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The social impact of private equity in The Netherlands

A literature review and empirical research on the effect of private equity ownership on sales, employees and wages

Author: Bob Lemmens
Student Number: 334542
Thesis supervisor: Drs. H.T. Haanappel
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Acknowledgement

Dear reader,

After seven year, I have reached the end of my studies at the Erasmus University Rotterdam. During a bachelor in economics and business economics, my profound interest in corporate finance emerged. This interest led me to apply for the Financial Economics programme at the Erasmus School of Economics. The programme challenged me to think outside of the box and critically assess companies' public statements and news reports. Writing this master thesis was a challenging yet intellectually rewarding process. Private equity has always interested me and I was thrilled when Hans Haanappel told me that I could write my thesis on a topic that is so highly actual and on which there is a lack of solid academic research.

There are certain people who supported my throughout this process to whom I want to extend my gratitude. First of all, I want to thank my family, especially my parents, for giving me the opportunity and the continuous support to study at the Erasmus University. I realise that studying at a university is a privilege that is not available for each person on this planet. I therefore did not take studying at the Erasmus University for granted. Besides my parents, I wish to thank my friends in Rotterdam, who gave meaning to my life in Rotterdam and supported me in writing this thesis. Finally, I want to thank my thesis supervisor Hans Haanappel, for supporting me throughout this entire process and his availability for when I had questions.

Having that said, I invite you to start reading this thesis and find out more about the social impact of private equity.

Bob Lemmens

Abstract

Recently, private equity firms were placed under public scrutiny after several Dutch companies under ownership went bankrupt. Dutch politicians and policymakers urge academics to investigate what impact private equity firms have on societal values, as enhanced regulation may be needed for the sector. This thesis uses a dataset consisting of 50 Dutch buyouts between 2006 and 2012 and a control group to examine how private equity owned companies affect social measures sales, the number of employees and wages compared to companies not owned by private equity. Using ordinary least squares regressions, I find evidence for private equity buyouts delivering a higher sales growth, employee growth and wages growth in the first year and total four years after a buyout, compared to non-buyouts. This paper thereby contributes to academic literature and serves as a guideline for Dutch policymakers.

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1. Introduction

Since private equity investments emerged in the 1980s, considerable research has been conducted on the social impact of private equity investments. The positive or negative social impact of private equity backed investments is frequently debated in the academic community. Critics of private equity argue that private equity investments often bring along possible damaging changes for stakeholders, such as significant restructurings, asset stripping, wage cuts and job cuts. Supporters of this alternative investment vehicle on the other hand emphasise how private equity firms have the ability and experience to cure distressed companies, generate faster growth and provide capital to venture companies. This is argued to be beneficial to both shareholders and stakeholders. The social impact of private equity ownership can be measured in various ways. Measures can for example include the impact of a private equity buyout on trade union representation. Bacon et al., (2004) and Wright et al. (1984, 1990, 2009) study the impact of UK buyouts on trade union representation and find that the first wave of buyouts in the 1980s in the UK made relatively few changes to trade union representation, while Bruining et al. (2005) find evidence for decreased trade union recognition after a buyout in the UK and The Netherlands. Other social impact metrics include productivity, the extent to which information is shared with stakeholder, the employee share ownership level, the possibility for employees to be involved in decision making processes and other HRM practices, such as trainings. The results of these studies do not per se unanimously find positive or negative effects of private equity on these HRM practices. Several authors find private equity to increase productivity (Amess, 2002; Amess, 2003), while other academics find contradictory evidence (Harris et al., 2005). Bruining et al. (2005) show in their study that management buyouts (MBOs) lead to an increase in trainings and employee empowerment.

Along these lines, one can conclude that academics have not yet reached consensus on the topic of private equity's social impact. Due to increased interest from policy makers, research into the societal effects private equity firms have increased over the last years. The increased awareness did not go unnoticed by political parties in The Netherlands as well. In 2015, the Dutch parliament organised a debate with politicians, stakeholders and academics to discuss the need for enhanced regulation on private equity in The Netherlands (Dutch parliament, 2015). Following this debate, the Partij van de Arbeid (PvdA) subsequently proposed an amendment to existing regulation for private equity firms (PvdA, 2015). The proposal's main objective is to protect and strengthen the Rhenish planning model. This objective is aimed to be achieved through thirteen proposals that should lead to (1) investors being the biggest risk bearers of private equity investments, not taxpayers; (2) excessive debt financing and weakening a portfolio company's balance sheet to be limited; (3) employees' influence of target firms to be increased and (4) the costs and business model of private equity firms to become transparent.

In order to streamline the current debate about the social contributions of private equity, further profound academic research is essential. This study therefore aims contribute to this debate through providing a literature overview as well as an empirical research. The study investigates the social impact of private equity ownership in The Netherlands using three measures: the impact of buyouts on (1) sales, (2) the number of employees and (3) wages.

If the proposed amendments for existing private equity regulation come into force, the Dutch private equity landscape will be altered, which may have substantial financial consequences for private equity firms. The goal of this paper is to give guidance for policymakers such as the Dutch parliament on whether private equity investments indeed generally lead to negative consequences for stakeholders (which subsequently could justify private equity firms facing revised regulations) or whether positive externalities outweigh negative effects. Next to that, this study is of great importance to academics as well, since the results in this thesis may serve as academic support for the public policy decision making processes regarding to private equity regulation. Given the recent debates on the impact of private equity in The Netherlands, there is a high demand for academic research on the social impact of private equity. Third, the Nederlandse Vereniging van Participatiemaatschappijen (NVP) may use the results of this thesis in their decision making processes and communication to stakeholders. The results of this thesis will also be of interest to pension funds and other limited partners in private equity, since social responsibility becomes increasingly important for limited partners' capital allocation to private equity funds. Finally, this thesis will contribute to existing literature by analysing more recent private equity deals and specifically focusing on the Dutch buyout market, which is a relatively unexplored market for this topic. The aim of this paper is translated in the following research question:

"What is the social impact of private equity buyouts?"

Several sub-questions will help answering this main research question. They are stated as follows:

"1. How does private equity work?"

"2. What are the social impact claims of private equity?"

"3. What do academics find about the social impact of private equity?"

"4. What is the effect of private equity buyouts on sales?"

"5. What is the effect of private equity buyouts on the number of employees?"

"6. What is the effect of private equity buyouts on employee wages?"

These sub-questions are answered throughout different chapters in this thesis. In the section 2.2, the first sub-questions will be answered, while the section 2.3 gives an answer to the second sub-question. Sections 2.4 through 2.10 will elaborate on sub-

question 3. The main research question as well as sub-questions 4 through 6 will be collectively answered in chapters 3, 4 and 5. Chapter 6 summarises the answers to the research questions.

This thesis is structured as followed. In the chapter 2, relevant literature studies will be presented, which are followed by a description of the dataset in chapter 3. Chapter 4 discusses the methods used to perform a quantitative analysis. Chapter 5 describes and interprets the results of the analysis and finally, chapter 6 will give some concluding remarks, which include a summary, limitations and suggestions for further research.

2. Literature Review

2.1. Introduction

The aim of this chapter is to give an answer to the first three sub-questions. In this section, academic literature on the social impact of private equity will be presented and discussed. After explaining how private equity works in paragraph 2.2, I present the current claims of stakeholders regarding the social impact of private equity buyouts in paragraph 2.3. Paragraphs 2.4 through 2.9 discuss the relevant studies on the impact of private equity. Each measure for social impact will be discussed in separate paragraphs, split up in articles finding positive or negative relations. In paragraph 2.10, some critical notes on the private equity social impact studies are presented, so that shortcomings of methods used in these studies become clear. This chapter ends with a summary of cited articles and a conclusion in paragraph 2.11.

2.2. The private equity business model

In order to provide clarifying insights into the academic literature on private equity impact, a good understanding of the private equity business model is essential. Private equity is a broad definition of various alternative investments forms that invest equity and possibly debt in non-publicly traded operating companies. Watt (2008) describes the private equity business model as follows: “Private equity involves the pooling of capital from individual and institutional investors in funds which are used to purchase, usually with recourse to bank loans (‘leverage’), a controlling interest in existing productive enterprises. These ‘target’ or ‘portfolio’ companies are not, or—if they were previously listed—are no longer, publicly traded on stock exchanges. The purpose of the purchase is to resell the target company at a higher price after a limited period during which the company’s operations are restructured. The proceeds—a capital gain from resale plus dividends and other pay-outs prior to resale—are shared between the investors [limited partners (LP)] and the owner-managers of the private equity fund [general partners (GP)]".

As stated by Watt (2008), a private equity firms plans to resell its portfolio company after a limited period, usually 3 to 5 years after the purchase (Haanappel, 2014). The investment can be exited through various manners. Commonly applied exit strategies

include a secondary or tertiary buyout (i.e. selling the company to another private equity firm), selling the company to a strategic buyer (an operating company in the same industry) or an exit through an initial public offering.

The acquisition of a target company according to the business model described by Watt (2008) is called a buyout. Buyouts can come in various forms. The most well known forms of buyouts are leveraged buyouts (LBOs), management buyouts (MBOs) and management buy-ins (MBIs). A leveraged buyout occurs when a target company is purchased using a significant proportion of bank debt (explaining 'leveraged' in leveraged buyouts). LBOs are typically performed by private equity firms, although technically, other companies engage in LBOs as well when purchasing another operating company using a significant proportion of bank debt. In practice, however, this latter case is not referred to as an LBO, since the target companies usually are merged with the acquiring company and a resale at a later stage is often not the company's objective. An MBO is the purchase of a company by the incumbent managers. This type of buyout is often supported by private equity firms, especially when the target firm is large and demands a high transaction price. It can therefore by viewed as an MBO as well as an LBO (even though the presence of a private equity firm is not required). LBOs usually are also MBOs, since private equity firms often require the incumbent management team to individually invest equity in the target company as well, so that goals are aligned.

This so-called financial participation by managers would (partially) offset the principal-agent problem, which states that the separation of ownership and control leads to agency costs. Agency costs are costs caused by managers (the agents) of a company not being the owners of that company (the principals). A conflict of interest arises, because the two parties have different interests and the manager (agent) has more information than the owner (principal). An owner can thus not ensure that the manager is acting in the best interest of the owners. Managers can for example aim to increase their personal power and reputation by buying other companies, even though such purchases do not necessarily add value to the company. Private equity firms aim to solve this problem by requiring managers of target firms to invest personally in the target company, so that agency costs are reduced (Jensen & Meckling, 1976). Another benefit of LBOs is that they lead to improved monitoring practices (since there is only one, or a few shareholders instead of a widely dispersed ownership). Next to that, a high debt service induces managers to curb non-profitable investments and improve operations. This leads to agency costs being further reduced (Haanappel, 2014). Jensen (1997) foresaw that buyouts became a more dominant organisational structure in non-listed companies. He pointed out that the resolution to the principal-agent problem explains how private equity firms can more effectively motivate employees and manage resources than publicly held companies.

The main reason for a private equity firm to initiate an LBO instead of a buyout financed by 100% equity is leverage. Because of leverage, private equity firms can increase the return of their investment. While the equity percentage of the

transaction is for example 50%, 100% of the company is acquired. After accounting for (the tax deductibility of) costs of debt, private equity firms can potentially generate a significantly larger return on their equity than when they would have financed the transaction with 100% equity. LBOs can however also be risky. By increasing the proportion of bank debt in a transaction too much, the operating company can become highly levered. In this case, the debt services can become too high to be completed from the company's cash flows. The company may become distressed and faces a potential bankruptcy.

MBIs are very similar to MBOs. The only difference is that in an MBI, external managers buy themselves 'in' the target company. As with MBOs, MBIs are often supported by private equity firms. In an MBI, a new team thus replaces the incumbent managers of the target company. MBIs often go hand in hand with significant restructuring, compared to MBOs. Although the objective of such restructurings is to reduce costs and subsequently increase profits, MBIs tend perform worse than originally intended and worse relative to MBOs (Robbie et al., 1992). This is likely to be caused by information asymmetry between incumbent and external managers.

Next to buyouts, there are other types of private equity investments, such as growth capital, turnarounds, recapitalizations and venture capital. Venture capital is the most well known type of private equity investment besides buyouts. Certain private equity firms are specialised in investing in small, early-stage companies. These types of private equity firms are called venture capitalists. Since these small, early-stage companies (popularly known as 'start-ups') are very young and do often not generate stable cash flows (yet), venture capitalists invest equity in these start-ups, introduce their network and apply their industry knowledge, which are utilised and used to achieve high growth. Because of unstable cash flows, investing debt in start-ups is rare (since debt requires stable cash flows in order to meet interest and principal payments). While some of these small, early-stage companies grow to be big, impactful companies, others fail after several years of operation. By investing in multiple start-ups simultaneously, venture capitalists lower their exposure to one start-up, and can therefore decrease risks. Obviously, a venture capitalist's business model differs significantly from buyouts-specialised private equity firms.

2.3. Social impact of private equity

Since the private equity boom of the 1980s, the number of academic publications on the effects of private equity ownership have increased. In 2007, at the start of the financial crisis, private equity investments reached a record-breaking level and also the media focus on private equity increased. Following the financial crisis of 2007, trade unions in various countries initiated campaigns to protest against the in their opinion negative impact of private equity on jobs and wages[1]. Alongside those campaigns, parliamentary inquiries were initiated and more academic studies on

[1] E.g. see http://www.ipe.com/international-trade-unions-target-private-equity/21012.fullarticle

private equity impact were published, aiming to investigate the impact of private equity on a micro- and macro-level (Watt, 2008).

The negative impact of private equity is addressed in various manners. One complication of – by private equity frequently used – LBOs is that firms can become financially distressed. When the structure of an LBO comprises a large proportion of bank debt, the costs of debt (which are to be serviced by the company) can be substantial. During economic downturns, when cash flows become unstable, companies can have trouble servicing their debt costs. In this case, the company becomes financially distressed, and may potentially go bankrupt (which goes hand in hand with an obviously enormous impact on the company's stakeholders).

In the Netherlands, private equity firms have become a subject of public scrutiny. The PvdA (the Dutch labour party) for instance, has accused several private equity firms of 'asset stripping'. This implies that private equity firms quickly sell some of acquired companies' assets and pay out the capital gain from those disposals to shareholders. Other accusations of the PvdA on private equity firms include personnel costs cutting, dividend recapitalizations and charging operating companies with disproportionately high monitoring costs (PvdA, 2015).

Research into the social impact of private equity is still at a relatively early stage. Therefore, the academic community lacks profound studies that use large case numbers (Watt, 2008). Besides that, due to a lack of transparency of non-public companies, gathering sufficient data on private equity-owned companies can be quite a challenge. Several academics therefore conduct surveys instead of performing quantitative analyses, even though the latter is preferred in academics.

In this study, the three measures of private equity social impact are as earlier stated (1) revenue growth, (2) employee growth and (3) wages growth. Other factors of social impact are excluded from this research study. The most important of these other factors include companies' R&D intensity, private equity returns to limited partners such as pension funds (which has a significant social impact, since these funds are transferred indirectly to citizens), impact on trade union representation, impact of worker's council power, impact on productivity and the impact on human resources practices such as trainings and employee share ownership programs. While these are also important measures for social impact, this thesis deliberately covers only revenue growth, the number of employees and wages, as only for these measures, sufficient data on Dutch companies is available. Next to that, analyses in existing literature on the social impact of private equity use these measures as well. Consequently, choosing these three measures will make it more convenient to benchmark this research against other papers.

Academic literature that is focused on these three measures are be discussed below. Next to sales, the number of employees and wages, literature on the impact of private equity on R&D investments is provided, since I consider this metric important as well. Unfortunately, databases lack information on Dutch companies' R&D

expenditures. Therefore, the R&D intensity among private equity buyouts compared to peers are not examined in the quantitative analysis in chapters 3, 4 and 5. The presentation and discussion of academic studies will be narrowed down to buyouts, and thereby excluding venture capital investments, since general criticism on private equity is focused on investments in the form of buyouts, instead of venture capital. Furthermore, venture capital companies make a bad comparison for LBO targets, since they are significantly smaller and typically have high growth prospects.

2.4. Positive impact on sales growth

The impact of private equity ownership on sales growth of target firms is expected to be positive, since the business model of private equity is to resell an acquired company for a higher price. One would expect this higher price to be correlated with the company's revenue. Acharya et al. (2012) analyse the abnormal financial performance of buyouts by large private equity houses in the UK and the rest of the EU compared to peers and find that, after controlling for leverage and sector returns, abnormal performance of private equity targets is above average. The abnormal performance is due to sales and operating margin improvement. In the UK, academic studies show that between 2006 and 2011, sales of private equity-backed companies grew 8% per year on average (BVCA, 2007). Compared to sales growth of companies listed on UK's FTSE 100 index (6% on average per year), private equity-backed companies in the UK are thus found to have a positive effect on sales growth. Boucly et al. (2011) find a 12% increase in sales of LBO target companies in the four years following a buyout compared to peers. Bergström et al. (2007) perform a similar operation in Sweden. Using a dataset of all private equity deals with a value of over 5 million USD which were exited between 1998 and the first half of 2006, which yields 73 unique deals, they find that private equity target firms experience an higher increase in sales growth compared to peers. An older study, published by Singh (1990), finds evidence for higher sales growth in MBO firms compared to a control group. The study observes 65 MBOs between 1980 and 1987 and compares them with a control group of 130 peers.

2.5. Negative impact on sales growth

The amount of academic studies finding a negative impact of private equity buyouts on sales growth is limited. Wiersema et al. (1995) identified 64 LBOs in large firms in the US between 1980 and 1986 (i.e. during the private equity boom of the 80s). Their goal is to find out whether private equity LBOs in the 1980s had an effect on growth and employment. By comparing the sales growth figures of targets with a control group of the same size and industry, they find evidence that LBO targets' sales during the private equity wave of the 1980s grew slower than peers.

2.6. Positive impact on R&D investments

The earlier discussed study in the UK on private equity-owned companies (BVCA, 2007) also examines the effect of private equity ownership on corporate investments

and R&D expenditures. Under ownership of private equity firms, companies increase their corporate investments by 11% per year, where on a national level in the UK, companies increase their corporate investments by only 3% per year on average. R&D expenditure of private equity-backed companies grew by 14%. When considering only MBOs, the increase in R&D investments was even higher: 17% per year. A more recent research study published by Boucly et al. (2011) finds evidence for an increase in capital expenditures after a firm is subject to an LBO. Their dataset consists of 839 French LBOs that took place between 1994 and 2004. Capital expenditures in LBO targets was 24% higher compared to control firms. The increase in capital expenditures is consistent with a significant increase in firm assets of 12%.

Popov and Roosenboom (2009) find that private equity investment lead to a significant increase in ultimately successful patent applications. Their results show that the average impact of a euro of private equity finance relative to a euro of industrial R&D (measured in ultimately successful patent applications) is 2.6. This value is economically and statistically significant.

In the academic debates on the impact of private equity on R&D investments and innovation, research focuses mostly on venture capital investments. The majority of research studies supporting this debate have found a positive effect of venture capital investments on innovation and patent filings (Kortum and Lerner, 2000; Hirukawa and Ueda, 2008; Caselli et al., 2008). Since aim of this study to research the impact of private equity-backed buyouts, articles presenting the impact of venture capital investments will not be further elaborated upon.

2.7. Negative impact on R&D investments

Kaplan (1989) finds evidence that the ratio of capital expenditures to sales declines following a public-to-private transaction in the US. Lerner, Sorensen, and Strömberg (2008) study the change in innovation as measured by patenting after a company is subject to a buyout. They find that few private equity portfolio companies engage in patenting, but for those that do, there is no significant decline in patenting. Lichtenberg & Siegel (1990) collected data from a governmental annual survey on firms that have been subject to a buyout. They find evidence that LBO targets invest significantly less in R&D that other companies. They state that this is a consequence of LBO target companies being generally active in non-R&D-intensive environments and LBO target companies having the tendency to have an R&D-intensity that is below the industry average. The effect on R&D investments is also examined by Long and Ravenscraft (1993). Their results indicate that R&D intensity in target companies drops 40% after the buyout relative to the pre-buyout level. According the authors, this decline is caused by the increase in LBO-related debt.

2.8. Positive impact on employment

The impact of private equity ownership on employment is relatively vague. Employment can be measured in various ways, such as the number of employees,

trainings for employees, the impact of worker's councils and employees' wages. Though these variations could all be considered quite relevant, academic literature focuses on two methods: the number of employees and employees' compensation. Studies finding a positive effect on both measures are presented in separate paragraphs below.

2.8.1. Positive impact on the number of employees

The British Venture Capital Association (BVCA) published and funded extensive reports in which the impact of private equity ownership on employment is analysed. In one of their studies, the number of people employed by UK private equity-backed companies between 2001 and 2006 is examined (BVCA, 2007). The authors find the average increase in the number of people employed to be 8% per year, which is relatively higher than the FTSE 100 and the FTSE Mid-250 companies, which achieve an average employee growth of 0.4% and 3% per year, respectively. On a pan-European level, the European private equity and Venture Capital Association (EVCA) published a similar study. EVCA (2005) finds that between 2000 and 2004, the number of people employed at companies backed by private equity and venture capital increased by 5.4% annually. When excluding the employment effects in venture capital investments, EVCA finds that employment at companies involved in a buyout grew by 2.4% per year. These figures are relatively higher than the annual growth rate of total employment in the 25 member states[2] of the European Union, which is 0.7% annually between 2000 and 2004. An interesting detail in the study of EVCA (2005) is that buyouts of family businesses have the biggest impact on job growth: 7% annually.

