

**Erasmus
University
Rotterdam**



Efficiency gains added by private equity to target firms after the financial crisis

Erasmus School of Economics, Erasmus University

Master thesis: MSc Financial Economics

Author: Danny Kliffen

Student number: 455153

Supervisor: Dr. Volosovych

Date: 16/9/2020

The views stated in this thesis are those of the author and not necessarily those of the supervisor, second assessor, Erasmus School of Economics or Erasmus University Rotterdam.

Abstract

I study whether private equity firms are able to improve the efficiency of their target firms after the financial crisis of 2008, relative to control firms. In a sample of deals in the period 2011-2015 from countries in North-West Europe, I find that there is some evidence that private equity firms are able to improve the efficiency of target firms relative to control firms, even though existing literature indicates that it has become harder over time to improve the operational performance of target firms. However, the efficiency gains are strongly dependent on firm characteristics and transaction types. I find that initially capital intensive and financially constrained target firms improve in productivity. Furthermore, most efficiency gains are concentrated in divisional buyouts and private-to-private transactions as compared to other pre-buyout ownership structures. Finally, domestic transactions outperform foreign transactions in terms of efficiency gains.

Keywords: Private equity, buyout, efficiency, capital intensive, financially constrained, transaction type

Table of contents

1. Introduction.....	4
2. Literature review and hypotheses.....	7
2.1 Private equity performance through the years.....	7
2.1.1 The 1980s	8
2.1.2 The 1990s and 2000s.....	8
2.1.3 After the financial crisis	10
2.2 Efficiency developments around the deal.....	11
2.3 Potential sources of efficiency gains	13
2.3.1 Capital intensive firms	13
2.3.2 Financially constrained firms.....	14
2.3.3 Different types of pre-deal ownership structures.....	15
2.3.4 Domestic vs foreign transactions	16
3. Data	18
3.1 Data sample.....	18
3.2 Sample splitting	20
3.3 Efficiency measurements	22
4. Methodology	23
4.1 Regressions.....	23
4.2 Matching of target to control firms.....	24
4.3 Targets and controls compared.....	25
5. Results	26
5.1 Whole sample.....	27
5.2 Capital intensive firms	29
5.3 Financially constrained firms.....	31
5.4 Pre-buyout ownership structures	36
5.5 Domestic vs foreign transactions	39
6. Conclusion	41
6.1 Summary and implications	41
6.2 Limitations and suggestions for future research.....	42
References.....	45
Appendix.....	48
A.1 Efficiency developments for capital intensive firms per year post-buyout.....	48
A.2 Efficiency developments for financially constrained firms per year post-buyout	49

1. Introduction

In recent years the private equity market has become increasingly mature. Increasing competition between private equity firms has created an environment in which it has become harder for private equity to outperform public equity in terms of returns after the financial crisis of 2008¹ (Ilmanen, Chandra and McQuinn, 2019; Braun, Jenkinson and Stoff, 2017). When the private equity market was born in the 1980s, it was known as a market in which private equity firms quickly implemented operational changes to target firms, which resulted in immediate efficiency and profitability gains as for example the study of Kaplan (1989) shows. After the 1980s this already became harder. Although some papers still find significant operating gains of buyout firms in the 1990s and 2000s, other papers, like Guo, Hotchkiss and Song (2011), show weak evidence or no evidence at all for improved operational performance in this period. After the financial crisis this might have even become harder due to the increasing competition in the private equity market.

Papers that compare the returns of private equity relative to public equity, like Ilmanen et al (2019), point towards a negative development of operational performance of portfolio firms after the financial crisis. The literature that directly examines the operational performance of portfolio firms after the financial crisis is scarce however. This may be surprising, given the increasing amount of money that flows towards the private equity market. In 2019, asset under management of private equity firms equalled \$3.85 trillion globally and has multiplied eight times since 2000². Given this increase over time, it is relevant to know what private equity firms have done with this amount of money to their target firms in the recent years.

Traditionally speaking, the social and political implications of the operations private equity firms perform to their target firms have not always been positive. The high amount of debt used in buyouts and the reduction of employment and wages can often count on a lot of critique. The quote of the Danish Prime Minister Poul Rasmussen, used in the paper of Davis et al (2014, p.3956), is exemplary of how opponents of private equity firms may think about their operations. His words are: “‘leveraged buy-outs’ leave the company saddled with debt and interest payments, its workers are laid off, and its assets are sold, ... benefiting neither workers nor the real economy”. Another quote of a leading German Social Democratic Party politician, used in the paper of Froud & Williams (2007), underlines this thought, stating that private equity firms are ‘locusts’ that cut jobs and remove assets.

¹ From now on I will refer to the financial crisis of 2008 as the ‘financial crisis’.

² According to McKinsey Global Private Markets Review 2020.

Despite this critique from politicians there is much evidence in existing literature which indicates that private equity firms improve the operational performance of their target firms following a buyout, as they make targets more efficient on the short term. This could be both beneficial for target companies themselves as for the economy. Many studies, like for example Lichtenberg and Siegel (1990) and Amess (2003), show that productivity increases following a buyout, indicating increased efficiency. However, previous studies that find efficiency gains focus on the period before the financial crisis. The literature that examines whether those efficiency gains still occur after the financial crisis is scarce. I intend therefore to add to the existing literature, using various efficiency measurements, to examine whether private equity firms are able to increase the efficiency of their target firms relative to control firms that did not get involved in a buyout, thereby using a sample consisting of deals after the financial crisis. The following research questions is formulated to get an answer on this question:

- *“Do private equity firms increase the efficiency of their target firms post-buyout relative to control firms after the financial crisis”?*

The sample period of my research is 2011-2015, consisting of 316 deals from the following countries: Belgium, Germany, Spain, Finland, France, Great-Brittain and Sweden³. To get an answer on the research question different efficiency measurements are used, of which all of them are based on accounting ratios. These measurements focus on whether target firms improve in productivity, reduce working capital, hold less cash, lower employee costs and reduce taxes. Those efficiency improvements might be different than operating improvements such as increased profitability or sales. Even when for example profits or sales stay constant post-buyout, private equity firms may increase the value of the target firm by increasing efficiency. Therefore my narrowly defined efficiency ratios allow me to examine in detail if, and how, private equity firms are able to add value to targets.

To see how efficiency develops post-buyout I study a period of four years after the deal. To measure the effect of a buyout on the efficiency changes of the corresponding target firm I use the difference-in-difference method, which allows me to measure the difference of efficiency performance between targets and controls, and measure how this difference develops post-buyout compared to pre-buyout. The difference-in-difference method is used in conjunction with propensity score matching. With this matching method I am able to match control firms to targets based on both pre-deal trends as firm characteristics. Moreover, I require targets and controls to be in the same 2-digit SIC industry, deal year and country.

³ Data about deals is collected from Zephyr and data about financials of companies is retrieved from Orbis.

There is some evidence that target firms improve in efficiency post-buyout relative to their control firms. Both cash in assets and employee costs are significantly declined post-buyout, consistent with the idea that private equity firms enhance efficiency by using cash more productively and reducing wages. Other efficiency measurements are not significantly changed though. Operating measures like assets and employment are significantly increased post-buyout, suggesting that private equity firms focus also on growth of target firms, in line with previous research like the study of Boucly, Sraer and Thesmar (2011).

I also intend to add to the existing literature whether efficiency improvements are more concentrated for certain types of firms and transaction types. I distinguish between capital intensive and non-capital intensive firms, and financially constrained and non-financially constrained firms. With respect to the transaction types I distinguish between pre-buyout ownership structures (divisional buyouts, private-to-private transactions, secondary buyouts and public-to-private transactions), and domestic and foreign transactions (whether acquirer and target are from the same country or not). To my best knowledge, existing literature has not distinguished between those groups of firms and transaction types within one single dataset.

To measure whether efficiency changes are different for capital intensive and financially constrained firms, I include triple interaction terms in the whole sample with capital intensive and financially constrained indicators. The results of these analyses are comparable for the two types of firms, since both firm types increase significantly in asset turnover and decrease in assets. The results for capital intensive firms are consistent with the idea that private equity firms can improve efficiency of such firms by removing inefficient assets, since capital intensive firms have a relatively high amount of fixed assets. For financially constrained firms the results are in line with the thought that private equity firms free up cash for those firms by selling off assets. Furthermore, the expertise of private equity firms ensures that relative productivity of the remaining assets are increased, which could help to alleviate the financial constraints. Other efficiency indicators are not changed with the expected sign, suggesting that private equity firms focus on improving productivity while reducing assets of capital intensive and financially constrained firms.

The similar results of capital intensive and financially constrained firms encourage me to examine whether those results occur because financially constrained firms are also more capital intensive on average. When the financially constrained interaction is only added for a sample of capital intensive firms, the significant increase of asset turnover and decrease of assets disappear, which confirms the conjecture that financial dependent firms improve in productivity because they might be more capital intensive. In addition, when I split the sample of capital intensive firms into financially and non-

financially constrained firms, I find that asset turnover is in both cases significantly increased. This suggests that it does not matter for private equity firms whether a capital intensive target firm is financially constrained or not, in order to improve the productivity post-buyout. Besides, it seems that a high level of capital intensity before the deal is a more important driver of potential productivity improvements than the level of financial constraints pre-buyout.

For the different pre-buyout ownership structures I find most efficiency gains for divisional buyouts and private-to-private transactions, and those efficiency gains are roughly comparable to those found for the whole sample. This is contrary to the expectation that most efficiency gains should be concentrated in divisional buyouts, since divisions do not get enough attention from their parents (Alperovych, Amess and Wright, 2013), and might not get the funds it needs because of limitations in the internal capital market (Hoskisson and Turk, 1990). For secondary buyouts and public-to-private transactions I find only modest or not any efficiency gains, in line with the expectation that they underperform compared to divisional buyouts.

When I compare the efficiency gains of domestic transactions with those of foreign transactions, I find that most efficiency improvements are seen for domestic transactions. In domestic transactions, cash in assets, average employment costs and tax in assets are significantly reduced post-buyout, whereas for foreign transactions only the increased asset turnover at the 10% significance level indicates some efficiency gains. That most efficiency gains are concentrated in domestic transactions is consistent with the theory of information asymmetry, as for example described by Humphery-Jenner, Sautner and Suchard (2017), which should lead to higher efficiency post-buyout for those transactions as compared to foreign transactions.

The remainder of the paper is organised as follows. The second section gives an overview of previous relevant literature and the corresponding hypotheses. In the third and fourth section I will describe the data and empirical methodology used in this research. The fifth section describes the results. Finally, the conclusions are given in the sixth section.

2. Literature review and hypotheses

2.1 Private equity performance through the years

My study focuses on the operational performance of target companies of private equity firms, and in particular on efficiency developments following a buyout. I will first give an overview of how the operating performance of buyout companies have developed over the years. There are roughly three periods than can be distinguished: the 1980s, the beginning of the 1990s until the financial crisis and the period after the financial crisis.

2.1.1 The 1980s

The 1980s was a time of intense corporate restructuring, in which leveraged buyouts (LBO's) emerged as a way to quickly implement operational changes. The intense restructuring during this time is seen as a result of the corporate governance deficiencies many firms had before the 1980s (Kaplan, 1997). LBO's could help to overcome these deficiencies, as it led to more disciplined managers towards the shareholders and less underutilized resources, which resulted in operational improvements of buyout companies in the 1980s. Kaplan's (1989) study for example provides evidence that private equity firms improve the operational performance of target companies in public-to-private transactions between 1980 and 1986. Compared to a control group that did not get involved in a buyout, target firms improve in operating income ratios and net cashflows in the years after the deal. Moreover, these target firms decrease their capital expenditures, which is an important contribution to the increased net cashflows after the deal. The findings of Smith (1990) are comparable in terms of operational improvements of buyout companies. By focusing on buyouts between 1977–1986, Smith (1990) shows that operating performance of target firms improves post-buyout measured by cashflow ratios, both before and after adjustments for industry trends. Furthermore, resources in working capital, such as the period which it takes before account receivables are collected, are significantly reduced after a buyout, which indicates increased efficiency.

Smart and Waldfogel (1994) and Lichtenberg and Siegel (1990) also provide evidence for positive operating changes following buyouts in the 1980s. Using partially the same data as Kaplan (1989), Smart and Waldfogel (1994) find large increases in the operating income to sales ratio relative to control firms. Every year after the buyout this ratio increases further. Lichtenberg and Siegel (1990) focus on the influence of a buyout on efficiency developments, and to measure this they look at the productivity of companies. Although they do not find improvements in productivity in 1981 and 1982, for the period 1983-1986 they show that target companies increase significantly in productivity compared to the industry mean.

2.1.2 The 1990s and 2000s

After the 1980s some big changes occurred in the buyout activity. While during the 1980s buyouts were booming, after this period there was an abrupt ending in the buyout activity, which was for a large part due to a recession in the beginning of the 1990s (Guo et al, 2011). The recession not only changed the amount of deals after the 1980s, also a lot of deals defaulted later in the 1990s. Besides, the evidence for operational improvements of target firms is more mixed in the 1990s and 2000s. While some researchers still find significant gains in operating performance following a buyout, others find less convincing evidence. The reason for this might be that in the 1980s it was easier to find undervalued targets, so that operating gains could be more easily added to targets during that time (Weir, Jones

and Wright, 2008). In addition, because of the weak corporate governance model many corporations had before the 1980s, this was an ideal time to implement corporate governance improvements (Kaplan, 1997). After the 1980s operating gains might have been harder to add, since many corporate governance improvements had already been implemented.

