable. The final step is the removal of 416,629 entries for which the data on the control variables is incomplete. A step-by-step overview of the cleaning can be found in Table A.2.

3.1.3 Sample statistics

After the cleaning process, the final dataset consists of 587,076 unique director observations, or 40,403 aggregated company year observations from 5,600 different firms. The majority of these are active in the manufacturing (39.9%) or services (25.8%) industry. The most represented countries are the United Kingdom – England (41.9%) and Australia (11.8%). The average (median) sales for all observations are 5,626 (266) million per year, while average (median) earnings before interest and taxes (EBIT) was 921 (30) million. Besides this, average (median) return on assets (ROA) was -12.0% (3.2%) and average (median) slack was 2.36 (1.44). Average (median) size of the board of directors was 8 (7) and average (median) board tenure was 2,191 (1,997) days. In 16.7% of cases the entry was denoted as a recession year. Furthermore, CEO turnover happened in 8.3% of cases, while CFO turnover was present in 3.1%. Lastly, average (median) institutional ownership was 27.3% (2.6%) and the average (median) amount of institutional blockowners were 0.7 (0).

3.2 Variables

3.2.1 Firm performance

In line with previous research, firm performance in this study is measured as industry median-adjusted return on assets (ROA) (Easterwood and Nutt, 2012; Koh et al., 2022; Wiersema and Bantel, 1993). ROA is the ratio resulting from dividing net income by the total assets of a firm (Petersen and Schoeman, 2008). It is often preferred as a measure because it is not skewed by differences in financial leverage (Enekwe et al., 2014; Koh et al., 2022). To accommodate for differences in ROA among various industries, adjustments are made. The two-digit SIC code of each firm is taken to calculate a industry median

ROA per year. This median value is then subtracted from the specific company ROA. Ultimately, firm performance is computed by taking the average industry median-adjusted ROA over a time span of two years (*ROA_M1_2*) (being t+1 and t+2). By using this methodology, there is the possibility to adjust for sudden changes in ROA in a given year (Koh et al., 2022; Shen and Cannella, 2002). Like other studies suggested, I also conduct a sensitivity analysis for the variable by using the industry median-adjusted ROA over three years (being t+1, t+2 and t+3) (*ROA_M1_3*) (Koh et al., 2022).

$$ROA_t = \frac{\text{Net Income}_t}{\text{Total Assets}_t} \quad (3.1)$$

Formula 3.1: Return on assets.

$$ROA_M1_3 = \frac{\text{Adjusted ROA}_{t+1} + \text{Adjusted ROA}_{t+2} + \text{Adjusted ROA}_{t+3}}{3} \quad (3.2)$$

Formula 3.2: Average industry median-adjusted return on assets.

3.2.2 Magnitude of board turnover

As suggested by previous studies, the magnitude of board turnover is calculated by taking the sum of incoming directors (people that became a board member) and outgoing directors (people that left as a board member) over the past three years (being t-2, t-1, and t) (*BOARD_TURNOVER_3*), divided by the board size of a firm at the year t-2 (Boivie et al., 2016; Koh et al., 2022; Wiersema and Bantel, 1993). The three-year time frame was chosen in line with other studies since it is a standard duration for a board member in most Western countries (Srinivasan, 2005). Again, a sensitivity analysis is conducted for the magnitude of board turnover over a two-year window to check for consistency (*BOARD_TURNOVER_2*).

$$\begin{aligned} \text{BOARD_TURNOVER_3} = & \frac{\sum_{year=t-2}^t \text{Incoming Directors}_{year}}{\text{Board Size}_{t-2}} \\ & + \frac{\sum_{year=t-2}^t \text{Outgoing Directors}_{year}}{\text{Board Size}_{t-2}} \end{aligned} \quad (3.3)$$

Formula 3.3: Magnitude of board turnover.

3.2.3 Period of recession

The moderating factor included in this study is the presence of a period of recession in a specific country (*RECESSION*), which is shown as a dummy variable with the value 1 for a recession year and 0 for a non-recession year. It is measured for the same year as

board turnover, so year t . Consistent with a paper by Abberger and Nierhaus (2008), a recession is defined as a significant decline in economic activity that extends across much of the economy and lasts more than a few months. Indicators for a recession include GDP, real income, employment, industrial production, and wholesale-retail sales (Abberger and Nierhaus, 2008; National Bureau of Economic Research, nd; Dah, 2016). Between 2000 - 2023 recession periods in different countries include the global financial crisis of 2008/2009 (Edey, 2009), the European sovereign debt crisis of 2011/2012 (De Marco, 2018), and the worldwide market crash at the start of the Covid-19 outbreak in 2020 (Feroni et al., 2022). Based on available data, the years that are stated as a recession can differ for each country in the study, but the full overview can be found in Table A.1.

3.3 Control variables

Different control variables that have previously been found to have an effect on firm performance are used in this thesis. These variables include the financial characteristics of a firm, industry characteristics, individual board members characteristics, aggregated board characteristics, and ownership data. Except where indicated otherwise, all control variables are measured for the year prior to the measurement of firm performance (being year t).

At firm level, control variables are added on the financial data of a firm. Firstly, I added a control variable for firm size (*SIZE*), measured as the natural logarithm of the company's yearly net turnover, which has been shown to affect firm performance (Ibhagui and Olokoyo, 2018; Koh et al., 2022; Lee, 2009). Furthermore, available liquidity is considered (*LIQUIDITY*) by taking the ratio of the firms' current assets divided by current liabilities (Shen and Cannella, 2002; Zabczyk and Shin, 2010). Previous research has shown that this affects firm profitability as well (Ehiedu, 2014; Saleem and Rehman, 2011). Due to the dependent variable of the study, I controlled for returns on assets as well (*ROA*). Here I used industry median-adjusted returns on assets, to control for the risk of earnings reverting to the average (Koh et al., 2022).

Besides, CEO power in the year prior to board turnover (being $t-3$) is calculated (*CEO-POWER*), to control for the sources of influence that the firm's CEO has. This is determined by taking three indicators, namely i) CEO duality (Finkelstein and D'Aveni, 1994; Koh et al., 2022; Sauerwald and Peng, 2014), ii) relative tenure of the CEO when comparing it to the other board members (Koh et al., 2022; Wade et al., 1990; Westphal and Zajac, 1995), and iii) the relative amount of non-independent directors (NEDs) or insiders of the board (Koh et al., 2022; Westphal and Zajac, 1995). The first indicator is relevant due to a formal increase of power over the rest of the board of directors (Koh et al., 2022). This is coded as a dummy variable, where 1 means that the CEO is also named as the chairman/chairwoman (or president) of the board and 0 means that is not

the case. The latter two indicators heighten informal power over the rest of the board. Relative tenure is quantified as CEO tenure to average board tenure for the company in days, which increases CEO power due to the CEO having more firm specialized knowledge than board members with a lower tenure, thus increasing obligation from them (Koh et al., 2022). The extent of insiders is given by the ratio of non-independent directors to the total amount of directors on the board. This increases CEO power since the company’s own employees tend to have similar views to the CEO (Koh et al., 2022). After calculation, these three indicators are then standardized and combined to create one variable.

The experience of directors on the board is also controlled for (*EXPERIENCE*), which is based on the number of qualifications a board member has and the number of (un)listed boards they have been seated on. These have all been shown to have a positive correlation with firm performance (Gaité and Fernández, 2020; Hamori and Koyuncu, 2014; McIntyre et al., 2007). Qualifications in this case are the received diplomas for either a PhD, MBA, Masters, or Bachelors. These scores are weighted, where qualifications are equal to 1, unlisted boards account for 1.5 and listed boards for 2. The results are then standardized to compute the total value of the experience variable. Besides actual experience, dummy variables are also created for both CEO turnover (*CEO_TURNOVER*) and CFO turnover (*CFO_TURNOVER*), to capture changes to firm performance surrounding these shifts. A 1 in this case denotes that the CEO/CFO left during that fiscal year and a 0 denotes that this was not the case.

Next, control variables on board level are added to account for the differences in corporate governance. These are measured in the year after board turnover (being t). The size of the board of directors (*BOARD_SIZE*) and average tenure (*AVG_TENURE*) in days are both controlled for, due to their effects on firm performance (Guest, 2009; Huang and Hilary, 2018; Henderson and Miller, 2006). Board tenure in the year before turnover (being $t-3$) is also controlled for and distributed in three categories, namely high board tenure (*HIGH_TENURE*), medium board tenure, and low board tenure (*LOW_TENURE*). To achieve this, the average board tenure is calculated and a dummy variable for the top tercile of tenure is created, as well as for the bottom one. Here, 1 means the tenure of the respective board is in the mentioned tercile and 0 denotes that it is not. The tercile with relatively medium-high board turnover values is later used as the benchmark for the regression model, as can be seen in earlier research too (Koh et al., 2022).

Furthermore, control variables are added to account for the composition within the board, since previous research has shown that this affects firm performance (Fernández and Gaité, 2020; Miller and Del Carmen Triana, 2009; Solakoglu and Demir, 2016). Both the gender ratio (*DIV_GENDER*) and nationality mix (*DIV_ETHNIC*) are considered. The gender ratio is measured as the relative percentage of male board members in a company and the nationality mix is computed as the proportion of directors from different countries than the home country of the firm.

On industry level, I incorporated industry growth (*INDUSTRY_GROWTH*) and industry dynamism (*INDUSTRY_DYNAMISM*) as control variables since the industry a firm operates in affects its performance (Henderson and Miller, 2006; Short et al., 2009). The first is measured by taking industry turnover and regressing it on a time variable. Then the regression coefficients are divided by the average industry revenue and the result of that calculation provides industry growth, as is common practice (Dess and Beard, 1984; Koh et al., 2022). For industry dynamism the same approach is used, but the standard errors of regression coefficients are taken instead of the coefficients themselves (Dess and Beard, 1984; Koh et al., 2022). Previous research suggests that a high industry growth causes less need for information processing demands, since it shields the company from external threats. This is the other way around for industry dynamism, which increases information processing demands, due to a higher necessity for obtaining and understanding information regarding changes in the external environment of the firm. When plotting the variables, it can be found that there is a clear decline in industry growth after the financial crisis of 2008, which is the opposite for industry dynamism from that point onwards. For both variables, the industry that best fits the company on the basis of their SIC code in Compustat is used, as is common practice (Koh et al., 2022).

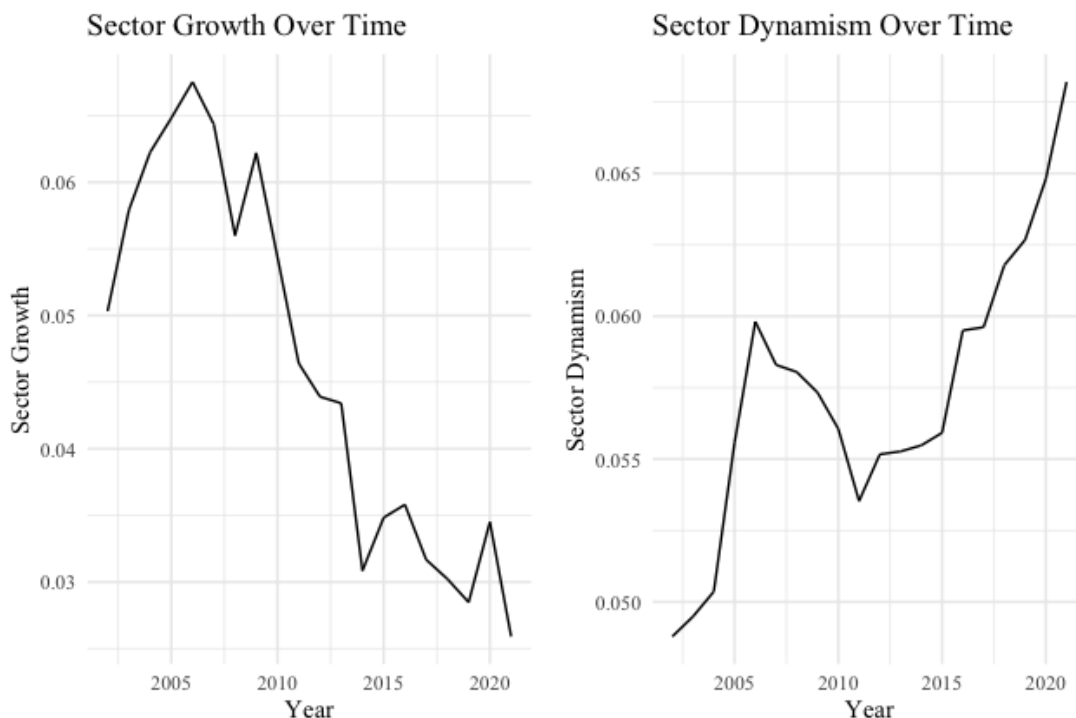


Figure 3.1: Time series plot of the *INDUSTRY_GROWTH* and *INDUSTRY_DYNAMISM* variables, which show a clear decline for growth after the great financial crisis of 2008 and an increase in dynamism from around the same time.