Consistent with the report of BVCA (2007), Kaplan (1989) proves that employment increases after a private equity buyout. However, the increase falls short when the results are compared to similar companies. Amess and Wright (2007b) find that for firms undergoing LBOs in the UK between 1993 and 2004 (private equity-financed as well as non-private equity-financed), employment levels are higher pre- and post - buyout compared to firms that were not LBOs, when LBOs are determined exogenously. When allowing for LBO endogeneity though, there is not a significant difference in the employment levels between LBOs and non-LBOs. The authors therefore conclude that the results are not consistent with popular claims that LBOs and private equity either create or destruct jobs.

Cressy et al. (2008), find evidence in favour of protesters as well as supporters of private equity investments. They compare 57 UK buyouts between 1995 and 2000 with 83 control companies and examine the effect on employment in the first year after the buyout up until the fifth year. They find that directly after a buyout, there is a highly significant decrease in employment of 7%, rising to 23% over the first four years after a buyout. In the last year however, there tends to be an increase in employment of 2%. Cressy et al. (2008) believe that the increase in employment in

[2] As per 1 May 2004, the European Union had 25 member states.

the fifth year following the buyout is due to an increase in turnover. From these results, they conclude that buyouts bring about a direct fall in employment, which could be a consequence of initial restructurings, but they lead to an increase in employment in the long run.

The social impact of private equity investments has not merely been investigated on an international spectrum, but also on a national level. Bruining et al. (2005) compare 145 private equity buyouts in the UK and 45 private equity buyouts in the Netherlands between 1992 and 1998. They find that buyouts have a positive effect on trainings, employee involvement and the level of employment. Their results suggest the positive effects of private equity buyouts to be greater in the UK than in The Netherlands. This finding is somewhat surprising, since the Netherlands has an institutional setting in which there is a relatively high degree of employee protection. Therefore, one would expect the institutional setting of The Netherlands to lead to greater positive effects of buyouts compared to the UK. Buyouts in the UK nonetheless increase these human resource management (HRM) practices to a higher level, but are still below the level of HRM practices in Dutch buyouts. Bacon et al. (2008) obtained data on UK and Dutch private equity buyouts from both questionnaires sent to buyout managers and data on company performance and characteristics from financers and archives. Their results show that buyouts have a positive effect on management in terms of the number of high HRM commitment practices reported. Their subset of private equity buyouts is less likely to introduce new high HRM commitment practices compared to non-private equity buyouts, but does not necessarily reduce those practices.

More recently published literature should give a better understanding of the impact of private equity buyouts in the 21st century. Amess and Wright (2012) use a dataset consisting of 533 LBOs that occurred between 1993 and 2004. They find that private equity-backed LBOs as well as non-private equity-backed LBOs do not have a significant effect on the level of employment. Amess and Wright (2012) therefore caution policymakers about responding the calls for increased regulation for private equity firms on the ground of job destruction. Olsson and Tåg (2012) make an interesting observation in their study on the employment impact of private equity buyouts. Using a dataset of 201 private equity-backed LBOs undertaken between 1998 and 2004, they find that even though there is a lower employment growth in LBO target companies compared to peers, the unemployment risk declines after a buyout. According to Olsson and Tåg (2012), this phenomenon can be explained by a stop in new recruits rather than a layoff of incumbent employees. Even though Olssen and Tåg (2012) find that employment growth is lower in LBO targets compared to peers, they conclude that concerns about private equity firms in Sweden generating returns at the expense of employees are unwarranted.

The earlier discussed article of Boucly et al. (2011) also entails an analysis of the development of the employment level of LBO target companies. When examining the

four years pre- and post-buyout, LBO targets have a 18% larger employment level compared to peers. Their estimates are highly robust over time.

2.8.2. Positive impact on wages

The earlier cited study by Bruining et al. (2005) also finds evidence that wages tend to increase after an LBO. More specifically, there is an increase in the compensation of non-managerial employees as well as an increase in performance related compensation. This effect is larger in the UK than in The Netherlands. The previously cited work by Olssen and Tåg (2012) analyses the wage impact of LBOs. Next to a decline in employment growth and unemployment risk, they find evidence for an increase in wages following an LBO. This might be the cause for their conclusion that concerns about private equity firms in Sweden generating returns at the expense of employees are unwarranted.

2.9. Negative impact on employment

Structured according to paragraph 2.8, studies that find a negative impact of private equity ownership on the numbers of employees and wages will be presented in separate paragraphs below.

2.9.1. Negative impact on the number of employees

Amess and Wright (2007a) investigate the effect of LBOs on employment by comparing the employment development of LBOs and non-LBOs in the same sector. Their data sample consists of 1,350 LBOs between 1999 and 2004. In the group of companies who experienced an LBO, the authors made a distinction between management buyouts and management buy-ins and find somewhat surprising results. The results of their study show that all LBOs together do not have a significant effect on the level of employment. MBOs, however, have a positive effect on the growth of the number of employees, while MBIs have a negative effect on employee growth relative to companies in the same industry. Their results are in line with Amess et al. (2008), who find no significant effect of private equity-backed LBOs on employment. Curiously, Amess et al. (2008) find evidence that non-private equity-backed LBOs have a negative impact on employment, but a positive impact on wages (provided that both companies involved in the acquisition are active in the same industry).

EVCA (2005) finds that in management buy-ins, the number of employees fell by 2.3% per year on average. This is surprising, since EVCA (2005) finds that after a management buy-out, the number of employees grows at 3.1% per year. It should however be noted, that there is a very small sample of management buy-ins (N=15) in the study. EVCA (2005) indicates that the decrease in employment after a management buy-in could indicate that a restructuring process during a management buy-in is more intense than in management buy-outs, since in the former case, the

previous management is replaced by a new management who might not feel the need to abide to informal contracts with employees.

Davis et al. (2011) published a similar study as Cressy et al. (2008). Using a dataset of US private equity transactions from 1980 to 2005, they track 3,200 target companies and compare their pre- and post-buyout characteristics with a control group of the same size, age, industry and growth history. They find evidence that over the first two years following a buyout, the level of employment declines by 3%. Over five years after a buyout, the employment declines with 6%. After adjusting the data for the creation of new jobs, there is a net relative job loss of less than 1% over the two years following a buyout. According to Davis et al. (2011), this result is a consequence of target firms acquiring and divesting establishments (e.g. factories, offices etc.) more rapidly than peers, and thereby reallocating employee to different establishments more often.

The previously discussed study by Lichtenberg and Siegel (1990) on LBOs in the US also finds interesting results on the topic of employment. The number of employees of target firms declines after the buyout relative to industry peers, but at a slower pace than before the buyout.

Liebeskind et al. (1992) are more focused on the governance structure of LBOs. They examine 33 US LBOs between 1980 and 1984 and compared them with a control group of 33 peers. Their results indicate that the mean number of employees of decreases in LBOs, while on average, the mean number of employees in control groups grows.

2.9.2. Negative impact on wages

In their previously mentioned work, Amess and Wright (2007a) not only investigate the effect of LBOs, MBOs and MBIs on the number of employees. They also analyse the effect on wage growth. While they find no significant effect of LBOs on the number of employees, LBOs do have a significantly decreasing effect on the growth of wages compared to non-LBOs (the effect is -0.53 percentage points). When splitting LBOs in MBOs and MBIs, Amess and Wright (2007a) find that MBOs lead to a 0.31 percentage points lower wage growth and MBIs lead to a 0.97 percentage point lower wage growth compared to non-LBOs. The higher fall in wage growth for MBIs could indicate that MBIs occur more frequently when target companies are in need of restructuring. While the results of Amess and Wright's (2007a) study would seemingly be beneficial for protestors of private equity, the authors infer from the outcomes that the results are "consistent with MBIs and MBOs involving the adjustment of wages to a more sustainable basis". The evidence found by Amess & Wright (2007a) is in line with Amess et al. (2008) who use a dataset of 232 buyouts that occurred between 1996 and 2006 and find a negative effect of LBOs on wages. This effect was, however, not significant.

2.10. Critical notes on employment impact studies

Though they are academically verified, some of the presented articles should be interpreted with caution. Hall (2007) identifies several serious problems that occur whilst analysing papers on the impact of private equity ownership on target companies' employment levels. He states that the conclusions of several studies on the impact on employment of private equity are based on a survey. These surveys are mostly based on answers provided by respondents (e.g. managers) in the portfolio companies themselves. The data retrieved from such surveys is therefore difficult to verify. Hall (2007) stresses that survey-backed data is less robust than verifiable publicly available data.

He discusses the previously mentioned reports from BVCA (2007) and EVCA (2005) in particular and stresses various methodological problems in these reports. Firstly, neither the research conducted by BVCA (2007) nor by EVCA (2005) support the claim that employment grows faster after a buyout. Hall's biggest concern is the data sample used in the studies. He stresses that a number of studies on the number of employees after private equity ownership include venture capital investments. Start-ups that survive the first few years usually achieve high growth numbers, and including venture capital investments in a data sample can significantly distort or skew the outcomes. Concluding that the results of such a survey would accurately reflect the effect of buyouts would be incorrect. BVCA (2007) and EVCA (2005) however both make a distinction between venture capital investments and buyout investments, so they do not qualify for the accusation of false conclusions per se, but they both include venture capital companies in their most commonly mentioned figures. A second concern about data sample is a type of the selection bias: the voluntary response bias. Since both BVCA (2007) and EVCA (2005) sent surveys to managers of portfolio companies, managers can decide for themselves whether they are willing to participate. Hall (2007) states that this bias causes the data sample to possibly be unrepresentative. Next to that, the research reports of EVCA (2005) and BVCA (2007) may suffer from the survey bias. If surveys were sent to private equity firms, there firms can decide themselves which portfolio companies to include and may be inclined to omit portfolio companies who have seen job cuts. The data retrieved from the surveys thus cannot be verified and can be skewed by private equity firms. Besides the voluntary response bias, data samples collected from surveys also often suffer from the survivorship bias. Former managers from failed companies simply do not have the opportunity to participate in a survey sent to companies backed by private equity. Furthermore, Hall (2007) stresses that studies stating that there was an increase in the number of people employed by private equity over the last few years might give a false interpretation of the data. An increase in the number of people employed by private equity might as well arise because an increased proportion of businesses is being backed by private equity firms over the last few years. The increase may thus not necessarily be a direct consequence of an increase in the number of employees in private equity-backed companies individually.

Hall (2007) also questions the fashion in which the results are interpreted. BVCA (2007) compares the increase in the numbers of jobs in private equity-backed companies with an increase in the number of employees at companies in the FTSE 100 and FTSE Mid-250. According to Hall (2007), both studies make a bad comparison. Companies in the FTSE 100 and FTSE Mid-250 are an illustration of trends in the whole economy, while the private equity-backed companies in the data sample should be compared to non-private equity backed companies of similar size and in the same industry. Besides that, the FTSE 100 and FTSE Mid-250 companies are relatively large companies, who rarely achieve huge growth number. The private equity-backed companies are generally quite small compared to the FTSE 100 and FTSE Mid-250 companies. Since small companies typically experience higher growth than large corporates, one would expect private equity-backed companies to experience higher growth. Next to that, Hall (2007) states that buyouts often occur in growth sectors. A comparison with the FTSE 100 and FTSE Mid-250 companies would therefore not be fair.

The same reasoning applies to the employment growth in 25 European member states, which EVCA (2005) compares to its own findings of employment growth in private equity-backed companies. When zooming in on the research study performed by EVCA (2005), Hall (2007) points out that EVCA (2005) does not base its analysis on actual levels of employments, but rather on estimates. The number of portfolio companies per size class is multiplied by the average number of employees in a company of a specific size class. The employment figures thus do not rely on actual data from individual portfolio companies, but on estimates. On top of that, EVCA (2005) makes the subjective assumption that portfolio companies with less than 200 employees at the time of investment are considered to be venture capital investments, while investments in portfolio companies with an employee base of more than 200 are considered to be buyout investments. In reality, not all private equity-backed companies with less than 200 employees are venture capital investments and not all private equity investments in companies with more than 200 employees should be regarded as buyout-financed investments.

Finally, Hall (2007) examines the earlier discussed study by Amess and Wright (2007a). Contrary to the methodologies used by EVCA (2005) and BVCA (2007), Hall's opinion on the Amess and Wright (2007a) study is more positive. Their study is not based on a survey that was sent to private equity firms, but rather on real data on employment (and thus, there is no self-selection bias or voluntary response bias). One of the criteria for LBO companies to be included in the data sample of Amess and Wright (2007a) is that the LBO firms should have a unique Companies House[3] registration number. These data are publicly available, and therefore their study can be more easily reproduced. Next to that, Amess and Wright (2007a) exclude venture companies from their dataset, which Hall (2007) argues to give a fairer representation of the impact of private equity investments. Fourth, Amess and

[3] Companies House is the governmental registrar of companies in the UK. Listed as well as non-listed UK companies are required to file their company accounts at this institution.

Wright (2007a) compare the results of their analysis with companies in the same industry who did not undergo an LBO. This is a more reliable comparison than the comparison made by EVCA (2005) and BVCA (2007), who compare employment growth at private equity-backed companies with employment growth in 25 EU member states and FTSE 100 and FTSE Mid-250 companies, respectively.

Hall (2007) also gives some criticism on Amess and Wright (2007a). Their data sample includes MBOs and MBIs, even though there is not necessarily a private equity firm involved. In these situations, the incumbent or external management would entirely use their own personal funds to buy out a company. Their finding that MBOs have a positive effect on employment growth relative to peers may therefore in theory not per se be true for MBOs where private equity firms participated. In practice however, MBOs and MBIs rarely happen without interference of private equity firms. Furthermore, Amess and Wright (2007a) make some adjustments to their data set of control firms. They exclude companies whose assets have increased by more than 100% in a given year in order to exclude companies who did acquisitions or mergers. They do not perform this operation in the dataset of LBO firms and therefore LBO companies who grow through acquisitions and mergers are still included while peers who experience growth through acquisitions are not. The employment growth in LBOs may therefore be overestimated relative to the control group.

Even though Hall (2007) only discusses the reports published by EVCA (2005), BVCA (2007) and Amess and Wright (2007a) which were earlier cited in this paper, his critiques apply to other studies cited in this paper as well. Like BVCA (2007) and EVCA (2005), Bacon et al. (2008) and Bruining et al. (2005) obtain their data through sending out questionnaires as well. The same critique applies to Lichtenberg & Siegel (1990) and Wright et al. (1984).

2.11. Conclusion

In this chapter, deeper insights on the academic literature on the social impact of private equity was presented. Table 1 summarises the papers and their findings.

Authors	Year	Sample	Time period	Major findings	Effect
Acharya et al.	2012	395 buyouts	1991-2008	Abnormal performance for private equity targets due to sales and operating margin improvement	+
Amess et al.	2008	232 buyouts	1996-2006	Private equity-backed LBOs do not have a significant effect on the employment level or wages	n/a
Amess & Wright	2007a	1,350 buyouts	1999-2004	There is an insignificant effect on employment growth by LBOs. When LBOs are split up in MBOs and MBIs, authors find a higher employment growth for MBOs and lower for MBIs compared to peers. Furthermore, there were significant wage increases, but for LBOs and MBIs, these were lower than peers	+
Amess & Wright	2007b	533 LBOs	1993-2004	There are no significant differences in employment between private equity-backed LBOs and controls	n/a
Amess & Wright	2012	533 LBOs	1993-2004	No significant effect of private equity-backed LBOs on employment compared to control group. Authors cautions policymakers not to introduce increased regulations	n/a
Bacon et al.	2008	193 buyouts	1994-1997	Wages increased in 55% of all buyouts, while wages decreased in only 2% of all buyouts.	+
Bergström et al.	2007	73 buyouts	1998-2006	Private equity transactions in Sweden lead to an increase in sales growth compared to peers. Furthermore, wages in target firms increased in line with peers.	+
Boucly et al.	2011	839 buyouts	1994-2004	Private equity-backed deals lead to an increase in sales of 12% compared to peers, an increase in capital expenditures of 24%, and an increase in employment of 18%	+
Bruining et al.	2005	190 buyouts	1992-1998	Buyouts experience an increase in compensation to non-managerial employees and an increase in performance-related wages. Furthermore, buyouts lead to an increase in the level of employment	+
BVCA	2007	All UK private equity firms	2001-2006	During sample period, the number of people employed in MBO companies increased with 8% per year, sales grew with 8% per year and R&D expenditure increased with 17% per year	+
Cressy et al.	2008	57 buyouts	1995-2002	Compared to peers, buyouts experience a decrease in employment of 7% at t+1, which cumulates in t+4 to a total decrease of 23%. In t+5, there is an increase of 2% in employment. LBOs thus experience job losses in the short run, but lead to job increases in the long run	-
Davis et al.	2011	3,200 buyouts	1980-2005	After the first two years post buyout, employment declined by 3%, cumulating to a 6% decrease after five years. After adjusting for the creation of new jobs, the net job loss is less than 1%	-
EVCA	2005	All EU private equity firms	2000-2004	Employment at buyouts grew by 2.4% per year. While MBOs experience an increase of employment of 3.1%, MBIs lead to a decrease of 2.3%. This could be the consequence of MBIs facing a more intense restructuring process	+
Kaplan	1989	76 buyouts	1980-1986	Employment increases after a buyout, but falls short when compared to a control group. The ratio of capital expenditures to sales declines after a buyout	-

Lerner, Sorensen & Strömberg	2008	472 LBOs	1984-2007	Few LBOs engage in patenting, but for those that do, there is no significant evidence that LBOs lead to lower patenting (which is a measure for innovation)	n/a
Lichtenberg & Siegel	1990	1,132 buyouts	1983-1986	Between t-1 and t+2, the employment level of non-production employees decreased with 8.5%. Furthermore, buyouts invest significantly less in R&D than other companies, which is due to private equity generally being more active in non-R&D intensive industries. Finally, there was a wage increase for blue collar employees of 3.5% between t-1 and t+2	-
Liebeskind et al.	1992	33 LBOs	1980-1984	Average number of employees decreased in LBOs, while employment at peers increased. Differences were significant.	-
Long & Ravenscraft	1993	198 LBOs	1981-1987	R&D intensity in target companies drops 40% after the buyout relative to the pre-buyout level of R&D intensity	-
Olsson and Tåg	2012	201 buyouts	1998-2004	There is a lower employment growth in LBO target compared to peers. However, the unemployment risk declines after an LBO, which is in line with LBOs freezing the recruitment of new talent	-
Popov & Roosenboom	2009	18 countries	1991-2004	The average impact of a private equity financed euro spent on R&D is 2.6 times bigger than to a euro of industrial R&D. The effect is significant	+
Singh	1990	65 MBOs	1980—1087	Compared to a control group of 130 peers, MBOs have a significantly higher sales growth	+
Wiersema et al.	1995	84 LBOs	1980-1986	Sales at LBO targets grew slower than peers during the 1980s buyout wave	-

Table 1: summarised findings of academic literature on the social impact of private equity, measure by sales growth, R&D investments and employees and wages. '+', '-' represent a positive and negative effect respectively. 'n/a' represents an insignificant effect.

From the discussed literature, one can derive multiple conclusions. It is evident that academics have not completely reached consensus on the social impact of private equity. While some papers find evidence for a positive relation between private equity and social impact, other papers find contradictory evidence. Next to that, there are several authors who find no significant relation between private equity ownership and social impact. However, when examining the number of articles finding a positive effect versus the number of articles finding negative effects, one can conclude private equity to have a positive social impact. By splitting social impact up in sales growth, R&D investments, wages and the employment level authors, more differentiated conclusions can be drawn. The number of articles finding a higher sales growth for LBOs compared to peers is larger than articles finds evidence for a contrary effect, indicating a predominantly positive effect of private equity ownership of sales growth. Articles on R&D investments impact are more diversified, though there is also a slight skew to more articles finding a positive effect. Regarding the impact on wages, a majority of articles find positive effects of private equity ownership on wages. Therefore, one could conclude that based on the presented literature, private equity has a positive effect on employee compensation. Articles covering the effect on the number of employees are more diversified. Though there were slightly more articles finding LBOs to be leading to a higher number of employees relative to peers.

Looking at the periods in which papers were published, one can observe that during periods of increased private equity activity (such as during the buyout wave of 1980s and the period leading up to the credit crisis of 2008) more academic articles relating to private equity were published. This phenomenon indicates increased awareness for the effects of private equity when private equity activity is high. Furthermore, academics tends to focus their research on the social effects of private equity in the US and the UK market. This may be due to the US and the UK having a different institutional setting than other countries. Private equity firms may be more likely to be localised in the US or the UK due to those countries' Anglo Saxon culture. This subsequently leads for a higher degree of data availability in the US or the UK.

This study, however, addresses the social impact of private equity in specifically The Netherlands, which is a not frequently covered country in the discussed literature. It builds on the work of Bruining et al. (2005), who observe the development of employee relations after a buyout in the UK and The Netherlands. Besides the usage of a more recent dataset, this thesis examines the impact of buyouts on sales growth as well (which is not covered in Bruining et al.'s (2005) work). For these reasons, this study will serve as a pioneer paper. The outcomes will be of great importance to Dutch policy makers, academics and the Nederlandse Vereniging van Participatiemaatschappijen (NVP, the Dutch representative association for private equity firms).

3. Data

3.1. Introduction

This chapter discusses the dataset that is used in the quantitative analysis. Paragraph 3.2 discusses from which sources the dataset was extracted. Next, paragraph 3.3 features an elaboration on filtering operations that led to the final dataset. Paragraph 3.4 then presents and discusses descriptive statistics of the dataset. This chapter ends with concluding remarks in paragraph 3.5.