Several researchers show findings which indeed suggest that it has become harder to implement operational improvements to target companies in the 1990s and 2000s. Guo et al (2011) find mixed evidence for improvements in operating performance following buyouts in the period 1990-2006. In some cases modest improvements are found, while in other cases the change in operating performance of buyout companies is comparable to control firms. Results differ for different post-buyout periods and depend on which measurement for operating performance is used. Cohn, Mills and Towery (2014) use tax returns to evaluate the performance of buyout companies between 1995 and 2007. In line with Guo et al (2011), they find little evidence for increased operational performance, as most of the performance measurements indicate that buyout companies do not outperform their public peers. Weir et al (2008) results even show that buyout companies decrease in operational performance, which is against existing literature that finds that LBO's create operating improvements. It must be noted however that their public peers also decrease in operating performance, and as a consequence, buyout companies do not perform worse than control firms. In fact, there is some evidence that buyout firms perform less worse than their public peers. Overall, the papers of Guo et al (2011), Cohn et al (2014) and Weir et al (2008) are not in line with the papers that study the period of the 1980s and find strong operating improvements.

There are several researchers though who find evidence of increased operational performance for target companies in the 1990s and 2000s. Boucly et al (2011) show convincing evidence that target firms of a LBO become more profitable than control firms in the period 1994-2004, and these results are robust for different types of targets in terms of size and ownership structure before the buyout. Acharya, Gottschalg, Hahn & Kehoe (2013), who use a comparable time frame as used by Boucly et al (2011), find improvements in EBITDA margins compared to their sector peers. In addition, Bergström, Grubb and Jonsson (2007) also find improved operating performance of buyout companies after the 1980s. By focusing on a sample between 1998 and 2006, they show that companies which engaged in a buyout experience an increase in EBITDA margin and Return on Invested Capital (ROIC). Previous mentioned papers, that provide evidence for increased operating performance of target firms in the 1990s and 2000s, show that not all papers are in line whether private equity firms are able to add operating gains to targets in this period.

2.1.3 After the financial crisis

While much of the private equity research indicates that from the beginning of the 1990s to the financial crisis it was harder to add operating gains to target companies than before, after the financial crisis it might have even become harder. AMG Almeida (2018) finds that buyout companies in Portugal underperform in operating performance relative to the industry benchmark after the financial crisis. Worth noticing however is that those companies did grow in terms of assets and employees, suggesting that private equity firms focus more on growth of their target companies. Other literature that directly examines the operational performance of buyout companies, using a sample period of after the financial crisis, is scarce. There are several papers however though that compare the returns of private equity with public equity, and study those returns both before and after the financial crisis, which might give an indication of how the operational performance of target companies have developed over this period. Both Ilmanen et al (2019) and Harris, Jenkinson & Kaplan (2016) show that private equity returns have declined over time relative to public equity. While before the financial crisis private equity outperformed public equity in terms of returns, after the financial crisis this outperformance has largely disappeared. An explanation for this finding might be that private equity firms could not sell their portfolio companies for as much money after the financial crisis relative to before the crisis. This would suggest that operational performance of portfolio companies has declined after the financial crisis, and that those companies had a lower valuation as a result.

There are good reasons why it could have become harder for private equity firms to add operating gains to their target firms after the financial crisis. Competition between private equity firms has increased for example (Ilmanen et al, 2019). In the early 2000s the returns of private equity were higher than those of public equity, making it more attractive for investors to put their money in private equity, which likely has contributed to the increasing competition in the private equity market. The findings of Braun et al (2017), who study the persistence in private equity performance, confirm this increased competition. Implications of this study are that it has become harder for the current top performing private equity firms to stay among the top performing firms in the future. In the more recent years of this study persistence in performance has largely disappeared, suggesting increasing competition between private equity firms. A consequence of this increased competition could be that it has become harder for private equity firms to find targets to which operating gains can be added, because those target firms are already picked by another private equity firm.

Something else what might have a negative influence on the operational performance of target companies are the restrictions in leverage after the crisis. The financial crisis created increasing regulation regarding the amount of debt a company can take (Ilmanen et al, 2019). If these restrictions

make it harder for private equity firms to finance the operational changes they are planning to implement, operating performance of target firms might deteriorate.

There are other papers however that suggest that operational performance of target firms did not decline after the financial crisis relative to before. Brown and Kaplan (2019) find, contrary to previous papers mentioned, that private equity returns remain higher than the returns of public equity after the financial crisis. They argue that they use more reliable data and performance measures than other papers that find a negative development of private equity returns after the financial crisis, which could explain that their findings are not in line with the papers of Ilmanen et al (2019) and Harris et al (2016). The study of Bernstein, Lerner and Mezzanotti et al (2017) provides evidence that operating performance of target firms was not worse after the crisis compared to before the crisis, since the profitability ratios of targets relative to controls did not change around the financial crisis. In addition, they find that buyout firms decreased their investments with a smaller amount than their peers did during the crisis, which had as a consequence that buyout companies grew in size and market share in this period. So while there are good reasons why operating performance of target firms could have deteriorated after the crisis, and some papers indeed indicate this, not all papers are in agreement with this.

2.2 Efficiency developments around the deal

Most papers that examine the operational performance of target companies following a buyout focus on whether the target becomes more profitable. However, potential efficiency improvements might be an important driver behind increasing profitability of the target post-buyout. Both Lichtenberg and Siegel (1990) and Amess and Girma (2009) show that changes in efficiency can have a big impact on profitability and market valuations of firms. That efficiency gains can have a positive impact on profitability seems logical. An increase in efficiency, through an increase in productivity for example, should normally lead to an increase in profitability as well, something also argued by Lichtenberg and Siegel (1990). Besides the influence on profitability, efficiency gains can also result in higher stock prices and market valuations of firms. Lichtenberg and Siegel (1990) and Amess and Girma (2009) provide evidence for this, showing higher market valuations of publicly traded firms after efficiency improvements. These findings suggest that stock markets put a lot of value to efficiency gains of companies.

Many papers that do examine the impact of buyouts on efficiency find significant efficiency improvements post-buyout. Those papers differ however in which time frame around the buyout those improvements take place. Lichtenberg and Siegel (1990) document significant efficiency gains in the first three years after the buyout. They report that target companies were already slightly more efficient in the three years before the buyout, only after the buyout a significant improvement in

efficiency occurs. Besides, it is found that the wages of production workers are immediately reduced post-buyout, indicating that wage cutting could be an important source of short-term efficiency improvements. Alperovych et al (2013) also report efficiency improvements following a buyout using a sample of deals in the 2000s, and in line with Lichtenberg and Siegel (1990), those improvements occur in the first three years post-buyout.

Other papers find efficiency gains in a time frame that deviate from the first three years post-buyout found in the two previous mentioned papers. Amess (2003) even provides evidence for efficiency gains that occur two years before the buyout. Two potential reasons for this finding are given. One is that vendors involved in the buyout try to make the proposition as attractive as possible. Another possibility is that implicit agreements between the acquirer and vendor are made, and as a consequence, managers involved in such an arrangement try to add efficiency gains before the buyout takes place to satisfy the acquirer. Besides the efficiency improvements two years prior to the buyout, improvements are also found in the four years after the deal in the study of Amess (2003). Those superior efficiency gains stop to occur after that period, suggesting a temporary impact of buyouts on efficiency improvements. Wright, Wilson and Robbie (1996) do not find significant improvements in efficiency immediately after the buyout, but show that efficiency gains occur in the second to fifth year post-buyout. They argue that immediate re-organisations or noise in accounting data post-buyout might be reasons why there were not efficiency gains found in the first year post-buyout.

However, not all papers find efficiency gains for target companies post-buyout. Scellato and Ughetto (2013), who study a period of three years post-buyout, find that the development of labour productivity is not significantly different between buyout companies and control firms. This is not in line with the papers of Lichtenberg and Siegel (1990) and Alperovych et al (2013), that find significant efficiency improvements for targets relative to controls in the first three years post-buyout.

Although existing literature is not in agreement when efficiency gains exactly happen, most papers indicate that buyouts do have a positive impact on the efficiency of targets. Only what all previously mentioned papers that examine efficiency changes have in common, is that the period investigated is before the financial crisis. This leaves an interesting gap open to fill in, namely whether private equity firms can still add efficiency gains to their target firms after the financial crisis. As previously described, there are good reasons why it might have been harder to add operating improvements to target firms after the financial crisis. On the other hand, there is not clear evidence that operational performance of target firms decreased after the crisis, and in addition, there are papers that suggest that this did not happen. Since efficiency developments of target companies after the crisis have not been

examined yet to my best knowledge, and existing literature for a large part agrees that private equity firms add efficiency gains to their portfolio firms, I formulate the following hypothesis:

H1 – *Efficiency of target companies improve post-buyout relative to control firms.*

2.3 Potential sources of efficiency gains

There are many papers that have shown that operating improvements may differ for different types of firms and different transaction types. In this section I will argue what the sources of potential efficiency gains might be for different types of companies and transaction types.

2.3.1 Capital intensive firms

Capital intensive firms have a relatively high amount of fixed assets. If firms are capital intensive, there might be a good chance that not all the assets are put to their most efficient use. Private equity firms might come in play here to enhance the efficiency of such firms by reducing inefficient assets. Since for very capital intensive firms returns to capital are expected to be decreasing (Bansraj, Smit and Volosovych, 2020), a lot of potential efficiency gains could be added to such firms by removing redundant assets. Empirical evidence of buyouts in the manufacturing industry, which is known to be a capital intensive industry, points towards improved efficiency for capital intensive firms post-buyout. Davis et al (2014) find for example that for target companies in the manufacturing industry productivity improves relative to control firms. Private equity firms close plants that underperform, and they open new ones which have a higher level of productivity, which results in efficiency improvements of buyout companies. Another source of efficiency gains in the study of Davis et al (2014) is the lowering of labour costs. These costs are immediately reduced in the first two years after the deal, indicating that it is an important source of short-term efficiency improvements.

The studies of Lichtenberg and Siegel (1990) and Harris, Siegel, and Wright (2005) also imply enhanced efficiency in the manufacturing industry following a buyout. Lichtenberg and Siegel (1990) find, in line with Davis et al (2014), that productivity rises significantly following a buyout. An important source for this increase in productivity could be a declining ratio of nonproduction workers to production workers post-buyout found in their study. Nonproduction workers are significantly reduced post-buyout, whereas production workers are not significantly changed, suggesting that private equity firms put more attention to production workers to improve productivity. In addition, wages of production workers are found to increase while compensation of nonproduction workers decrease. Only since the decline of wages for nonproduction workers is larger than the increase of wages for production workers, total labour compensation is decreased in the study of Lichtenberg and Siegel (1990). Harris et al (2005) find that output for buyout companies in the manufacturing industry is reduced post-buyout, but since employment decreases even more, labour productivity is increased. It is suggested

in their paper that buyout companies outsource a part of the production, which results in improved efficiency.

Because of the argument that private equity can improve efficiency of capital intensive firms by removing redundant assets, and evidence in the manufacturing industry that indicates efficiency gains in various ways post-buyout, I propose the following hypothesis:

H2 – *Capital intensive target firms improve in efficiency post-buyout relative to non-capital intensive target firms.*

2.3.2 Financially constrained firms

An important reason why a target firm would want to get involved in a private equity buyout is the access to funds. Amess, Stiebale and Wright (2016) argue that private equity firms play an important role in reducing the financial constraints of target firms, which could for example lead to increasing innovation activity. Other papers focus more on the effect of a buyout on the growth and investments of financially constrained firms. Engel and Stiebale (2014) show that private equity buyouts result in higher investments of target firms, but only for small and medium-sized enterprises, since it is argued that those firms are more likely to be financially constrained before the buyout. Boucly et al (2011) provide evidence that financially dependent target firms grow more and increase their capital expenditures relative to non-financially constrained firms.

It seems clear that financially constrained firms can profit from the funds of private equity firms in various ways. But to my best knowledge, it has not been examined in existing literature whether financially constrained firms become more efficient relative to non-financially constrained firms following a buyout. I expect that firms which are financially constrained before the buyout have more limitations in the operations they want to take on. This could result in situations where such firms are not able to make strategic changes to more efficient operations, since such changes often require an initial investment, for which the funds of private equity firms could be a solution. Besides, financially constrained firms might not only need the funding of private equity firms, but also the expertise. Since existing literature has shown that private equity firms are able to improve the efficiency of target companies, financially constrained firms could use the help of private equity to make such efficiency improvements, which might reduce the problems regarding financial constraints. Therefore I formulate the following hypothesis:

H3 – *Financially constrained target firms improve in efficiency post-buyout relative to non-financially constrained target firms.*

2.3.3 Different types of pre-deal ownership structures

The pre-deal ownership structure of the target company is an important determinant for the possibilities to add efficiency gains to the target (Alperovych et al, 2013). There are four different types of ownership structures that can be distinguished: divisional buyouts, private-to-private transactions, secondary buyouts and public-to-private transactions. Both with private-to-private transactions and secondary buyouts the target company is privately owned before the deal. The difference is that in private-to-private transactions the seller is an individual or family (Boucly et al, 2011), while for secondary buyouts the target company was formerly owned by another private equity firm. A divisional buyout is a buyout in which the target company was initially a business unit, subsidiary or division of a parent company (Meuleman, Amess, Wright and Scholes, 2009). When the acquired company was a public company before the deal, the transaction is called a public-to-private transaction.

It is often argued in existing literature that divisional buyouts might be most suitable of all pre-buyout ownership structures for efficiency improvements. Typical issues of large organizations are for instance that the strategic control over divisions is poor and that there might be limitations in the internal capital markets of such organizations (Hoskisson and Turk, 1990). If this is the case, a division might not get the funds it needs to make potential profitable investments, for which the funding of a private equity firm could be the solution. Other shortcomings of large conglomerates might be that the parents do not put enough attention to distant divisions, or that it is hard for parents to understand other divisions of large and complex organizations (Alperovych et al, 2013). Agency problems are also a typical problem of large organizations, where ownership and management are separated. As a consequence, there could be a conflict of interest between ownership and management, or the control of the shareholders over managers is not optimal (Wright, Hoskisson and Busenitz, 2001). A private equity firm might be able to alleviate these problems by taking a division private.