Lastly, two control variables surrounding ownership are measured, since these have been shown to affect firm performance (Hillman and Dalziel, 2003). Firstly, institutional investors tend to monitor their investments more closely than retail investors (Elyasiani

and Jia, 2010; Lin and Fung, 2017), which is why I control for the percentage ownership that is held by this type of investors (*INST_OWNERSHIP*). The variable is defined as their share of the total equity of a firm. Secondly, I control for the presence of institutional blockholders (*BLOCK_DUMMY*), which is a dummy variable that shows a 1 when investors who hold more than five percent of the total outstanding shares of a company are present (Koh et al., 2022) and 0 otherwise. A total overview of all variables can be found in Table A.3. Another summary of the average, standard deviation, minimum and maximum values per variable (excluding dummy variables) can be found in Table A.4.

3.4 Multicollinearity analysis

To validate the sample data, variables, and the subsequent results, a check for multicollinearity of the variables is conducted. This is checked by looking at the Variance Inflation Factor (VIF), for which the results can be found in table A.5. Important to note is that almost all variables have a VIF lower than 4, except for *BLOCK_DUMMY* and *INST_OWNERSHIP*, for which the factors are a little over four. This means that all variables have low multicollinearity and for the latter two moderate multicollinearity is present Hair et al. (2011), but their values are still way below the usual rule of thumb that is 10 O'Brien (2007). This supports the suggestion that the sample and chosen variables are properly selected.

Chapter 4

Method

Since the purpose of the study is to measure the dynamics of firm performance of multiple companies over multiple years, I use a panel data model (or longitudinal time series data model) (Bai, 2009; Baltagi, 1997; Schmidheiny, 2014). There will be four models present that are compared with each other: i) One with *ROA_M1_2* as the dependent variable with all control variables, ii) one with *ROA_M1_2* as the dependent variable without any predictors, iii) one with *ROA* as the dependent variable, and iv) one with *ROA_M1_3* as the dependent variable.

As for the type of panel model, there are two types available, namely those with fixed (FE) or random (RE) effects (Hausman, 1978). With fixed effects, it is possible to separate time-invariant characteristics in the data, which will in turn improve the estimations on the effects of the predictors (Pesaran and Zhou, 2016). This way I can account for time-specific unobserved heterogeneity by allowing individual-specific effects to be removed, thereby isolating the impact of the independent variables on the dependent variable (Best and Wolf, 2014). However, this makes it impossible to adjust for industry effects as well, since they are time-invariant. Thus, the fixed effects model will be compared with a random effects model, to see whether there is important data missing in the fixed effects analysis. The Hausman test will also be employed to decide between FE and RE models Hausman (1978). This statistical test examines the null hypothesis that random effects are better suited for the model against the alternative that fixed effects would be better, based on whether the unique errors are correlated with the regressors in the model. If these errors correlate, fixed effects should be used and vice versa Hausman (1978); Schmidheiny (2014).

Besides this, the moderating effect of the recession variable (*RECESSION*) is calculated by using interaction terms (Bowen, 2010; Koh et al., 2022). This also functions as a way to incorporate year effects in the panel model, so these do not have to be accounted for anymore. Then the marginal effects, that are calculated directly from the estimated coefficients in the model. For a predictor, this effect is given by the coefficient beta, which represents the average change in *ROA_M1_2* for a one-unit change of said predictor. For

the interaction term however, being *BOARD_TURNOVER*₋₃ times *RECESSION*, the interpretation of the marginal effect becomes conditional. This means that the coefficient of the term indicates how the effect of the predictor on the dependent variable changes at different values of the other predictor.

Next to this, I check for multicollinearity, by looking at the Variance Inflation Factor (VIF), which is a measure to see how much of the coefficient variance increases in case of correlation of predictors Shrestha (2020). Furthermore, I account for heteroscedasticity and serial correlation in observations of the same firm over time by calculating firm-clustered and robust standard errors within the panel model (Koh et al., 2022; Zhou, 2013). To do this, I use the ‘**vcovHC**’ function from the ‘**sandwich**’ package in R, specifying the cluster option for firm-level clustering and the HC1 option for heteroscedasticity-consistent standard errors (Zeileis, 2004). Additionally, a Breusch-Pagan test will be conducted, which indicates whether the variances of the residuals are constant across the levels of the independent variable (Breusch and Pagan, 1980). Lastly, to check for serial correlation, a Breusch-Wooldridge test will also be performed Wooldridge (2002).

Notably, due to missing information in the databases used for extracting the data of this paper, the model is unbalanced, since it does not include the same number of observations or the same data points for each firm (Antweiler, 2001; Baltagi and Song, 2006). This can cause sample selection bias, which is why a comparison will be performed with a smaller subset of the data that is a balanced panel. Additionally, an auxiliary variable is added to the unbalanced panel to compare the results and their significance. This variable is the number of available time observations per entity (*TIME_OBSERVATIONS*) Nijman and Verbeek (1992). Still, the error terms, denoted as $\epsilon_{i,t}$ are presumed to be independent and identically distributed with zero mean and constant variance across both time and entities. Lastly, to control for outliers in the continuous variables, which can otherwise heavily distort the results, I winsorized these at 1% and 99% levels (Koh et al., 2022; Kwak and Kim, 2017). All data is handled within R to perform the analysis.

$$\begin{aligned}
\text{Firm Performance}_{i,t+1} = & \alpha + \beta_1 \text{Board Turnover}_{i,t-1} + \beta_2 \text{Board Turnover}_{i,t-2} \\
& + \beta_3 \text{Board Turnover}_{i,t-3} + \beta_4 \text{Recession}_t \\
& + \beta_5 (\text{Board Turnover}_{i,t} \times \text{Recession}_t) \\
& + \gamma \text{Control Variables}_{i,t} + u_i + \epsilon_{i,t}
\end{aligned} \tag{4.1}$$

Formula 4.1: Panel data model formula for firm performance.

Chapter 5

Results

5.1 Main model outcomes

5.1.1 Main variables

In the main unbalanced fixed effects model (1) there are 19 predictors, or degrees of freedom, that are included. The increase of the coefficient of the board turnover over the past three years (*BOARD_TURNOVER_3*) by one unit, causes an 0.02% increase in the return on assets over the upcoming two years (*ROA_M1_2*). Important to note is that this small effect is statistically insignificant. When switching from a continuous board turnover variable to one with three terciles (high, medium, and low turnover), these effects remain close to zero and statistically insignificant, supporting the overall findings. Thus, hypothesis 1 (H1) is rejected, since board turnover is not proven to have a negative effect on future firm performance. These variables are moderated by a whether a year is marked as a recession period (*RECESSION*), which has a positive effect of 1.13% on *ROA_M1_2* in the first model. This is surprising, since one would expect a recession to have a negative effect on firm performance over the years. Also noting this relationship is strongly significant, this is a remarkable insight, which also causes hypothesis 2 (H2) to be rejected. The presence of a recession period is not shown to amplify the negative correlation between board turnover and return on assets.

Lastly, the interaction effect between *RECESSION* and *BOARD_TURNOVER_3* has a negative coefficient of 0.78% and is statistically insignificant. As can be seen in the recession effects plot in figure 5.1, there is no distinguishable difference in the effect of magnitude of board turnover on return on assets, conditionally on whether the period is marked as a recession. The variation surrounding the trend lines also suggests that ROA is not explained by board turnover alone, especially for the non-recession panel. This coincides with the previously found statistical insignificance.

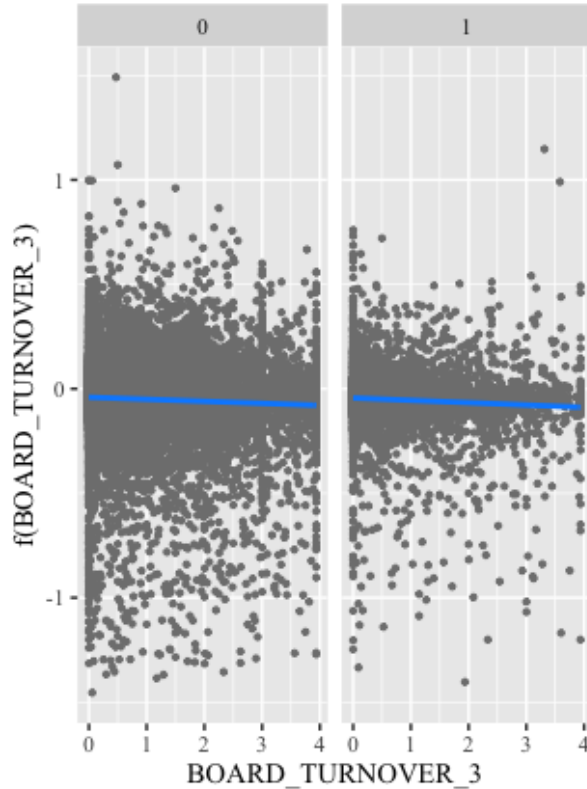


Figure 5.1: Effects plot of the interaction effect of magnitude of board turnover on return on assets, moderated by recession (where 0 is no recession and 1 is a recession).

5.1.2 Other variables

Furthermore, there are multiple control variables used in the model that are found to be significant. Of these, return on assets (ROA) has one of the biggest effects, with the coefficient being 0.833. This result seems logical since ROA in the future tends to increase if current ROA increases as well. Another financial variable that is slightly significant is $LIQUIDITY$, with a coefficient of 0.001. Of the specific board member variables, only CEO_POWER is significant, with a coefficient of 0.001. Furthermore, DIV_GENDER has a surprising negative coefficient of -0.015. Contrary to existing research (Li and Chen, 2018), this would mean that gender diversity in the board has negative impact on the firm performance.

Additionally, $EXPERIENCE$ is also significant, with a coefficient of 0.000, suggesting that the effect is nonexistent. AVG_TENURE is also significant, but again has a negligible effect of 0.000. Furthermore, both ownership variables ($INST_OWNERSHIP$ and $BLOCK_DUMMY$) are significant, with opposing coefficients of 0.750 and -0.727 respectively. This would suggest that a higher percentage of institutional ownership has a positive effect on the financial performance of an organization, while the presence of block owners decreases future firm performance. Besides, $INDUSTRY_GROWTH$ is a significant control variable, with a negative effect of -0.273. Again, this seems counter-intuitive,

Table 5.1: Main unbalanced fixed effects model (1) with all variables added.