3.2. Data sources

There are several methods for identifying the social impact of private equity ownership. While some reports make us of a survey sent to managers of private equity specialists (EVCA, 2005; BVCA, 2007; Bruining et al., 2005), other studies are based on archival data (Amess and Wright, 2007a; Boucly et al., 2011). Evidence based on archival data is scientifically preferred over survey based results (Hall, 2007). Therefore, the analysis in this thesis is based on archival data. The buyouts dataset is retrieved from the Nederlandse Vereniging van Participatiemaatschappijen (NVP). It includes publicly available information from portfolio companies and private equity firms. The NVP created the dataset by scanning press statements and other reports on websites of private equity firms. The total dataset of the NVP consisted of 4,064 companies that have received private equity funding of some sort. The dataset contained the company name, private equity firm name, year of the buyout, year of divestment, transaction value, type of private equity funding, industry, revenue, number of employees and the location. However, the dataset was not complete. A big majority of all portfolio companies in the dataset missed information on sales and employees. Next to that, a lot of cases lacked an industry classification. Consequently, the amount of portfolio companies retrieved from the dataset was significantly narrowed down due to filters and operations set out in paragraph 3.2.

In order to give meaningful valid comments about the Dutch buyouts in the NVP database, the construction of a control group that has the same characteristics as the original dataset is essential. Database Orbis was used to construct this control group. Using a top-down approach, I started with all Dutch active companies and applied filters to come up with a control group of 616 companies. Since the final NVP data sample consists of 50 Dutch buyouts, the total dataset contains complete information on 666 Dutch companies. Filters there were applied to the Orbis dataset are explained below.

3.3. Data operations

Regarding the NVP dataset, multiple filtering operations were applied. First, since the aim of this thesis is to provide empirical evidence for policy makers and academics, a

dataset focused on recent private equity transactions is important. Recent evidence makes a better case for policy makers during debates, and academics would get a better understanding of the social impact of private equity ownership in the current economic environment. Consequently, only transactions that were initiated after 2005 will be included in the dataset. For each private equity buyout, the effect on sales growth, the number of employees and wages are will be analysed starting from the initial year of investment up until four years later. Private equity investments with an investment period less than four years are thus excluded. As a consequence, LBOs initiated after 2012 will not be included in the dataset. By examining the impact of private equity ownership up to four years after the year of investment, the analysis becomes more robust.

Second, as stated earlier, venture capital deals will be excluded from the dataset. In this study, I want to measure the social impact of private equity-backed buyouts, since criticism on private equity is focused on the buyouts business model. Therefore, several other private equity transactions are excluded: venture capital investments, growth capital, later stage venture financing, refinancing transactions and seed capital are dropped from the dataset. Turnaround/restructuring transactions, however, remain included in the dataset, because turnarounds and restructurings are a common practice of private equity firms when performing a buyout.

Third, the dataset includes investments from Dutch private equity firms in Dutch companies as well as investments from foreign private equity firms in Dutch companies. In order for a portfolio company to be included in the dataset, its headquarters have to be located in The Netherlands.

After accounting for all these filters, the dataset consists of 358 Dutch buyouts that occurred between 2006 and 2012. Almost all of these portfolio companies lacked information on sales and employment. Therefore, I looked each of these cases up at the Dutch chamber of commerce and looked into their annual reports of company websites to complete the information in the NVP dataset. Since most small- and medium sized companies do not publish their annual reports and information at the chamber of commerce is not always available, the total group of buyouts was narrowed down to 50 entries. These 50 cases all had information in every examined year on revenue, the number of employees and wages.

I subjected the Orbis database to filtering operations as well. First, all companies having an employee base in the last available year of more than 37,468 or less than 22 were excluded, since these were the maximum and minimum number of employees in the NVP dataset , respectively. Thereby, the companies in the control group are of a similar size as the buyouts. Furthermore, I deleted companies with zero revenues, employees and/or personnel expenses from the dataset, as I considered them inactive or incorrect.

Third, only companies that had available data on sales, employment and wages for the years 2006 until 2015 were included. The Orbis dataset contained a significant amount of invalid entries (fields filled with "n.a.", e.g. not available). Therefore, this operation reduced the total number of companies significantly. Finally, I discarded all companies that are under ownership of or have received financing by private equity firms from the dataset. These filters led to a control group of 616 companies.

This paper studies the social effects of ownership of private equity firms in the first four years following a buyout. Since each buyout was initiated in different years, I transformed years to time periods. For example, if company A underwent a buyout in 2009, this year will be named *t0 (year 0)*, while 2010 will be transformed into *t1 (year 1)*, 2011 is *t2* and so forth until *t4*. This operation was performed for each entry in the original dataset. Regarding the control group, I constructed a time period as well, so that I can make a comparison between the two groups. Since I only examine five consecutive years of each portfolio company following a buyout (with the year in which the buyout took place being *t0*), I also need five consecutive years for the control group that can subsequently be transformed to *t0*, *t1*, *t2*, *t3* and *t4*. In order to stay as close as possible to the time period in which the buyouts occurred, I chose to include years 2009 through 2013 for the control group to correspond with *t0* (year 0, e.g. the year in which the buyout took place) through *t4* (year 4 after the buyout). I classified 2009 as *t0*, since 2009 is the average year in which all buyouts were initiated.

Finally, the control group should have the same industry characteristics as the buyouts dataset. NVP assigned an industry label to most companies in their dataset, which led to a total amount of fourteen different industries. The buyouts are not distributed evenly over all industries. In fact, some industries are not represented by a buyout at all. These industries are 'Real Estate' and 'Computer and Consumer Electronics'. There were no buyouts in the 'Real Estate' industry present in the NVP database and very few buyouts active in the 'Computer and Consumer Electronics' industry. I decided to merge the 'Computer and Consumer Electronics' and 'Communications' industries into 'Communications', since these two industries included similar companies. Consequently, I discarded companies active in the 'Real Estate' industry and merged companies active in the 'Computer and Consumer Electronics' industry in the 'Communications' industry in the control group. Since the Orbis dataset applies other names for industries than the NVP database, I transformed all industry names from the Orbis database (officially called "BvD Major Sectors") into the industry classifications of the NVP database. These transformations are presented in Figure 2 in Appendix A.

The Orbis dataset is relatively large compared to the NVP dataset. The entries for companies are however not as trustworthy as the NVP dataset, whose entries I verified completely at the Dutch chamber of commerce. Orbis retrieves information on companies from documents from the chamber of commerce as well, but also from other

undisclosed sources. Not all entries in the Orbis database are 100% correct, which can potentially influence the total dataset significantly. In this research, I calculate ratios from the data points in the dataset. One of these ratios is e.g. the ratio of sales in year 1 relative to sales in year 0 after a buyout for a specific company. Thereby, the ratio represents the year-on-year growth factor of company A's revenue. If the revenue in year zero of company A is stated incorrectly in the Orbis database, say 1 Euro instead of 1,000 million Euros, while the revenue in year one is correct (say, 1,050 million Euros), the growth ratio would be a staggering 1,005.0 instead of 1.05. Such entries can cause a distribution to be highly flawed which may have severe implications for the results of the analysis. Therefore, I tracked down those entries and dropped them from the dataset.

There are multiple ways to treat outliers. Academics agree that one can e.g. remove the outlier completely from the dataset (Field, 2009). Another method to deal with outliers is transforming the data. This can be done by applying a logarithmic scale to the variables, which limits the impact of outliers in the data. Furthermore, one can simply change the score of the outlier in the database. This may seem like cheating, but there are guidelines for changes the score of an outlier. One may change the score of a big outlier to the next highest score plus one, or convert all scores to Z-scores and change the outlier to two or three times the average or delete it. This is a frequently used operation in academic literature. In this situation, a Z-score of 3.29 is considered an outlier (Field, 2009). In this thesis, I chose to drop each interval variable that had a Z-score of 3.29 or higher.

After these filters and data operations, the total dataset comprised 666 companies, of which 50 were the buyouts from the NVP and 616 were companies of the Orbis control group. Since both buyouts and non-buyouts can be active in mergers and acquisitions, I assumed that add-on investments and disposals happen to both of them equally often and no additional data operations are required for mergers and acquisitions. On the same grounds, a possible survivorship bias was accounted for by assuming that both buyouts and non-buyouts carry the same risk of default.

3.4. Descriptive statistics

This section provides descriptive statistics for the total dataset as well as for the NVP and Orbis dataset separately. Tables and figures are presented in Appendix A.

First, the variables of interest in this research as presented. Table 3 in provides an overview of all variables and corresponding description. The presented variables are elements of the regression analyses that will be introduced later in this thesis.

Second, frequency tables are provided for the industries. Table 4 provides an overview of all industries. Each company is ascribed to one of these industries. As can be observed in Table 5.1, a majority of the companies in the total dataset is active in either

'Consumer goods and retail' or 'Consumer services other'. Tables 5.2 and 5.3 clarify that the overrepresentation of companies in these industries is because of a large amount of companies in the control group being active in either one of these industries. An explanation for this phenomenon is that of all the "BvD Major Sectors" in Orbis, most companies were classified as being active in 'Wholesale and retail trade' or 'Other services'. These industry classifications were transformed to 'Consumer goods and retail' and 'Consumer services other' respectively.

Table 6.1, Table 6.2 and Table 6.3 present descriptive statistics on each of the dependent variables used in the regressions. The descriptive statistics of the complete dataset show us that almost all dependent variables have a positive mean, meaning that there is a positive growth factor. In Table 6.1 (which presents descriptive statistics for the entire dataset) the only the average relative increase of sales between year 4 and year 3 is less than 1.0, which indicates a decrease in sales between year 4 and year 3, instead of an increase. When comparing the descriptive statistics of the Orbis dataset (Table 6.2) and the NVP dataset (Table 6.3), I can derive some interesting observations. In Table 6.2 the ratio of sales in year 4 to sales in year 3 is less than 1.0, just like this ratio in the table of the complete dataset. In Table 6.3 however, I observe a value of 1.0582 for the year 4 sales relative to the year 3 sales. The cause for this ratio being less than 1.0 in the complete dataset is thus due to an overrepresentation of companies in the control group in the total dataset.

Looking at the NVP dataset, all ratios are more than 1.0x, except for the number of employees in year 3 relative to year 2 after the buyout. Other notable observations can be derived from the standard deviations. The standard deviations of ratios that compare year 4 to year 0 are relatively high. This is a logical consequence of these ratios containing the total growth of sales, employees or wages over the four years after a buyout and thus having higher and more dispersed scores. This is in accordance with the data having quite large maximum values in Table 6.1, since they show an aggregate increase. Ratios that do not present an aggregate effect have lower maximum values on average. Some of them, however, do have a high maximum, such as *Rel. Incr. Sales t1*, which has a maximum value of 4.8188. Along with this relatively high maximum, this ratio has a high standard deviation. The relatively high standard deviations of ratios in the NVP dataset seem to be mainly caused by high maximum values. Ratios with a very high standard deviation indicate a great variation in the data and should therefore be examined with caution.

Comparing the mean of both groups of data shows that almost all ratios have a higher mean in the NVP dataset than in the Orbis dataset. Only the variables *Rel. Incr. Sales t2*, *Rel. Incr. Empl. t2*, *Rel. Incr. Empl. t3* and *Rel. Incr. Wages t3* have a lower mean in the NVP dataset than in the Orbis dataset. These observations might imply that private

equity ownership leads to a positive social impact in general. To test this, statistical testing is required. The framework of these tests is be presented in the next chapter.

3.5. Conclusion

This chapter presented the dataset that is used the empirical analysis of this thesis. First, I disclosed how the buyouts dataset was retrieved from the NVP, while I extracted the control group from database Orbis. Next, I discussed all data operations that were required for the data entries to be included in the sample for the empirical analysis. Finally, I presented and discussed the descriptive statistics for the complete dataset, as well as the buyouts dataset and the control group separately.

4. Methods

4.1. Introduction

As concluded from the literature review, some academics find evidence for a negative effect of private equity on the three measures of social impact, but the majority of academic literature stressed that the private equity industry is of importance to society and has proven that it affects society in a positive manner accordingly. Some of these studies do a peer analysis and compare metrics such as sales growth, R&D investments and the employment of a buyout target in several years after the buyout with a group of control companies in the same industry. This thesis applies a similar method in the empirical analysis. This chapter explains how I constructed the analysis. In the second paragraph, I provide hypotheses that will be tested as well as corresponding regression equations. Paragraph 4.3 presents robustness tests that test to which extent the data satisfies regression assumptions and paragraph 4.4 summarises this chapter.

4.2. Hypotheses

Based on the fact that the majority of academics for a positive relation, I expect private equity have a positive effect on the three measures. The traditional business model of private equity buyouts is to acquire companies, achieve significant growth, and sell them for a higher price. Taking this into account, the following normative hypotheses will be tested during the empirical analysis. Each main hypothesis predicts that private equity has a positive impact on the corresponding social impact measure. Each of those hypotheses is accompanied with four sub-hypotheses. These sub-hypotheses make predictions on the time period in which a possible effect of private equity may occur:

H1: *Private equity buyouts are associated with increased sales growth compared to non-private equity backed counterparts of the same size and industry in the four years following a buyout*

H1a: *Private equity buyouts are associated with increased sales growth compared to non-private equity backed counterparts of the same size and industry in the first year following a buyout*

H1b: *Private equity buyouts are associated with increased sales growth compared to non-private equity backed counterparts of the same size and industry in the second year following a buyout*

H1c: *Private equity buyouts are associated with increased sales growth compared to non-private equity backed counterparts of the same size and industry in the third year following a buyout*

H1d: *Private equity buyouts are associated with increased sales growth compared to non-private equity backed counterparts of the same size and industry in the fourth year following a buyout*

H1e: *Private equity buyouts are associated with increased sales growth compared to non-private equity backed counterparts of the same size and industry in the aggregate four years following a buyout*

H2: *Private equity buyouts are associated with an increased number of employees compared to non-private equity backed counterparts of the same size and industry in the four years following a buyout*

H2a: *Private equity buyouts are associated with an increased number of employees compared to non-private equity backed counterparts of the same size and industry in the first year following a buyout*

H2b: *Private equity buyouts are associated with an increased number of employees compared to non-private equity backed counterparts of the same size and industry in the second year following a buyout*

H2c: *Private equity buyouts are associated with an increased number of employees compared to non-private equity backed counterparts of the same size and industry in the third year following a buyout*

H2d: *Private equity buyouts are associated with an increased number of employees compared to non-private equity backed counterparts of the same size and industry in the fourth year following a buyout*

H2e: *Private equity buyouts are associated with an increased number of employees compared to non-private equity backed counterparts of the same size and industry in the aggregate four years following a buyout*

H3: *Private equity buyouts are associated with increased wages compared to non-private equity backed counterparts of the same size and industry in the four years following a buyout*

> H3a: *Private equity buyouts are associated with increased wages compared to non-private equity backed counterparts of the same size and industry in the first year following a buyout*
>
> H3b: *Private equity buyouts are associated with increased wages compared to non-private equity backed counterparts of the same size and industry in the second year following a buyout*
>
> H3c: *Private equity buyouts are associated with increased wages compared to non-private equity backed counterparts of the same size and industry in the third year following a buyout*
>
> H3d: *Private equity buyouts are associated with increased wages compared to non-private equity backed counterparts of the same size and industry in the fourth year following a buyout*
>
> H3e: *Private equity buyouts are associated with increased wages compared to non-private equity backed counterparts of the same size and industry in the aggregate four years following a buyout*

In order to test the hypotheses formulated above, a methodological framework is required. In this thesis, I use ordinary least squares regressions. Comparable academic literature frequently uses regressions when examining the social impact of private equity. Therefore, this method is considered well suited for this study as well. The regressions try to assess whether the hypotheses should be rejected. The aim of these regressions is to find the relation between private equity ownership and several measures for social impact. I constructed a predictive validity framework, which provides insights in the way in which variable will interact with each other. The predictive validity framework is presented in Figure 1 below.

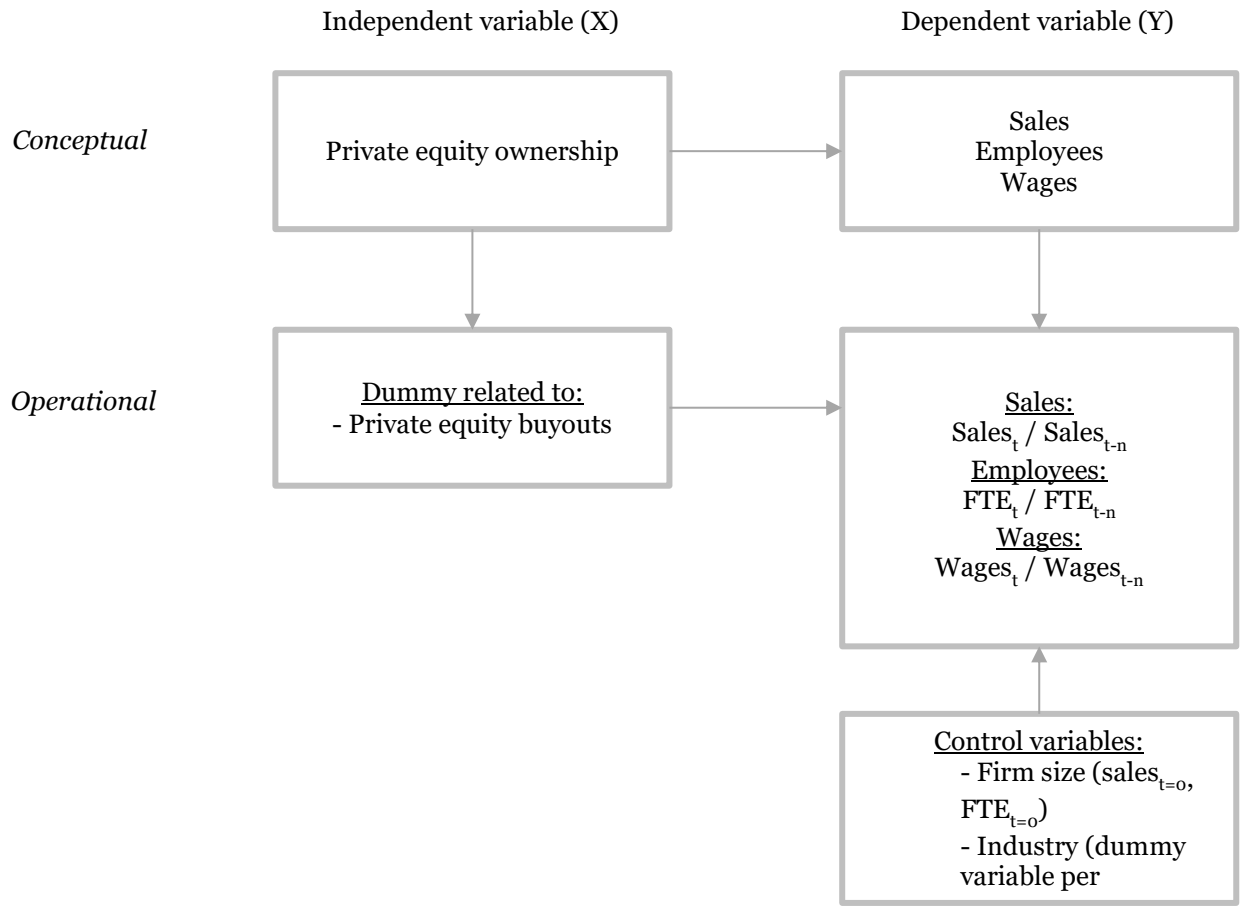

Figure 1: Predictive Validity Framework

I constructed a number of accompanying regressions for each hypothesis, which I present below.

Regressions for hypothesis 1:

$$\frac{Sales_{t=1}}{Sales_{t=0}} = \alpha + \beta_1 * DummyPE + \beta_2 * FTE_{t=0} + \beta_3 * Ind_1 + \cdots + \beta_{13} * Ind_{11} \qquad (1.1)$$

$$\frac{Sales_{t=2}}{Sales_{t=1}} = \alpha + \beta_1 * DummyPE + \beta_2 * FTE_{t=0} + \beta_3 * Ind_1 + \cdots + \beta_{13} * Ind_{11} \qquad (1.2)$$

$$\frac{Sales_{t=3}}{Sales_{t=2}} = \alpha + \beta_1 * DummyPE + \beta_2 * FTE_{t=0} + \beta_3 * Ind_1 + \cdots + \beta_{13} * Ind_{11} \qquad (1.3)$$

$$\frac{Sales_{t=4}}{Sales_{t=3}} = \alpha + \beta_1 * DummyPE + \beta_2 * FTE_{t=0} + \beta_3 * Ind_1 + \cdots + \beta_{13} * Ind_{11} \qquad (1.4)$$

$$\frac{Sales_{t=4}}{Sales_{t=0}} = \alpha + \beta_1 * DummyPE + \beta_2 * FTE_{t=0} + \beta_3 * Ind_1 + \cdots + \beta_{13} * Ind_{11} \qquad (1.5)$$

Each regression is designed to test the sub-hypotheses belonging to hypothesis 1. These serve to test main hypothesis 1. In these regressions, $Sales_{t=n}$ represents the sales level of a private equity-backed company in year n. The dependent variable thus is the relative increase in sales of a company from year n to year $n+1$. *DummyPE* is a dummy variable taking the value of 1 of the company has received private equity funding in the form of a buyout and the value of 0 if the company has not received such private equity funding in the examined period. $FTE_{t=n}$ represents the number of employees of a company in year n and is measured in full time equivalent. Ind_i variables are dummy variables. Each dummy variable of Ind_i takes on a value of 1 if the company is active in the corresponding industry. All companies are classified as being active in either one of twelve industries. With 'agriculture' for example being the first industry classification, variable Ind_1 would take a value of 1, while variables Ind_2 through Ind_{14} would all take on a value of 0 if a company is active in the agricultural industry. A detailed elaboration of different values of the variable Ind_n was earlier presented in Table 3 and 4 in Appendix A. While the independent variable *DummyPE* is the variable of interest for testing hypothesis 1, variables $FTE_{t=n}$ and Ind_i serve as control variables. They control for size and industry, respectively. Control variables are added in regression equations to control for the risk that the relationship between two variables may be caused by another variable or other variables.