The agency problems that apply to large organizations are typically non-existent for private-to-private transactions. As Howort, Westhead and Wright (2004) describe, private firms that are owned by a family or individual normally do not have a separation of ownership and control. This could lead to managers that act more in the interest of the company as opposed to managers of large organizations, and as a consequence, managers of private firms might have more incentives to increase the profitability of the company (Alperovych et al, 2013). When this is the case, it can be argued that for private-to-private transactions less efficiency gains can be added, since prior to the deal the ownership structure is more efficient. On the other hand, buyouts of family firms could give rise to opportunities for strategic changes, especially for companies operating in dynamic markets (Dyck, Mauws, Starke and Mischke, 2002). In addition, Scholes, Wright, Westhead, Bruining and Kloeckner (2009) argue that

family firms also follow non-economic goals, which might be in conflict with the focus on operational performance, which in turn could give room for efficiency gains that can be added by private equity firms.

For secondary buyouts it is often argued that there is not much room left for efficiency improvements, since the previous private equity owner already had the opportunity to add the possible efficiency improvements. As Wang (2012) argues, the occurrence of a secondary buyout cannot be explained by the usual arguments of why a buyout occurs, when there is for example room for operating improvements. So there must be other reasons at play for why a secondary buyout would take place. An important explanation is given by Wright, Robbie and Albrighton (2000), who argue that for buyouts an exit must take place after a specified period. If there are no other exit routes available, a secondary buyout might be a solution.

The agency problems that exist for divisions of large organizations can also be applied to publicly traded companies, which are large organizations too. This might, in line with divisional buyouts, give a good reason for potential efficiency improvements in public-to-private transactions. On the other hand, the limitations of funding which may exist for individual divisions are non-existent for publicly traded companies. Firstly, the problems of the internal capital markets of large organizations that Hoskisson and Turk (1990) describe, which could result in limitations in funding for individual divisions, are not a problem for a publicly traded company as a whole. Second, publicly traded companies have the possibility to attract additional funding through secondary market offerings, and are as described by Boucly et al (2011) therefore not likely to be financially constrained.

It can be derived from previous paragraphs that post-buyout efficiency can strongly depend on the previous ownership structure. Since most reasons for efficiency improvements can be found for divisional buyouts, and some of these reasons do not apply to other buyout types, I expect the efficiency gains following a deal to be strongest for divisional buyouts. Therefore I formulate the following hypothesis:

H4 – Efficiency improvements of target firms are more concentrated in divisional buyouts relative to other buyout types.

2.3.4 Domestic vs foreign transactions

Cross-border private equity transactions have grown in importance over time. The study of Mailander (1997) shows that in the 1990s foreign equity holdings of US investors grew. This was mainly due to institutional changes, like the fall of the Berlin Wall at the end of the 1980s and the development of democratic principles in Latin America. These events contributed to a developed interest of private equity firms in foreign companies in the 1990s (Mailander, 1997). However, it is emphasized that

international private equity investments were in its early years during that time, and its success depended on the availability of exit opportunities for foreign target companies. The internationalization of the private equity market developed further in the 2000s (Cornelius, 2011). Although the private equity market was still largest in the United States at the end of the 2000s, other regions over the world were catching up. This left open more investment opportunities for private equity firms in foreign countries, which likely contributed to a further development of cross-border transactions. In line with this, Humphery-Jenner et al (2017) write that cross-border mergers and acquisitions in general have developed further after the financial crisis, and had a total deal value of 40% of all mergers and acquisitions in 2015, in which private equity backed deals played an important role.

Since international private equity transactions have grown over time, it is relevant to know how those deals perform relative to domestic transactions. The information asymmetry theory indicates that cross-border transactions have a lower change of increasing operating performance of target companies relative to domestic deals. According to this theory foreign acquirers have an information disadvantage about the target company and its market compared to domestic acquirers, which might be an important determinant for the relative performance of domestic versus foreign transactions (Humphery-Jenner et al, 2017). Information asymmetry between a target firm and foreign acquirer could for example arise because of differences in language or in legal and accounting standards between countries. In addition, domestic acquirers are better able to visit companies or talk with directors or employees of target companies, and are as a consequence likely to know more about the corporate culture than foreign acquirers (Kang and Kim, 2010). Because of these information disadvantages there is often a liability of being a foreign acquirer relative to a domestic one (Zaheer, 1995).

A solution for the information asymmetry problems might be cross-border syndication. In such a syndication, a foreign private equity firm works together with a local partner when investing abroad (Meuleman and Wright, 2011). Since local partners are likely to know more about the local market and country in which is invested, information asymmetry problems might be reduced. Another reason why cross-border transactions do not necessarily have to underperform domestic transactions, or maybe even could outperform domestic transactions, is that private equity firms that engage in foreign transactions are likely to have large international networks. As Hochberg, Ljungqvist and Lu (2007) describe, networks and relationships are essential in financial markets. In their study, in which they focus on venture capital funds, it is showed that a better network increases the performance of the funds, which might also be applied to private equity firms.

Despite potential reasons why foreign transactions could perform as good as, or maybe even outperform, domestic transactions, I expect that the problems regarding information asymmetry are more prevalent in determining the relative performance of those two transaction types. Therefore I propose the following hypothesis:

H5 – *Efficiency gains of target companies post-buyout are more concentrated in domestic deals relative to foreign deals.*

3. Data

3.1 Data sample

My dataset consists of 316 deals over the period 2011-2015. I choose this period because operational performance of private equity owned firms have not been extensively examined yet in the years after the financial crisis. This allows me to investigate if performance of target companies in terms of efficiency differs after the financial crisis relative to the efficiency gains before the crisis reported by other papers. The sample period is stopped in 2015 since I require target companies to report several years of financial data after the deal. I focus in my research on North-West Europe, and more specifically on the following countries: Belgium, Germany, Spain, Finland, France, Great-Brittain and Sweden. These countries are known to have good data coverage, and by selecting different countries I can account for country specific trends. The data is retrieved from the Zephyr and Orbis databases, where deal data is from Zephyr and financial data about target companies from Orbis. These databases are both from Bureau van Dijk (BvD) and can be merged with each other through a common BvD identifier. By collecting deal data from Zephyr I ensure that the deals are backed by a private equity firm. Several criteria in Zephyr can be selected which makes sure I am only left with private equity backed transactions.

Orbis, which includes balance sheets and income statements of both private and public firms, is the largest cross-country database on the firm level (Kalemli-Ozcan, Sorensen, Villegas-Sanchez, Volosovych and Yesiltas, 2015). Since most private equity deals involve private companies, see for example studies of Boucly et al (2011) and Strömberg (2008), it is important that data coverage of private firms is sufficient. For the Orbis database the data coverage of private companies is good, which makes it a suitable database for my research. I require target firms to report data of the relevant financials three years before the deal and four years after. This way I can identify pre-deal trends in efficiency, profitability and size, and use those trends in matching target firms to control firms. Furthermore, the time frame of four years post-deal should be long enough for private equity firms to implement their operational changes, which allows me to carefully determine the effect of a buyout

on the efficiency development of the target. I use consolidated data of the target companies when available, since companies are often acquired including all the subsidiaries. I dropped target companies which had incomplete data or had a negative value for either assets or employees in any year as recommended by Kalemli-Ozcan et al (2015). After cleaning the data I ended up with 316 target firms.

In table 1 it can be seen that most deal occurred between 2012 to 2014. In 2011 only five of the 316 deals in my sample took place, which is probably due to the aftermath of the financial crisis. 2015 is also not good represented in my sample with only 17 deals, which might be a result of the requirement in my study that target companies must report four years of post-deal data. Since for deals in 2015 target firms must report data in 2019, and it is likely that for many firms not all financial data has been reported yet in Orbis over 2019, a lot of deals from 2015 are dropped. When the sample is divided by industry, it stands out that the manufacturing industry is clearly the best represented industry with almost 45% of the deals. This is not surprising, given that this industry has been extensively examined by several researchers (see for example Lichtenberg and Siegel, 1990; Harris et al, 2005), which makes it likely that data coverage of this industry is good. The service sector is also well represented in my sample, since it counts for 29% of the deals. That these two sectors are disproportionately represented is in line with the study of Davis et al (2014), who also find that target firms in their data are concentrated in the manufacturing and service industry. The other seven industries are in total by 25% of the deals represented in my sample, which means that they are individually not well represented. Finally, it can be seen in table 1 that the UK is by far the best represented country in my sample, which is also not surprising given that Kaplan and Stromberg (2009) show that the UK has the largest private equity market after the United States and Canada over the period 1970 - 2007.

Table 1: Overview of how the deals are divided by deal year, industry and country.

	Amount of deals	Deal percentage
Deal year		
2011	5	1,58%
2012	77	24,37%
2013	114	36,08%
2014	103	32,59%
2015	17	5,38%
Total	316	100,00%
Industry division (based on SIC codes)		
Agriculture, Forestry & Fishing	3	0,95%
Mining	1	0,32%
Construction	13	4,11%
Manufacturing	141	44,62%
Transportation & Public Utilities	22	6,96%
Wholesale trade	14	4,43%
Retail trade	21	6,65%
Finance, Insurance & Real Estate	9	2,85%
Services	92	29,11%
Total	316	100,00%
Country		
Belgium	31	9,81%
Germany	30	9,49%
Spain	59	18,67%
Finland	1	0,32%
France	47	14,87%
United Kingdom	126	39,87%
Sweden	22	6,96%
Total	316	100,00%

3.2 Sample splitting

After analysing the whole sample, the sample is split according to pre-buyout ownership structure and whether the acquirer and target are from the same country or not. This allows me to examine further how efficiency developments might be different for different types of buyouts. I distinguish between the following pre-buyout ownership structures: private-to-private transactions, divisional buyouts, secondary buyouts and public-to-private transactions. In some cases the variable 'deal sub-type'

provided by Zephyr can tell whether the deal is a secondary buyout or not, but in most cases I need to look up in Orbis the ownership structure of the target company before the buyout in order to determine the pre-buyout ownership structure. To do this I download in Orbis data of the ownership structure on the 31st of December in the year before the deal year. So for example when a deal takes place in 2011, I look at the ownership structure of the target at the 31st of December in 2010.

Most deals consist of divisional buyouts and private-to-private transactions, with 38.9% and 37,7% of the deals, respectively. This is in line with the samples of Boucly et al (2011) and Strömberg (2008), except for the fact that in their samples the private-to-private transactions count for most of the deals. A reason for that divisional buyouts are now more represented in my sample than those two former studies might be that this type of deal has increased over time, which Strömberg (2008) shows in his sample that goes from 1970 to 2007. Since my study focuses on the period 2011 to 2015, it is not weird that the amount of divisional buyouts is now slightly larger than private-to-private transactions, given this increase over time. Finally, my sample consists for 15,2% of secondary buyouts and for 8,2% of public-to-private transactions, which are also comparable numbers to the samples of Boucly et al (2011) and Strömberg (2008).

Furthermore, I distinguish between domestic and foreign transactions. The buyout is called a domestic transaction if the acquirer and target are from the same country, and a foreign transaction if they are from different countries. To determine whether an acquirer is from the same country as the target I use the country code that Zephyr provides. When this data is missing, I manually look it up at the acquirer's website. Of the 316 target firms in my sample, I have 205 domestic transactions, 94 foreign transactions and 17 transactions of which I was not able to determine from which country the acquiring company was.

I also examine whether capital intensive and financially dependent target firms become more efficient post-buyout, compared to respectively non-capital intensive and non-financially constrained target firms. To determine the capital intensity of a company, I first divide fixed assets by employees, which is also done in the study of Bansraj et al (2020). A firm is capital intensive in my sample when this ratio is higher than the median value of all targets in the year before the deal. Financially dependent firms are the target companies that have a cash in assets ratio lower than the median value of all targets in the pre-deal year. The intuition behind this is that private equity firms can reduce the financial constraints of firms by providing access to external finance (Engel and Stiebale, 2014). Since the firms that have relatively much cash are expected to be less dependent on external finance, they are considered as non-financially constrained, and firms that have relatively little cash are considered as financially constrained firms.

3.3 Efficiency measurements

There are different measurements that can indicate efficiency gains. In table 2 I provide an overview of the used efficiency indicators and the corresponding calculations. Often used efficiency measurements focus on productivity, either measured by a production function or accounting ratios. I focus on accounting ratios to indicate productivity, and use asset turnover and sales over employees to measure it. Other ways to increase efficiency are reduction in working capital or cash. Boucly et al (2011) argue that value can be created by collecting the payments of customers sooner and shorten the inventories. Besides, it is argued that efficiency can be enhanced by using cash more productively. Also Smith (1990) argues, and find evidence, that efficiency can be improved by shorten the period in which account receivables are collected, while holding the period in which suppliers are payed constant. Following Boucly et al (2011) and Smith (1990), I expect working capital in assets and the current ratio to decline post-buyout. In addition, since Boucly et al (2011) argue that it is expected that buyout firms use cash more productively, I expect cash in assets to decline.

Wage reductions after a buyout can also be an important source of short-term efficiency gains (Kaplan and Stromberg, 2009). To indicate wages I use the average employment costs per employee. Finally, the reduction of taxes can be a helpful source to increase efficiency post-buyout. Kaplan (1989b) argues that following a buyout the increase in debt results in higher tax-deductible interest expenses, which in turn results in lower taxes. I use the ratio of tax in assets to measure the development of taxes after a buyout. Besides the efficiency measurements, I also study the development of profitability (measured by return on assets), size (measured by assets and employment) and the use of debt (measured by leverage ratio) post-buyout. These measurements are specified in table 2 as well with the corresponding calculations.