Dependent variable:	ROA_M1_2	
	(1)	
BOARD_TURNOVER_3	0.000	(0.001)
RECESSION	0.010***	(0.001)
BOARD_TURNOVER_3:RECESSION	-0.001	(0.001)
ROA	0.833***	(0.008)
SIZE	-0.000	(0.001)
LIQUIDITY	0.001*	(0.000)
CEO_TURNOVER	0.001	(0.002)
CFO_TURNOVER	-0.001	(0.002)
CEO_POWER	0.007*	(0.003)
BOARD_SIZE	-0.001	(0.000)
DIV_GENDER	-0.015**	(0.005)
DIV_ETHNIC	0.002	(0.003)
EXPERIENCE	-0.000***	(0.000)
MIDDLE_TENURE	0.002	(0.001)
AVG_TENURE	0.000**	(0.000)
BLOCK_DUMMY	-0.727***	(0.125)
INST_OWNERSHIP	0.750***	(0.117)
INDUSTRY_GROWTH	-0.274***	(0.034)
INDUSTRY_DYNAMISM	-0.052***	(0.013)
Observations	40,403	
R2	0.768	
Adjusted R2	0.734	
F Statistic	6,137.6 (df = 19; 35,204)	
P-value	0.000	

Note: *p_i0.1; **p_i0.05; ***p_i0.01

For firm-clustered standard errors, the **vcovHC** function from the **sandwich** package in R is used, and the HC1 option for heteroscedasticity-consistent standard errors.

since it suggests that a growing industry has a lower return on assets as a result. Lastly, *INDUSTRY_DYNAMISM* is significant, but has a smaller negative effect of -0.052, which is in line with expectations.

The other control variables are all insignificant. Interestingly, *CEO_TURNOVER* seems to have a positive (albeit small) effect of 0.001, while *CFO_TURNOVER* has a negative effect of -0.001. These opposite effects seem unexpected, given that it suggests that CFO turnover would benefit firm performance. Finally, the other control variables produce the expected coefficients, with *DIV_ETHNIC* and *MIDDLE_TENURE* having positive effects and *SIZE* and *BOARD_SIZE* having a negative effect. Notably all these results are non-significant, meaning that no conclusions can be drawn from the data.

5.1.3 Overall model performance

The R-squared value of this main model is 0.768, which means that 76.8% of the variance of the dependent variable can be explained by the model (Miles and Hamilton, 2005). When adjusting for the number of data points in the model, an adjusted R-squared of 0.734 can be found, indicating that 73.4% of the variance can still be explained (Karch, 2020; Miles and Hamilton, 2005). Based on other research in the field, these seem to be acceptable numbers (Demerjian et al., 2012; Koh et al., 2022). Lastly, the F-statistic is a relatively large number, and the p-value is very small, being 6,137.56 and 0.000 respectively. This shows that the main model is statistically significant (Cutler and Miller, 2005; Thiese, 2016). All results can be found in table 5.1.

5.2 Building the model

5.2.1 Main variables

To further corroborate the variables that are used in the main fixed effects balanced panel model (1), this model is built up bit by bit, starting with the dependent (*ROA_M1_2*), independent (*BOARD_TURNOVER_3*), moderating (*RECESSION*) variable and the interaction term (*RECESSION * BOARD_TURNOVER_3*). This equals the second model shown in the overall results in Table 5.2. The results can be found in Table A.6. In these results a negative significant effect of -0.010 between *ROA_M1_2* and *BOARD_TURNOVER_3* can be found. The other results remain insignificant, but show slightly negative coefficients, while they were slightly positive for the full model. Furthermore, the R-squared and R-squared adjusted are extremely low at 0.003 and -0.143 respectively, suggesting that the predictors in the model hold basically all the explaining power (Miles and Hamilton, 2005). This model also has a significant p-value, but a low F-statistic (Cutler and Miller, 2005; Thiese, 2016).

5.2.2 Financial performance variables

The next variables that are added are the ones that indicate the financial performance of a firm, being *ROA*, *SIZE* and *LIQUIDITY*. The full results can be found in Table A.7. Notably, the relationship between *BOARD_TURNOVER_3* and *ROA_M1_2* is not significant anymore after adding the additional variables. However, the relationship between *RECESSION* and *ROA_M1_2* becomes significant, with a coefficient of 0.010. Furthermore, the new control variables *ROA*, *SIZE* and *LIQUIDITY* have statistically significant effects as well, with their coefficients being 0.833, 0.002 and 0.001 respectively. Especially the strong effect of *ROA* seems expected, given the likeliness that current ROA impacts future firm performance. These effects suggest that the earlier effects captured in *BOARD_TURNOVER_3* were actually due to missing variable outcomes, that were not yet captured in the model. Overall, the R-squared increased to a respectable 65.0% and the F statistic is now at 19,313.7 as well, which suggests a stronger explanatory power with the new model variables.

5.2.3 Individual board member variables

Another set of variables that will be added to the model are the individual board member variables, being *CEO_TURNOVER*, *CFO_TURNOVER* and *CEO_POWER*, which apply to specific people on the board of directors of a firm. The full results with these additions can be found in Table A.8. First of all, it is important to note that nothing changes in the significance or the coefficients of the earlier variables, which further corroborates the previous findings. Besides, only *CEO_POWER* turns out to be a significant variable, with an effect of 0.005. On the other hand, it turns out that the new variables influence the R-squared substantially, suggesting that they provide the model with additional explaining power and are thus important to maintain.

5.2.4 General board variables

Besides individual board member descriptions, control variables describing the overall board of directors are also added to the model. These include *BOARD_SIZE*, *DIV_GENDER*, *DIV_ETHNIC*, *EXPERIENCE*, *MIDDLE_TENURE* and *AVG_TENURE*. The full results with these changes can be found in Table A.9. Again, after adding these variables, it can be found that the coefficients of the previously added variables do not change. However, *SIZE* is not statistically significant anymore. That suggests that the significance of this variable is weakened due to other effects that come to the surface after being added to the model. The removal of this significant variable seems to be replaced with the coefficient of *DIV_GENDER*, which is strongly significant, with an effect of -0.027.

5.2.5 External variables

The last variables that are added are the external variables , being *BLOCK_DUMMY*, *INST_OWNERSHIP*, *INDUSTRY_GROWTH* and *INDUSTRY_DYNAMISM*. The full results can be found in Table 5.2. The first thing to note is that there are minimal changes in the coefficients of the variables that were previously added, but some additional variables turn significant, namely *EXPERIENCE* and *AVG_TENURE*. The coefficients of both of these are 0.000. Also, all four new variables turn out to be statistically significant. These are *BLOCK_DUMMY*, *INST_OWNERSHIP* and *INDUSTRY_GROWTH* and *INDUSTRY_DYNAMISM*, with their coefficients being -0.727, 0.750, -0.274 and -0.052 respectively. The significance of these variables underlines their importance for the completeness of the model. The R-squared and F statistic remain at proper values, which further solidifies the explaining power of the model.

5.3 Comparison with other models

Besides the main fixed effects unbalanced panel model (1), I created three other models and compared their relative results. The first additional model has been described in section 5.2.1, being the model without any predictors. The second one has *ROA* as a dependent variable instead of *ROA_M1_2* and the last one replaces the dependent variable with *ROA_M1_3*. For model number three, the R-squared and R-squared adjusted values are similar to the first model, suggesting that using *ROA* as a dependent variable while adding industry and year effects has similar effects to using *ROA_M1_2*. However, for the fourth model, a lower explanatory power can be found, as well as an F-statistic about half of the one from the first model. Thus, there can be concluded that *ROA_M1_3* is a less suitable dependent variable.

The third model and the main model (1) produce quite different results, which overall suggests that the short-term effects of the variables on *ROA* are different than those over a longer period of time. Firstly, *BOARD_TURNOVER_3* produces a similar significant, albeit smaller, effect as the second model, with a negative coefficient of -0.002. This could be explained by there being a noticeable effect on the short term, which is less noticeable when lagged *ROA* over time is studied. Secondly, the *RECESSION* variable is significant, as it is in the main model as well, but here the coefficient is negative. This was originally expected to be the case for all models. This could mean that a period of recession has a short-term negative effect, but that that does not hold true for the longer term. Besides, the interaction between *BOARD_TURNOVER_3* and *RECESSION* produces the same small and insignificant result as in the first two models, only negative instead of positive.

Furthermore, there are some statistically significant control variables, with the most important one being *ROA_M1_2* that produces a large effect of 0.900. This seems logical

when comparing it to the effect of *ROA* in the main model, which produces a similar coefficient. Additionally, *SIZE* and *CEO_TURNOVER* produce significant effects of 0.014 and -0.004 respectively. These are the expected effects, being that a company that has a larger turnover has a larger ROA and that a leaving CEO has a negative impact on ROA in that specific year. However, these variables are only significant in the third model, suggesting the effects do not hold up for the future firm performance. Other significant variables such as *LIQUIDITY* and *AVG_TENURE* produce similar outcomes as the main model as well, with their coefficients being 0.005 and 0.000. Lastly, the only statistically significant control variables are *DIV_GENDER*, *EXPERIENCE* and *INDUSTRY_GROWTH*, and they all produce opposite outcomes of the main model, with their effects being 0.022, 0.001 and 0.362. All other variables are insignificant with the expected effects, with the only exception being *INDUSTRY_DYNAMISM*, which produces a small and positive coefficient.

Finally, the fourth model produces outcomes that are close to the main model with respect to its coefficients, standard errors, and significance. It only shows a slightly decreased significance for *LIQUIDITY* and *CEO_POWER*, but these coefficients remain at the same level, so the fourth model still corroborates the findings of the first model. Overall, the additional models provide a further testament to the viability of the main model (1), because they produce similar or explainable results for both their main- and control variables. Mainly they provide a nuance to some of the more unexpected effects that are found in the main model, explaining that these could be present in the longer term.

Table 5.2: Comparison of the four models: i) main model with ROA_M1_2 as a dependent variable, ii) main model without predictors, iii) model with ROA as a dependent variable, and iv) model with ROA_M1_3 as a dependent variable.

Dependent variable:	ROA_M1_2		ROA		ROA_M1_3	
	(1)	(2)	(3)	(4)	(5)	(6)
BOARD_TURNOVER_3	0.000 (0.001)	-0.010*** (0.001)	-0.002** (0.001)	0.000 (0.001)		
RECESSION	0.010*** (0.001)	-0.003 (0.003)	-0.014*** (0.001)	0.011*** (0.002)		
BOARD_TURNOVER_3:RECESSION	-0.001 (0.001)	-0.002 (0.002)	0.001 (0.001)	-0.001 (0.001)		
ROA	0.833*** (0.008)			0.795*** (0.003)		
ROA_M1_2			0.900*** (0.003)			
SIZE	-0.000 (0.001)		0.014*** (0.001)	0.000 (0.001)		
LIQUIDITY	0.001* (0.000)		0.005*** (0.001)	0.001 (0.000)		
CEO_TURNOVER	0.001 (0.002)		-0.004* (0.002)	0.000 (0.002)		
CFO_TURNOVER	-0.001 (0.002)		-0.002 (0.002)	-0.001 (0.003)		
CEO_POWER	0.007* (0.003)		-0.001 (0.003)	0.007 (0.003)		
BOARD_SIZE	-0.001 (0.000)		-0.000 (0.000)	-0.001 (0.000)		
DIV_GENDER	-0.015** (0.005)		0.022*** (0.005)	-0.015** (0.006)		
DIV_ETHNIC	0.002 (0.003)		0.001 (0.003)	0.001 (0.003)		
EXPERIENCE	-0.000*** (0.000)		0.001*** (0.000)	-0.000*** (0.000)		
MIDDLE_TENURE	0.002 (0.001)		0.000 (0.001)	0.002 (0.001)		
AVG_TENURE	0.000** (0.000)		0.000** (0.000)	0.000*** (0.000)		
BLOCK_DUMMY	-0.727*** (0.125)		-0.141 (0.130)	-0.879*** (0.136)		
INST_OWNERSHIP	0.750*** (0.117)		0.092 (0.122)	0.900*** (0.128)		
INDUSTRY_GROWTH	-0.274*** (0.034)		0.362*** (0.035)	-0.275*** (0.037)		
INDUSTRY_DYNAMISM	-0.052*** (0.013)		0.005 (0.014)	-0.056*** (0.014)		
Observations	40,403	40,403	40,403	40,403		
R2	0.768	0.003	0.752	0.718		
Adjusted R2	0.734	-0.143	0.731	0.676		
F Statistic	6,137.6 (df = 19; 35,204)	39.461 (df = 3; 35,220)	6,078.1 (df = 19; 35,204)	4,705.9 (df = 19; 35,204)		
P-value	0.000	0.000	0.000	0.000		

Note: *p<0.1; **p<0.05; ***p<0.01

For firm-clustered standard errors, the **vcovHC** function from the **sandwich** package in R is used, and the HC1 option for heteroscedasticity-consistent standard errors.