Regressions for sub-hypotheses 2:

$$\frac{FTE_{t=1}}{FTE_{t=0}} = \alpha + \beta_1 * DummyPE + \beta_2 * Sales_{t=0} + \beta_3 * Ind_1 + \cdots + \beta_{13} * Ind_{11} \qquad (2.1)$$

$$\frac{FTE_{t=2}}{FTE_{t=1}} = \alpha + \beta_1 * DummyPE + \beta_2 * Sales_{t=0} + \beta_3 * Ind_1 + \cdots + \beta_{13} * Ind_{11} \qquad (2.2)$$

$$\frac{FTE_{t=3}}{FTE_{t=2}} = \alpha + \beta_1 * DummyPE + \beta_2 * Sales_{t=0} + \beta_3 * Ind_1 + \cdots + \beta_{13} * Ind_{11} \qquad (2.3)$$

$$\frac{FTE_{t=4}}{FTE_{t=3}} = \alpha + \beta_1 * DummyPE + \beta_2 * Sales_{t=0} + \beta_3 * Ind_1 + \cdots + \beta_{13} * Ind_{11} \qquad (2.4)$$

$$\frac{FTE_{t=4}}{FTE_{t=0}} = \alpha + \beta_1 * DummyPE + \beta_2 * Sales_{t=0} + \beta_3 * Ind_1 + \cdots + \beta_{13} * Ind_{11} \qquad (2.5)$$

In order to test the sub-hypotheses of hypothesis 2, the dependent variable in the regressions on sales growth is replaced by the previously discussed proxy for the relative increase in the number of employees from year *n* to year *n+1*. Since the dependent variable is a function of $FTE_{t=n}$, the control variable $FTE_{t=n}$ is replaced by the control variable $Sales_{t=n}$, which controls for size as well. $Sales_{t=n}$ is measured in thousands of Euros

Regressions for sub-hypothesis 3:

$$\frac{Wages_{t=1}}{Wages_{t=0}} = \alpha + \beta_1 * PE + \beta_2 * FTE_{t=0} + \beta_3 * Ind_1 + \cdots + \beta_{13} * Ind_{11} \qquad (3.1)$$

$$\frac{Wages_{t=2}}{Wages_{t=1}} = \alpha + \beta_1 * PE + \beta_2 * FTE_{t=0} + \beta_3 * Ind_1 + \cdots + \beta_{13} * Ind_{11} \qquad (3.2)$$

$$\frac{Wages_{t=3}}{Wages_{t=2}} = \alpha + \beta_1 * PE + \beta_2 * FTE_{t=0} + \beta_3 * Ind_1 + \cdots + \beta_{13} * Ind_{11} \qquad (3.3)$$

$$\frac{Wages_{t=4}}{Wages_{t=3}} = \alpha + \beta_1 * PE + \beta_2 * FTE_{t=0} + \beta_3 * Ind_1 + \cdots + \beta_{13} * Ind_{11} \qquad (3.4)$$

$$\frac{Wages_{t=4}}{Wages_{t=0}} = \alpha + \beta_1 * PE + \beta_2 * FTE_{t=0} + \beta_3 * Ind_1 + \cdots + \beta_{13} * Ind_{11} \qquad (3.5)$$

Since hypothesis 3 tests whether companies backed by private equity are associated with higher wages compared to non-private equity-backed companies of the same size and industry, the dependent variable in the applicable regressions will be a proxy for the relative increase in wages from year *n* to year *n+1*. Wages are measured by the personnel expenses of a company in year *n*, portrayed by variable $Wages_{t=n}$ in the regressions. $FTE_{t=n}$ and Ind_i once again serve as control variables.

4.3. Assumptions

There are a few assumptions that should be tested in order to determine if a dataset is applicable for a parametric test such as an ordinary least squares linear regression

(Brooks, 2008). These conditions and the tests proving the conformation or violation of the data used in this paper are stated below.

1. The variance of the errors is constant and finite over all values of the independent variable (x_t)

This assumption tests the data for homoscedasticity. A violation of this assumption is called heteroscedasticity, which is a situation in which the errors become more dispersed over different levels over *x*. Heteroscedasticity can be checked using scatterplots in which the standardized predicted value of the models is plotted against the standardized residuals of the dependent variable. In figures 3, 4 and 5 of Appendix B, scatterplots for all dependent variables are presented.

The scatterplots reveal that most of the values concentrate around a standardized predicted value of zero. This sometimes makes it difficult to detect heteroscedasticity. Figure 3 presents scatterplots for all variables relating to the relative increase of sales. The data suffers from heteroscedasticity if for different levels of the standardized predicted values, the standardized residuals become more dispersed. Only for the variables *Rel. Incr. Sales t2*, one might think there is evidence for heteroscedasticity. However, since there are a large number of observations (N=666), the importance of extreme values can easily be overvalued. Keeping the large numbers of observations in mind, I therefore do not detect strong evidence for heteroscedasticity in Figure 3.

Figure 4 presents the plots for the employee increase variables. Even though a few extreme values make it once again complicated to detect heteroscedasticity, there is no evident case in which the values become more dispersed for different standardized predicted values of the model (which would be consistent with the presence of heteroscedasticity).

Finally, Figure 5 presents the scatterplots for the wage increase variables. The scatterplots for variables *Rel. Incr. Wages t4* ad *Rel. Incr. Wages tot*. seem to exhibit a somewhat heteroscedastic pattern. The values become more dispersed around a standardized predicted value of 0, after which the data seems to become less dispersed. The effect does however not seem to be strong. The assumption of homoscedasticity is thus not considered to be violated.

2. The errors are linearly independent of one another

This assumption is also called independence of errors. It states that serial correlation is not allowed in regressions. Serial correlation refers to a situation in which the residuals of two observations in a regression are correlated (Field, 2009). The Durbin-Watson test can be used to check whether the residuals in the model are independent. The Durbin-Watson statistic takes a value between 0 and 4. A Durbin-Watson statistic close to 2

indicates that there is no serial correlation between the error terms. In general, a Durbin-Watson statistic lower than 1 or greater than 3 is a cause for concern. Table 7 in Appendix B presents the Durbin Watson statistic.

Almost all regressions have a Durbin-Watson statistic that is close to 2, except for regression 3.4. Regression 3.4 is the regression with dependent variable Rel. Incr. Wages t4, with a corresponding Durbin-Watson statistic of 0.121, which is lower than the threshold of 1. This regression might thus be problematic. The outcomes of the model should therefore be interpreted with caution for regression 3.4.

3. The error terms are normally distributed

Residuals of a regression should be normally distributed with a mean of zero. There are various ways of testing this assumption. One of them is creating a histogram or a probability-probability plot (P-P plots) of the standardized residuals. The P-P plots are presented in Figures 6, 7 and 8 in Appendix B, while the histograms of the standardized residuals are presented in Figures 9, 10 and 11 of Appendix B.

A P-P plot plots the cumulative probability of a variable against the cumulative probability of a particular distribution (in this specific case: a normal distribution). First, the data are ranked and sorted. Then, for each rank-number a Z-score is calculated, which presents the expected value that the score would have in a normal distribution. Third, each score itself is transformed into a Z-score. The normal probability plot then plots the actual Z-score against the expected Z-score. If the errors were normally distributed, the actual Z-scores would then lie perfectly on the line of expected Z-scores. The P-P plots in Tables 6, 7 and 8 clarify that none of the standardized residuals of the dependent variables used in the regressions follows a perfect normal distribution, since the observed cumulative probabilities do not exactly follow the straight line that corresponds with a normal distribution. An interesting observation is that the residuals of the first set of regressions (Table 6) seem to be more normally distributed than residuals of regressions in Table 7 and 8. Next to that, regressions in Table 8 seems to be more normally distributed than regressions presented in Table 7.

The frequency histograms of the residuals are presented in Tables 10, 11 and 12. The figures show that the majority of histograms seems to be not perfectly symmetrical. This implies some degree of skewness in those variables. A skewed distribution has one fat tail and leads to an asymmetrical histogram. Skewness is often caused by the presence of outliers in the data. However, data operations described in paragraph 3.2 deleted big outliers from the dataset. Without these operations, each histogram would suffer from an even heavier positively skewed distribution and would have the most frequent scores clustered at the far left end of the scale. Since the number of observations in this study is large (N=666), the seemingly skewed distributions are likely to be caused by only a few

extreme values of the standardized residuals. Therefore, the skewness observed in the histogram is not per se problematic. However, one should still be aware of the fact that the errors do not follow a perfect normal distribution when interpreting the regression output.

One other deviation from normality that can be observed in the histograms is kurtosis. Kurtosis refers to the extent to which scores are clustered in the tails of the shape. A positive kurtosis corresponds with a pointy shape, while a negative kurtosis refers to a state in which score are clustered in the tails. In both situations, there is a lack of a perfectly bell-shaped curve. Looking at the histograms provided in Tables 9, 10 and 11, it is evident that all distributions suffer from positive kurtosis (called leptokurtic) to some extent. This is due to the fact that the dependent variables are all growth ratios. A growth of sales, employees or wages of more than 100% (corresponding with a ratio of 2) seems extreme for an average company. Most (mature) companies probably grow between -20% and +20% each year, corresponding with a ratio of 0.8 and 1.2, respectively. This is the cause for scores of the standardized residuals being highly concentrated around 0. A high kurtosis score may be problematic for parametric tests. The outcomes of the model should therefore be interpreted with some caution.

4. There is a linear relationship

When running a linear regression, it is evident that there should be a linear relationship between the dependent and independent variables. Checking for linearity is important, since it would make no sense to try to fit a straight line through data that does not follow a straight line. Testing for linearity is quite straightforward. A scatterplot of the observed versus the expected values of the standardized residuals indicates whether there is a linear relation. Scatterplots of the standardized residuals of the regressions were previously presented in Tables 3, 4 and 5 of Appendix B for testing for homoscedasticity. When testing for homoscedasticity, I was interested in the change in dispersion of scores (the variance) for different levels of the standardized predicted values. When testing for linearity, I am interested in the scattering of the scores in the plot. This means that the scores should be somewhat clustered around a value of the standardized residual of 0 and the scores should be horizontally distributed. The scatterplots in Tables 3, 4 and 5 show that the scores of each scatterplot is indeed clustered around 0, but not all scores of every scatterplot is evenly horizontally distributed. This is once again due to a large number of observations in the regression, which cluster around a standardized residual of 0. However, the effect does not seem to very strong, and there does thus not seem to be a serious violation of the linearity assumption in the data.

Next to these four assumptions, there are other tests of a lesser importance. One of these is a test for multicollinearity. Multicollinearity refers to a situation in which there is

correlation between independent variables. Multicollinearity only exists in multiple linear regressions, since a simple regression with only one predictor has no second independent variable to possibly correlate with. An extreme situation of multicollinearity is perfect collinearity, which is a situation in which two independent variables have a correlation of 1. This poses a problem, since the coefficient of these two independent variables in the model would then be interchangeable. Next to that, multicollinearity limits the size of R-squared (R^2), which will be elaborated upon in the next chapter. Third, a situation of multicollinearity makes it difficult to assess the importance of individual independent variables. When two independent variables are highly correlated, they account for a similar variance in the dependent variable, and it becomes impossible for scientists to tell which independent variable is more important.

In Tables 8.1, 8.2a and 8.2b in Appendix B, the correlation matrices are presented. Table 8.1 shows Pearson's correlation between all independent variables used in the regression equations. Even though the correlations between some independent variables are significant, none of them have a correlation of plus or minus 0.80 or higher, which serves as a rule of thumb for multicollinearity (Field, 2009). This observation leads to the conclusion that there is no presence of multicollinearity in the data. The significance of Pearson's correlation coefficient can be interpreted as followed: a p-value of e.g. 0.01 for a Pearson's correlation coefficient of 0.82 indicates that the probability of getting a Pearson's correlation coefficient of 0.82 while in fact the null hypothesis is true (being there is no correlation between the two variables) is 0.01. The correlation coefficient of 0.82 between variable A and variable B means that as variable A increases/decreases, variable B increases/decreases as well, i.e. there is a strong positive relation. The correlation coefficient does however not make statements about causality (like ordinary least squares regression does).

In this thesis, a p-value of 0.05 constitutes significance. Since the hypotheses stated earlier are of a normative nature, the p-values shown in the correlation matrices are one-tailed. Tables 8.2a and 8.2b show the correlation between dependent and independent variables. A strong positive or negative correlation is desirable in this matter, since it would imply a greater R^2. The correlations of most interest in this matrix are correlations between *Dummy.PE* and all dependent variables. These correlations do not appear to be very strong: the highest correlation coefficient is 0.168, which is the correlation between *Dummy.PE* and *Rel. Incr. Sales tot*. Nevertheless, most correlations between *Dummy.PE* and dependent variable indicate a positive relation, some of which are significant.

4.4. Conclusion

This chapter explained the methodological framework for this thesis' empirical study. First, I developed hypotheses, associated regressions and a predictive validity

framework. Next to that, I tested whether the data violates assumptions of ordinary least squares regression, which turned out to be the case. The fact that the data violates various assumptions of ordinary least squares regression is not per se problematic. One can run an ordinary least squares regression with data that violates the assumptions, but generalising the outcome of the model to the total population can becomes problematic. This is important to keep in mind whilst interpreting regression results.

5. Results

5.1. Introduction

In this section, the results of the empirical study will be presented. First, I test and discuss the goodness of fit of the model, after which paragraph 5.3 presents, discusses and interprets the regression output. Paragraph 5.4 subsequently translates the model output to answers for the earlier presented hypotheses. Finally, a conclusion summarises the regressions output and answers the research questions set out in the introduction of this thesis.

5.2. Fit of the model

Before going deeper into the presentation and interpretation of the regression coefficients, I present an assessment of the fit of the regression model based on the extent to which the model predicts the outcome well (ANOVA) and the values of R^2 for each regression.

To make further statement about the explanatory value of the model, an analysis of variance (ANOVA) for each regression is reported in Table 9 of Appendix C. An analysis of variance s tests whether the regression model predicts the dependent variable significantly better than simply using the mean of the dependent variable as a 'best guess'. A significant F-ratio states that the model predicts the outcome significantly better than this average. Table 9 shows that only the models of regressions 1.1, 1.4, 1.5 and 3.1 predict the dependent variable significantly better than the simply taking mean of the dependent variable. Therefore, only the regressions in which the effect of private equity ownership on sales growth in the first year, the fourth year and the total four years are examined predict the outcome variable well. For the regressions where the effect on the number of employees is examined, none of the models deliver a significantly better prediction of the dependent variable than the taking the mean. Regarding the effect on wages, only the model that predicts the effect on wages in the first year after the buyout predicts the model better than simply taking the mean growth of wages in the first year. These results stress that the model coefficients should be interpreted with caution.

The values of R^2 indicate what proportion of the variance in the dependent variable is explained by the model. It is calculated by dividing the model sum of squares by the total sum of squares. The R^2 equals the square root of Pearson's correlation coefficient (in this case of multiple linear regression, this is called Pearson's multiple correlation coefficient). The R^2 values for the first four regressions are presented in Table 2.1 below. Since I want the model to explain as much of the variance in the dependent variable as possible, a high R^2 is desirable. Table 2.1 shows that the values of R^2 for regressions 1.1, 1.2, 1.3, 1.4 and 1.5 are 0.100, 0.028, 0.026, 0.045 and 0.213, respectively. These are not quite high values for R^2: only 10%, 2.8%, 2.6%, 4.5% and 21.3% of the variance in the respective dependent variables is explained by the associated models. The R^2 for the first regression can be interpreted as follows: 10% of the variance in the factor of sales in year 1 relative to sales in the year of the buyout can be explained by the variable *DummyPE* and the control variables for size and industry. For the second set of regressions, Table 2.2 reports R^2 values of 0.025, 0.025, 0.023, 0.010 and 0.020 for regressions 1.1, 1.2, 1.3, 1.4 and 1,5, respectively. This means that in these respective regressions, 2.5%, 2.5%, 2.3%, 1.0% and 2.0% of the variance in the employee growth ratio is explained by *DummyPE* and the control variables. Finally, the values of R^2 for the regressions on wages is reported in Table 2.3. For regressions 3.1, 3.2, 3.3, 3.4 and 3.5, the R^2 values are 0.047, 0.024, 0.021, 0.017 and 0.030, respectively. Thereby, those models explain 4.7%, 2.4%, 2.1%, 1.7% and 3% of the variance in the dependent variable, respectively.

The ANOVA shows that a large proportion of the variance in the dependent variables is not explained by the model. Therefore, there are other variables that explain a proportion of the variance in the dependent variables. The low proportion of variance in the dependent variable that is explained by the model does however not necessarily mean than the regression coefficients will insignificant.

5.3. Regression output

Using multiple ordinary least squares regression, I examine the effect of private equity on the social measures. Tables 2.1, 2.2 and 2.3 below report the coefficients of the regression models with corresponding t-statistics, indicating whether the effect is significant. The coefficients represent the values of β in the regression equations described in chapter 4.

5.3.1. PE impact on sales

Table 2.1 reports the regression coefficients for regressions that include the sales growth ratio as a dependent variable. Since data operations discussed in chapter 3 revealed that I excluded companies missing data on any of the variables in any of the time examined period from the regression, the total number of observations for each variable is 666.

The coefficients of most interest are the coefficients of the variable *DummyPE*. For regressions 1.1, 1.4 and 1.5, the variable *DummyPE* is significant at the 5% level. In multiple regression, if a coefficient is statistically significant, then the predictor is making a significant contribution to the model.

Recall that the equation of regression 1.1 was

$$\frac{Sales_{t=1}}{Sales_{t=0}} = \alpha + \beta_1 * DummyPE + \beta_2 * FTE_{t=0} + \beta_3 * Ind_1 + \cdots + \beta_{14} * Ind_{11} + \varepsilon$$

The variables in the above stated equation are renamed in the regression output table. $\frac{Sales_{t=1}}{Sales_{t=0}}$ is converted to *Rel. Incr. Sales t1*, while the control variable $FTE_{t=0}$ was renamed to *Employees t0*. All 12 control variables for industries were renamed to variables reported in Table 3 in Appendix A. Recall that the variable *DummyPE* takes the value of 1 if the company belongs to the NVP dataset of buyout, and the value of 0 if the company belongs to the control group from the Orbis database. The interpretation of the coefficient of an interval variable is quite straight forward: the beta value shows the change in the dependent variable cause by an increase in the independent variable of 1 unit. The interpretation of a dummy variable coefficient is quite different, since dummy variables can only take a value of 0 and 1. The coefficient of a dummy variable shows the change in the dependent variable that results from the dummy variable changing from 0 to 1. The coefficient (i.e. the beta) thus shows the value in the dependent variable by which the group classified as 1 increases compared to the group classified as 0. Therefore, the coefficient of *DummyPE* in regression 1.1 shows the difference between the change in the sales volume in the first year after the buyout relative the year of the buyout for buyouts and control companies.

Table 2.1: Output for OLS regressions. The table contains regression coefficients, corresponding t-statistics and R^2 values for regressions 1.1, 1.2, 1.3, 1.4 and 1.5. The number of observations for each variable of each regression is 666. Values in parentheses represent t-statistics for the corresponding regression coefficient. *** indicates that the coefficient is significant at the 0.01 level. ** indicates a coefficient that is significant at the 0.05 level, while * indicates significance at the 0.10 level

	1.1	**1.2**	**1.3**	**1.4**	**1.5**
Constant	1.075	1.096	1.016	0.978	1.192
	(54.523)***	(102.125)***	(112.252)***	(100.862)***	(33.132)***
Employees t0	0.000	0.000	0.000	-0.000	0.000
	(0.294)	(-1.465)	(0.213)	(-0.618)	(-0.332)
DummyPE	0.225***	-0.006	0.012	0.088***	0.386***
	(3.715)	(-0.171)	(0.414)	(2.953)	(3.488)
D.Agri	0.038	0.090	0.042	-0.015	0.191
	(0.355)	(1.538)	(0.847)	(-0.281)	(0.974)
D.Chem	0.110*	0.040	-0.028	0.070**	0.142
	(1.690)	(1.115)	(-0.922)	(2.173)	(1.191)
D.BIP	0.098*	-0.017	-0.038	0.016	0.081
	(1.671)	(-0.519)	(-1.398)	(0.557)	(0.752)
D.BIS	-0.258	0.010	-0.049	-0.026	-0.432
	(-1.603)	(0.117)	(-0.659)	(-0.330)	(-1.470)
D.Constr	-0.205**	-0.078	-0.025	-0.098**	-0.452**
	(-2.047)	(-1.429)	(-0.534)	(-1.987)	(-2.466)
D.Trans	0.09	-0.063*	0.018	0.083***	0.135

	(1.500)	(-1.934)	(0.661)	(2.809)	(1.227)
D.CGR	0.056*	-0.011	0.004	0.028*	0.080
	(1.911)	(-0.683)	(0.307)	(1.920)	(1.482)
D.Energy	-0.156	-0.003	0.042	-0.105	-0.270
	(-1.114)	(-0.036)	(0.659)	(-1.531)	(-1.057)
D.Fin	1.351***	0.241*	0.042***	0.058	4.934***
	(5.567)	(1.826)	(3.027)	(0.483)	(11.138)
D.Comm	-0.210*	-0.020	0.008	-0.023	-0.295
	(-1.777)	(-1.304)	(0.148)	(-0.389)	(-1.364)
D.Life	-0.069	-0.137	-0.077	-0.003	-0.316
	(-0.356)	(-1.304)	(-0.871)	(-0.032)	(-0.895)
R^2	0.100	0.028	0.026	0.045	0.213

The value of the coefficient of *DummyPE* (in the regression equation *β1*) is 0.225 (which is statistically significant). Since the dependent variable *Rel. Incr. Sales t1*, which is the ratio of sales in the first year after the buyout relative to sales in the year of the buyout, this coefficient can be interpreted as follows: the regression results suggest that a company that was subject to a buyout by a private equity firm has a 2,250 basis points higher ratio of sales in year 1 relative to sales in the year of the buyout compared to companies that did not receive the same type of private equity funding. Thus, if company A (non-buyout) has a relative sales increase factor in year 1 of 1.2, company B (buyout) achieves a relative sales increase factor in year 1 of 1.425.