Table 2: Description of the used variables in my analyses.

Category	Measurement	Calculation
Efficiency	Asset turnover (ATO)	Sales / total assets
	Sales over employees	Sales / employees
	Working capital in assets	Working capital / total assets
	Current ratio	Current assets / current liabilities
	Cash in assets	Cash / total assets
	Average employment costs	Total employment costs / employees
	Tax in assets	Tax / total assets
Profitability	Return on assets (ROA)	Ebitda / total assets
Size	Assets	Logarithm of total assets
	Employment	Logarithm of employees
Leverage	Leverage ratio	Debt / assets

4. Methodology

4.1 Regressions

To determine the effect of a buyout on the efficiency development I use the difference-in-difference method. With this method I am able to measure the difference in performance of target and control firms, and compare this difference before and after the private equity deal took place. The following regression is estimated:

$$Y_{it} = \alpha + \beta_1 POST_{it} + \beta_2 POST_{it} * DEAL_i + n_i + n_t + \varepsilon_{it} \quad (1)$$

where Y_{it} are the different variables as described in table 2 for firm i in year t . $POST_{it}$ equals one in the four years after the deal and zero in the year $t-1$, whereas $DEAL_i$ equals one when the company is a target firm and zero for control firms. β_2 is the difference-in-difference estimator and measures the effect of a buyout on the performance of the target. The dummy $POST_{it}$ is included to control for potential trends over time that could influence both the target and control firm. Firm and year fixed effects are used in this regression to control for unobservable firm specific factors and trends over time. In addition, error terms are clustered at the firm and year level.

I also study how efficiency is developed each year post-buyout for target firms. To do this I estimate the following regression:

$$Y_{it} = \alpha + \beta_1 YEAR_{it} * DEAL_i + n_i + n_t + \varepsilon_{it} \quad (2)$$

where $YEAR_{it}$ is a categorical variable that uses as the reference year the year before the deal, and takes a separate value for each of the four years after the deal. The coefficient β_1 shows in which years the efficiency gains take place, if there are any.

To examine whether the efficiency developments are more pronounced for capital intensive and financially constrained target firms, the following two regressions are estimated:

$$Y_{it} = \alpha + \beta_1 POST_{it} + \beta_2 POST_{it} * DEAL_i + \beta_3 POST_{it} * DEAL_i * CapInt_i + n_i + n_t + \varepsilon_{it} \quad (3)$$

$$Y_{it} = \alpha + \beta_1 POST_{it} + \beta_2 POST_{it} * DEAL_i + \beta_3 POST_{it} * DEAL_i * FinDep_i + n_i + n_t + \varepsilon_{it} \quad (4)$$

CapInt_i is a dummy variable that takes value one for target firms with a ratio of fixed assets / employees above the median value of all targets in the pre-deal year, and value zero otherwise. *FinDep_i* is a dummy that takes value one for target firms with a cash / assets ratio below the median value in the pre-deal year, and zero otherwise. The coefficient β_3 is the coefficient of interest in the two regressions above. This coefficient measures how efficiency develops in (3) for target companies that are capital intensive and in (4) for target companies that are financially constrained.

4.2 Matching of target to control firms

To construct the control group I download the relevant financials of all companies from the countries that are represented among the target firms. I require the companies to report data of total assets and number of employees in all the last 10 relative years, to shorten the amount of companies from which I need to download data. To ensure that the control group does not include private equity owned companies, I download all private equity deals between 2005 and 2019 and merge the targets of those deals to the control group, after which merged observations are dropped. I end up with approximately 52.000 control firms after cleaning the control group data.

I use propensity score matching to match control firms to targets. Blundel and Dias (2000) find in their study, in which they apply non-experimental methods to labour market programmes, that propensity score matching is especially robust in conjunction with the difference-in-difference method. Since I intend to use the difference-in-difference method in the regression analyses, I believe that propensity score matching is an appropriate matching method for my study. Another reason why I use propensity score matching is that I am able to extract three years of pre-deal data of targets and controls. This allows me to match on pre-deal trends, something Blundel and Dias (2000) and Roberts and Whited (2013) emphasize is important to do in order to get accurate matches. Besides, it could make the problems related to the endogeneity of private equity deals less stringent, since buyouts are not exogenous (Boucly et al, 2011). Private equity firms could for example target firms that were already expanding or becoming more efficient, so matching on pre-deal trends would reduce the problem regarding endogeneity.

Roberts and Whited (2013) also advise to match on firm characteristics. Therefore I match on the following firm characteristics and pre-deal trends of these characteristics: size (log assets), profitability (return on assets) and efficiency (asset turnover). Pre-deal trends are determined by calculating the growth of assets and the change in return on assets and asset turnover between year t-1 and year t-3. I also require the target and control firms to be in the same 2-digit industry, deal year and country. This way certain changes which are country, industry or year specific and that could influence the performance target and control firms, do not affect the results.

Nearest neighbour matching with replacement is the method used for matching and I require each target firm to have five control firms. Nearest neighbour matching can also be performed without replacement. With this matching method a control firm can only be matched once to a target, while matching with replacement allows a control firm to be matched more than once to a target firm. A disadvantage of matching without replacement is that the order of how target firms are matched to controls could affect the estimated effect, as argued by Roberts and Whited (2013). Moreover, matching with replacement increases the quality of the matches and decreases the bias relative to matching without replacement. On the other hand, the precision of matches is better when matching without replacement. But since Roberts and Whited (2013) emphasize that proper identification has the priority in most corporate finance research, in which case the quality of the matches is more important, I choose to match with replacement. This matching procedure leaves me with 316 target firms and 1401 control firms.

4.3 Targets and controls compared

In table 3, where the mean values of the variables of matched treated and control firms are reported, it can be seen that there is a significant difference in size between the treated and control group. The mean of log assets is significantly higher at the 1% level for the treated group. Furthermore, controls have on average a higher asset turnover in the pre-deal year, suggesting that private equity firms pick firms that have a low productivity to which they can add efficiency gains. Return on assets is not significantly different between treated and control firms, which means that those two groups are not different in terms of profitability before the deal. The significant size and efficiency differences between the treated and control firms pre-buyout could raise concerns that target firms are already different than controls before the deal takes place, which could affect the outcomes. Reassuring is that I use firm fixed effects in the regression analyses, which would take care of persistent differences if there were any. Often a bigger concern is that private equity firms pick firms that were already developing in another way than controls (Boucly et al, 2011). If a target firm was already becoming more efficient than a control firm before the deal, and this trend just keeps going after the deal, efficiency gains might be incorrectly assigned to the buyout, whereas it could have been that without the buyout the target firm would also keep increasing in efficiency. Most important therefore is that the change and growth in the matching variables before the deal are not significantly different between targets and controls (Bansraj et al, 2020). From table 3 it can be derived that this is the case.

There are also some differences in the mean of other level variables in the pre-deal year. Working capital in assets, the current ratio, average employment costs per employee, log employment and leverage are significantly different between target and control firms. However, the other level

variables are not significantly different in the pre-deal year, which are: sales over employees, cash in assets and tax in assets.

Table 3: Pre-deal year differences between treated and control firms. Matching is performed on asset turnover (ATO), log assets, return on assets (ROA), change in ATO, asset growth and change in ROA. Robust standard errors are reported in parentheses. ***, **, * indicate a significance level of 1%, 5% and 10%, respectively.

	Mean treated	Mean control	Difference	T-stat
Matching variables				
ATO	1.320	1.468	-0.148***	(2.839)
Log assets	17.598	17.117	0.480***	(-4.460)
ROA	0.116	0.123	-0.008	(1.562)
Pre ATO change	0.034	0.046	-0.013	(0.415)
Pre asset growth	0.007	0.008	-0.000	(0.047)
Pre ROA change	0.010	0.007	0.002	(-0.335)
Other outcome variables				
Sales over employees	370.067	378.445	-8.378	(0.410)
Working capital in assets	0.210	0.239	-0.029**	(2.458)
Current ratio	1.678	1.929	-0.251***	(3.241)
Cash in assets	0.107	0.104	0.003	(-0.398)
Average employment costs	64.287	60.391	3.896***	(-2.792)
Tax in assets	0.016	0.017	-0.002	(1.522)
Log employment	5.092	4.763	0.330***	(-3.233)
Leverage	0.850	0.783	0.067***	(-3.845)

Since potential outliers can negatively influence the accuracy of the estimates, I winsorize the ratios before the matching procedure at the 5th and 95th percentile. Osborne & Overbay (2004) for example show strong benefits of removing outliers, since in most of their analyses accuracy increased while errors of inference substantially decreased after correcting for outliers. Winsorizing at the 5th and 95th level should take care of potential outliers as these levels are not uncommon for research in private equity, since these percentiles are for instance also used by Acharya et al (2013) and Castellaneta and Gottschalg (2016).

5. Results

In this section I will show the results of my study and interpret them. First I will show the results for the whole sample, after that I will give the results when the interaction terms with capital intensity and financial dependency are included. Finally, the results for the separated samples according to the pre-buyout ownership structure and whether it is a domestic or foreign transaction are shown.

5.1 Whole sample

In table 4 the results for the whole sample are shown. The dummy *Post* indicates the period after the deal, and equals one in the four years after the deal and zero in the year before the deal. *Deal* is a dummy variable that takes value one for target companies and zero for control firms. The interaction *Post x Deal* measures the effect of a buyout on the performance of target firms and is the coefficient of interest. Error terms are clustered at the company and year level.

The efficiency measurements are the dependent variables in the models 1 to 7. From table 4 it can be derived that there is some evidence for improved efficiency for target firms post-buyout, given that cash in assets and average employment costs are significantly declined in model 5 and 6, respectively. This is consistent with the thought that private equity firms try to use cash in a more productive way instead of keeping it, something Boucly et al (2011) argue as well. To be said has that asset turnover (model 1) and sales over employees (model 2) are not significantly improved, so the lower cash holdings do not cause any productivity improvements. The declining of the average employment costs is in line with the idea that private equity firms cut wages to reduce expenses in the short term, for example found in the studies of Davis et al (2014) and Lichtenberg and Siegel (1990), and which can count on a lot of critique (Kaplan and Stromberg, 2009). Reassuring however is that employment (model 10) of target firms is significantly increased post-buyout, contrary to the fear and critique that employees of target firms suffer job losses (Kaplan and Stromberg, 2009). In addition, assets (model 9) are significantly increased post-buyout, indicating that private equity firms invest in growth, something also found by for example Boucly et al (2011). It seems therefore likely that the declining of cash in assets is mostly due to the increase of assets, while holding cash levels constant.

While the declining of cash in assets and average employment costs indicate some efficiency gains for target companies, other ratios that measure productivity, working capital and taxes are not significantly changed post-buyout. That productivity is not changed following a buyout is contrary to most previous research, like the studies of Lichtenberg and Siegel (1990), Amess (2003) and Alperovych et al (2013), which find that private equity firms are able to increase the productivity of target firms. My paper differs however in the measurement of productivity. Whereas previous mentioned papers measure productivity through production functions, I use accounting ratios to determine the productivity, what might explain the different results. Another reason what might explain the difference is that I study the period after the financial crisis, whereas previous mentioned papers look at the period before the crisis. Ilmanen et al (2019) write that competition between private equity firms has increased after the financial crisis, and as a consequence, it might have become harder for private equity firms to find target firms to which operating improvements can be added. In line with this explanation, return on assets (model 8) is also not significantly improved post-buyout in my study.

Table 4: Sample of target firms and their corresponding control firms. Sample period is 2011-2015. *Post* is a dummy variable that equals value 1 in the years t+1 to t+4, and value 0 in year t-1. *Deal* is a dummy variable which takes value 1 when the company is a target company and 0 for control firms. *Empl* is total employees. *WorkCap* is working capital. *CurRatio* is the current ratio. *Av. Cost per Empl.* is the average employment costs per employee. All regressions include firm and year fixed effects. Error terms are clustered at the company and year level. Robust standard errors are reported in parentheses. ***, **, * indicate a significance level of 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	ATO	Sales / Empl	WorkCap / Assets	CurRatio	Cash / Assets	Av Cost per Empl.	Tax / Assets	ROA	LogAssets	LogEmployment	Leverage
Post x Deal	0.021 (0.023)	0.906 (7.138)	-0.005 (0.005)	0.064 (0.056)	-0.015*** (0.005)	-1.323*** (0.508)	-0.001 (0.001)	0.003 (0.004)	0.087*** (0.023)	0.109*** (0.020)	0.010 (0.011)
Post	-0.086*** (0.009)	-40.944*** (2.603)	-0.006*** (0.002)	0.146*** (0.021)	0.011*** (0.002)	-5.228*** (0.188)	-0.002*** (0.000)	-0.007*** (0.001)	0.032*** (0.008)	0.086*** (0.008)	-0.032*** (0.004)
Observations	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.019	0.046	0.002	0.011	0.005	0.119	0.007	0.004	0.012	0.044	0.013

I also look at how potential efficiency changes develop each year after the buyout, of which the results are reported in table 5. The variable *Year* is a categorical variable that uses as the reference year the year before the deal takes place, and takes a separate value for each of the four years after the deal. Average employment costs in model 6 are every year significantly reduced, while cash in assets (model 5) is only in year 1 not significantly declined. In addition, it can be seen that the current ratio in model 4 is significantly increased at the 10% level in the first year post-buyout, which is against the idea that target firms improve efficiency by shorten inventories and collect payments of customers sooner. Finally, there is weak evidence that private equity firms lower the taxes of their target firms, given the significant decline of tax in assets (model 7) in year 3 at the 10% level. Overall, there is some evidence in favour of hypothesis one, since cash in assets and the average employment costs decline post-buyout. On the other hand, productivity is not improved, taxes are not lowered and private equity firms are also not able to shorten inventories and account receivables, given that working capital in assets and the current ratio are not changed post-buyout in table 4.