5.4 Robustness checks

5.4.1 Overall checks

Firstly, to determine whether the choice for fixed effects was the right choice for the main model, or whether random effects were a better fit, I conduct a Hausman test Hausman (1978). As a conclusion, a p-value of approximately 0.000 is found, which means I reject the null hypothesis, which was that random effect would be preferable. Thus, this supports the previous decision to make use of fixed effects in the panel model. To substantiate this choice, the results of the models will also be compared to random effects models with the same variables included. These findings are shown in section 5.4.3.

Secondly, besides using firm-clustered and robust standard errors, I conduct a Breusch-Pagan test to check for heteroscedasticity. This test results in a p-value of approximately 0.349, which means that the null hypothesis is not rejected and thus there is no heteroscedasticity present in the model Breusch and Pagan (1980). Furthermore, to check for serial correlation, I perform a Breusch-Wooldridge test Wooldridge (2002). This test yields a p-value of approximately 0.000, suggesting that the null hypothesis is rejected and there is serial correlation present in the data Uyanto (2020). Besides using robust standard errors, I check for the significance of different interaction effects in the model, to determine the possible effects that the serial correlation could have on the results. These results can be found in section 5.4.4.

The last general check that will be done is the performance of a quasi-Hausman test, due to the unbalanced nature of the panel. With this test, the presence of sample selection bias can be uncovered. Again, the results are significant with a p-value of approximately 0.000, thus suggesting the presence of sample selection bias I need to be account for Nijman and Verbeek (1992). To realize this, a comparison is made between the results of firms that have data points present for all sample years versus those that have not. This is done by adding an auxiliary variable, being the number of available time observations. The results of this analysis can be found in section 5.4.2.

5.4.2 Balanced versus unbalanced panel

After conducting a quasi-Hausman test, I concluded that there might be sample selection bias present in the dataset. To control for this, a balanced panel is created from the dataset, keeping only the observations of firms that have data available for all years between 2002 - 2021. This leaves 5,600 observations of 280 different firms, thus significantly reducing the sample size. Then, the four models that were previously tested for the unbalanced panel are tested again for the balanced panel as well. Additionally, an auxiliary variable for the number of available time observations (*TIME_OBSERVATIONS*) is added to the unbalanced panel to compare the results and their significance. The full

results of the analysis can be found in table A.10.

After adding the additional variable, the results of the unbalanced panel model (2), as shown in table 5.3, only marginally differ from the original main unbalanced panel model (1). However, the additional variable *TIME_OBSERVATIONS* does produce a significant coefficient of approximately -0.005. This suggests that when an entity has more observations from different years present in the panel model, their *ROA_M1_2* is lower than that of a firm with fewer observations in the sample. Although it is impossible to be certain on the cause of these results, it does confirm the presence of sample selection bias. This could be due to firms with more observations operating during economically adverse times as well, which causes their financial performance to go down. Besides, it could be that companies which are excluded later on in the sample are the ones that focus on aggressive growth first, whilst later going bankrupt. This could still skew the sample because the entities remaining might be the ones that are growing more slowly and take less risks. Ultimately, that could cause the overall balanced sample to have reduced financial performance.

Additionally, the main unbalanced panel model (1) is compared to a fully balanced panel model with the same variables (3), as shown in table 5.3. First of all, the effects of the independent variable remain the same and insignificant, with *BOARD_TURNOVER_3* having a negligible negative effect. The *RECESSION* variable, however, changes from a positive and significant coefficient to a negative and insignificant one of approximately -0.005. This could provide minor evidence for sample selection bias, because some firms that are hit harder by recession circumstances drop out of the sample (due to for example bankruptcy) and thus skew the overall effect upwards. Especially since it would be suspected that a period of recession would negatively affect future firm performance. However, since the variable is not statistically significant in the balanced panel, this remains uncertain. Furthermore, the coefficient of the interaction effect between the central variables remains somewhat similar and insignificant.

Some notable changes do occur for the variables *INST_OWNERSHIP*, *INDUSTRY_GROWTH*, and *INDUSTRY_DYNAMISM*, since their coefficients change from positive to negative for the first variable and from negative to positive for the latter two. However, all three of them become statistically insignificant, so no further conclusions can be drawn from these changes. This is not the case for *DIV_GENDER* and *BLOCK_DUMMY*, which both show significant effects that are opposite to the effects found in the unbalanced panel model (1) at respectively 0.014 and 0.012. This suggests that there is a difference in the effects of these variables depending on whether the sample consists of an unbalanced panel or a balanced panel, underlining the sample selection bias.

Table 5.3: Comparison of the main unbalanced and main balanced model, including the new control variable of how many time observations a firm has (*TIME_OBSERVATIONS*).

Dependent variable:	ROA_M1_2 (1)	ROA_M1_2 (2)	ROA_M1_2 (3)
BOARD_TURNOVER_3	0.000 (0.001)	0.000 (0.001)	-0.000 (0.001)
RECESSION	0.010*** (0.001)	0.012*** (0.001)	-0.005 (0.009)
BOARD_TURNOVER_3:RECESSION	-0.001 (0.001)	-0.001 (0.001)	0.003 (0.003)
ROA	0.833*** (0.008)	0.833*** (0.008)	0.842*** (0.007)
SIZE	-0.000 (0.001)	-0.000 (0.001)	-0.000 (0.001)
LIQUIDITY	0.001* (0.000)	0.001 (0.000)	0.003** (0.001)
CEO_TURNOVER	0.001 (0.002)	0.001 (0.002)	0.000 (0.003)
CFO_TURNOVER	-0.001 (0.002)	-0.001 (0.002)	0.003 (0.005)
CEO_POWER	0.007* (0.003)	0.008* (0.005)	0.007* (0.003)
BOARD_SIZE	-0.001 (0.000)	-0.000 (0.000)	-0.000 (0.000)
DIV_GENDER	-0.015** (0.005)	-0.016** (0.005)	0.014* (0.004)
DIV_ETHNIC	0.002 (0.003)	0.002 (0.004)	0.014*** (0.004)
EXPERIENCE	-0.000*** (0.000)	-0.000** (0.000)	-0.000 (0.000)
MIDDLE_TENURE	0.002 (0.001)	0.002 (0.001)	0.005* (0.002)
AVG_TENURE	0.000** (0.000)	0.000* (0.000)	0.000* (0.000)
BLOCK_DUMMY	-0.727*** (0.125)	-0.724*** (0.146)	0.012** (0.004)
INST_OWNERSHIP	0.750*** (0.117)	0.750*** (0.138)	-0.889 (0.006)
INDUSTRY_GROWTH	-0.274*** (0.034)	-0.283*** (0.052)	0.024 (0.033)
INDUSTRY_DYNAMISM	-0.052*** (0.013)	-0.039 (0.030)	0.012 (0.025)
TIME_OBSERVATIONS		-0.005** (0.002)	
Observations	40,403	40,403	5,600
R2	0.768	0.768	0.783
Adjusted R2	0.734	0.734	0.782
F Statistic	6,137.6 (df = 19; 35,204)	5,833.6 (df = 20; 35,203)	1,058.3 (df = 19; 5,561)
P-value	0.000	0.000	0.000

Note: *p<0.1; **p<0.05; ***p<0.01.

For firm-clustered standard errors, the **vcovHC** function from the **sandwich** package in R is used, and the HC1 option for heteroscedasticity-consistent standard errors.

When looking at other control variables, it can be found that *ROA*, *SIZE*, *LIQUIDITY*, *CEO_TURNOVER*, *CEO_POWER*, *BOARD_SIZE*, and *AVG_TENURE* behave similarly in the unbalanced (1) and the balanced (3) panel models, which especially underlines the explanatory power of *ROA* as a control variable. Additionally, *DIV_ETHNIC* and *MIDDLE_TENURE* provide the expected and previously found outcomes, but they change from not being significant to becoming statistically significant. This partially holds for *EXPERIENCE* as well, but this variable goes from significant to insignificant instead. Lastly, the coefficient of *CFO_TURNOVER* changes from negative to positive, but since it remains insignificant no further conclusions can be drawn.

Overall, both the balanced and the unbalanced models are statistically significant, with high R-squared values between 76.8 – 78.3% and high F-statistics as well, underlining their validity and explanatory power. Most variables provide similar coefficients for both models, suggesting that there are no major concerns for sample selection bias or altered effects due to the unbalanced nature of the main model (1). The only variables that result in different outcomes are not part of the main group of variables, further corroborating this statement. Especially since the balanced panel (3) yields much fewer observations, it should be considered that the findings from this model are more sensitive to outliers as well.

5.4.3 Random effects versus fixed effects model

To further substantiate the findings from the main model, especially the choice to use fixed effects in the panel model, the results will be compared to a random effects model. A fixed effects model isolates the impact of *BOARD_TURNOVER_3* on *ROA_M1_2* within the same firm over different time periods. On the other hand, a random effects model assumes that individual entity effects are random and uncorrelated with the independent variables. This way, the industry effects can also be considered, since they are time-invariant and thus removed in the regular fixed effects model Pesaran and Zhou (2016). All four of the original unbalanced fixed effects panel models are transformed to random effects panel models, with the full results of this analysis available in table A.11.

Firstly, when looking at the comparison in table 5.4, it is noticeable that the intercept is statistically significant with a negative coefficient of approximately -0.020. This shows that there is a negative baseline for *ROA_M1_2*, since with all other variables being zero, the dependent variable would have an outcome of -0.020. Furthermore, *BOARD_TURNOVER_3* and the interaction variable *BOARD_TURNOVER_3: RECESSION* provide the same outcomes in the random effects model (2) as in the fixed effects model (1). Even though they are not significant, this does underline the robustness of the results. The same holds true for *RECESSION*, but this moderating variable is strongly statistically significant, suggesting that conclusions can be drawn from the outcome.

Table 5.4: Comparison of the main fixed effects model and main random effects model.