The control variables for size and industry in regression 1.1 are not all statistically significant. Only the variables *D.Constr* and *D.Fin* are statistically significant. Since the control variables for industries are all dummy variables, there is one specific industry control dummy variable that is omitted in each regression. This is the dummy variable for the 'consumer services other' industry. All other industry control variables included in the regression are compared to this 'consumer services other' industry variable. I chose 'Consumer services other' to be used as a comparison variable, since this industry was overrepresented in the database. The coefficient for *D.Constr* is -0.205 and the coefficient for *D.Fin* is 1.351. This means that the regression yields evidence consistent with companies active in the 'construction' industry typically having a 2,050 basis point lower ratio of sales in year 1 relative to sales in sales in year 0 compared to companies active in the 'consumer services other' industry. The coefficient for the 'financial services' industry dummy is positive. For this output, the following interpretation applies: the regression yields evidence consistent with companies active in the financial services sector typically having a 13,510 basis point higher ratio of sales in year 1 relative to sales in sales in year 0 compared to companies active in the consumer services other industry.

The beta values for *DummyPE* in regressions 1.2 and 1.3 are not statistically significant. This leads to the conclusion that the model does not provide evidence consistent with private equity ownership having an effect on the ratio of sales in year 2 or year 3 after the buyout compared to the prior year. While regression 1.2 does not include any

significant independent variables at all, the only significant independent variable in regression 1.3 is the coefficient of the dummy variable for the finance services industry. Its value is 0.042, stating that companies active in the 'financial services' industry typically deliver a 420 basis points higher sales growth between year 2 and year 3 compared to companies active in the 'consumer services other' industry.

The coefficient of the *DummyPE* variable in regression 1.4 is statistically significant. Its value is 0.088, which represents a positive effect just like the same coefficient in regression 1.1. The coefficient suggests that buyouts achieve a 880 basis points higher sales in year 4 to sales in year 3 ratio compared to companies that were not subject to a buyout. This implies that compared to a non-buyout company that has a relative increase in sales between year 3 and 4 of 1.500, a buyout attain a relative sales increase between the same years of 1.588. This value translates to a year on year growth of 50% for the non-buyout company and a 58.88% growth for the buyout. Regarding the control variables in regression 1.4, three industry dummy variables are statistically significant. The 'chemicals' dummy coefficient is 0.070, the 'construction' dummy coefficient is -0.098 and the 'transport' dummy coefficient is 0.083. This implies that companies active in the 'chemicals', 'construction' and 'transport' industry respectively have a 700 basis points higher, 980 basis points lower and 830 basis points higher sales growth between year 3 and year 4 compared to companies active in the 'consumer services other' industry.

Similar to regressions 1.1 and 1.4, regression 1.5, which includes the relative sales increase after 4 years following the buyout as the dependent variable, reports a positive effect of private equity. The coefficient of *DummyPE* is 0.386 and it is statistically significant. Following the same interpretation as for regressions 1.1 and 1.4, the output suggests that compared to non-buyouts, buyouts have a 3,860 basis point higher ratio of sales in the fourth year following a buyout relative to the year in which the buyout took place. This finding leads to the conclusion that the regression model provides evidence that compared to a non-buyout that has a 1.2 relative sales increase ratio over four years, a buyout experiences a 1.586 relative sales increase ratio over the four years following a buyout. Other significant independent variables in regression 1.5 are the coefficients of industry dummy variables for 'construction' and 'financial services'. These coefficients are respectively -0.452 and 4.934, meaning that companies active in the 'construction' and the 'financial services' industry respectively have a 4,520 basis points lower and 49,340 basis points higher sales growth over four years that companies active in the 'consumer services other' sector.

What stands out from these results is that each time the variable *DummyPE* was statistically significant in a regression, it was higher than zero, indicating a generally positive relation and a positive effect of buyouts on sales. Beware that all interpretations of significant coefficient of *DummyPE* assume that the effects of the other predictors in

the regressions are held constant. The results indicate that private equity firms may typically emphasise on accelerating sales growth, starting directly after the buyout is completed.

5.3.2. PE impact on the number of employees

Table 2.2 below reports the regression output for regression 2.1, 2.2, 2.3, 2.4 and 2.5, which include employee growth as a dependent variable. Similar to the regression on sales growth, each variable has 666 companies (N=666). Since regressions in Table 2.2 use the employee growth ratio as a dependent variable, instead of the number of employees in year 0 (which was used in the first set of regressions as control variable for size), the sales in year 0 was used as a control variable for size. The variable *DummyPE* is of most importance in the interpretation of the regression, since the other independent variables are solely used as control variables. Only regressions 2.1 and 2.5 have a statistically significant coefficient for *DummyPE*.

Table 2.2: Output for OLS regressions. The table contains regression coefficients, corresponding t-statistics and R^2 values for regressions 2.1, 2.2, 2.3, 2.4 and 2.5. The number of observations for each variable of each regression is 666. Values in parentheses represent t-statistics for the corresponding regression coefficient. *** indicates that the coefficient is significant at the 0.01 level. ** indicates a coefficient that is significant at the 0.05 level, while * indicates significance at the 0.10 level

	2.1	**2.2**	**2.3**	**2.4**	**2.5**
Constant	1.042	1.050	1.035	1.010	1.139
	(53.200)***	(56.419)***	(68.651)***	(72.700)***	(34.051)***
Sales to	0.000	0.000	0.000*	0.000	0.000
	(0.606)	(-0.423)	(1.822)	(-0.071)	(1.058)
DummyPE	0.171***	0.004	-0.021	0.057	0.215**
	(2.823)	(0.066)	(-0.460)	(1.317)	(2.076)
D.Agri	0.133	-0.019	-0.039	0.093	0.138
	(1.244)	(-0.185)	(-0.476)	(1.229)	(0.752)
D.Chem	-0.085	0.053	-0.017	0.013	-0.083
	(-1.306)	(0.859)	(-0.346)	(0.277)	(-0.749)
D.BIP	-0.074	-0.027	-0.012	0.026	-0.073
	(-1.262)	(-0.485)	(-0.255)	(0.612)	(-0.7423)
D.BIS	-0.085	-0.085	-0.063	0.025	-0.219
	(-0.526)	(-0.555)	(-0.507)	(0.216)	(-0.795)
D.Constr	-0.046	-0.106	-0.119	0.061	-0.340**
	(-0.459)	(-1.125)	(-1.554)	(0.869)	(-2.001)
D.Trans	0.037	0.160***	-0.047	0.005	0.097
	(0.614)	(2.794)	(-1.019)	(0.123)	(0.947)
D.CGR	-0.049*	0.002	0.045**	0.009	-0.012
	(-1.670)	(0.058)	(1.971)	(0.430)	(-0.231)
D.Energy	-0.111	0.031	-0.029	-0.048	-0.160
	(-0.795)	(0.234)	(-0.266)	(-0.481)	(-0.670)
D.Fin	-0.236	-0.489**	0.039	0.017	-0.742*
	(-0.973)	(-2.121)	(0.207)	(0.099)	(-1.790)
D.Comm	-0.193*	-0.032	-0.032	0.031	-0.185
	(-1.709)	(-0.299)	(-0.370)	(0.383)	(-0.957)
D.Life	-0.002	0.119	0.053	-0.003	0.204
	(-0.011)	(0.649)	(0.354)	(-0.024)	(0.619)
R^2	0.025	0.025	0.023	0.010	0.020

In regression 2.1, the effect of private equity ownership on the ratio of employees in year 1 after the buyout relative to the year of the buyout is examined. The coefficient of *DummyPE* is 0.171. The model provides evidence consistent with buyouts experiencing a 1,710 basis points higher factor of employee base in year 1 after the buyout relative to the year of the buyout compared to non-buyouts of the same size and industry. The model thus predicts that a buyout would experience an employee increase of 17.1% in the first year after the buyout compared to a similar company that is not a buyout and that does not grow or shrink in the same time period. The output of regression 2.1 thus predicts that there is a positive effect of private equity on the number of employees in the first year after the buyout.

Regressions 2.2, 2.3 and 2.4 do not include significant values of the coefficient for *DummyPE*. Those regression models thus do not deliver evidence for private equity ownership having an effect on the year on year factor of the number of employees in year 2, 3 or 4 after the buyout. However, regressions 2.2 and 2.3 produce significant coefficients for control variables. In regression 2.2, the coefficients for industry dummy variables 'transportation' and 'financial services' are 0.160 and -0.489, respectively, indicating that transportation companies and financial institutions respectively have a 1,600 basis points higher and 4,890 basis points lower employee growth in the second year compared to companies active in the 'consumer services other' industry. In regression 2.3, only the coefficient of the industry dummy variable for companies active in 'consumer goods and retail' is significant: 0.045. The model suggests that companies active in this sector typically attain a 450 basis points higher employee growth in the third year compared to companies active in the 'consumer services other' industry.

In regression 2.5, the effect of private equity buyout on the ratio of employees in the fourth year after the buyout relative to the year of the buyout is examined. Thereby, the model tries to capture the aggregate effect on private equity ownership on the number of employees over the total 4 years following a buyout, instead in the yearly change. The coefficient of *DummyPE* in this regression is 0.215, which is statistically significant. The model thereby suggests that over the four years following a buyout, the number of employees at buyouts grew with 2,150 basis points more than at non-buyout peers over the same time period. Accordingly, a company on which a private equity firm performs a buyout attains a growth of 31.50% over four years following a buyout compared to a peer company that lacks private equity funding and grows 10% over the same time horizon. Furthermore, the coefficient of the industry control variable for 'construction' is significant and -0.340, which indicates that construction companies have a 3,400 basis points lower employee growth over four years than 'consumer services other' companies.

When comparing the results of regression 2.5 with those of regression 1.5, I see that both regressions have a positive and significant coefficient for *DummyPE*, which

indicates that the aggregate effect over four years of private equity ownership is clearly visible. Next to that both the effect of private equity on sales and the number of employees in the first year after the buyout is significant. A possible cause for this observation is that the effect of private equity in the first year after the buyout is included in the effect over the aggregate four years after the buyout.

5.3.3. PE impact on wages

The last set of regressions examines the effect of private equity ownership on the development of wages at companies. Similar to the previous two sets of regressions, the number of observations for all variables in all regressions is 666. In Table 2.3, the output for regressions 3.1, 3.2, 3.3, 3.4 and 3.5 is reported. Again, the variable *DummyPE* is the most important for my analysis. The table reports that its coefficient is statistically significant in regressions 3.1 and 3.5, while the coefficient for *DummyPE* in regressions 3.2, 3.3 and 3.4 is not significant.

Table 2.3: The table Regression coefficients, corresponding t-statistics and R^2 values for regressions 3.1, 3.2, 3.3, 3.4 and 3.5. The number of observations for each variable of each regression is 666. Values in parentheses represent t-statistics for the corresponding regression coefficient. *** indicates that the coefficient is significant at the 0.01 level. ** indicates a coefficient that is significant at the 0.05 level, while * indicates significance at the 0.10 level

	3.1	**3.2**	**3.3**	**3.4**	**3.5**
Constant	1.080	1.063	1.057	1.016	1.253
	(54.551)***	(104.484)***	(89.745)***	(95.738)***	(31.320)***
Employees to	0.000	0.000	0.000	0.000	0.000
	(0.396)	(0.735)	(-1.183)	(-1.232)	(-0.419)
DummyPE	0.247***	0.030	0.022	0.034	0.464***
	(4.054)	(0.960)	(0.620)	(1.053)	(3.774)
D.Agri	0.029	0.012	-0.008	-0.008	-0.016
	(0.272)	(0.222)	(-0.133)	(-0.135)	(-0.074)
D.Chem	0.079	-0.019	-0.039	0.024	-0.018
	(1.213)	(-0.558)	(-1.009)	(0.674)	(-0.136)
D.BIP	-0.109*	-0.023	-0.009	0.049	-0.136
	(-1.843)	(-0.750)	(-0.265)	(1.533)	(-1.142)
D.BIS	-0.273*	0.068	-0.121	-0.005	-0.524
	(-1.688)	(0.814)	(-1.254)	(-0.058)	(1.605)
D.Constr	-0.067	-0.072	-0.113*	-0.083	-0.453**
	(-0.662)	(-1.385)	(-1.891)	(-1.535)	(-2.224)
D.Trans	-0.034	0.005	0.014	0.035	0.025
	(-0.567)	(0.154)	(0.400)	(1.067)	(0.202)
D.CGR	-0.008	0.011	0.013	0.015	0.023
	(-0.260)	(0.740)	(0.767)	(0.964)	(0.392)
D.Energy	-0.188	0.009	-0.040	-0.028	-0.349
	(-1.337)	(0.125)	(-0.475)	(-0.373)	(-1.227)
D.Fin	0.523**	-0.400***	-0.002	0.094	0.010
	(2.148)	(-3.193)	(-0.015)	(0.720)	(0.020)
D.Comm	-0.233	-0.075	-0.107	0.023	-0.495**
	(-1.961)	(-1.222)	(-1.512)	(0.366)	(-2.062)
D.Life	-0.140	0.005	-0.001	0.046	-0.146
	(-0.721)	(0.047)	(-0.012)	(0.438)	(-0.372)
R^2	0.047	0.024	0.021	0.017	0.030

Regression model 3.1 examines the effect of buyouts on the ratio of wages in year 1 over wages in year 0 after the buyout. The value of beta of *DummyPE* is 0.247, from which can be inferred that the model delivers evidence consistent with buyouts realising a wage increase in the first year after the buyout that is 2,470 basis points higher that the development of wages at a non-buyout company over the same time period. Thus, a company that received private equity funding grows 64.70% in the first year compared to a non-private equity backed company that grows 40% in one year. The only other statistically significant independent variable coefficient in regression 3.1 is the industry control variable for 'financial services'. Its value is 0.532, which translates to financial institutions having a 5,320 basis points higher wages growth than companies active in the 'consumer services other' industry.

The coefficients of *DummyPE* in regressions 3.2, 3.3 and 3.4 are not significant, which implies that those regression models did not find any significant effect of private equity backing on companies' wages increase in the year 2, 3 and 4 after the buyout. Like regression 3.1, the coefficient of the industry control variable 'financial services' is significant in regression 3.2. The coefficient has a value of -0.400, which implies that financial institutions decrease wages by 4,000 basis points in the second year compared to 'consumer services other' companies. This is quite surprising, since coefficient of the 'financial services' industry variable in regression 3.1 showed an opposite effect in the first year.

Regression 3.5 captures the effect of private equity ownership on the development of wages in the total four years after a buyout. The coefficient of *DummyPE*'s beta is 0.464, from which the interpretation can be inferred that buyouts realise a 4,640 basis points higher wages growth in four years after the buyout compared to non-private equity backed companies in the same time period. While a non-buyout company realises a growth of 30% over four years (implying a factor of 1.3), a buyout experiences a 74.60% growth (implying a ratio of 1.764) of wages in four years after the buyout. Next to *DummyPE*, the coefficients of independent variables *D.Constr* and *D.Comm* are significant. The coefficients are -0.453 and -0.495, respectively. This can be translated to construction companies and communications companies having a significantly lower wages development over four years of 4,530 and 4,950 basis points, respectively compared to firms active in the 'consumer services other' industry.

From the interpretations reported above, some interesting observations can be deduced. What clearly stands out is that for all three regressions on the first year growth of sales, employees and wages, and on the aggregate total growth over the first four years, the coefficient of *DummyPE* is significant. Next to that, these significant coefficients are all positive. The only other regression in which the coefficient for *DummyPE* is significant is the regression where the ratio of sales in the fourth year relative to sales in the third year after the buyout serves as dependent variable.

Private equity firms thus have a significant positive effect on companies' sales, number of employees and wages in the first year and the total four years after a buyout relative to non-buyouts. The positive effect in the first year may be due to private equity companies investing more capital in the company to boost revenue, while attracting more employees and increasing their motivation to perform through higher wages. Obviously, the effect in the first year after the buyout works through all four years of the buyout, which may be a reason for the significant effect of private equity on social impact over four years following a buyout compared to peers.

5.4. Hypothesis testing

Following the regression output, the hypotheses formulated earlier can either be rejected or not rejected. Recall that hypothesis 1 was that "private equity buyouts are associated with increased sales growth compared to non-private equity backed counterparts of the same size and industry in the four years following a buyout." Regressions 1.1, 1.2, 1.3, 1.4, and 1.5 serve to test hypotheses H1a, H1b, H1c, H1d and H1e. Following the model output, I can conclude that there is no evidence that hypotheses H1b and H1c are true, and they will therefore be rejected. Hypotheses H1a, H1d and H1e, however, cannot be rejected, since the regression output provides evidence consistent with these hypotheses. I can subsequently conclude that the model output suggests that (1) private equity buyouts are associated with increased sales growth compared to non-private equity backed counterparts of the same size and industry in the first year following a buyout; (2) private equity buyouts are associated with increased sales growth compared to non-private equity backed counterparts of the same size and industry in the fourth year following a buyout; and (3) private equity buyouts are associated with increased sales growth compared to non-private equity backed counterparts of the same size and industry in the aggregate four years following a buyout. Since the regression results are consistent with hypotheses H1a, H1d and H1e, there is sufficient evidence that hypothesis 1 cannot be rejected. Hence, the output of the regressions on sales growth provide evidence consistent with hypothesis 1: private equity buyouts are associated with increased sales growth compared to non-private equity backed counterparts of the same size and industry in the four years following a buyout.

The second set of regressions (2.1, 2.2, 2.3, 2.4 and 2.5) test the sub-hypotheses that support hypothesis 2: "private equity buyouts are associated with an increased number of employees compared to non-private equity backed counterparts of the same size and industry in the four years following a buyout." The regression output showed that in regressions 2.1 and 2.5, there was a significantly positive effect of private equity on the number of employees. These findings are consistent with hypotheses H2a and H2e. The coefficient of *DummyPE* in regressions 2.2, 2.3 and 2.4 was not statistically significant, which implies that hypothesis H2b, H2c and H2d will be rejected. The evidence for

hypotheses 2.1 and 2.5 serves as evidence for the main hypothesis 2. Therefore, I can state that the regression results provide evidence consistent with private equity buyouts being associated with an increased number of employees compared to non-private equity backed counterparts of the same size and industry in the four years following a buyout.

Finally, regressions 3.1, 3.2, 3.3, 3.4 and 3.5 demonstrated the effect of private equity on wages. The output showed that private equity buyouts have a significant effect on wages in the first year and the total four years after the buyout. The regressions test the sub-hypotheses accompanying hypothesis 3, which states that private equity buyouts are associated with increased wages compared to non-private equity backed counterparts of the same size and industry in the four years following a buyout. Since the model provided statistically significant coefficients for regression 3.1 and 3.5, there is evidence consistent with hypotheses H3a: private equity buyouts being associated with increased wages compared to non-private equity backed counterparts of the same size and industry in the first year following a buyout. Also there is evidence that supports H3e: private equity buyouts being associated with increased wages compared to non-private equity backed counterparts of the same size and industry in the aggregate four years following a buyout. While the model output leads to rejection of hypotheses H3b, H3c and H3d, the evidence for hypotheses H1a and H1e supports main hypothesis 3. This means that the regression results lead to the conclusion that private equity buyouts are associated with increased wages compared to non-private equity backed counterparts of the same size and industry in the four years following a buyout.

The regressions thus provide evidence in favour of the three main hypotheses. This is a result that was expected. Based on the literature review (in which a majority of papers found evidence for positive social impact of private equity), private equity is expected to have a positive effect on sales, the number of employees and wages.

5.5. Conclusion

This chapter discussed the empirical analysis of this thesis. First, I tested and discussed the goodness of fit of the regression models by reporting the analyses of variance and values of R^2. Then, I presented, discussed and interpreted the output paragraphs 5.3 and 5.4.

The evidence for the upholding of the three main hypotheses serves as an important explanation for the answers to sub-research questions 4, 5 and 6. These research questions are stated below, along with their answer:

"4. What is the effect of private equity buyouts on sales?"

The results of the empirical research show that there is evidence that hypothesis 1 upholds. The regression analysis reported a statistically significant positive effect of private equity buyouts on sales growth in the first year and over four years after the buyout compared to peers. The effect of private equity buyouts on sales can consequently be considered positive.

"5. What is the effect of private equity buyouts on the number of employees?"

The answer to this question is provided by hypothesis 2 and its accompanying sub-hypotheses H2a, H2b, H2c, H2d and H2e. The upholding of hypotheses H2a and H2e subsequently led to the upholding of hypothesis 3. Since this hypothesis includes the expectation of an increased number of employees in private equity buyouts compared to non-buyouts of a similar size and industry, the effect of private equity buyouts on the number of employees is considered to be positive.

"6. What is the effect of private equity buyouts on wages?"

This last research question is answered with the help of hypothesis 3 and its corresponding sub-hypotheses. The empirical review suggested that hypothesis H3a and H3e could not be rejected, which in turn suggests that hypothesis 3 cannot be rejected. Like hypothesis 1 and 2, hypothesis 3 has a normative nature and states that private equity buyouts experience increased wages compared to non-buyout of a similar size and industry. Therefore, the effect of private equity buyouts on wages can be considered positive based on the empirical analysis.