Table 5: Sample of target firms and their corresponding control firms. Sample period is 2011-2015. The variable *Year* is a categorical variable which takes value 0 for year t-1 and a unique value for each of the four years after the deal. *Deal* is a dummy variable which equals 1 for the target firms and 0 for control firms. *Empl* is total employees. *WorkCap* is working capital. *CurRatio* is the current ratio. *Av. Cost per Empl.* is the average employment costs per employee. All regressions include firm and year fixed effects. Error terms are clustered at the company and year level. Robust standard errors are reported in parentheses. ***, **, * indicate a significance level of 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	ATO	Sales / Empl	WorkCap / Assets	CurRatio	Cash / Assets	Av. Cost per Empl.	Tax / Assets	ROA	LogAssets	LogEmployment	Leverage
Year+1 x Deal	0.013 (0.026)	-2.209 (8.513)	-0.005 (0.006)	0.122* (0.063)	-0.008 (0.005)	-1.450** (0.604)	-0.002 (0.001)	0.002 (0.004)	0.058** (0.026)	0.076*** (0.022)	-0.009 (0.012)
Year+2 x Deal	0.024 (0.024)	-3.284 (7.787)	-0.004 (0.006)	0.030 (0.060)	-0.014*** (0.005)	-1.521*** (0.577)	-0.001 (0.001)	0.004 (0.004)	0.078*** (0.024)	0.111*** (0.021)	0.019* (0.011)
Year+3 x Deal	0.023 (0.025)	0.588 (8.115)	-0.003 (0.006)	0.060 (0.062)	-0.016*** (0.005)	-1.034* (0.589)	-0.002* (0.001)	0.001 (0.004)	0.099*** (0.026)	0.132*** (0.022)	0.016 (0.012)
Year+4 x Deal	0.026 (0.026)	8.529 (8.693)	-0.008 (0.006)	0.045 (0.066)	-0.022*** (0.006)	-1.285** (0.611)	-0.001 (0.001)	0.004 (0.005)	0.111*** (0.028)	0.119*** (0.024)	0.014 (0.013)
Year+1	-0.055*** (0.010)	-27.520*** (2.899)	-0.002 (0.002)	0.097*** (0.024)	0.007*** (0.002)	-2.934*** (0.234)	-0.001*** (0.000)	-0.003** (0.002)	0.021*** (0.008)	0.047*** (0.008)	-0.024*** (0.004)
Year+2	-0.080*** (0.010)	-49.717*** (2.872)	-0.007*** (0.002)	0.176*** (0.023)	0.011*** (0.002)	-6.504*** (0.216)	-0.001*** (0.000)	-0.005*** (0.002)	-0.008 (0.008)	0.079*** (0.008)	-0.032*** (0.004)
Year+3	-0.104*** (0.010)	-48.765*** (2.964)	-0.010*** (0.002)	0.136*** (0.023)	0.011*** (0.002)	-6.409*** (0.221)	-0.002*** (0.000)	-0.009*** (0.002)	0.033*** (0.008)	0.095*** (0.009)	-0.033*** (0.004)
Year+4	-0.106*** (0.010)	-37.775*** (3.189)	-0.006** (0.003)	0.172*** (0.026)	0.013*** (0.002)	-5.063*** (0.234)	-0.002*** (0.000)	-0.012*** (0.002)	0.084*** (0.009)	0.122*** (0.009)	-0.039*** (0.005)
Observations	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.024	0.058	0.002	0.012	0.006	0.159	0.008	0.009	0.036	0.061	0.015

5.2 Capital intensive firms

Next, I examine whether target companies that are capital intensive become more efficient post-buyout relative to target firms that are not capital intensive. The results of this hypothesis are reported in table 6. *Cap. Int.* is a dummy variable that indicates capital intensive firms, and which takes value one when the target has a fixed assets to employees ratio higher than the median value of all targets, and value zero otherwise. The triple interaction term *Post x Deal x Cap. Int.* is the coefficient of interest, which measures if target firms that are capital intensive become more efficient post-buyout than targets that are not.

Consistent with the idea that private equity firms remove inefficient assets of capital intensive firms, assets are significantly decreased in model 9, and productivity, measured by asset turnover in model

1, is significantly increased post-buyout. Asset turnover is probably increased by holding sales constant while selling off redundant assets. The increased asset turnover provides evidence in favour of the second hypothesis, in which is argued that capital intensive target firms become more efficient following a buyout relative to non-capital intensive target firms. The other productivity measure, sales over employees (model 2), is not increased however. It can also be derived from the increased return on assets in model 8 that private equity firms are able to keep the profits of capital intensive firms constant while assets are decreased, indicating increased relative profitability. It seems like that the increased asset turnover has caused the return on assets also to increase, which is in line with the argument of Lichtenberg and Siegel (1990), who state that an increase in productivity should lead to an increase in profitability as well.

In line with the whole sample, average employment costs (model 6) are decreased post-buyout, only now weaker significant at the 10% level. Contrary to the idea that private equity firms can enhance efficiency by reducing working capital and putting cash to more efficient use, it can be seen in model 3 and 4 that working capital in assets and cash in assets are significantly increased post-buyout for capital intensive target firms. A logic explanation for this finding might be that private equity firms sell redundant assets for cash, which in turn increases the cash holdings and thus working capital too, since cash is a part of working capital. Another interpretation is that working capital and cash stay constant after the buyout while assets are decreased, which causes these ratios to increase. It can also be seen in model 7 that tax in assets is significantly increased for capital intensive target firms, contrary to the idea that private equity firms reduce taxes through the increase of tax-deductible interest expenses. However, it again seems likely that tax in assets is mostly due to the decrease of assets increased, while taxes are held constant. The changes in the ratios of cash, working capital and taxes are not in line with hypothesis two. It could be however that private equity firms focus more on productivity improvements and lowering of labour costs in order to improve the efficiency of capital intensive firms, given the increase in asset turnover and decrease of average employment costs. This is also consistent with prior research like the studies of Davis et al (2014) and Lichtenberg and Siegel (1990).

Table 6: Sample of target firms and their corresponding control firms. Sample period is 2011-2015. *Post* is a dummy variable that equals value 1 in the years t+1 to t+4, and value 0 in year t-1. *Deal* is a dummy variable which takes value 1 when the company is a target company and 0 for control firms. *Cap. Int.* is a dummy variable which equals 1 when the target firm has a capital intensity higher than the median value of all targets in the pre-deal year, measured by fixed assets / employees. *Empl* is total employees. *WorkCap* is working capital. *CurRatio* is the current ratio. *Av. Cost per Empl.* is the average employment costs per employee. All regressions include firm and year fixed effects. Error terms are clustered at the company and year level. Robust standard errors are reported in parentheses. ***, **, * indicate a significance level of 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	ATO	Sales / Empl	WorkCap / Assets	CurRatio	Cash / Assets	Av. Cost per Empl.	Tax / Assets	ROA	LogAssets	LogEmployment	Leverage
Post x Deal x Cap. Int.	0.214*** (0.044)	2.942 (14.262)	0.040*** (0.010)	-0.034 (0.111)	0.030*** (0.010)	-1.790* (1.007)	0.009*** (0.002)	0.032*** (0.007)	-0.134*** (0.046)	-0.012 (0.040)	0.034 (0.021)
Post x Deal	-0.085** (0.036)	-0.582 (8.188)	-0.025*** (0.008)	0.081 (0.077)	-0.030*** (0.008)	-0.429 (0.648)	-0.006*** (0.001)	-0.013** (0.005)	0.154*** (0.030)	0.115*** (0.026)	-0.007 (0.015)
Post x Cap. Int.	0.046*** (0.018)	-15.765*** (5.196)	0.012*** (0.004)	-0.002 (0.041)	-0.004 (0.003)	-1.057*** (0.375)	0.000 (0.001)	-0.003 (0.003)	-0.046*** (0.015)	0.018 (0.015)	0.003 (0.007)
Post	-0.109*** (0.012)	-33.045*** (3.666)	-0.013*** (0.003)	0.147*** (0.027)	0.013*** (0.003)	-4.698*** (0.258)	-0.002*** (0.000)	-0.006*** (0.002)	0.055*** (0.010)	0.077*** (0.011)	-0.033*** (0.005)
Observations	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.029	0.048	0.009	0.011	0.007	0.121	0.014	0.008	0.019	0.044	0.014

In the appendix in table A.1 the triple interaction term with the categorical variable *Year* instead of the dummy *Post* is reported, to see how efficiency develops for capital intensive target firms per year after the deal. The results of these regressions are not surprising, since the variables which are significant in table 7 are now each year significant with the same sign. Only in model 5 average employment costs are not significantly negative in year one and three, which means that wages are not immediately reduced in the first year post-buyout.

5.3 Financially constrained firms

In table 7 the results are reported with the financial dependency interaction. Target firms that are financially constrained before the deal are expected to become more efficient after the deal relative to targets that are non-financially constrained pre-buyout. The triple interaction term *Post x Deal x Fin. Dep.* measures if financially constrained target firms become more efficient post-buyout relative to non-financially constrained targets. *Fin. Dep.* is a dummy variable that takes value one for target firms

that have a ratio of cash in assets lower than the median value of all targets, and value zero for targets which have a ratio higher than the median value.

Interestingly, the results are comparable to the results reported for capital intensive target firms. Assets are reduced (model 9) while asset turnover is increased (model 1), significantly. This is consistent with the idea that private equity firms sell off assets of financially constrained firms to get more cash. The expertise of private equity firms ensures that they are able to hold sales roughly constant while assets are decreased, since asset turnover is significantly increased post-buyout. In line with the results for capital intensive firms, the increased productivity causes return on assets to increase in model 8. Because private equity firms sell assets of financially constrained firms, working capital in assets (model 3) and cash in assets (model 4) are significantly increased post-buyout. It could be that cash holdings are increased because assets are sold for cash, but it seems more likely that cash holdings and working capital are held roughly constant while assets are decreased. If this is the case, private equity firms do not keep all the money they receive for the sold assets, but use that money to make strategic investments in order to change operations for example, which might have contributed to the increased asset turnover. Tax in assets is consistent with the results for capital intensive firms significantly increased (model 7), but this is again likely due to the decrease in assets. The increased productivity, measured by asset turnover, provides evidence in favour of hypothesis three, while other efficiency variables do not support this hypothesis.

Interestingly, the results for financially constrained target firms with respect to average employment costs and growth in employment differs relative to capital intensive target firms. While the average employment costs decline for capital intensive target firms, for financially constrained target firms those costs are held constant (model 6). On the other hand, employment (model 10) is significantly reduced for financially constrained target firms, whereas for capital intensive target firms this was held constant post-buyout. An explanation for the decreased employment for financially constrained target firms could be that private equity firms try to free up more cash, because a reduction in employment causes the total employment costs to decline when wages are held constant.

Table 7: Sample of target firms and their corresponding control firms. Sample period is 2011-2015. *Post* is a dummy variable that equals 1 in the years t+1 to t+4, and 0 in year t-1. *Deal* is a dummy variable which takes value 1 when the company is a target company and 0 for control firms. *Fin. Dep.* is a dummy variable which equals 1 when the target has a financial dependency higher than the median value of all targets in the pre-deal year, measured by cash / assets. *Empl* is total employees. *WorkCap* is working capital. *CurRatio* is the current ratio. *Av. Cost per Empl.* is the average employment costs per employee. All regressions include firm and year fixed effects. Error terms are clustered at the company and year level. Robust standard errors are reported in parentheses. ***, **, * indicate a significance level of 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	ATO	Sales / Empl	WorkCap / Assets	CurRatio	Cash / Assets	Av. Cost per Empl.	Tax / Assets	ROA	LogAssets	LogEmployment	Leverage
Post x Deal x Fin. Dep.	0.134*** (0.045)	12.557 (14.273)	0.022** (0.010)	0.090 (0.111)	0.072*** (0.009)	0.701 (1.015)	0.007*** (0.002)	0.022*** (0.007)	-0.181*** (0.046)	-0.089** (0.040)	-0.027 (0.021)
Post x Deal	-0.045 (0.036)	-5.275 (9.994)	-0.016* (0.008)	0.019 (0.087)	-0.051*** (0.008)	-1.664** (0.756)	-0.005*** (0.001)	-0.008 (0.005)	0.177*** (0.034)	0.154*** (0.030)	0.023 (0.017)
Post x Fin. Dep.	0.009 (0.018)	-16.057*** (5.195)	0.003 (0.004)	-0.008 (0.041)	0.004 (0.003)	-1.400*** (0.375)	0.001 (0.001)	-0.000 (0.003)	-0.035** (0.015)	0.017 (0.015)	0.014** (0.007)
Post	-0.091*** (0.012)	-33.013*** (3.669)	-0.008** (0.003)	0.150*** (0.027)	0.009*** (0.002)	-4.536*** (0.272)	-0.002*** (0.000)	-0.007*** (0.002)	0.050*** (0.011)	0.077*** (0.011)	-0.039*** (0.005)
Observations	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.022	0.047	0.003	0.011	0.021	0.121	0.012	0.006	0.021	0.045	0.013

In the appendix in table A.2 the triple interaction term with the categorical variable *Year* instead of the dummy *Post* is added, and some things stand out. Working capital in assets is in the first year post-buyout significantly increased and in the third year weakly significantly at the 10% level, but in year two and four post-buyout not significantly changed (model 3), while assets are every year significantly decreased (model 9). This might be due to reductions in inventories and faster collection of payments of customers after year one that causes working capital to decline post-buyout, and that as a consequence working capital in assets is not changed or only slightly increased after year one. This would indicate efficiency gains and some additional evidence in favour of hypothesis three.