Dependent variable:	ROA_M1_2	
Type	Fixed effects	Random effects
Intercept		-0.020 (0.007)**
BOARD_TURNOVER_3	0.000 (0.001)	0.000 (0.001)
RECESSION	0.010*** (0.001)	0.011*** (0.001)
BOARD_TURNOVER_3:RECESSION	-0.001 (0.001)	-0.001 (0.001)
ROA	0.833*** (0.008)	0.852*** (0.007)
SIZE	-0.000 (0.001)	0.001 (0.001)
LIQUIDITY	0.001* (0.000)	0.001** (0.000)
CEO_TURNOVER	0.001 (0.002)	0.002 (0.002)
CFO_TURNOVER	-0.001 (0.002)	-0.000 (0.002)
CEO_POWER	0.007* (0.003)	0.007 (0.005)
BOARD_SIZE	-0.001 (0.000)	-0.000 (0.000)
DIV_GENDER	-0.015** (0.005)	-0.014** (0.004)
DIV_ETHNIC	0.002 (0.003)	0.005 (0.003)
EXPERIENCE	-0.000*** (0.000)	-0.000** (0.000)
MIDDLE_TENURE	0.002 (0.001)	0.002* (0.001)
AVG_TENURE	0.000** (0.000)	0.000** (0.000)
BLOCK_DUMMY	-0.727*** (0.125)	-0.003 (0.005)
INST_OWNERSHIP	0.750*** (0.117)	0.001 (0.007)
INDUSTRY_GROWTH	-0.274*** (0.034)	-0.264*** (0.044)
INDUSTRY_DYNAMISM	-0.052*** (0.013)	-0.061** (0.023)
factor(Industry)Transportation		-0.001 (0.003)
factor(Industry)Wholesale Trade		0.001 (0.007)
factor(Industry)Manufacturing		0.014*** (0.003)
factor(Industry)Construction		-0.016** (0.006)
factor(Industry)Mining		0.075*** (0.004)
factor(Industry)Finance		0.012 (0.012)
factor(Industry)Retail Trade		-0.014*** (0.004)
factor(Industry)Nonclassifiable		-0.002 (0.011)
factor(Industry)Agriculture		0.008 (0.010)
Observations	40,403	40,403
R2	0.768	0.800
Adjusted R2	0.734	0.800
F-statistic/Chi-squared	6,137.6 (df = 19; 35,204)	156,300 (df = 28)
P-value	0.000	0.000

Note: *p<0.1; **p<0.05; ***p<0.01.

For firm-clustered standard errors, the `vcovHC` function from the `sandwich` package in R is used, and the HC1 option for heteroscedasticity-consistent standard errors.

Interestingly, the results of two control variables change when comparing the two models, namely *INST_OWNERSHIP* and *BLOCK_DUMMY*. For the random effects model, both of these variables turn statistically insignificant, with their coefficients changing from approximately -0.727 to -0.003 and 0.750 to 0.001 respectively. These changes suggest that the variations of their effects are much more pronounced when comparing a firm over time, as opposed to comparing different firms. However, due to the insignificance of these variables, it is not possible to say this with certainty.

Almost all control variables, such as *ROA*, *SIZE*, *LIQUIDITY*, *CEO_TURNOVER*, *CFO_TURNOVER*, *BOARD_SIZE*, *DIV_GENDER*, *DIV_ETHNIC*, *EXPERIENCE*, *AVG_TENURE*, *INDUSTRY_GROWTH* and *INDUSTRY_DYNAMISM* provide the same results as their counterparts in the fixed effects model (1), underlining these previous findings. The same goes for *CEO_POWER* and *MIDDLE_TENURE*, only changing that former was significant in the fixed effects model, but not in the random effects model and vice versa for the latter. Lastly, the industry factors all result in different negative or positive coefficients, with about half of them being significant. Especially the effect for the industry *Mining* is quite large, with a positive coefficient of 0.075. This shows that the industry in which the firms operate has significant effects on their future firm performance.

Overall, the R-squared values of both models are quite high, at 76.8% and 80.0% respectively. The F-statistic and Chi-squared values are also sufficient, being 6,137.6 and 156,300, and both models are statistically significant, with p-values around 0.000. Furthermore, it can be observed that most variables yield similar results for both models, despite the industry effects only being added in the random effects model. Just two control variables provide different outcomes (being *INST_OWNERSHIP* and *BLOCK_DUMMY*). For those, it can be found that they show more pronounced and significant effects in the fixed effects model. Considering this, and the fact that the outcome of the Hausman test was 0.000, it can ultimately be concluded that a fixed effects model was indeed the preferential choice for the model Hausman (1978); Schmidheiny (2014).

5.4.4 Interaction effects

Another way to validate the results from the main unbalanced fixed effects panel model (1), is to see whether there are more relevant interaction effects present. These results can be found in table 5.5. The main relevance lies in interaction effects surrounding the moderating variable, *RECESSION*. It can be found that important effects to discuss would be the interaction effect between *RECESSION* and *CEO_TURNOVER* or *CFO_TURNOVER*, due to recent research showing that these types of turnover occur more often when macroeconomic downturns are present (Lafuente and García-Cestona, 2021; Li et al., 2024). The outcome of these interaction effects is indeed positive, but non-significant.

Table 5.5: Comparison of the main fixed effects model and main fixed effects model with all mentioned possible interaction effects included.

Dependent variable:	ROA_M1_2	
	(1)	(2)
BOARD_TURNOVER_3	0.000 (0.001)	0.000 (0.001)
RECESSION	0.010*** (0.001)	0.010* (0.002)
BOARD_TURNOVER_3: RECESSION	-0.001 (0.001)	-0.001 (0.001)
ROA	0.833*** (0.008)	0.854*** (0.009)
SIZE	-0.000 (0.001)	-0.001 (0.001)
LIQUIDITY	0.001* (0.000)	0.000 (0.000)
CEO_TURNOVER	0.001 (0.002)	0.001 (0.002)
CFO_TURNOVER	-0.001 (0.002)	-0.000 (0.003)
CEO_POWER	0.007* (0.003)	0.007 (0.013)
BOARD_SIZE	-0.001 (0.000)	-0.000 (0.000)
DIV_GENDER	-0.015** (0.005)	-0.016** (0.005)
DIV_ETHNIC	0.002 (0.003)	0.001 (0.004)
EXPERIENCE	-0.000*** (0.000)	-0.000 (0.000)
MIDDLE_TENURE	0.002 (0.001)	0.002 (0.001)
AVG_TENURE	0.000** (0.000)	0.000 (0.000)
BLOCK_DUMMY	-0.727*** (0.125)	-0.630*** (0.130)
INST_OWNERSHIP	0.750*** (0.117)	-0.256 (0.319)
INDUSTRY_GROWTH	-0.274*** (0.034)	-0.257*** (0.052)
INDUSTRY_DYNAMISM	-0.052*** (0.013)	-0.057 (0.029)
RECESSION:CEO_TURNOVER		0.003 (0.004)
RECESSION:CFO_TURNOVER		0.000 (0.005)
RECESSION:SIZE		0.000 (0.000)
RECESSION:LIQUIDITY		0.000 (0.000)
RECESSION:INDUSTRY_GROWTH		-0.075 (0.032)
RECESSION:INDUSTRY_DYNAMISM		0.052 (0.026)
CEO_TURNOVER:CFO_TURNOVER		-0.005 (0.004)
BLOCK_DUMMY:INST_OWNERSHIP		0.908** (0.345)
SIZE:ROA		-0.011*** (0.002)
Observations	40,403	40,403
R2	0.768	0.768
Adjusted R2	0.734	0.734
F-statistic/Chi-squared	6,137.6 (df = 19; 35,204)	4,048.6 (df = 29; 35,194)
P-value	0.000	0.000

Note: *p_i0.1; **p_i0.05; ***p_i0.01.

For firm-clustered standard errors, the `vcovHC` function from the `sandwich` package in R is used, and the HC1 option for heteroscedasticity-consistent standard errors.

Furthermore, it would be interesting to look at the effects between financial indicators, such as *SIZE* and *LIQUIDITY* with *RECESSION*. An earlier study by Picard and Rimmer (1999) for example, showed that recession have a bigger impact on larger firms. These two interactions have positive coefficients with insignificant p-values, so they are not included in the main model. Lastly, there are suspected interactions between *RECESSION* and *INDUSTRY_GROWTH* or *INDUSTRY_DYNAMISM*, since a recession impacts the macroeconomic environment in which these industries operate Peric and Vitezic (2015). Contrary to expectations, these effects are found to be negative and positive respectively, yet they are still statistically insignificant and thus they are also not included in the model.

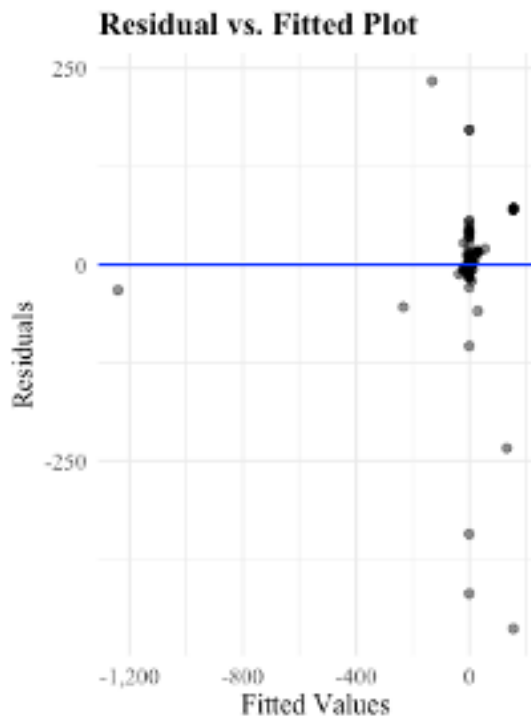
On the other hand, there are possible interaction effects that are worth exploring due to evidence in existing literature, but that are not relevant enough to include in the main unbalanced fixed effects panel model (1). Still, it is interesting to see their individual and overall effects on the model, to verify that they are rightfully excluded. These are the interaction between *CEO_TURNOVER* and *CFO_TURNOVER*, which could show they have an impact on each other. Nonetheless, this coefficient is found to be negative and insignificant. Next to this, there is the possibility of interaction between *SIZE* and *ROA*, that is shown to be highly significant, with a coefficient of -0.011. Lastly, the existence of blockholders (*BLOCK_DUMMY*) has a statistically significant interaction effect of 0.908 with the amount of institutional ownership (*INST_OWNERSHIP*), a connection that was previously uncovered by Kang et al. (2018) and Wright et al. (1996).

However, these significant interactions are purposefully not included in the main model, since they do not hold a strong enough connection to the main variables of the paper and are thus a risk for overfitting. This is especially the case since the determinants such as R-squared do not increase when adding said interactions and many previously significant control variables turn insignificant after their addition as well Kuhn and Johnson (2013). These variables are *LIQUIDITY*, *CEO_POWER*, *MIDDLE_TENURE*, *AVG_TENURE*, *INST_OWNERSHIP*, and *INDUSTRY_DYNAMISM*. On the other hand, all results of the variables in the main model stay consistent with what was previously found, except for *INST_OWNERSHIP*, which could be due to the significant interaction effect with *BLOCK_DUMMY* capturing a large portion of the previously found coefficient. In conclusion, the overall consistency in the results underlines the robustness of the main unbalanced fixed effects panel model (1).