6. Concluding remarks

Recently, private equity firms were placed under public scrutiny in The Netherlands after several companies that were under ownership of private equity defaulted, which led to considerable job losses. This phenomenon raised political attention for the business model of private equity. PvdA member Henk Nijboer consequently proposed enhanced regulation for the private equity industry in The Netherlands, in order to battle so-called excesses in private equity. This created a greater demand for academic research on the social impact of private equity. Taking that into account, this study tries to answer this demand and provide new insights in the way in which the business model of private equity affects social norms. While existing academic literature covers mainly Anglo Saxon countries like the USA and the UK due to data availability and enhanced private equity activity, this thesis contributes to the existing literature by covering the effect for The Netherlands. This thesis subsequently helps Dutch policymakers such as Henk Nijboer to gain insights in the social impact of private equity in The Netherlands, which in turn contributes to the development of possible new regulation for the private equity industry in The Netherlands. The main research question of this thesis accordingly is:

"What is the social impact of private equity buyouts?"

In this section, a summary of this thesis is presented, which ultimately provides an answer to the main research question. Furthermore, limitations of this study are discussed and recommendations for future research as proposed.

6.1. Summary

In this thesis, I did a literature review and an empirical research on the social contribution of private equity on The Netherlands. In the literature review, the current available academic research on the social impact of private equity ownership was presented and discussed. The discussed literature mainly uses sales, R&D investments, the number of employees and wages as a measure for social impact. Conclusions of existing academic research are not congenial. While some researchers find evidence for a negative impact of private equity ownership of sales, the number of employees and wages, others find a positive effect. In general, though, a small majority of articles find evidence for a positive social impact of private equity.

The literature review provided answers to the first three sub-questions: section 2.2 explains extensively how the private equity business model works, while section 2.3 explains which social impact private equity is claimed to have on society, such as 'asset-stripping' and initiating mass layoffs. The academic findings on the social impact of private equity are discussed in the remainder of the academic literature review in sections 2.4 through 2.10., which showed that a narrow majority of academic papers find evidence for a positive social impact of private equity.

The finding that the majority of studies finds evidence of a positive social private equity impact helped shaping various normative hypotheses. These hypotheses predict that private equity buyouts have a positive effect on sales, the number of employees and wages, used in the empirical research. Using a dataset consisting of 50 Dutch buyouts that occurred between 2006 and 2012 and 616 Dutch peer companies of similar a size and industry, these hypotheses were subsequently tested by performing ordinary least squares regressions. The aim of these regressions was to find a possible relation between private equity ownership and the three social metrics up to four years after the completion of the buyout transaction.

The regression output provided evidence consistent with private equity buyouts experiencing a significantly higher sales growth in year 1, year 4 and over the total 4 years after the buyout. In the first year after the buyout, buyouts realise a 2,250 basis points higher factor of sales in year 1 to sales in the year of the buyout compared to non-buyouts of similar size and industry. The factor of sales in year 4 to sales in year 3 after the buyout was also significantly higher for private equity backed companies than for non-private equity backed companies. These outcomes also affected the factor of sales in

year 4 relative to sales in the year of the buyout, which was significantly 3,860 basis points higher for buyouts than for non-buyouts. The findings suggest that private equity firms emphasise on increasing company sales more than non-private equity backed companies.

Regarding the impact of private equity ownership on the number of employees, the model produced statistically significant results for the employee development in year 1 and the total 4 years after the buyout. The regression output provided evidence that he ratio of the number of employees one year after the buyout relative to the year of the buyout was 1,171 basis points higher for buyouts than for non-buyouts of a similar size and industry. When examining the impact of private equity ownership in the total four years after a buyout, the model finds that buyouts have a 2,150 basis points higher ratio of sales in year 4 to sales in the year of the buyout compared to non-buyouts. This evidence is consistent with private equity hiring more employees directly after the buyout and/or freezing layoffs, which is contrary to popular claims that private equity quickly fires employees after a buyout to cut costs.

The last set of regressions examined the effect of buyouts on employee wages, and suggested that there is statistically significant positive effect of buyouts on wages in the first year after the buyout and over the total four years after a buyout. Buyouts are associated with a 2,470 basis points higher ratio of wages in year 1 relative to wages in the year of the buyout compared to non-buyouts, while they obtain a 4,640 basis points higher ratio over four years after the buyout. This outcome is consistent with private equity firms increasing the motivation of employees through increased compensation directly after a buyout.

The findings in this thesis contradict popular claims by critics that a negative social impact is embedded in the private equity business model. In fact, the results suggest that private equity portfolio companies perform even better on social impact than non-buyouts. With these outcomes, the main hypotheses cannot be rejected.

This finding served as a basis for answering the last three sub-questions: these aimed to find the effect of private equity buyouts on (1) sales growth (2) the number of employees and (3) employee wages. The regression output and the interpretation of the hypotheses in section 5.3 showed that based on the empirical analysis, private equity buyouts are considered to have a positive effect on sales growth, as well as the number of employees and employee wages.

The sub-questions answered in the literature review and the empirical study collectively address the mean research question, which is as follows:

“What is the social impact of private equity buyouts?”

Although there are several limitations to this study, the findings of the literature review and the empirical analysis suggest that private equity buyouts tend to have a positive social impact.

6.2. Limitations

This study has several limitations. First, there were several selection biases for selected data. Since the dataset of 50 buyouts was provided by the Nederlandse Vereniging van Participatiemaatschappijen (NVP), which in turn extracted data from private equity firms' press releases, only companies that deliberately disclosed portfolio company data on their website are included in the dataset. Also, the majority of buyouts in the NVP database lacked important data, which was complemented by publicly available data from the Dutch chamber of commerce. Companies whose public accounts were not available on the website of the chamber of commerce were subsequently dropped from the dataset. Regarding the dataset of 616 peer companies from database Orbis, there was a selection bias as well. Due to data availability, all companies for which not every single social measure used in the empirical analysis was available between 2009 and 2013 were dropped from the dataset. Next to that, the Orbis database suffers from various flaws in company statements, probably caused by wrong entries from Orbis employees. Some of these wrong entries could be detected and subsequently dropped from the dataset, but incorrect data entries not deviating much from comparable entries cannot easily be detected.

To some extent, the data suffers from survivorship bias. I did not account for survivorship bias, since I made the assumption that bankruptcy is equally likely in the buyouts dataset and the control group. However, bankruptcy may be typically more common amongst private equity buyouts, due to possible more risk-seeking behaviour under ownership of private equity. After all, one of the reasons for increased public awareness for the private equity business model is the sudden bankruptcy of big Dutch private equity-backed companies such as V&D. Besides that, I made the assumption that buyouts and non-buyouts are equally often active in M&A transactions, where private equity companies often carry out buy-and-build strategies, which may lead to private equity buyouts doing add-on acquisitions at a higher pace than non-buyouts.

The robustness checks carried out in the methodological frame revealed that the dataset violates several assumptions of ordinary least squares regression. These violations indicate that instead of an ordinary least squares regression, other models are more suitable for the dataset. This makes generalising the model outcomes of the sample to the general total population problematic. Next to the violations of regression assumptions, tests for the goodness of fit of the model yielded low values of R^2 and the analyses of variances indicated that in some instances, the mean could have better been used as a 'best guess' rather than the regression equation.

Even though the regressions yielded significant coefficients for independent variables, it should be noted that the sample of Dutch buyouts was very small (N=50). This sample would preferable be significantly larger for more reliable results, since in a small sample, few large deviations from the mean can have a great impact.

6.3. Recommendations for future research

Since the debate and the academic literature on the social impact of private equity is still young, there is a great demand future research on this topic. Based on the empirical analysis in this thesis, I want to propose several recommendations for future research.

First of all, I advise future researchers to extract data from more extensive databases which have reliable data entries, such as The Centre for Management Buy-out Research (CMBOR). Retrieving data from reliable and sound databases such as the CMBOR could easily decrease the risk of assumption violations. Unfortunately, I was not able to extract data from this dataset due to financial constraints, which might not be problematic for other researchers.

Next to that, future researchers could extend the measurement of social impact by including additional metrics, such as R&D intensity, productivity, worker's council power or other factors that contribute to a company's social impact.

Furthermore, I recommend future researchers to look for additional explanatory variables that can be used as control variables in the regressions. Clearly, the low R^2 values indicate that there are more independent variables that explain variability in sales growth, employee growth and wages growth.

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8. Appendix

8.1. Appendix A

Table 3: a detailed description of all variables in the empirical research.

Variable	Description
Rel. Incr. Sales t1	A scale variable describing the year on year growth in sales. It is calculated by dividing the sales in year 1 by the sales in year 0.
Rel. Incr. Sales t2	A scale variable describing the year on year growth in sales. It is calculated by dividing the sales in year 2 by the sales in year 1.
Rel. Incr. Sales t3	A scale variable describing the year on year growth in sales. It is calculated by dividing the sales in year 3 by the sales in year 2.
Rel. Incr. Sales t4	A scale variable describing the year on year growth in sales. It is calculated by dividing the sales in year 4 by the sales in year 3.
Rel. Incr. Sales tot.	A scale variable describing the overall growth in sales during the examined time period. It is calculated by dividing the sales in year 4 by the sales in year 0.
Rel. Incr. Empl. t1	A scale variable describing the year on year growth in the number of employees. It is calculated by dividing the number of employees in year 1 by the number of employees in year 0.
Rel. Incr. Empl. t2	A scale variable describing the year on year growth in the number of employees. It is calculated by dividing the number of employees in year 2 by the number of employees in year 1.
Rel. Incr. Empl. t3	A scale variable describing the year on year growth in the number of employees. It is calculated by dividing the number of employees in year 3 by the number of employees in year 2.
Rel. Incr. Empl. t4	A scale variable describing the year on year growth in the number of employees. It is calculated by dividing the number of employees in year 4 by the number of employees in year 3.
Rel. Incr. Empl. tot.	A scale variable describing the overall growth in the number of employees during the examined time period. It is calculated by dividing the number of employees in year 4 by the number of employees in year 0.
Rel. Incr. Wages t1	A scale variable describing the year on year growth in wages. It is calculated by dividing wages in year 1 by wages in year 0.
Rel. Incr. Wages t2	A scale variable describing the year on year growth in wages. It is calculated by dividing wages in year 2 by wages in year 1.
Rel. Incr. Wages t3	A scale variable describing the year on year growth in wages. It is calculated by dividing wages in year 3 by wages in year 2.
Rel. Incr. Wages t4	A scale variable describing the year on year growth in wages. It is calculated by dividing wages in year 4 by wages in year 3.
Rel. Incr. Wages tot.	A scale variable describing the overall growth in wages during the examined time period. It is calculated by dividing the wages in year 4 by the wages in year 0.
DummyPE	A dummy variable taking the value of 1 is the company is a buyout and the value of 0 if the company is in the control group
D.Agri	A dummy variable taking the value of 1 if the company is active in the agricultural industry and the value of 0 if the company is active in any other industry. This variable is included in the regressions to control for industry differences
D.Chem	A dummy variable taking the value of 1 if the company is active in the chemicals and materials industry and the value of 0 if the company is active in any other industry. This variable is included in the regressions to control for industry differences

D.BIP	A dummy variable taking the value of 1 if the company is active in the business and industrial products industry and the value of 0 if the company is active in any other industry. This variable is included in the regressions to control for industry differences
D.BIS	A dummy variable taking the value of 1 if the company is active in the business and industrial services industry and the value of 0 if the company is active in any other industry. This variable is included in the regressions to control for industry differences
D.Constr	A dummy variable taking the value of 1 if the company is active in the construction industry and the value of 0 if the company is active in any other industry. This variable is included in the regressions to control for industry differences
D.Trans	A dummy variable taking the value of 1 if the company is active in the transportation industry and the value of 0 if the company is active in any other industry. This variable is included in the regressions to control for industry differences
D.CGR	A dummy variable taking the value of 1 if the company is active in the consumer goods and retail industry and the value of 0 if the company is active in any other industry. This variable is included in the regressions to control for industry differences
D.CSO	A dummy variable taking the value of 1 if the company is active in the consumer services other industry and the value of 0 if the company is active in any other industry. This variable is included in the regressions to control for industry differences.
D.Energy	A dummy variable taking the value of 1 if the company is active in the energy and environment industry and the value of 0 if the company is active an any other industry. This variable is included in the regressions to control for industry differences
D.Fin	A dummy variable taking the value of 1 if the company is active in the financial services industry and the value of 0 if the company is active in any other industry. This variable is included in the regressions to control for industry differences
D.Comm	A dummy variable taking the value of 1 if the company is active in the communications industry and the value of 0 if the company is active in any other industry. This variable is included in the regressions to control for industry differences
D.Life	A dummy variable taking the value of 1 if the company is active in the life sciences industry and the value of 0 if the company is active in any other industry. This variable is included in the regressions to control for industry differences
Sales t0	An interval variable presenting the revenue volume in the year of the buyout if the case originates from the NVP database or the revenue volume in 2009 if the case belongs to the control group. This variable is included in some regressions to control for size
Employees t0	An interval variable presenting the number of employees active in the company in year 0. This variable is included in some regressions to control for size

Table 4: Overview of industry classifications

#	**Industry**
1	Agriculture
2	Chemicals and Materials
3	Business and Industrial Products
4	Business and Industrial Services
5	Construction
6	Transportation
7	Consumer Goods and Retail
8	Consumer Services other
9	Energy and Environment
10	Financial Services
11	Communications
12	Life Sciences

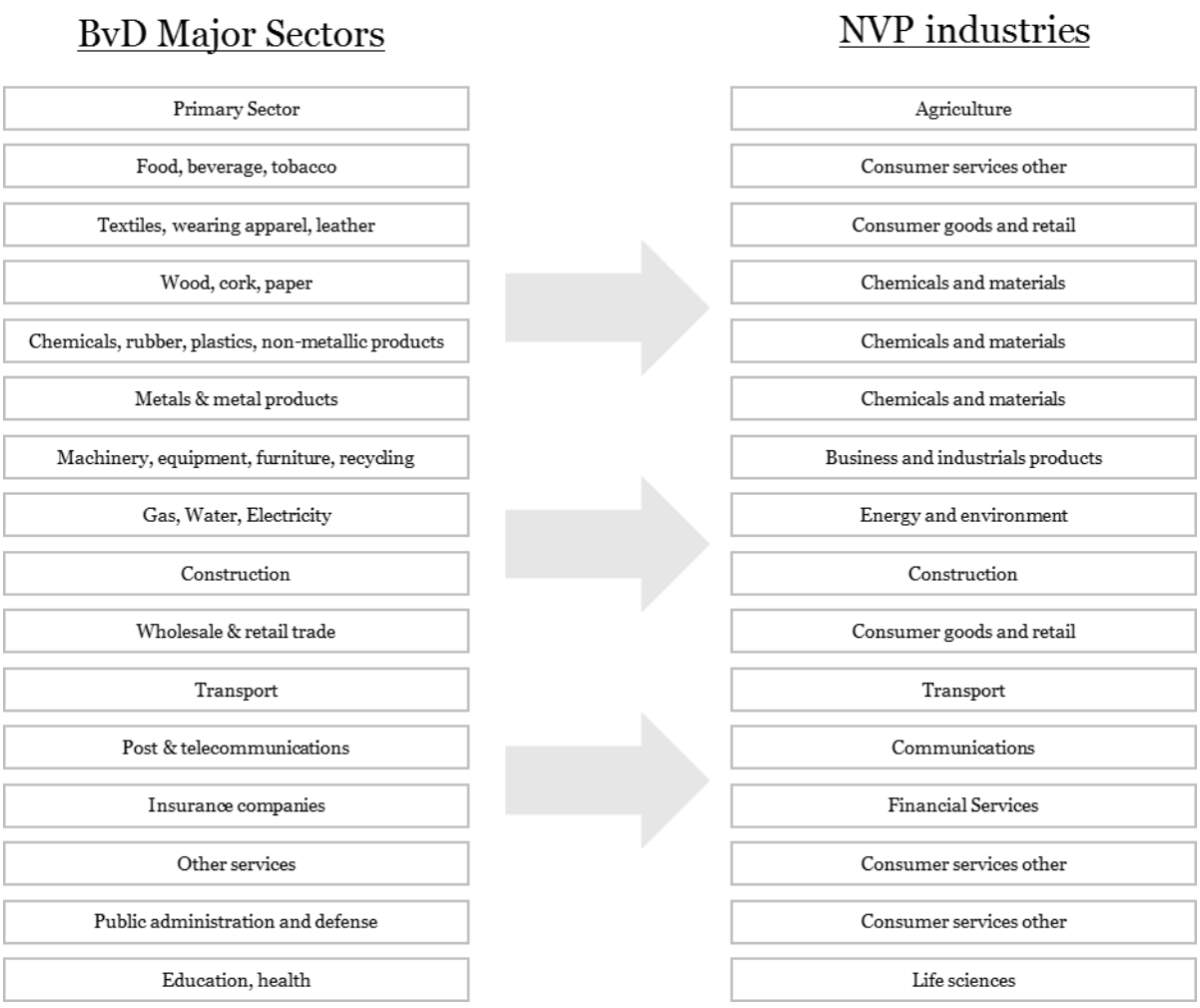

Figure 2: Industry classification transformations

Table 5.1: Frequency table of industries for the total dataset

	Frequency	Percent	Cumulative Percent
Agriculture	10	1.5	1.5
Business and industrial products	37	5.6	7.1
Business and industrial services	5	.8	7.8
Chemicals and materials	29	4.4	12.2
Communications	11	1.7	13.8
Construction	12	1.8	15.6
Consumer goods and retail	228	34.2	49.8
Consumer services other	289	43.4	93.2

Energy and environment	6	.9	94.1
Financial Services	2	.3	94.4
Life Sciences	3	.5	94.9
Transportation	34	5.1	100.0
Total	666	100.0	100.0

Table 5.2: Frequency table of industries for buyouts from the NVP dataset

	Frequency	Percent	Cumulative Percent
Agriculture	2	4.0	4.0
Business and industrial products	7	14.0	18.0
Business and industrial services	5	10.0	28.0
Chemicals and materials	3	6.0	34.0
Communications	9	18.0	52.0
Construction	4	8.0	60.0
Consumer goods and retail	8	16.0	76.0
Consumer services other	4	8.0	84.0
Energy and environment	3	6.0	90.0
Financial Services	2	4.0	94.0
Life Sciences	1	2.0	96.0
Transportation	2	4.0	100.0
Total	50	100.0	100.0

Table 5.3: Frequency table of industries for peer companies from the Orbis database

	Frequency	Percent	Cumulative Percent
Agriculture	8	1.3	1.3
Business and industrial products	30	4.9	6.2
Chemicals and materials	26	4.2	10.4
Communications	2	.3	10.7
Construction	8	1.3	12.0
Consumer goods and retail	220	35.7	47.7
Consumer services other	285	46.3	94.0
Energy and environment	3	.5	94.5
Life Sciences	2	.3	94.8
Transportation	32	5.2	100.0
Total	616	100.0	100.0

Table 6.1: Descriptive statistics for all dependent variables in the total dataset

	N	Minimum	Maximum	Mean	Std. Deviation
Rel. Incr. Sales t1	666	.4467	4.8188	1.1206	.3459
Rel. Incr. Sales t2	666	.5343	2.7822	1.0865	.1813
Rel. Incr. Sales t3	666	.3498	1.6105	1.0178	.1527
Rel. Incr. Sales t4	666	.0027	2.1032	.9982	.1653
Rel. Incr. Sales tot.	666	.0015	11.4568	1.2616	.6754
Rel. Incr. Empl. t1	666	.1721	6.7875	1.0284	.3323
Rel. Incr. Empl. t2	666	.3284	4.6053	1.0551	.3157
Rel. Incr. Empl. t3	666	.2893	4.4242	1.0433	.2556
Rel. Incr. Empl. t4	666	.0009	4.7283	1.0223	.2340
Rel. Incr. Empl. Tot.	666	.0010	7.5789	1.1399	.5663
Rel. Incr. Wages t1	666	.3261	4.3598	1.0857	.3378
Rel. Incr. Wages t2	666	.3730	2.1219	1.0656	.1714
Rel. Incr. Wages t3	666	.1588	2.6047	1.0539	.1981
Rel. Incr. Wages t4	666	.1096	1.9338	1.0260	.1782
Rel. Incr. Wages tot.	666	.0910	7.9617	1.2612	.6760

Table 6.2: Descriptive statistics for all dependent variables in the control group dataset from the Orbis database

	N	Minimum	Maximum	Mean	Std. Deviation
Rel. Incr. Sales t1	616	.4467	4.2253	1.1060	.2841
Rel. Incr. Sales t2	616	.5343	2.7822	1.0870	.1792
Rel. Incr. Sales t3	616	.3498	1.6105	1.0164	.1516
Rel. Incr. Sales t4	616	.0027	2.1032	.9933	.1657
Rel. Incr. Sales tot.	616	.0015	5.2845	1.2293	.5085
Rel. Incr. Empl. t1	616	.1721	6.7875	1.0199	.3118
Rel. Incr. Empl. t2	616	.3284	4.6053	1.0579	.3244
Rel. Incr. Empl. t3	616	.5457	4.4242	1.0471	.2616
Rel. Incr. Empl. t4	616	.0009	4.7283	1.0170	.2229
Rel. Incr. Empl. Tot.	616	.0010	7.5789	1.1325	.5578
Rel. Incr. Wages t1	616	.3261	4.3477	1.0723	.2980
Rel. Incr. Wages t2	616	.3730	2.1219	1.0655	.1694
Rel. Incr. Wages t3	616	.1588	2.6047	1.0560	.1980
Rel. Incr. Wages t4	616	.1096	1.9338	1.0236	.1798
Rel. Incr. Wages tot.	616	.0910	7.9617	1.2426	.6255

Table 6.3: Descriptive statistics for all dependent variables for the buyouts from the NVP dataset