The similar results for the financial dependent and capital intensive target firms causes me to wonder if financially constrained firms are the firms which are also more capital intensive on average. This would explain, or at least for a part, why the results of these two groups are roughly similar. The intuition of why financially constrained firms would also be more capital intensive, is that capital intensive firms normally do a lot of investments in fixed assets, which causes the cash position to worsen. First I include in table 8 a triple interaction term with the financial dependency indicator for only a sample of capital intensive firms. If the reason for the increased productivity of financially

constrained targets is mainly due to that financially constrained firms are also more capital intensive, I expect the asset turnover to be not significantly increased for financially constrained firms relative to non-financially constrained firms in this sub-sample. Thereafter, I split the sample of capital intensive firms into financially and non-financially constrained firms in table 9, to examine in more detail whether the results for capital intensive firms are different when the target is financially constrained relative to when it is not.

In line with the conjecture that financially constrained firms are for a large part also capital intensive, table 8 shows that asset turnover is not significantly increased anymore (model 1). It seems that the reason for the improved productivity of financially constrained firms is that they are on average also more capital intensive, to which efficiency gains can be added by removing inefficient assets. It can also be seen in table 8 that other results have changed compared to the whole sample in table 7. Assets are not significantly declined (model 9) whereas return on assets (model 8) is not significantly increased anymore, which strengthens the conjecture that financially constrained firms are also more capital intensive on average.

Table 8: Sample of capital intensive target firms and corresponding control firms. Sample period is 2011-2015. *Post* is a dummy variable that equals 1 in the years t+1 to t+4, and 0 in year t-1. *Deal* is a dummy variable which takes value 1 when the company is a target company and 0 for control firms. *Fin. Dep.* is a dummy variable which equals 1 when the target has a financial dependency higher than the median value of all targets in the pre-deal year, measured by cash / assets. *Empl* is total employees. *WorkCap* is working capital. *CurRatio* is the current ratio. *Av. Cost per Empl.* is the average employment costs per employee. All regressions include firm and year fixed effects. Error terms are clustered at the company and year level. Robust standard errors are reported in parentheses. ***, **, * indicate a significance level of 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	ATO	Sales / Empl	WorkCap / Assets	CurRatio	Cash / Assets	Av. Cost per Empl.	Tax / Assets	ROA	LogAssets	LogEmployment	Leverage
Post x Deal	-0.016	-2.467	0.012	0.279*	0.045***	1.401	0.003	0.001	-0.112	-0.050	-0.058*
x Fin. Dep.	(0.051)	(23.578)	(0.013)	(0.169)	(0.011)	(1.652)	(0.002)	(0.010)	(0.070)	(0.064)	(0.034)
Post x Deal	0.138***	3.949	0.007	-0.124	-0.028***	-3.075**	0.002	0.018**	0.088	0.134***	0.063**
	(0.040)	(17.963)	(0.010)	(0.140)	(0.009)	(1.382)	(0.002)	(0.008)	(0.055)	(0.051)	(0.029)
Post x Fin. Dep.	0.024	-17.397**	-0.003	0.040	0.010**	-1.002*	0.001	0.003	-0.036	0.004	0.011
	(0.026)	(7.481)	(0.006)	(0.060)	(0.005)	(0.572)	(0.001)	(0.004)	(0.023)	(0.021)	(0.011)
Post	-0.078***	-38.204***	0.002	0.120***	0.002	-5.144***	-0.002***	-0.010***	0.031	0.092***	-0.037***
	(0.020)	(5.769)	(0.005)	(0.042)	(0.004)	(0.466)	(0.001)	(0.003)	(0.020)	(0.016)	(0.008)
Obs.	860	860	860	860	860	860	860	860	860	860	860
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.013	0.062	0.001	0.011	0.015	0.135	0.007	0.008	0.004	0.050	0.011

In table 9 it stands out that asset turnover (model 1) is both significantly increased for financially and non-financially constrained target firms that are capital intensive, in panel A and panel B, respectively. This is also consistent with the idea that the significant increased asset turnover for financially constrained firms in the whole sample was found because they seem to be also more capital intensive on average. The level of capital intensity pre-buyout seems to be a more important driver for private equity firms to improve the productivity of the target post-buyout, and those productivity improvements are not influenced by whether the capital intensive firm is financially constrained or not. Interestingly, assets (model 8) are not significantly changed in panel A and B, whereas in previous analyses with the capital intensity indicator it became clear that capital intensive firms decrease in assets relative to non-capital intensive firms. This suggests that non capital-intensive firms increase in assets whereas capital intensive firms hold assets constant post-buyout, and it does not matter for the development of assets whether the capital intensive firm is financially constrained or not.

Table 9: Sample of capital intensive target firms and corresponding control firms. Panel A only includes deals in which the target firm is financially constrained and Panel B includes deals in which the target firm is not financially constrained. Sample period is 2011-2015. *Post* is a dummy variable that equals 1 in the years t+1 to t+4, and 0 in year t-1. *Deal* is a dummy variable which takes value 1 when the company is a target company and 0 for control firms. *Empl* is total employees. *WorkCap* is working capital. *CurRatio* is the current ratio. *Av. Cost per Empl.* is the average employment costs per employee. All regressions include firm and year fixed effects. Error terms are clustered at the company and year level. Robust standard errors are reported in parentheses. ***, **, * indicate a significance level of 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	ATO	Sales / Empl	WorkCap / Assets	CurRatio	Cash / Assets	Av. Cost per Empl.	Tax / Assets	ROA	LogAssets	LogEmployment	Leverage
Panel A: Financially constrained firms											
Post x Deal	0.122*** (0.032)	1.481 (15.272)	0.020** (0.008)	0.155 (0.095)	0.017*** (0.005)	-1.674* (0.905)	0.004*** (0.002)	0.019*** (0.007)	-0.023 (0.043)	0.085** (0.039)	0.004 (0.018)
Post	-0.054*** (0.016)	-55.600*** (4.763)	-0.001 (0.004)	0.160*** (0.043)	0.012*** (0.003)	-6.146*** (0.332)	-0.001** (0.001)	-0.008*** (0.002)	-0.004 (0.013)	0.096*** (0.013)	-0.026*** (0.007)
Obs.	525	525	525	525	525	525	525	525	525	525	525
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.010	0.080	0.003	0.014	0.019	0.151	0.006	0.007	0.000	0.048	0.009
Panel B: Non-financially constrained firms											
Post x Deal	0.138*** (0.040)	3.949 (17.969)	0.007 (0.010)	-0.124 (0.140)	-0.028*** (0.009)	-3.075** (1.383)	0.002 (0.002)	0.018** (0.008)	0.088 (0.055)	0.134*** (0.051)	0.063** (0.029)
Post	-0.078*** (0.020)	-38.204*** (5.771)	0.002 (0.005)	0.120*** (0.042)	0.002 (0.004)	-5.144*** (0.466)	-0.002*** (0.001)	-0.010*** (0.003)	0.031 (0.020)	0.092*** (0.016)	-0.037*** (0.008)
Obs.	335	335	335	335	335	335	335	335	335	335	335
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.017	0.034	0.000	0.005	0.008	0.112	0.009	0.011	0.010	0.052	0.016

5.4 Pre-buyout ownership structures

Next, I distinguish between the following pre-buyout ownership structures: divisional buyouts, private-to-private transactions, secondary buyouts and public-to-private transactions, for which I expect the efficiency gains to be most concentrated in divisional buyouts. Results for the different transaction types are reported in table 10. For divisional buyouts in panel A there are some signs of improved efficiency. In line with the whole sample, cash in assets is significantly decreased (model 5), suggesting that private equity firms put cash in those transactions to more productive use. Contrary to the whole sample, the current ratio is significantly decreased post-buyout at the 10% level (model 4). This is

consistent with the idea brought forward by Smith (1990), who argues that private equity firms can improve efficiency by reducing the period in which payments of customers are collected relative to the period in which suppliers are payed. As a consequence, account receivables are expected to decline relative to account payables, which would contribute to a reduction in the current ratio. Productivity, measured by asset turnover and sales over employees, is not significantly changed for divisional buyouts in model 1 and 2, respectively. This can be considered as a surprising result, since Meuleman et al (2009) find that sales over employees increases for divisional buyouts, and this increase is larger than for other pre-buyout ownership structures.

The results for private-to-private transactions are shown in panel B and are comparable to the whole sample. Cash in assets (model 5) and average employment costs (model 6) are significantly decreased consistent with the whole sample, which indicates improved efficiency for private-to-private transactions post-buyout. To be said has that the reduction of those two ratios is only significant at the 10% level, whereas for the whole sample it is significant at the 1% level. In line with the whole sample, targets of private-to-private transactions grow post-buyout, given the significant increase in assets and employment in model 9 and 10, respectively.

For secondary buyouts in panel C it is found that tax in assets is significantly declined (model 7). This is inconsistent with the idea that for a secondary buyout no efficiency gains can be added, since those efficiency gains should already be incorporated by the former private equity firm. However, it must be noted that tax in assets is only significantly declined at the 10% level, and all other efficiency indicators are not significantly changed. For public-to-private transactions there are not any efficiency gains found as shown in panel D, which is consistent with the expectation that for public-to-private transactions there is less room for efficiency gains relative to divisional buyouts. Surprisingly, return on assets increases post-buyout (model 8) even though there are not any efficiency improvements, for which there is not a logic explanation to my knowledge.

Table 10: Sample of target firms and their corresponding control firms. Sample period is 2011-2015. Panel A uses private-to-private transactions only, Panel B uses divisional buyouts, Panel C uses secondary buyouts and Panel D uses public-to-private transactions. *Post* is a dummy variable that equals 1 in the years t+1 to t+4, and 0 in year t-1. *Deal* is a dummy variable which takes value 1 when the company is a target company and 0 for control firms. *Empl* is total employees. *WorkCap* is working capital. *CurRatio* is the current ratio. *Av. Cost per Empl.* is the average employment costs per employee. All regressions include firm and year fixed effects. Error terms are clustered at the company and year level. Robust standard errors are reported in parentheses. ***, **, * indicate a significance level of 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	ATO	Sales / Empl	WorkCap / Assets	CurRatio	Cash / Assets	Av. Cost per Empl.	Tax / Assets	ROA	LogAssets	LogEmploy ment	Leverage
Panel A: Divisional Buyouts											
Post x Deal	-0.022 (0.038)	3.847 (10.147)	-0.013 (0.009)	-0.160* (0.092)	-0.019** (0.008)	-1.275 (0.784)	-0.002 (0.001)	-0.002 (0.006)	0.052 (0.035)	0.067** (0.029)	0.004 (0.018)
Post	-0.082*** (0.014)	-34.152*** (4.332)	-0.011*** (0.003)	0.172*** (0.031)	0.010*** (0.003)	-5.123*** (0.301)	-0.002*** (0.001)	-0.010*** (0.002)	0.048*** (0.012)	0.087*** (0.012)	-0.023*** (0.006)
Obs.	641	641	641	641	641	641	641	641	641	641	641
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.021	0.038	0.008	0.011	0.005	0.119	0.014	0.009	0.014	0.048	0.006
Panel B: Private-to- private											
Post x Deal	0.062 (0.038)	-2.997 (14.089)	0.007 (0.008)	0.268*** (0.086)	-0.015* (0.008)	-1.611* (0.898)	-0.001 (0.002)	0.007 (0.007)	0.137*** (0.039)	0.164*** (0.036)	0.014 (0.016)
Post	-0.099*** (0.014)	-43.086*** (4.009)	-0.003 (0.003)	0.083** (0.037)	0.013*** (0.003)	-4.751*** (0.283)	-0.001** (0.001)	-0.005** (0.002)	0.026** (0.012)	0.090*** (0.013)	-0.033*** (0.006)
Obs.	656	656	656	656	656	656	656	656	656	656	656
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.022	0.049	0.000	0.011	0.008	0.113	0.003	0.002	0.019	0.050	0.015
Panel C: SBO's											
Post x Deal	0.001 (0.047)	13.400 (12.850)	-0.019 (0.014)	0.045 (0.127)	-0.007 (0.009)	-1.023 (0.953)	-0.004* (0.002)	-0.004 (0.009)	0.044 (0.060)	0.088** (0.043)	-0.006 (0.027)
Post	-0.070*** (0.023)	-43.838*** (6.453)	-0.008 (0.006)	0.284*** (0.051)	0.010** (0.004)	-5.638*** (0.534)	-0.001 (0.001)	-0.008** (0.004)	0.016 (0.020)	0.055*** (0.019)	-0.056*** (0.009)
Obs.	260	260	260	260	260	260	260	260	260	260	260
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.013	0.060	0.008	0.038	0.005	0.123	0.008	0.006	0.001	0.027	0.046
Panel D: Public-to- private											
Post x Deal	0.077 (0.076)	12.187 (22.259)	0.005 (0.012)	0.153 (0.219)	-0.017 (0.014)	-1.053 (2.080)	0.005*** (0.002)	0.022** (0.009)	0.082 (0.094)	0.095 (0.085)	0.060 (0.040)
Post	-0.073** (0.030)	-51.927*** (9.987)	0.001 (0.007)	0.123* (0.065)	0.003 (0.005)	-6.873*** (0.750)	-0.002** (0.001)	-0.008* (0.004)	0.034 (0.027)	0.122*** (0.023)	-0.038*** (0.012)
Obs.	149	149	149	149	149	149	149	149	149	149	149
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.012	0.044	0.000	0.009	0.000	0.133	0.011	0.009	0.008	0.048	0.015

Overall, most efficiency gains are found for both divisional buyouts and private-to-private transactions. This is inconsistent with both the fourth hypothesis, in which I argue that efficiency gains should be most concentrated in divisional buyouts, and with the findings of Meuleman et al (2009) and Alperovych et al (2013), who provide evidence that divisional buyouts outperform other buyout types in terms of efficiency. It can be considered as a surprising result, since the agency problems existent for divisions of large organizations are non-existent for private firms owned by a family or individual, so one might expect that there is more room for efficiency improvements in divisional buyouts. My sample period differs however relative to the ones used by Meuleman et al (2009) and Alperovych et al (2013), since they look at deals which took place before the financial crisis, whereas my sample consists of deals after the crisis, which might affect the relative performance of divisional buyouts and private-to-private transactions. Maybe future research can shed a light on this issue, and can come up with explanations of how the financial crisis may have affected the relative performance of those two pre-buyout ownership structures. For secondary buyouts and public-to-private transactions the results were according to expectations, since it was found that the efficiency improvements were weaker in those transactions as compared to divisional buyouts.