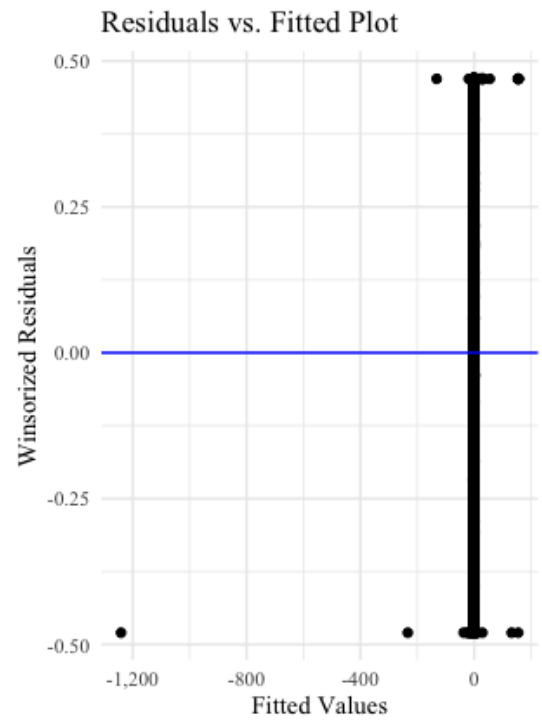
5.4.5 Residuals analysis

The last robustness check that is conducted to see whether the results actually hold up in different scenario's, is a residuals analysis for the main unbalanced fixed effects panel model (1). Firstly the residuals plot, which shows that most observations appear near the

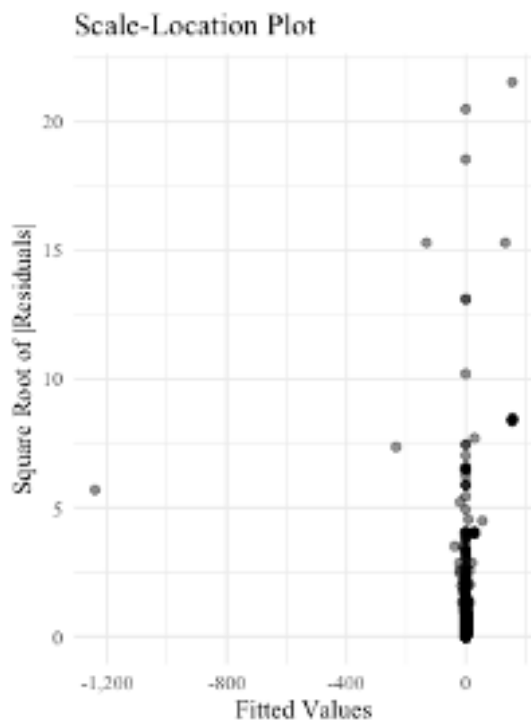
horizontal zero line, so these are accurately predicted by the model, as seen in figure a and b from 5.2. This is also substantiated by the histogram of the residuals that can be found in figure B.1a. Besides, the data is close to being normally distributed, as can be seen in the Q-Q plot in figure B.2a as well. However, this is not true for the outliers, which are shown to be skewed and because of that, difficult to predict. To partially prevent this effect, the data is winsorized at 1% and 99%. The outliers do seem to be randomly scattered, with the exception of the funnel-shaped predictions on the right end of the plot, which is confirmed when looking at the scale-location plot in figure c and d of 5.2. This could stem from the effect of outliers, a hypothesis that seems to be confirmed when comparing the plots with the winsorized variants.



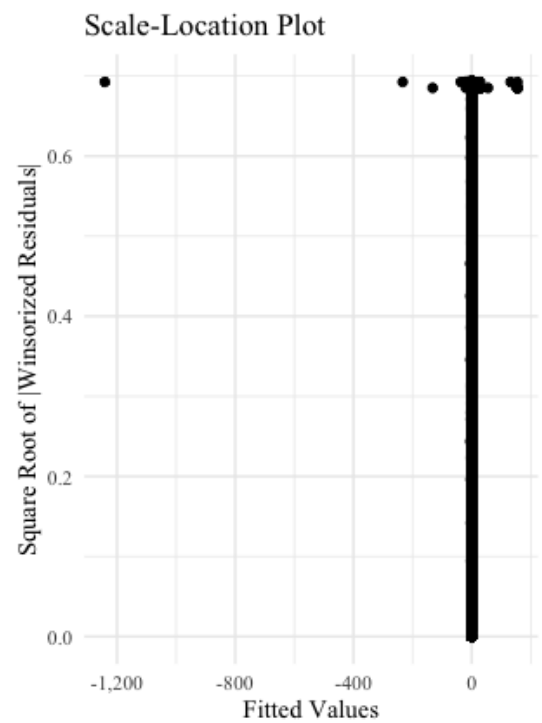
(a) Residual plot of the main model of the unbalanced panel.



(b) Winsorized residual plot of the main model of the unbalanced panel.



(c) Scale-location plot of the main model of the unbalanced panel.



(d) Winsorized scale-location plot of the main model of the unbalanced panel.

Figure 5.2: Residual and scale-location plots of the main model.

Chapter 6

Discussion

The results of the panel models in this study show similarities with previously existing research on the relationship between board turnover and firm performance, but they also provide some possible new insights. Earlier papers from Koh et al. (2022) and Liu et al. (2013) found a negative relationship between board turnover and firm performance, whereas this study found a nearly nonexistent non-significant effect between the two variables. This is more in line with the research from Anderson and Chun (2014), who found that moderate board turnover could be beneficial. However, when grouping board turnover in the sample into different relative terciles, there is still an absence of significant effects. These results indicate that the relationship is not always straightforward and can vary depending on the context. The findings can be an interesting addition to existing research, as the topic is quite understudied, with little papers written about it as of now.

As a result, these implications suggests that there should be a broader discussion surrounding the effects of board turnover on firm performance, specifically when including more variables that could influence the outcomes. From this study, it can be concluded that the presence of a recession can have an effect on the relationship between board turnover and firm performance. Nevertheless, the insignificant interaction effect could imply that the hypothesized amplification effect of a recession on the negative impact of board turnover on ROA is not as straightforward or may depend on additional variables that are not accounted for in this thesis. An alternative explanation might be that firms with high board turnover are already undergoing restructurings or realignments, which reduce the expected decrease in firm performance.

On the other hand, the context of control variables such as liquidity, current ROA, CEO power, gender diversity, different types of ownership, and industry growth or dynamism does have a statistically significant effect on firm performance. That could mean that other (similar) variables could influence board turnover as well, but that those contextual elements are not yet fully captured in this study. Furthermore, experience and board member tenure are shown to not have an effect, which provides additional insights. The broad time frame from 2000 – 2023, combined with the large number of countries

and industries included, could also influence the results. Future and more narrow research might result in different findings.

In conclusion, because most of the results of this study differ from the expected results based on previous research, these findings introduce some new perspectives. This is mainly the case for recession effects or the interaction between board turnover and these recession periods. They suggest that while board turnover may have a negative impact on firm performance, the moderating effect of the presence of a recession is more complex and does require further investigation. For organizations, understanding these dynamics is crucial when they are trying to navigate periods of economic uncertainty.

Chapter 7

Conclusion

7.1 Overall conclusion

The goal of this paper was to research the relationship between board turnover and firm performance, particularly in the context of economic recessions. With that in mind, I aimed to fill the gap in existing literature by diving into whether the presence of a recession amplifies the effects of board turnover on return on assets (ROA). This relationship and the understanding thereof are of utmost importance for both firms and their stakeholders, such as the board of directors, because it can help with setting up strategies for board management, especially in uncertain times of economic downturn. The research question of this study was: *“What is the moderating effect of periods of recession on the relationship between board turnover and firm performance for Western companies?”*

To address this research question, a fixed effects panel model analysis is conducted, with data from all countries classifying as Western. The data was sourced from both BoardEx, Eikon Refinitiv, and Compustat and comprised the time frame between 2000 – 2023, so that it includes multiple recession periods. This paper used industry median-adjusted ROA for the upcoming two years as the measure for firm performance and defined board turnover as the sum of incoming and outgoing directors divided by the board size over a three-year period. A dummy variable was used to indicate the presence of recession years. In the end, these results showed no significant relationship between board turnover and firm performance, and the interaction between recession periods and board turnover also did not yield a significant effect. The presence of a recession did yield a statistically significant effect, but this turned out to be unexpectedly positive.

These results suggest that the negative impact of board turnover on firm performance that was found in earlier studies on the topic is not as straightforward as thought for geographies outside of the United States. Furthermore, the presence of a period of recession does not necessarily amplify this relationship. This highlights the fact that additional factors need to be looked into, as they might influence these dynamics. The fact that the

results also show that the non-significant effect between the two variables is almost negligible suggests that organizations have already developed mechanisms to manage board turnover transitions, whilst effectively making sure that this does not affect firm performance. This is especially the case during periods of recession, as shown by the significant positive effect. New research could dive deeper into these mechanisms and the possibility to further optimize those.

7.2 Implications and recommendations

There are multiple implications and recommendations that can be drawn from the results of this thesis. Firstly, the findings imply that there are many more factors that influence firm performance besides board turnover. This causes the need for a multi-factorial, holistic approach when addressing these effects. It shows the importance of a focus on the quality of governance practices as a whole and the effectiveness of transition processes, instead of just the rate of turnover. This is even more so during periods of recession, which change firm performance as a whole. Firm-specific factors such as succession planning, robust on-boarding processes, and maintaining a balance between fresh perspectives and experienced oversight could help mitigate potential disruptions caused by board turnover. For the firm as a whole, sufficient liquidity, CEO power, and institutional ownership are shown to be beneficial factors that can be considered. Overall, looking deeper into these facets could help the board of directors, the management of a company, and the firm as a whole in their decision-making.

7.3 Limitations

Although I tried to be as thorough as possible during this research, there are some shortcomings that could be explored in further studies, to see whether a different approach yields different results. First of all, this thesis tried to capture data from all over the Western world, but the sample ended up being slightly skewed, due to a lack of data availability from some countries. This results in an over representation of data from the United Kingdom, while some smaller European countries are only included with a few observations. This could make the overall results less generalizable than I initially aimed for, which is why it would be interesting to see whether a different sample would yield different results.

Secondly, some possible interesting control variables were excluded from the data since they had too limited availability for the different geographies. Examples are the number of board meetings before turnover, which was practically only available for US observations, and the percentage of shares that were owned by institutional block holders, which was again only available for US data. Lastly, industry measurements are used for growth

and dynamism, instead of the more specialized sector measurements because the smaller dataset caused these to otherwise be heavily skewed for some sector. However, the fact that the results of this paper show that these types of variables did have a significant impact on board turnover suggests that it would be interesting to see what the effects of the excluded variables would be in a different study. This way they can be compared to my results, to again see whether they hold up in different scenario's.

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Appendix A

Appendix A: Tables

Table A.1: Overview of all countries and recession years in the study.

Country	Observations	Recession Years	Source
Australia	4,787	2020	Reserve Bank of Australia
Austria	449	2008, 2009, 2012, 2020	Eurostat, ECB
Belgium	778	2008, 2009, 2012, 2020	Eurostat, ECB
Bulgaria	2	2008, 2009, 2020	Eurostat
Canada	15	2008, 2009, 2020	The Canadian Encyclopedia
Croatia	34	2008, 2009, 2020	Eurostat, ECB
Cyprus	61	2008, 2009, 2012, 2020	Eurostat, ECB
Czech Republic	37	2008, 2009, 2020	Eurostat
Denmark	416	2008, 2009, 2020	Eurostat
Estonia	4	2008, 2009, 2020	Eurostat, ECB
Finland	174	2008, 2009, 2012, 2020	Eurostat, ECB
France	4,406	2008, 2009, 2012, 2020	Eurostat, ECB
Germany	3,361	2008, 2009, 2012, 2020	Eurostat, ECB
Greece	251	2008, 2009, 2010, 2011, 2012, 2020	Eurostat, ECB
Hungary	56	2008, 2009, 2020	Eurostat
Iceland	1	2008, 2009, 2010, 2020	Central Bank of Iceland, Eurostat
Italy	1,374	2008, 2009, 2012, 2020	Eurostat, ECB
Lithuania	2	2008, 2009, 2020	Eurostat, ECB
Luxembourg	232	2008, 2009, 2012, 2020	Eurostat, ECB
Malta	4	2008, 2009, 2020	Eurostat, ECB
Monaco	6	2008, 2009, 2012, 2020	Eurostat, ECB
Netherlands	1,216	2008, 2009, 2020	Eurostat, ECB
New Zealand	220	2009, 2020	Reserve Bank of New Zealand
Poland	221	2008, 2009, 2020	Eurostat
Portugal	348	2008, 2009, 2012, 2020	Eurostat, ECB
Republic Of Ireland	535	2008, 2009, 2012, 2020	Eurostat, ECB
Romania	13	2008, 2009, 2020	Eurostat, ECB

Table A.1: Overview of all countries and recession years in the study, continued.