	N	Minimum	Maximum	Mean	Std. Deviation
Rel. Incr. Sales t1	50	.6562	4.8188	1.3003	.7587
Rel. Incr. Sales t2	50	.6818	1.8193	1.0798	.2064
Rel. Incr. Sales t3	50	.6147	1.5184	1.0342	.1665
Rel. Incr. Sales t4	50	.7704	1.4367	1.0582	.1488
Rel. Incr. Sales tot.	50	.6548	11.4568	1.6599	1.6642
Rel. Incr. Empl. t1	50	.6294	4.4091	1.1340	.5155
Rel. Incr. Empl. t2	50	.4901	1.5944	1.0203	.1761
Rel. Incr. Empl. t3	50	.2893	1.2860	.9959	.1583
Rel. Incr. Empl. t4	50	.4773	2.9800	1.0868	.3387
Rel. Incr. Empl. Tot.	50	.5769	4.5000	1.2314	.6616
Rel. Incr. Wages t1	50	.7244	4.3598	1.2511	.6353
Rel. Incr. Wages t2	50	.4772	1.7897	1.0671	.1966
Rel. Incr. Wages t3	50	.5712	1.9014	1.0279	.1990
Rel. Incr. Wages t4	50	.6243	1.4653	1.0555	.1563
Rel. Incr. Wages tot.	50	.4463	7.4221	1.4905	1.1106

8.2. Appendix B

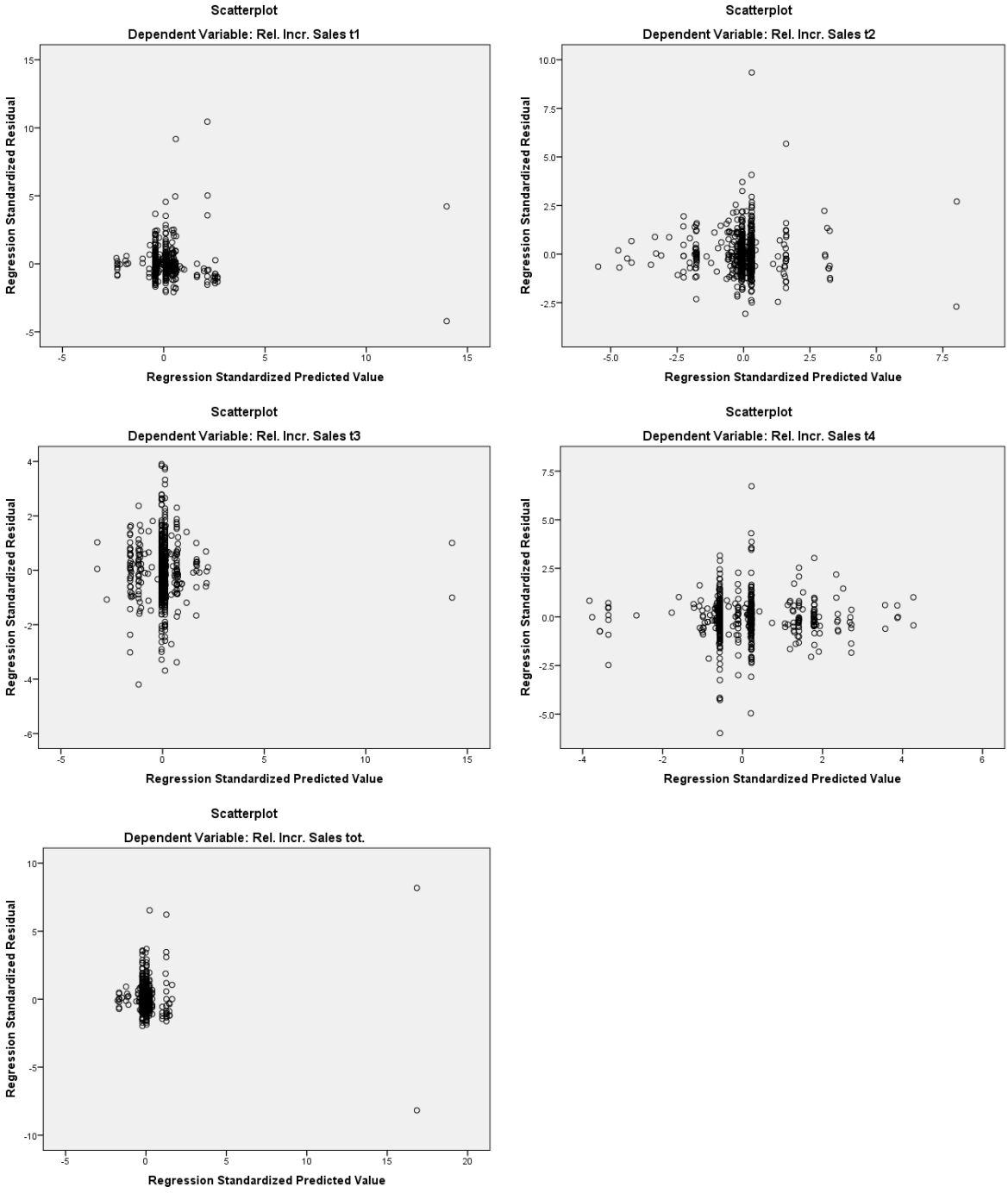

Figure 3: Heteroscedasticity tests for sales variables *Rel. Incr. Sales t1, Rel. Incr. Sales t2, Rel. Incr. Sales t3, Rel. Incr. Sales t4* and *Rel. Incr. Sales tot.*

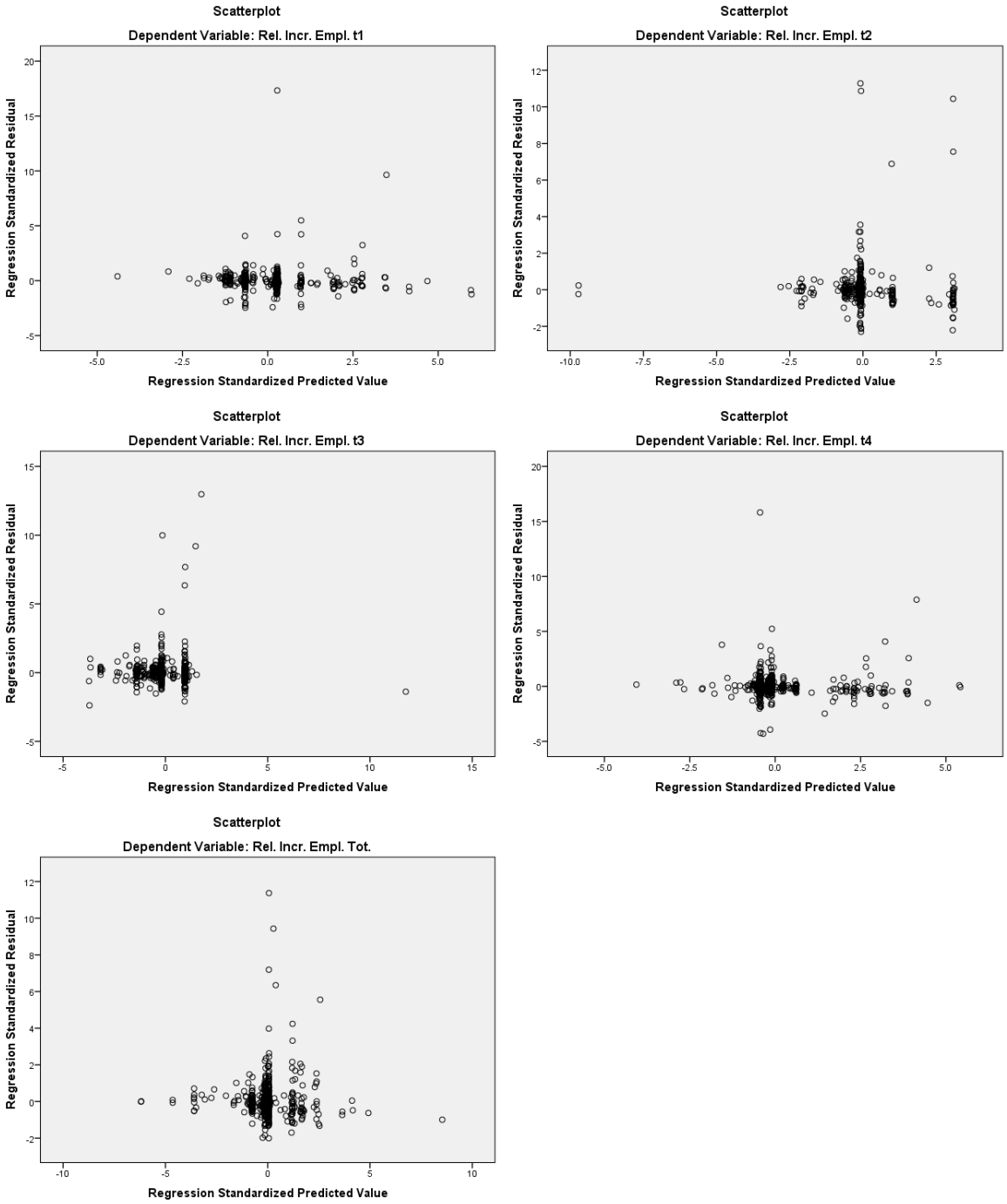

Figure 4: Heteroscedasticity tests for employee variables *Rel. Incr. Empl. t1, Rel. Incr. Empl. t2, Rel. Incr. Empl. t3, Rel. Incr. Empl. t4* and *Rel. Incr. Empl. tot.*

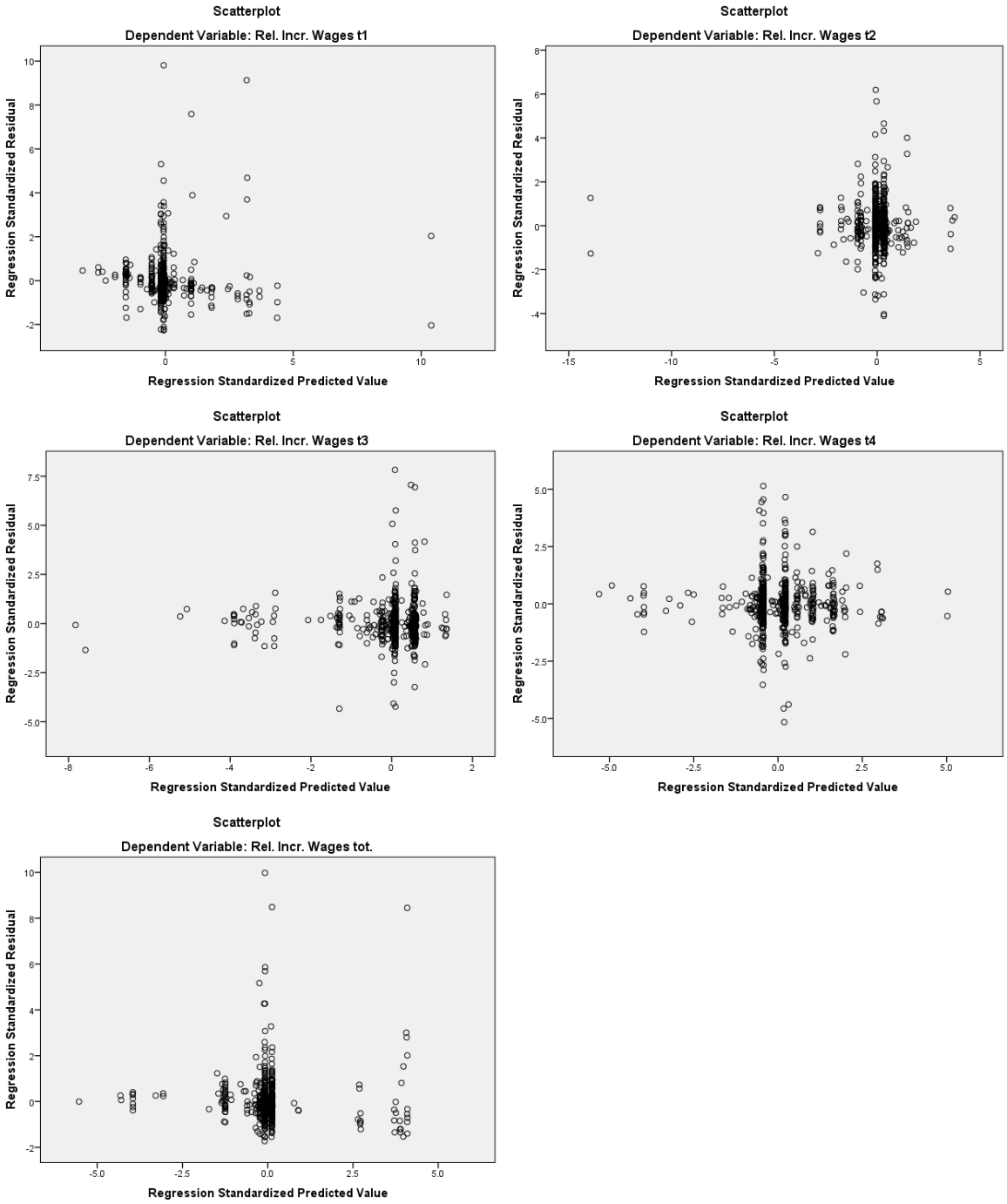

Figure 5: Heteroscedasticity tests for wage variables *Rel. Incr. Wages t1, Rel. Incr. Wages t2, Rel. Incr. Wages t3, Rel. Incr. Wages t4* and *Rel. Incr. Wages tot*.

Table 7: Durbin-Watson statistics for each regression, indicating whether serial correlation exists in the dataset

Regression #	Durbin-Watson statistic
1.1	2.022
1.2	1.948
1.3	1.775
1.4	1.710
1.5	1.876
2.1	1.923
2.2	1.857
2.3	1.945
2.4	1.836
2.5	1.791
3.1	1.889
3.2	1.968
3.3	2.050
3.4	0.121
3.5	1.525

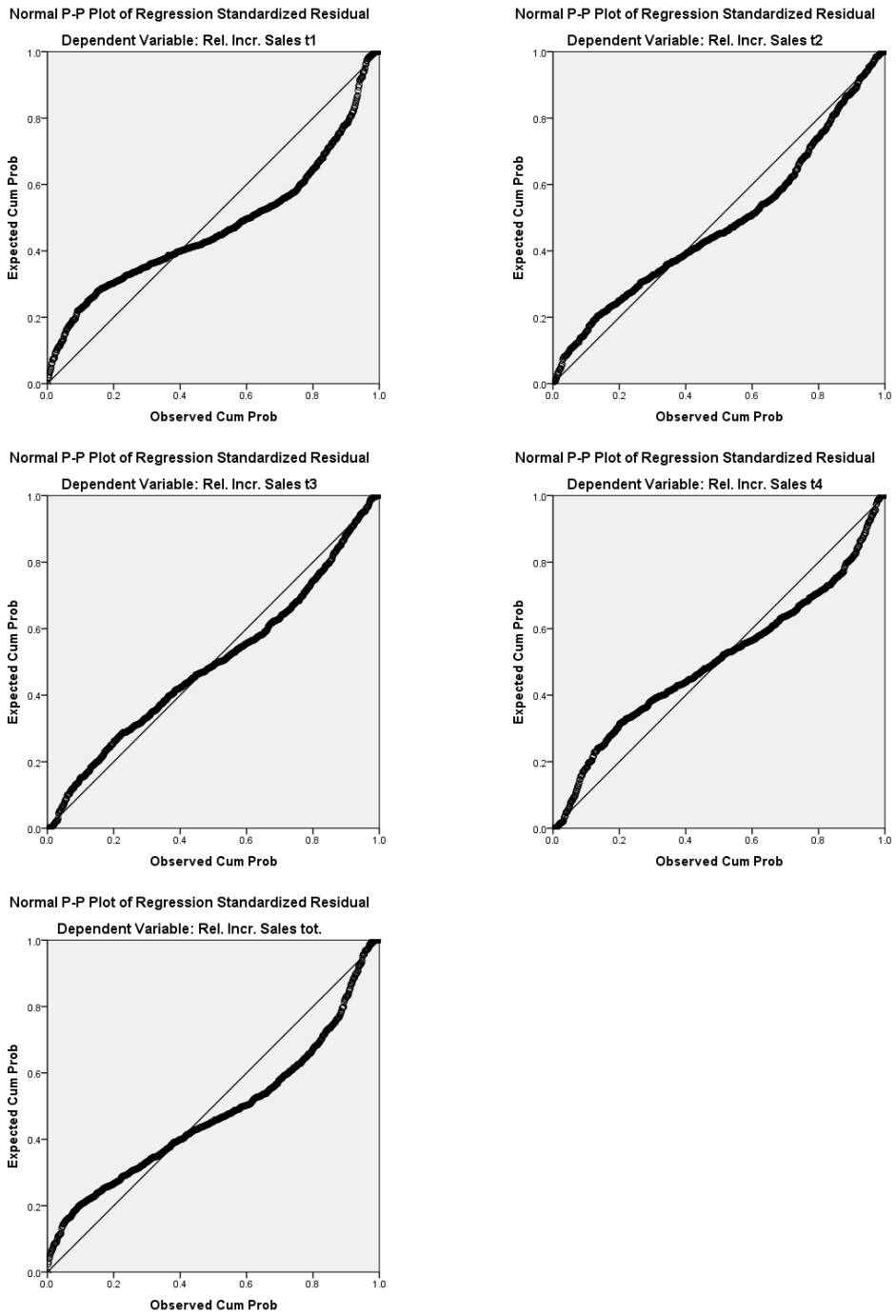

Figure 6: Normal probability plots for regressions 1.1, 1.2, 1.3, 1.4 and 1.5.

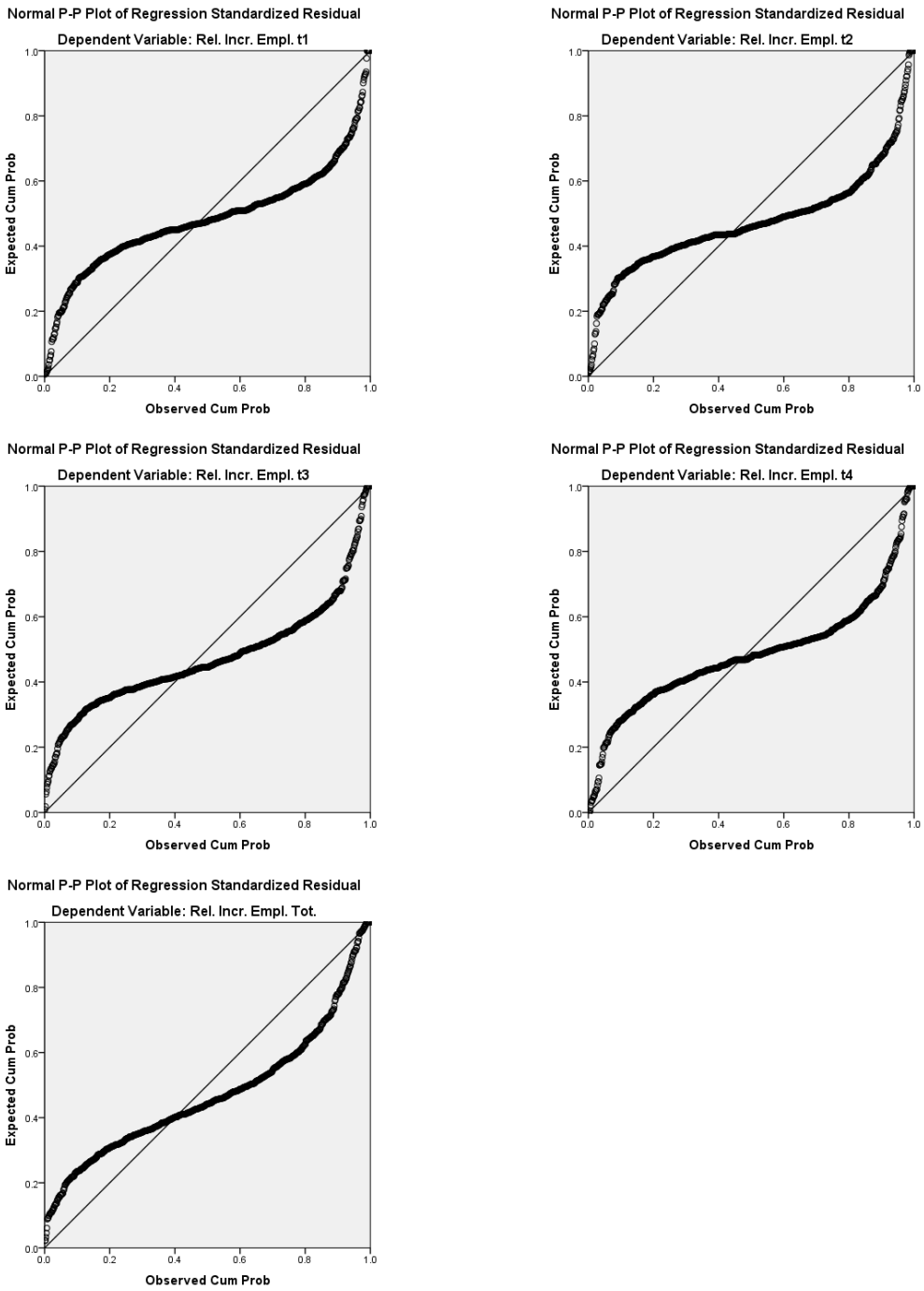

Figure 7: Normal probability plots for regressions 2.1, 2.2, 2.3, 2.4 and 2.5.