5.5 Domestic vs foreign transactions

In this section I examine whether efficiency improvements in domestic transactions, in which acquirer and target are from the same country, are more prevalent than in foreign transactions, when acquirer and target are from different countries. In panel A of table 11 the results are shown for domestic transactions, in which clear efficiency improvements can be observed post-buyout. Cash in assets (model 5) and tax in assets (model 7) are significantly declined at the 1% level. In addition, in model 6 are the average employment costs significantly declined at the 5% level in domestic transactions. In line with the whole sample, assets are significantly increased in domestic transactions (model 9), which also probably influences the changes in cash in assets and tax in assets again. For foreign transactions in panel B there are less efficiency gains found post-buyout, since only the significant increase of asset turnover at the 10% level in model 1 indicates some efficiency improvements. These results are in line with the idea that problems regarding information asymmetry should lead to more efficiency improvements in domestic transactions relative to foreign transactions. I find therefore evidence for my fifth hypothesis.

Table 11: Sample of target firms and their corresponding control firms. Sample period is 2011-2015. Panel A uses only buyouts where the acquiring firm is from the same country as the target firm. Panel B uses buyouts where the acquiring firm and the target firm are from different countries. *Post* is a dummy variable that equals 1 in the years t+1 to t+4, and 0 in year t-1. *Deal* is a dummy variable which takes value 1 when the company is a target company and 0 for control firms. *Empl* is total employees. *WorkCap* is working capital. *CurRatio* is the current ratio. *Av. Cost per Empl.* is the average employment costs per employee. All regressions include firm and year fixed effects. Error terms are clustered at the company and year level. Robust standard errors are reported in parentheses. ***, **, * indicate a significance level of 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	ATO	Sales / Empl	WorkCap / Assets	CurRatio	Cash / Assets	Av. Cost per Empl.	Tax / Assets	ROA	LogAssets	LogEmployment	Leverage
Panel A: Domestic											
Post x Deal	0.002 (0.029)	5.971 (8.128)	-0.001 (0.006)	0.041 (0.061)	-0.016*** (0.006)	-1.507** (0.586)	-0.003*** (0.001)	-0.002 (0.005)	0.101*** (0.028)	0.092*** (0.023)	0.009 (0.013)
Post	-0.100*** (0.011)	-36.884*** (3.146)	-0.011*** (0.003)	0.141*** (0.024)	0.013*** (0.002)	-4.769*** (0.228)	-0.002*** (0.000)	-0.007*** (0.002)	0.042*** (0.009)	0.088*** (0.010)	-0.031*** (0.004)
Obs.	1.114	1.114	1.114	1.114	1.114	1.114	1.114	1.114	1.114	1.114	1.114
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.027	0.039	0.006	0.011	0.008	0.109	0.012	0.005	0.018	0.043	0.013
Panel B: Foreign											
Post x Deal	0.065* (0.038)	-10.761 (15.438)	-0.011 (0.011)	0.089 (0.118)	-0.011 (0.008)	-0.799 (1.041)	0.002 (0.002)	0.011 (0.007)	0.017 (0.046)	0.109*** (0.040)	0.029 (0.019)
Post	-0.065*** (0.016)	-49.040*** (4.898)	-0.001 (0.004)	0.138*** (0.040)	0.006* (0.003)	-5.781*** (0.344)	-0.002*** (0.001)	-0.009*** (0.003)	0.027** (0.013)	0.085*** (0.013)	-0.036*** (0.007)
Obs.	512	512	512	512	512	512	512	512	512	512	512
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.010	0.063	0.000	0.008	0.001	0.131	0.004	0.006	0.003	0.041	0.013

Interestingly, foreign acquirers seem to focus more on productivity improvements of target firms, whereas domestic acquirers focus on other efficiency improvements, such as using cash more productively, cutting wages and lower taxes. The finding that domestic acquirers are better able than foreign acquirers to reduce wages and lower taxes seems logic in the context of information asymmetry. Domestic acquirers are expected to know more about the legal standards in the target country, which is likely to be important in order to reduce wages and lower taxes.

6. Conclusion

6.1 Summary and implications

In this paper I examine whether private equity firms are able to add efficiency gains to their target companies in the first four years after the deal, using a sample of 316 deals in the period 2011-2015. The period of 2011-2015 is deliberately chosen, as it has not been extensively examined yet how the operational performance of target companies have developed after the financial crisis. For the 1980s there is strong evidence that private equity firms add operating gains to their target companies. For buyouts in the 1990s and 2000s evidence is more mixed regarding the operational performance of target companies. While some papers provide evidence of significant operational improvements, others find that contrary to the 1980s private equity firms are not able add operating gains to target firms in this period. Increasing competition between private equity firms after the financial crisis suggests that it might have become even harder to add operating gains after the crisis.

Most papers indicate that private equity firms are experts in letting buyout companies operate more efficiently post-buyout. Existing literature has shown that this can be done in various ways: an increase in productivity, reducing working capital, using cash more productively, lowering of labour costs and reducing taxes. All these ways are tested in this paper to examine whether private equity firms can still add efficiency gains to target firms after the financial crisis. The sample is also split in various ways to discover the channels of potential efficiency gains. I examine whether efficiency gains are more concentrated among capital intensive and financially constrained target firms. Moreover, I look at the ownership structure before the buyout to see if efficiency gains are more pronounced for divisional buyouts, and split the sample in domestic and foreign transactions to examine if domestic acquirers can implement efficiency improvements more easily relative to foreign acquirers.

For the whole sample there is some evidence found that private equity firms increase the efficiency of target firms relative to their peers, as the cash in assets ratio and the average employment costs are significantly declined post-buyout. When the interaction terms for capital intensive and financial dependent target firms are included, some big changes occur. Especially the significantly increased asset turnover for both firm types implies that such firms can operate more productively post-buyout, in line with the hypotheses that private equity enhance the efficiency of capital intensive and financially constrained target firms. Other efficiency measurements are not changed in the expected way, suggesting that private equity firms focus on productivity improvements of capital intensive and financially constrained firms. Further analysis shows that financially constrained firms seem to be on average also more capital intensive, which helps explain the similar findings found for those two firm types.

For the different pre-buyout ownership structures most efficiency gains were found in both divisional buyouts and private-to-private transactions, contrary to the hypothesis that divisional buyouts outperform other types of buyouts. Efficiency improvements for those two transaction types occurred roughly through the same ways as compared to the whole sample. Secondary buyouts and public-to-private transactions show not or only modest efficiency improvements. There was evidence found for the hypothesis that efficiency gains should be more concentrated in domestic transactions relative to foreign transactions. Domestic acquirers lower cash holdings, wages and taxes of target firms, whereas for foreign acquirers there was only at the 10% significance level evidence that they improve the productivity of targets.

Whereas existing literature indicates that it has become harder over time for private equity firms to improve the operational performance of target firms, I find evidence that private equity firms are still able to add efficiency gains to targets after the financial crisis. This is an important finding, since the private equity market has grown significantly over the recent years, which makes it relevant to know if the money of private equity firms is used productively. It must be emphasized however that if, and how efficiency gains occur, is strongly dependent on the characteristics of the target firm and the type of transaction.

6.2 Limitations and suggestions for future research

Although I tried to construct this study with great care, there are a few limitations of this study. A common problem in private equity research is that private equity buyouts are not exogenous events (Boucly et al, 2011), which means that private equity firms are able to pick the 'better' firms that have more potential to improve in efficiency. I tried to reduce this problem by using the propensity score matching method in order to match control firms to target firms, thereby matching on both firm characteristics (efficiency, profitability and size) as the pre-deal trends of these characteristics. Despite I match on efficiency (measured by asset turnover) and size (measured by assets), those two characteristics were significantly different in the pre-deal year. In addition, there were also significant differences found in some of the other efficiency outcome variables. These differences in the pre-deal year show that targets and controls are not the same before the buyout, which might affect the outcomes. However, I use firm fixed effects in the regressions, which would take care of continued differences of those variables. In addition, changes and growth in matching variables before the deal are not significantly different between targets and controls. This may alleviate the problems of pre-deal differences between targets and controls, but still, those differences cannot be completely ignored. In an ideal situation, targets and controls are the same in both firm characteristics and pre-deal trends before the buyout, in order to measure the effect of the deal on the efficiency development of the target firm accurately.

Another limitation of my study might be that I use accounting ratios for my analyses. Accounting ratios can be manipulated, and evidence from prior studies which shows that target firms report lower earnings before the buyout, indicates that this actually happens. This happens especially when management participates in the buyout. Mao and Renneboog (2015) and Perry and Williams (1994) provide evidence that in management buyouts earnings are manipulated downwards prior to the buyout, and as a result, targets can be purchased more cheaply. Despite the fact that my sample does not consist solely of management buyouts, and evidence for earnings manipulation is in particular seen for those types of buyouts, I cannot rule out the possibility that the accounting ratios used in my sample may be affected by earnings manipulation.

Data availability is also often a problem in private equity research. Despite that my sample consists of 316 deals, of which I do not believe that this is a too small number, there are many papers in the field of private equity research that use larger sample sizes and thus can potentially get more robust results. Especially when I split my sample according to pre-buyout ownership structure, the secondary buyouts and public-to-private transactions are not with many deals left, 48 and 26 deals respectively. Larger sample sizes are useful when splitting according to pre-buyout ownership structure, to get more robust results for relative less represented groups.

Furthermore, one might question whether cash in assets is a good measure of financial dependency. Although I explained the intuition behind this measure, there might be better measures used by previous papers to indicate financial dependency. Rajan and Zingales (1998) for example look at the amount of investments a firm wants to do that can not be financed with internal cash, to indicate the financial constraints of a company. Since I do not take into account the desired amount of investments of a company, the measure of Rajan and Zingales (1998) might be a more precise indication of financial dependency.

For future research it would be interesting to see whether the results for productivity improvements are the same if a production function would be used for my sample, as opposed to the accounting ratios that I use. For the whole sample I do not find productivity improvements for targets post-buyout. This could be due to the fact that I use a sample period consisting of deals after financial crisis, for which the results might be different relative to before the crisis. Another explanation might be that the results for productivity changes would have been different if I had used a production function, since most prior studies that use a production function, like Amess (2003) and Lichtenberg and Siegel (1990), find increases in productivity post-buyout.

The relation that I found between financially constrained and capital intensive firms is also an interesting avenue for future research. From my findings it seems that financially constrained firms are

also on average more capital intensive, which probably have caused the results for efficiency improvements of those two firm types to be almost similar. Future research could elucidate what the exact relationship between financially constrained and capital intensive firms is, and what the implications are for potential efficiency gains for those two types of firms.

A surprising finding of my research is that divisional buyouts do not outperform private-to-private transactions, while most existing literature indicates that efficiency gains should be concentrated in divisional buyouts. However, a difference of my study relative to the studies of Meuleman et al (2009) and Alperovych et al (2013), that find most efficiency gains for divisional buyouts as compared to other buyout types, is that I use a sample consisting of deals after the financial crisis. Future research that uses larger sample sizes could clarify whether the performance of divisional buyouts and private-to-private transactions is really the same in terms of efficiency improvements after the financial crisis. If this is the case, future research might also come up with explanations of why the outperformance of divisional buyouts has disappeared, and what the relationship is with the financial crisis.