Country	Observations	Recession Years	Source
Serbia	4	2008, 2009, 2020	Eurostat
Slovakia	1	2008, 2009, 2020	Eurostat, ECB
Slovenia	17	2008, 2009, 2012, 2020	Eurostat, ECB
Spain	1,170	2008, 2009, 2012, 2020	Eurostat, ECB
Sweden	1,268	2008, 2009, 2020	Statistics Sweden
Switzerland	822	2008, 2009, 2020	State Secretariat for Economic Affairs
Ukraine	26	2008, 2009, 2014, 2015, 2020, 2022	Centre for Strategic & Int. Studies, Worldbank
UK - England	16,936	2008, 2009, 2020	Office for National Statistics
UK - Northern Ireland	95	2008, 2009, 2020	Office for National Statistics
UK - Scotland	680	2008, 2009, 2020	Office for National Statistics
UK - Wales	220	2008, 2009, 2020	Office for National Statistics
United States	161	2008, 2009, 2020	NBER

Table A.2: Overview of the data merging and cleaning process.

No. of Observations	Step	Database
8,172,021	Gather director data	BoardEx (UK, EU, NA, RoW)
-6,813,755	Remove irrelevant countries	BoardEx (UK, EU, NA, RoW)
-758,370	Remove duplicates & non-director data	BoardEx (UK, EU, NA, RoW)
599,896	Director data observations left	BoardEx (UK, EU, NA, RoW)
2,932,815	Gather company board data	BoardEx (UK, EU, NA, RoW)
-658,261	Remove irrelevant countries	BoardEx (UK, EU, NA, RoW)
2,274,554	Company board data observations left	BoardEx (UK, EU, NA, RoW)
1,120,983	Gather data on company ownership	Thompson Reuters Eikon Refinitiv
799,706	Gather financial company data	Compustat
1,452,072	Merge all datasets	BoardEx (UK, EU, NA, RoW), Eikon Refinitiv, Compustat
-144,488	Remove duplicates	BoardEx (UK, EU, NA, RoW), Eikon Refinitiv, Compustat
-95,378	Remove missing board turnover data	BoardEx (UK, EU, NA, RoW), Eikon Refinitiv, Compustat
-208,501	Remove missing return on assets data	BoardEx (UK, EU, NA, RoW), Eikon Refinitiv, Compustat
-416,629	Remove missing control variables data	BoardEx (UK, EU, NA, RoW), Eikon Refinitiv, Compustat
587,076	Total amount of director observations left	BoardEx (UK, EU, NA, RoW), Eikon Refinitiv, Compustat
40,403	Total amount of aggregated firm observations left	BoardEx (UK, EU, NA, RoW), Eikon Refinitiv, Compustat

Table A.3: Variable definitions.

Variable	Description
ROA_M1_3	Dependent variable: The average industry median-adjusted ROA over a time span of three years, being t+1, t+2 and t+3.
ROA_M1_2	Dependent variable: The average industry median-adjusted ROA over a time span of two years, being t+1, t+2.
BOARD_TURNOVER_3	Independent variable: The sum of incoming and outgoing directors over the past three years, being t-2, t-1, and t, divided by the board size at the year t-2.
BOARD_TURNOVER_2	Independent variable: The sum of incoming and outgoing directors over the past two years, being t-1, t, divided by the board size at the year t-1.
RECESSION	Moderating variable: A dummy variable on whether year t is a recession, where 1 is a recession year and 0 is a non-recession year.
SIZE	Control variable: The natural logarithm of the company's yearly net turnover at year t.
LIQUIDITY	Control variable: The ratio of the firms' current assets divided by current liabilities at year t.
ROA	Control variable: The industry median-adjusted returns on assets in year t.
INDUSTRY_GROWTH	Control variable: The time-variable regressed INDUSTRY turnover, followed by dividing the regression coefficients by the average industry revenue in year t.
INDUSTRY_DYNAMISM	Control variable: The time-variable regressed industry turnover, followed by dividing the standard errors of regression coefficients by the average industry revenue in year t.
BOARD_SIZE	Control variable: The size of the board of directors in year t.
AVG_TENURE	Control variable: The average tenure for the board of directors in days in year t.
HIGH_TENURE	Control variable: A dummy variable on whether the tenure of the board is in the top tercile, where 1 denotes that it is and 0 denotes that it is not.
LOW_TENURE	Control variable: A dummy variable on whether the tenure of the board is in the bottom tercile, where 1 denotes that it is and 0 denotes that it is not.

Table A.3: Variable definitions, continued.

Variable	Description
CEO_POWER	Control variable: A proxy for the sources of power that a CEO has, which combines three indicators: i) CEO duality, ii) relative tenure of the CEO, and iii) the relative amount of NEDs on the board.
DIV_GENDER	Control variable: The relative percentage of male board members at a company at year t.
DIV_ETHNIC	Control variable: The proportion of directors from different countries other than the home country of the firm that are on the board in year t.
EXPERIENCE	Control variable: A proxy for the experience that a board member has, based on three indicators: i) Number of qualifications, ii) number of listed boards, and iii) numbers of unlisted boards they have been on.
CEO_TURNOVER	Control variable: A dummy variable on whether there was CEO turnover, where 1 denotes that there was and 0 denotes that there was not.
CFO_TURNOVER	Control variable: A dummy variable on whether there was CFO turnover, where 1 denotes that there was and 0 denotes that there was not.
INST_OWNERSHIP	Control variable: The percentage of ownership that is held institutional investors at year t.
BLOCK_DUMMY	Control variable: A dummy variable on whether there was a block holder present as shareholder of the firm, where 1 denotes that there was and 0 denotes that there was not.

Table A.4: Summary of average, standard deviation, minimum and maximum value per variable.

Variable	Avg.	Std. Dev.	Min.	Max.
ROA_M1_3	-0.155	9.129	-1287.398	293.276
ROA_M1_2	-0.143	9.104	-1501.617	322.601
BOARD_TURNOVER_3	0.879	0.962	0.000	6.651
BOARD_TURNOVER_2	0.583	0.660	0.000	4.550
SIZE	5.336	2.988	-6.908	15.600
LIQUIDITY	2.356	7.458	0.001	928.900
ROA	-0.120	11.076	-2144.384	81.198
INDUSTRY_GROWTH	0.0413	0.053	-0.625	0.175
INDUSTRY_DYNAMISM	0.017	0.009	0.003	0.106
BOARD_SIZE	8.070	3.814	2	34
AVG_TENURE	2191.033	1085.473	175	11662
CEO_POWER	0.002	1.033	-1.687	62.754
DIV_GENDER	0.872	0.142	0.200	1.000
DIV_ETHNIC	0.214	0.249	0.000	0.900
EXPERIENCE	17.634	10.548	2.000	151.750
INST_OWNERSHIP	0.273	0.597	0.000	30.000
BLOCK_DUMMY	0.666	1.317	0	11

Table A.5: Variance Inflation Factor (VIF) multicollinearity analysis.

Variable	Df	GVIF	GVIF ^{1/(2*Df)}
BOARD_TURNOVER_3	1	1.575609	0.6346753
RECESSION	1	1.831928	0.5458731
ROA	1	1.387361	0.7207929
SIZE	1	2.709983	0.3690060
LIQUIDITY	1	1.223398	0.8173945
BOARD_SIZE	1	1.866211	0.5358451
CEO_TURNOVER	1	1.166777	0.8570622
CFO_TURNOVER	1	1.048535	0.9537118
BLOCK_DUMMY	1	4.290194	0.2330897
INST_OWNERSHIP	1	4.281329	0.2335723
DIV_GENDER	1	1.188893	0.8410918
DIV_ETHNIC	1	1.109216	0.9015380
CEO_POWER	1	1.041904	0.9597815
EXPERIENCE	1	1.031301	0.9696490
INDUSTRY_GROWTH	1	1.127707	0.8872542
INDUSTRY_DYNAMISM	1	1.305054	0.7662570
MIDDLE_TENURE	1	1.058042	0.9451419
AVG_TENURE	1	1.331769	0.7508808
BOARD_TURNOVER_3:RECESSION	1	1.991017	0.5022558

Table A.6: Main fixed effects unbalanced model (1) with only the dependent, independent, moderating and interaction variables.

Dependent variable:	ROA_M1_2 (1)
BOARD_TURNOVER_3	-0.010*** (0.001)
RECESSION	-0.003 (0.003)
BOARD_TURNOVER_3:RECESSION	-0.002 (0.002)
Observations	40,403
R2	0.003
Adjusted R2	-0.143
F Statistic	39.461 (df = 3; 35,220)
P-value	0.000

Note: *p<0.1; **p<0.05; ***p<0.01

Table A.7: Main fixed effects unbalanced model (1) with the dependent, independent, moderating, interaction and financial performance variables.

Dependent variable:	ROA_M1_2 (1)
BOARD_TURNOVER_3	0.000 (0.000)
RECESSION	0.010*** (0.001)
BOARD_TURNOVER_3:RECESSION	-0.001 (0.001)
ROA	0.833*** (0.003)
SIZE	0.002** (0.001)
LIQUIDITY	0.001* (0.001)
Observations	40,403
R2	0.650
Adjusted R2	0.634
F Statistic	19,313.7 (df = 6; 35,217)
P-value	0.000

Note: *p_i0.1; **p_i0.05; ***p_i0.01

Table A.8: Main fixed effects unbalanced model (1) with the dependent, independent, moderating, interaction, financial performance, and board member specific variables.

Dependent variable:	ROA_M1_2 (1)
BOARD_TURNOVER_3	0.000 (0.001)
RECESSION	0.010*** (0.001)
BOARD_TURNOVER_3:RECESSION	-0.001 (0.001)
ROA	0.833*** (0.003)
SIZE	0.002** (0.001)
LIQUIDITY	0.001* (0.001)
CEO_TURNOVER	0.001 (0.002)
CFO_TURNOVER	-0.000 (0.002)
CEO_POWER	0.005* (0.003)
Observations	40,403
R2	0.767
Adjusted R2	0.733
F Statistic	12,875.9 (df = 9; 35,214)
P-value	0.000

Note: *p_i0.1; **p_i0.05; ***p_i0.01

Table A.9: Main fixed effects unbalanced model (1) with the dependent, independent, moderating, interaction, financial performance, board member specific and general board variables.

Dependent variable:	ROA_M1_2 (1)
BOARD_TURNOVER_3	0.000 (0.001)
RECESSION	0.010*** (0.001)
BOARD_TURNOVER_3:RECESSION	-0.001 (0.001)
ROA	0.833*** (0.008)
SIZE	0.001 (0.001)
LIQUIDITY	0.001* (0.001)
CEO_TURNOVER	0.001 (0.002)
CFO_TURNOVER	-0.000 (0.002)
CEO_POWER	0.005* (0.005)
BOARD_SIZE	-0.000 (0.004)
DIV_GENDER	-0.027*** (0.005)
DIV_ETHNIC	0.004 (0.004)
EXPERIENCE	-0.000 (0.000)
MIDDLE_TENURE	0.002 (0.001)
AVG_TENURE	0.000 (0.000)
Observations	40,403
R2	0.767
Adjusted R2	0.733
F Statistic	8,689.3 (df = 15; 35,208)
P-value	0.000

Note: *p<0.1; **p<0.05; ***p<0.01

Table A.10: Results of panel models with balanced panels.