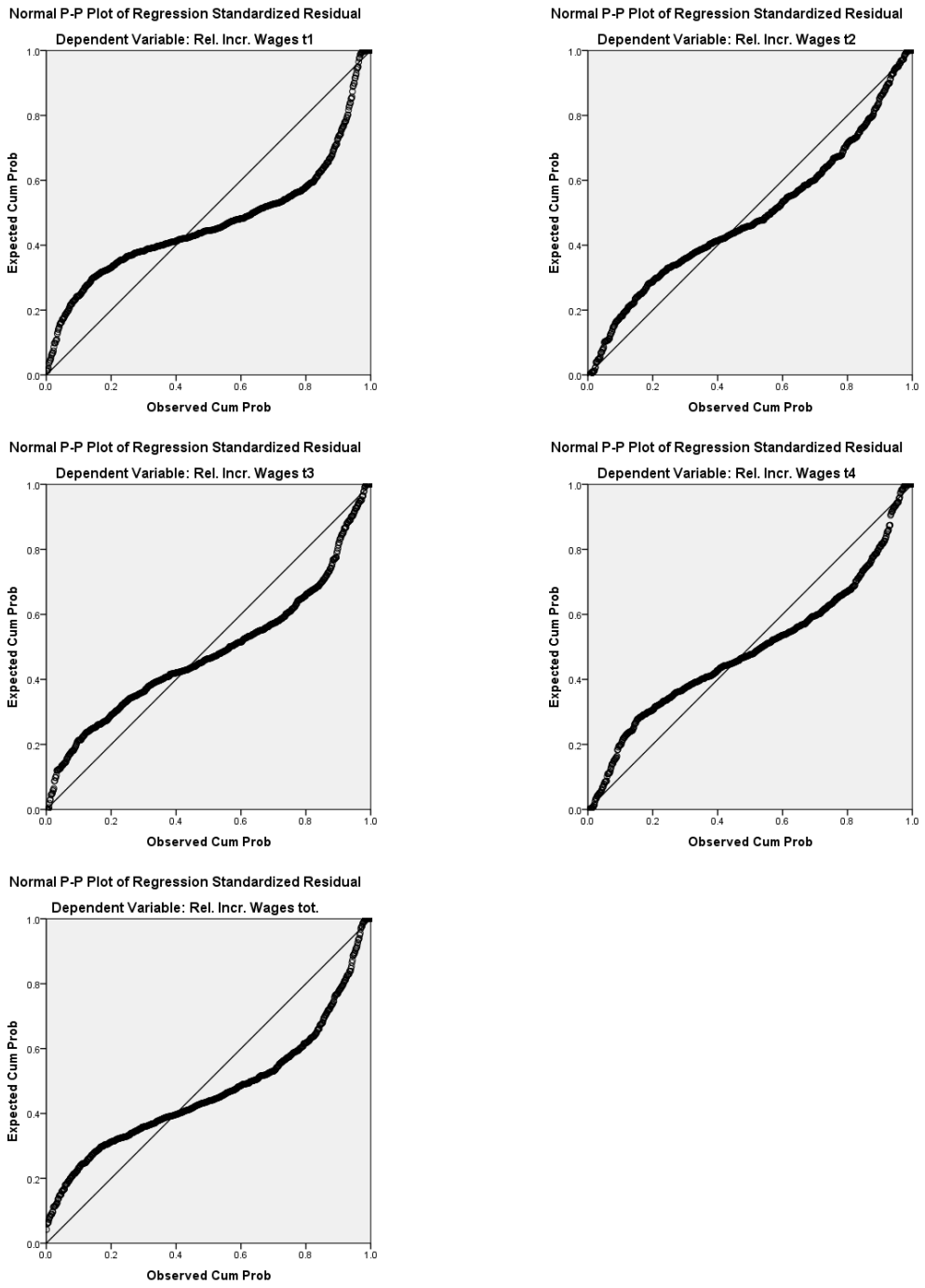

Figure 8: Normal probability plots for regressions 3.1, 3.2, 3.3, 3.4 and 3.5.

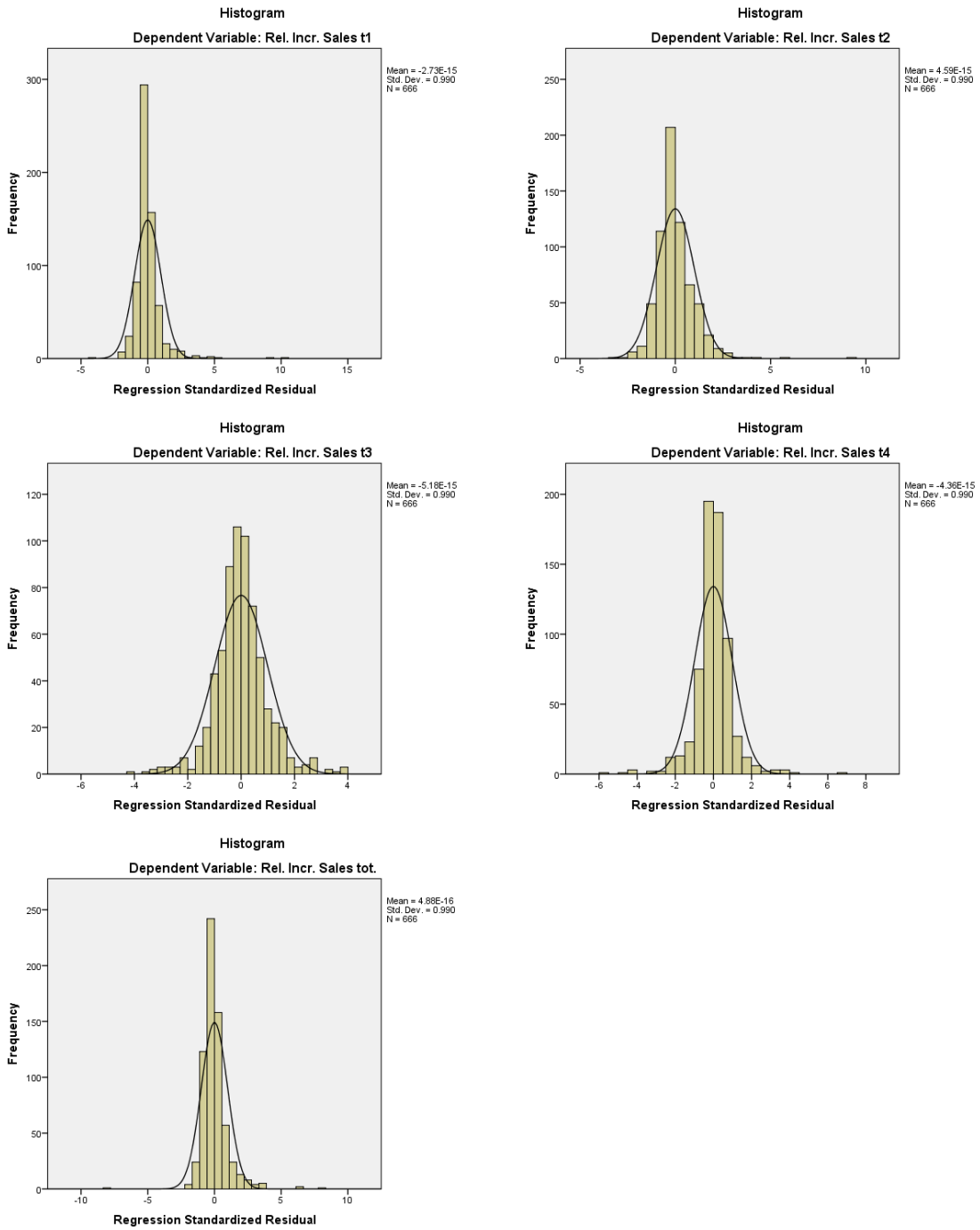

Figure 9: Histograms of the standardized residuals for regressions 1.1, 1.2, 1.3, 1.4 and 1.5, including a normal distribution curve

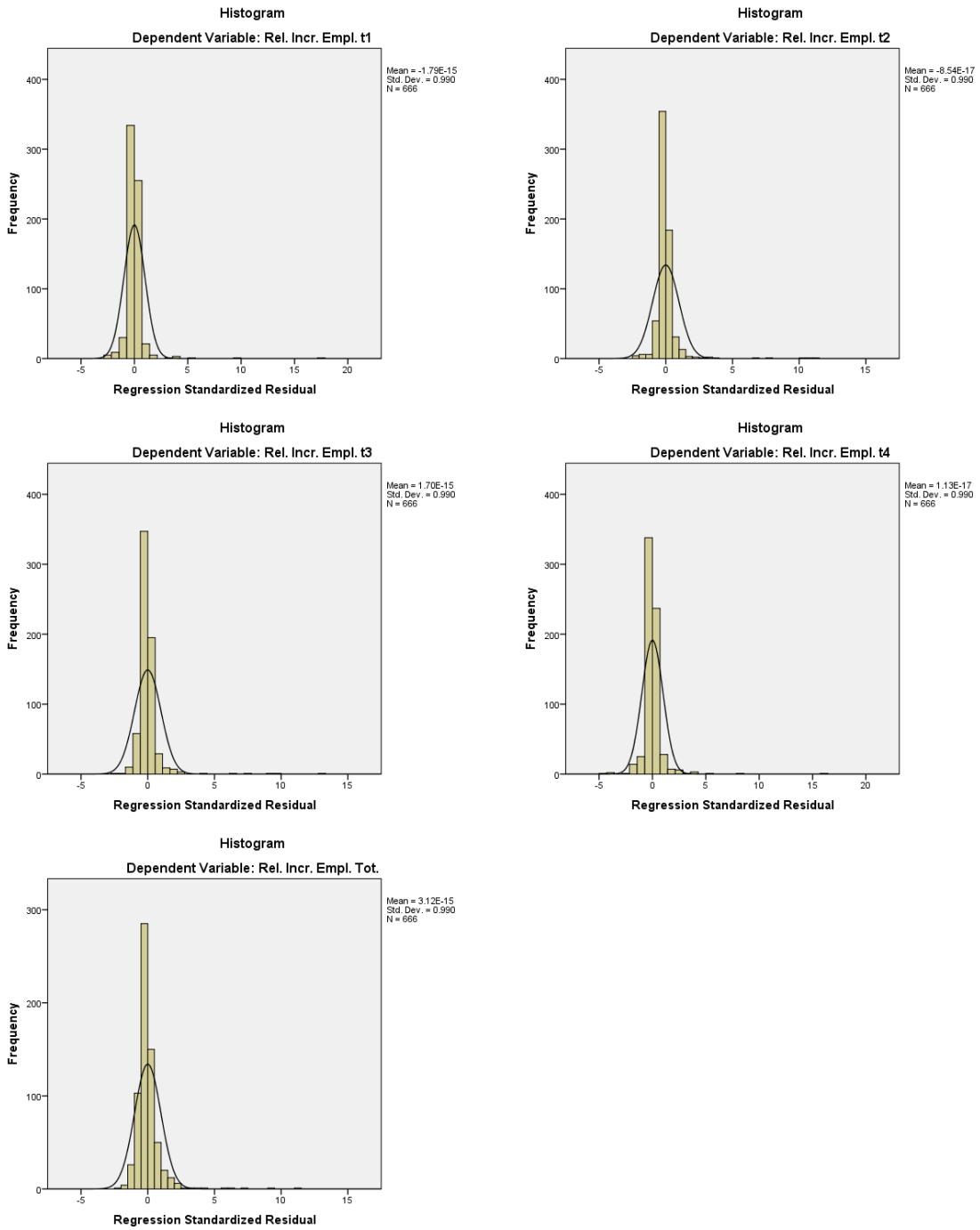

Figure 10: Histograms of the standardized residuals for regressions 2.1, 2.2, 2.3, 2.4 and 2.5., including a normal distribution curve

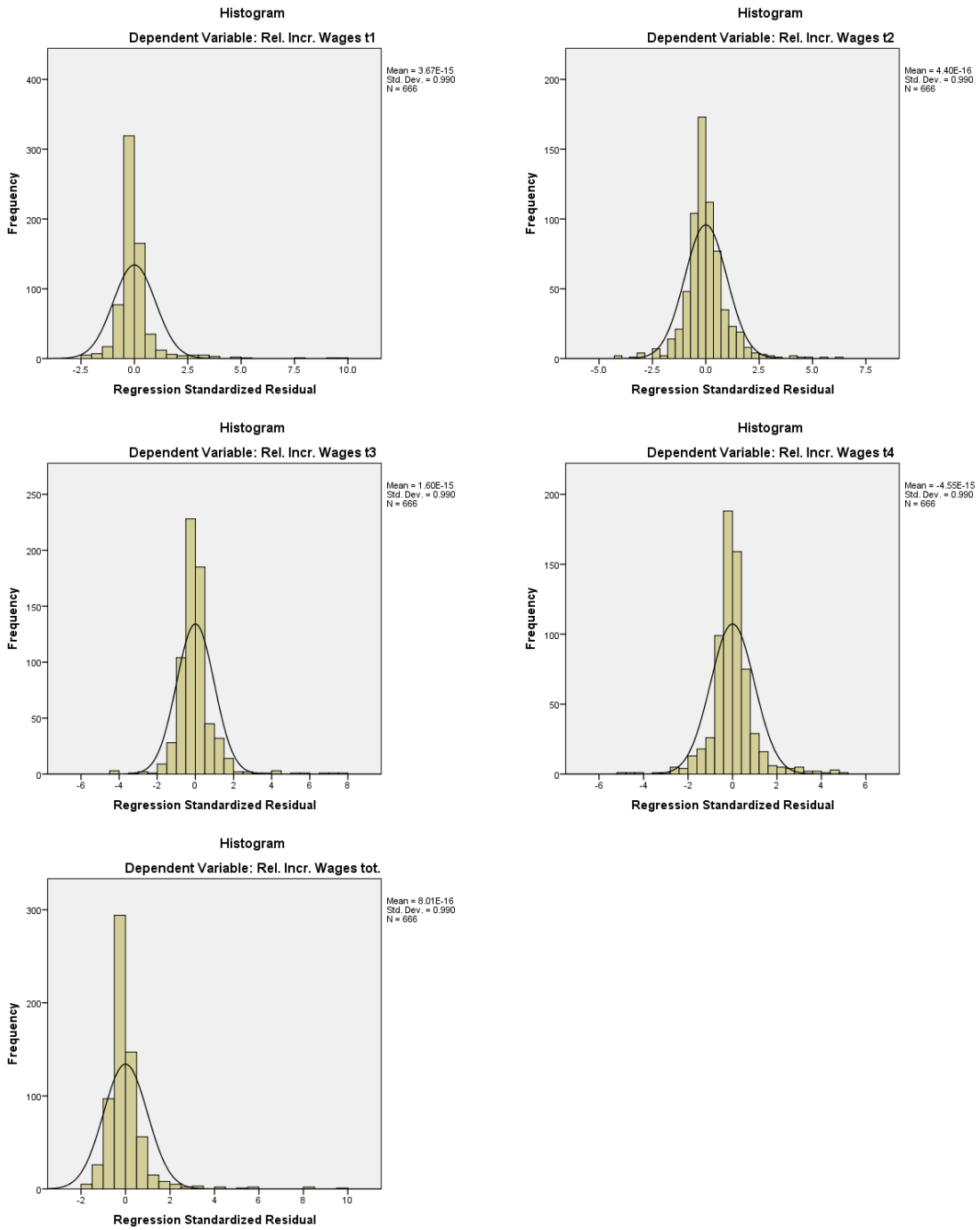

Figure 11: Histograms of the standardized residuals for regressions 3.1, 3.2, 3.3, 3.4 and 3.5., including a normal distribution curve

Table 8.1: Correlation matrix with Pearson's correlation coefficients between independent variables. Strong correlations between independent variables impose multicollinearity problems. ** and * indicate significance at the 0.01 and 0.05 level, respectively (1-tailed)

	Employees to	Sales to	Dummy.PE	D.Agri	D.Chem	D.BIP	D.BIS	D.Constr	D.Trans	D.CGR	D.CSO	D.Energy	D.Fin	D.Comm	D.Life
Employees to	1	.211**	.135**	-.015	.082*	.005	.008	.112**	-.008	-.104**	-.047	.039	-.011	.319**	-.012
Sales to	.211**	1	-.001	-.007	.010	-.014	-.004	.016	-.008	-.034	.023	.016	-.006	.045	-.006
Dummy.PE	.135**	-.001	1	.059	.023	.105**	.305**	.133**	-.014	-.109**	-.203**	.154**	.193**	.365**	.066*
D.Agri	-.015	-.007	.059	1	-.026	-.030	-.011	-.017	-.029	-.089*	-.108**	-.012	-.007	-.016	-.008
D.Chem	.082*	.010	.023	-.026	1	-.052	-.019	-.029	-.049	-.154**	-.187**	-.020	-.012	-.028	-.014
D.BIP	.005	-.014	.105**	-.030	-.052	1	-.021	-.033	-.056	-.175**	-.212**	-.023	-.013	-.031	-.016
D.BIS	.008	-.004	.305**	-.011	-.019	-.021	1	-.012	-.020	-.063	-.076*	-.008	-.005	-.011	-.006
D.Constr	.112**	.016	.133**	-.017	-.029	-.033	-.012	1	-.031	-.098**	-.119**	-.013	-.007	-.018	-.009
D.Trans	-.008	-.008	-.014	-.029	-.049	-.056	-.020	-.031	1	-.167**	-.203**	-.022	-.013	-.030	-.016
D.CGR	-.104**	-.034	-.109**	-.089*	-.154**	-.175**	-.063	-.098**	-.167**	1	-.632**	-.069*	-.040	-.093**	-.049
D.CSO	-.047	.023	-.203**	-.108**	-.187**	-.212**	-.076*	-.119**	-.203**	-.632**	1	-.083*	-.048	-.113**	-.059
D.Energy	.039	.016	.154**	-.012	-.020	-.023	-.008	-.013	-.022	-.069*	-.083*	1	-.005	-.012	-.006
D.Fin	-.011	-.006	.193**	-.007	-.012	-.013	-.005	-.007	-.013	-.040	-.048	-.005	1	-.007	-.004
D.Comm	.319**	.045	.365**	-.016	-.028	-.031	-.011	-.018	-.030	-.093**	-.113**	-.012	-.007	1	-.009
D.Life	-.012	-.006	.066*	-.008	-.014	-.016	-.006	-.009	-.016	-.049	-.059	-.006	-.004	-.009	1

Table 8.2a: Correlation matrix with Pearson's correlation coefficients between independent and dependent variables. Strong correlations are associated with a high R^2 and indicate a strong linear relation. ** and * indicate significance at the 0.01 and 0.05 level, respectively (1-tailed)

	Rel. Incr. Sales t1	Rel. Incr. Sales t2	Rel. Incr. Sales t3	Rel. Incr. Sales t4	Rel. Incr. Sales tot.	Rel. Incr. Wages t1	Rel. Incr. Wages t2	Rel. Incr. Wages t3	Rel. Incr. Wages t4
Employees to	-.006	-.067*	.006	-.025	-.029	.013	.009	-.084*	-.049
Dummy.PE	.148**	-.011	.031	.104**	.168**	.140**	.003	-.037	.047
D.Agri	.013	.066*	.035	-.013	.036	.027	.012	-.002	-.008
D.Chem	.056	.049	-.037	.073*	.034	.065*	-.019	-.043	.014
D.BIP	.067*	-.015	-.058	.017	.030	-.048	-.026	-.006	.058
D.BIS	-.020	.005	-.022	.021	-.015	-.008	.049	-.043	.008
D.Constr	-.067*	-.061	-.018	-.076*	-.081*	.006	-.046	-.078*	-.069*
D.Trans	.039	-.072*	.027	.095**	.030	-.017	.007	.019	.032
D.CGR	.039	-.011	.016	.046	.025	-.008	.043	.059	.022
D.CSO	-.106**	.036	-.005	-.103**	-.085*	-.003	-.006	.005	-.056
D.Energy	-.024	-.002	.030	-.049	-.022	-.019	.014	-.015	-.014
D.Fin	.243**	.074*	.125**	.042	.427**	.124**	-.119**	.006	.036
D.Comm	-.023	-.032	.017	.014	-.014	-.008	-.029	-.073*	.012
D.Life	-.008	-.048	-.033	.003	-.026	-.013	.005	.003	.018

Table 8.2b: Continuation of correlation matrix provided in Table 6.2a with Pearson's correlation coefficients between independent and dependent variables. Strong correlations are associated with a high R^2 and indicate a strong linear relation. ** and * indicate significance at the 0.01 and 0.05 level, respectively (1-tailed)

	Rel. Incr. Empl. t1	Rel. Incr. Empl. t2	Rel. Incr. Empl. t3	Rel. Incr. Empl. t4	Rel. Incr. Empl. Tot.
Sales t0	.021	-.017	.066*	-.003	.038
Dummy.PE	.091**	-.031	-.053	.079*	.046
D.Agri	.067*	-.009	-.025	.049	.040
D.Chem	-.034	.032	-.021	.006	-.022
D.BIP	-.021	-.025	-.022	.025	-.013
D.BIS	.026	-.024	-.031	.026	.000
D.Constr	.011	-.048	-.069*	.039	-.063
D.Trans	.043	.113**	-.050	-.004	.046
D.CGR	-.063	-.009	.104**	-.004	-.004
D.CSO	.044	-.016	-.021	-.043	.009
D.Energy	-.003	.008	-.016	-.013	-.008
D.Fin	-.009	-.085*	.002	.014	-.051
D.Comm	-.014	-.015	-.025	.036	.000
D.Life	.014	.025	.010	.001	.033

8.3. Appendix C

Table 9: Output for the analysis of variance (ANOVA) for all regressions. ** and * indicate a significant effect at the 0.01 and 0.05 level, respectively

Regression #	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	3.5
F-ratio	5.584	1.462	1.315	2.383	13.575	1.289	1.300	1.189	0.532	1.017	2.499	1.247	1.052	0.882	1.540
P-value	0.000**	0.127	0.199	0.004**	0.000**	0.214	0.208	0.283	0.906	0.433	0.002**	0.241	0.399	0.572	0.098