References

- Acharya, V. V., Gottschalg, O. F., Hahn, M., & Kehoe, C. (2013). Corporate governance and value creation: Evidence from private equity. *The Review of Financial Studies*, 26(2), 368-402.
- Almeida, Á. M. G. (2018). Operating Performance of Private Equity Backed Companies in Portugal.
- Alperovych, Y., Amess, K., & Wright, M. (2013). Private equity firm experience and buyout vendor source: What is their impact on efficiency?. *European Journal of Operational Research*, 228(3), 601-611.
- Amess, K. (2003). The effect of management buyouts on firm-level technical inefficiency: Evidence from a panel of UK machinery and equipment manufacturers. *The Journal of Industrial Economics*, 51(1), 35-44.
- Amess, K., & Girma, S. (2009). Do stock markets value efficiency?. *Scottish Journal of Political Economy*, 56(3), 321-331.
- Amess, K., Stiebale, J., & Wright, M. (2016). The impact of private equity on firms' patenting activity. *European Economic Review*, 86, 147-160.
- Bansraj, D., Smit, H., & Volosovych, V. (2020). Can Private Equity Funds Act as Strategic Buyers? Evidence from Buy-and-Build Strategies.
- Bergström, C., Grubb, M., & Jonsson, S. (2007). The operating impact of buyouts in Sweden: A study of value creation. *The journal of Private equity*, 11(1), 22-39.
- Bernstein, S., Lerner, J., & Mezzanotti, F. (2019). Private equity and financial fragility during the crisis. *The Review of Financial Studies*, 32(4), 1309-1373.
- Berk, R. A. (1999). Book Review: Observational Studies P. Rosenbaum New York: Springer-Verlag, 1995. *Journal of Educational and Behavioral Statistics*, 24(1), 95-100.
- Blundell, R., & Costa Dias, M. (2000). Evaluation methods for non-experimental data. *Fiscal studies*, 21(4), 427-468.
- Boucly, Q., Sraer, D., & Thesmar, D. (2011). Growth Ibos. *Journal of Financial Economics*, 102(2), 432-453.
- Braun, R., Jenkinson, T., & Stoff, I. (2017). How persistent is private equity performance? Evidence from deal-level data. *Journal of Financial Economics*, 123(2), 273-291.
- Brown, G. W., & Kaplan, S. N. (2019). Have Private Equity Returns Really Declined?. *The Journal of Private Equity*, 22(4), 11-18.
- Castellaneta, F., & Gottschalg, O. (2016). Does ownership matter in private equity? The sources of variance in buyouts' performance. *Strategic Management Journal*, 37(2), 330-348.
- Cohn, J. B., Mills, L. F., & Towery, E. M. (2014). The evolution of capital structure and operating performance after leveraged buyouts: Evidence from US corporate tax returns. *Journal of Financial Economics*, 111(2), 469-494.
- Cornelius, P. K. (2011). *International investments in private equity: asset allocation, markets, and industry structure*. Academic Press.
- Davis, S. J., Haltiwanger, J., Handley, K., Jarmin, R., Lerner, J., & Miranda, J. (2014). Private equity, jobs, and productivity. *American Economic Review*, 104(12), 3956-90.
- Dyck, B., Mauws, M., Starke, F. A., & Mischke, G. A. (2002). Passing the baton: The importance of sequence, timing, technique and communication in executive succession. *Journal of business venturing*, 17(2), 143-162.

- Engel, D., & Stiebale, J. (2014). Private equity, investment and financial constraints: firm-level evidence for France and the United Kingdom. *Small Business Economics*, 43(1), 197-212.
- Froud, J., & Williams, K. (2007). Private equity and the culture of value extraction. *New Political Economy*, 12(3), 405-420.
- Guo, S., Hotchkiss, E. S., & Song, W. (2011). Do buyouts (still) create value?. *The Journal of Finance*, 66(2), 479-517.
- Harris, R. S., Jenkinson, T., & Kaplan, S. N. (2015). How do private equity investments perform compared to public equity?.
- Harris, R., Siegel, D. S., & Wright, M. (2005). Assessing the impact of management buyouts on economic efficiency: Plant-level evidence from the United Kingdom. *Review of Economics and Statistics*, 87(1), 148-153.
- Hochberg, Y. V., Ljungqvist, A., & Lu, Y. (2007). Whom you know matters: Venture capital networks and investment performance. *The Journal of Finance*, 62(1), 251-301.
- Hoskisson, R. E., & Turk, T. A. (1990). Corporate restructuring: Governance and control limits of the internal capital market. *Academy of management Review*, 15(3), 459-477.
- Howorth, C., Westhead, P., & Wright, M. (2004). Buyouts, information asymmetry and the family management dyad. *Journal of Business Venturing*, 19(4), 509-534.
- Humphery-Jenner, M., Sautner, Z., & Suchard, J. A. (2017). Cross-border mergers and acquisitions: The role of private equity firms. *Strategic Management Journal*, 38(8), 1688-1700.
- Ilmanen, A., Chandra, S., & McQuinn, N. (2019). Demystifying Illiquid Assets: Expected Returns for Private Equity. *The Journal of Alternative Investments*, 22(3), 8-22.
- Kalemli-Ozcan, S., Sorensen, B., Villegas-Sanchez, C., Volosovych, V., & Yesiltas, S. (2015). *How to Construct Nationally Representative Firm Level Data from the Orbis Global Database: New Facts and Aggregate Implications* (No. w21558). National Bureau of Economic Research.
- Kang, J. K., & Kim, J. M. (2010). Do foreign investors exhibit a corporate governance disadvantage? An information asymmetry perspective. *Journal of International Business Studies*, 41(8), 1415-1438.
- Kaplan, S. (1989). The effects of management buyouts on operating performance and value. *Journal of financial economics*, 24(2), 217-254.
- Kaplan, S. (1989b). Management buyouts: Evidence on taxes as a source of value. *The journal of finance*, 44(3), 611-632.
- Kaplan, S. N. (1997). The evolution of US corporate governance: We are all Henry Kravis now. *The Journal of Private Equity*, 7-14.
- Kaplan, S. N., & Stromberg, P. (2009). Leveraged buyouts and private equity. *Journal of economic perspectives*, 23(1), 121-46.
- Lichtenberg, F. R., & Siegel, D. (1990). The effects of leveraged buyouts on productivity and related aspects of firm behavior. *Journal of financial economics*, 27(1), 165-194.
- Mailander, C. J. (1997). Searching for Liquidity: United States exit strategies for international private equity investment. *Am. U. Int'l L. Rev.*, 13, 71.
- Mao, Y., & Renneboog, L. (2015). Do managers manipulate earnings prior to management buyouts?. *Journal of Corporate Finance*, 35, 43-61.
- Meuleman, M., & Wright, M. (2011). Cross-border private equity syndication: Institutional context and learning. *Journal of Business Venturing*, 26(1), 35-48.

- Meuleman, M., Amess, K., Wright, M., & Scholes, L. (2009). Agency, Strategic Entrepreneurship, and the Performance of Private Equity–Backed Buyouts. *Entrepreneurship Theory and Practice*, 33(1), 213-239.
- Osborne, J. W., & Overbay, A. (2004). The power of outliers (and why researchers should always check for them). *Practical Assessment, Research, and Evaluation*, 9(1), 6.
- Perry, S. E., & Williams, T. H. (1994). Earnings management preceding management buyout offers. *Journal of Accounting and Economics*, 18(2), 157-179.
- Rajan, R., & Zingales, L. (1998). Financial development and growth. *American Economic Review*, 88(3), 559-586.
- Roberts, M. R., & Whited, T. M. (2013). Endogeneity in empirical corporate finance¹. In *Handbook of the Economics of Finance* (Vol. 2, pp. 493-572). Elsevier.
- Sahli, A., & Khemiri, S. (2020). Financial crisis and private equity performance in France. *International Journal of Entrepreneurship and Small Business*, 39(1-2), 279-294.
- Scellato, G., & Ughetto, E. (2013). Real effects of private equity investments: Evidence from European buyouts. *Journal of Business Research*, 66(12), 2642-2649.
- Scholes, L., Wright, M., Westhead, P., Bruining, H., & Kloeckner, O. (2009). Family-firm buyouts, private equity, and strategic change. *The Journal of Private Equity*, 12(2), 7-18.
- Smart, S. B., & Waldfoegel, J. (1994). Measuring the effect of restructuring on corporate performance: the case of management buyouts. *The Review of Economics and Statistics*, 503-511.
- Smith, A. J. (1990). Corporate ownership structure and performance: The case of management buyouts. *Journal of financial Economics*, 27(1), 143-164.
- Strömberg, P. (2008). The new demography of private equity. *The global impact of private equity report*, 1, 3-26.
- Wang, Y. (2012). Secondary buyouts: Why buy and at what price?. *Journal of Corporate Finance*, 18(5), 1306-1325.
- Weir, C., Jones, P., & Wright, M. (2008). Public to private transactions, private equity and performance in the UK: An empirical analysis of the impact of going private. *Private Equity and Performance in the UK: An Empirical Analysis of the Impact of Going Private*.
- Wright, M., Hoskisson, R. E., & Busenitz, L. W. (2001). Firm rebirth: Buyouts as facilitators of strategic growth and entrepreneurship. *Academy of Management Perspectives*, 15(1), 111-125.
- Wright, M., Robbie, K., & Albrighton, M. (2000). Secondary management buy-outs and buy-ins. *International Journal of Entrepreneurial Behavior & Research*.
- Wright, M., Wilson, N., & Robbie, K. (1996). The longer-term effects of management-led buy-outs. *The Journal of Entrepreneurial Finance*, 5(3), 213-234.
- Zaheer, S. (1995). Overcoming the liability of foreignness. *Academy of Management journal*, 38(2), 341-363.

Appendix

A.1 Efficiency developments for capital intensive firms per year post-buyout

Table A.1.: Sample of target firms and their corresponding control firms. Sample period is 2011-2015. The variable *Year* is a categorical variable which takes value 0 for year t-1 and a unique value for each of the four years after the buyout. *Deal* is a dummy variable which takes value 1 when the company is a target company and 0 for control firms. *Cap. Int.* is a dummy variable which equals 1 when the target firm has a capital intensity higher than the median value of all targets in the pre-deal year, measured by fixed assets / employees. *Empl* is total employees. *WorkCap* is working capital. *CurRatio* is the current ratio. *Av. Cost per Empl.* is the average employment costs per employee. All regressions include firm and year fixed effects. The variables *Year*, *Year x Deal* and *Year x Cap. Int.* are included but not shown. Error terms are clustered at the company and year level. Robust standard errors are reported in parentheses. ***, **, * indicate a significance level of 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	ATO	Sales / Empl	WorkCap / Assets	CurRatio	Cash / Assets	Av. Cost per Empl.	Tax / Assets	ROA	LogAssets	LogEmployment	Leverage
Year+1 x Deal x Cap. Int.	0.131** (0.051)	6.947 (17.021)	0.037*** (0.012)	0.062 (0.126)	0.023** (0.011)	-1.193 (1.201)	0.007*** (0.002)	0.025*** (0.009)	-0.090* (0.051)	-0.022 (0.044)	0.033 (0.025)
Year+2 x Deal x Cap. Int.	0.201*** (0.047)	9.085 (15.566)	0.037*** (0.011)	0.046 (0.120)	0.031*** (0.010)	-2.359** (1.144)	0.010*** (0.002)	0.032*** (0.008)	-0.113** (0.048)	0.002 (0.041)	0.031 (0.023)
Year+3 x Deal x Cap. Int.	0.250*** (0.049)	0.122 (16.222)	0.048*** (0.012)	-0.114 (0.124)	0.027** (0.011)	-1.005 (1.171)	0.010*** (0.002)	0.039*** (0.009)	-0.152*** (0.050)	-0.023 (0.045)	0.033 (0.024)
Year+4 x Deal x Cap. Int.	0.273*** (0.050)	-4.387 (17.377)	0.038*** (0.012)	-0.128 (0.132)	0.039*** (0.012)	-2.604** (1.215)	0.011*** (0.002)	0.034*** (0.009)	-0.181*** (0.056)	-0.004 (0.047)	0.040 (0.026)
Observations	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year x Deal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year x Cap. Int.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.037	0.059	0.010	0.013	0.008	0.162	0.017	0.014	0.043	0.061	0.015

A.2 Efficiency developments for financially constrained firms per year post-buyout

Table A.2: Sample of target firms and their corresponding control firms. Sample period is 2011-2015. The variable *Year* is a categorical variable which takes value 0 for year t-1 and a unique value for each of the four years after the buyout. *Deal* is a dummy variable which takes value 1 when the company is a target company and 0 for control firms. *Fin. Dep.* is a dummy variable which equals 1 when the target has a financial dependency higher than the median value of all targets in the pre-deal year, measured by cash / assets. *Empl* is total employees. *WorkCap* is working capital. *CurRatio* is the current ratio. *Av. Cost per Empl.* is the average employment costs per employee. All regressions include firm and year fixed effects. The variables *Year*, *Year x Deal* and *Year x Fin. Dep.* are included but not shown. Error terms are clustered at the company and year level. Robust standard errors are reported in parentheses. ***, **, * indicate a significance level of 1%, 5% and 10%, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	ATO	Sales / Empl	WorkCap / Assets	CurRatio	Cash / Assets	Av. Cost per Empl.	Tax / Assets	ROA	LogAssets	LogEmployment	Leverage
Year+1 x Deal x Fin. Dep.	0.099* (0.052)	5.376 (17.026)	0.033*** (0.012)	0.095 (0.126)	0.056*** (0.010)	0.799 (1.208)	0.004* (0.002)	0.012 (0.009)	-0.131*** (0.050)	-0.055 (0.044)	-0.015 (0.025)
Year+2 x Deal x Fin. Dep.	0.127*** (0.048)	21.726 (15.572)	0.016 (0.012)	0.195 (0.120)	0.060*** (0.010)	1.765 (1.152)	0.007*** (0.002)	0.018** (0.008)	-0.149*** (0.048)	-0.095** (0.041)	-0.056** (0.023)
Year+3 x Deal x Fin. Dep.	0.167*** (0.050)	16.172 (16.232)	0.020* (0.012)	-0.022 (0.124)	0.077*** (0.010)	0.392 (1.177)	0.008*** (0.002)	0.025*** (0.009)	-0.214*** (0.050)	-0.100** (0.044)	-0.024 (0.024)
Year+4 x Deal x Fin. Dep.	0.142*** (0.051)	6.953 (17.385)	0.017 (0.013)	0.093 (0.132)	0.095*** (0.011)	-0.154 (1.221)	0.009*** (0.002)	0.033*** (0.009)	-0.231*** (0.055)	-0.107** (0.047)	-0.014 (0.026)
Observations	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717	1.717
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year x Deal	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year x Fin. Dep.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.026	0.059	0.004	0.012	0.024	0.161	0.015	0.012	0.045	0.061	0.016