Dependent variable:	ROA_M1_2 (1)	ROA_M1_2 (2)	ROA (3)	ROA_M1_3 (4)
BOARD_TURNOVER_3	-0.000 (0.001)	-0.020*** (0.003)	-0.002 (0.001)	0.000 (0.001)
RECESSION	-0.005 (0.009)	-0.034 (0.019)	-0.071 (0.010)	-0.004 (0.010)
BOARD_TURNOVER_3:RECESSION	0.003 (0.003)	-0.001 (0.006)	0.003 (0.003)	0.003 (0.003)
ROA	0.842*** (0.007)		0.831*** (0.007)	
ROA_M1_2		0.884*** (0.007)		
SIZE	-0.000 (0.001)	0.009*** (0.001)	-0.000 (0.000)	0.000 (0.001)
LIQUIDITY	0.003** (0.001)	-0.000 (0.001)	0.002 (0.001)	0.001 (0.001)
CEO_TURNOVER	0.000 (0.003)	-0.003 (0.004)	0.000 (0.003)	0.003 (0.005)
CFO_TURNOVER	0.003 (0.005)	-0.006 (0.005)	0.003 (0.005)	0.005 (0.005)
CEO_POWER	0.007* (0.003)	-0.025 (0.007)	-0.024** (0.007)	0.005 (0.003)
BOARD_SIZE	0.000 (0.000)	-0.003*** (0.000)	0.001 (0.000)	-0.000 (0.004)
DIV_GENDER	0.014* (0.004)	-0.014 (0.008)	-0.017* (0.009)	-0.027*** (0.005)

Table A.10: Results of panel models with balanced panels, continued.

Dependent variable:	ROA_M1_2 (1)	ROA_M1_2 (2)	ROA (3)	ROA_M1_3 (4)
DIV_ETHNIC	0.014*** (0.004)	-0.028*** (0.004)	0.013** (0.004)	0.004 (0.004)
EXPERIENCE	-0.000 (0.000)	-0.000*** (0.000)	-0.000 (0.000)	-0.000 (0.000)
MIDDLE_TENURE	0.005* (0.002)	-0.001 (0.002)	0.004* (0.002)	0.002 (0.001)
AVG_TENURE	0.000* (0.000)	0.000*** (0.000)	0.000** (0.000)	0.000 (0.000)
BLOCK_DUMMY	0.012** (0.004)	-0.142 (0.005)	0.012* (0.005)	0.012* (0.005)
INST_OWNERSHIP	-0.889 (0.006)	0.002 (0.007)	0.008 (0.007)	0.008 (0.007)
INDUSTRY_GROWTH	0.024 (0.033)	0.044 (0.034)	0.027 (0.035)	0.027 (0.035)
INDUSTRY_DYNAMISM	0.012 (0.025)	-0.114*** (0.026)	0.018 (0.027)	0.018 (0.027)
Observations	5,600	5,600	5,600	5,600
R2	0.783	0.014	0.777	0.762
Adjusted R2	0.782	0.010	0.776	0.761
F Statistic	1,058.3 (df = 19; 5,561)	26.511 (df = 3; 5,577)	1,133.0 (df = 19; 5,561)	939.552 (df = 19; 5,561)
P-value	0.000	0.000	0.000	0.000

Note: *p<0.1; **p<0.05; ***p<0.01

Table A.11: Results of panel models with random effect models.

Dependent variable:	ROA_M1_2 (1)	ROA (3)	ROA_M1_3 (4)
Intercept	-0.020 (0.007)**	-0.079 (0.007)***	-0.054 (0.008)***
BOARD_TURNOVER_3	0.000 (0.001)	-0.013 (0.001)***	0.000 (0.001)
RECESSION	0.011 (0.001)***	-0.004 (0.003)	0.012 (0.001)***
BOARD_TURNOVER_3:RECESSION	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
ROA	0.852 (0.007)***	0.894 (0.012)***	0.821 (0.008)***
ROA_M1_2	0.884 (0.007)***		
SIZE	0.001 (0.001)	0.011 (0.001)***	-0.000 (0.000)
LIQUIDITY	0.001 (0.000)**	0.003 (0.000)***	-0.000 (0.001)
CEO_TURNOVER	0.002 (0.002)	-0.005 (0.002)**	0.000 (0.003)
CFO_TURNOVER	-0.000 (0.002)	-0.001 (0.002)	0.003 (0.005)
CEO_POWER	0.007 (0.005)	-0.000 (0.005)	-0.025 (0.007)
BOARD_SIZE	-0.000 (0.000)	-0.002 (0.000)***	-0.003 (0.000)***
DIV_GENDER	-0.014 (0.004)**	0.016 (0.004)***	-0.017 (0.009)*
DIV_ETHNIC	0.005 (0.003)	-0.014 (0.003)***	-0.028 (0.004)***
EXPERIENCE	-0.000 (0.000)**	0.000 (0.000)	-0.000 (0.000)
MIDDLE_TENURE	0.002 (0.001)*	0.001 (0.001)	-0.001 (0.002)
AVG_TENURE	0.000 (0.000)**	0.000 (0.000)***	0.000 (0.000)
BLOCK_DUMMY	-0.003 (0.005)	0.000 (0.004)	-0.142 (0.005)
INST_OWNERSHIP	0.001 (0.007)	0.005 (0.007)	0.002 (0.007)
INDUSTRY_GROWTH	-0.264 (0.044)***	0.336 (0.041)***	-0.257 (0.048)***
INDUSTRY_DYNAMISM	-0.061 (0.023)**	-0.005 (0.020)	-0.114 (0.026)***

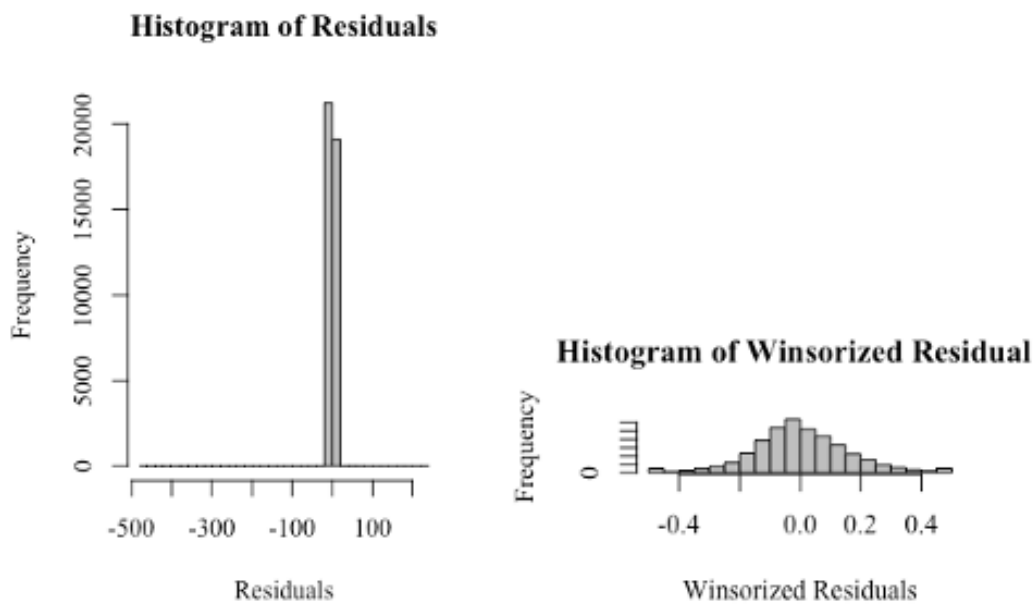
Table A.11: Results of panel models with random effect models, continued.

Dependent variable:	ROA_M1.2		ROA		ROA_M1.3	
	(1)	(2)	(3)	(4)	(5)	(6)
factor(Industry)Transportation	-0.001 (0.003)	0.043 (0.010)***	-0.004 (0.003)	-0.001 (0.004)		
factor(Industry)Wholesale Trade	0.001 (0.007)	0.050 (0.014)***	-0.014 (0.007)*	0.000 (0.008)		
factor(Industry)Manufacturing	0.014 (0.003)***	0.019 (0.011)**	-0.025 (0.003)***	0.013 (0.004)***		
factor(Industry)Construction	-0.016 (0.006)**	0.081 (0.015)***	0.012 (0.004)*	-0.015 (0.006)**		
factor(Industry)Mining	0.075 (0.004)***	-0.011 (0.013)	-0.077 (0.004)***	-0.011 (0.013)		
factor(Industry)Finance	0.012 (0.012)	0.019 (0.033)	0.002 (0.012)	0.019 (0.033)		
factor(Industry)Retail Trade	-0.014 (0.004)***	0.062 (0.011)***	0.011 (0.004)**	0.062 (0.011)***		
factor(Industry)Nonclassifiable	-0.002 (0.011)	0.000 (0.030)	-0.018 (0.012)	0.000 (0.030)		
factor(Industry)Agriculture	0.008 (0.010)	0.057 (0.028)*	-0.001 (0.010)	0.057 (0.028)*		
Observations	40,403	40,403	40,403	40,403		
R2	0.800	0.017	0.735	0.758		
Adjusted R2	0.800	0.017	0.735	0.758		
Chi-squared	156,300 (df = 28)	299.993 (df = 12)	166,365 (df = 28)	124,361 (df = 28)		
P-value	0.000	0.000	0.000	0.000		

Note: *p<0.1; **p<0.05; ***p<0.01

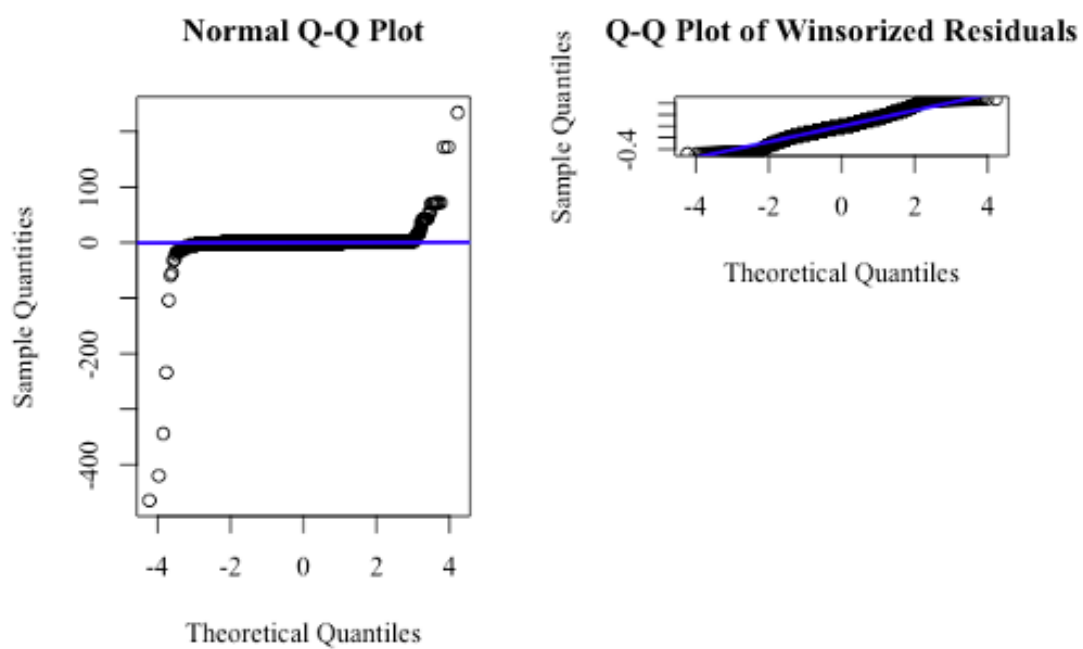
Appendix B

Appendix B: Figures



(a) Left: Histogram of the residuals of the main model of the unbalanced panel, showing that they centre sharply around zero. Right: Winsorized histogram of the residuals of the main model of the unbalanced panel.

Figure B.1: Figure B.1: Histogram of residuals.



(a) Left: Q-Q plot of the main model of the unbalanced panel data, which shows non-normal distribution for outliers. Right: Winsorized Q-Q plot of the main model of the unbalanced panel data, which shows close to normal distribution for outliers.

Figure B.2: Figure B.2: Q-Q plot.