The fate of the mega-funds - private equity during the crisis

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May 15, 2013

Abstract

In this thesis, we analyse the performance of very large buyout funds with a committed capital equal to and above USD 8 bn that were raised in the years before the financial meltdown of 2008 and which many predicted to perform miserably. Research areas are value improvements through higher efficiency and higher growth as well as the ultimate return generated for limited partners. We are applying difference-in-difference and fixed effects regressions to identify causality and are comparing the performance of the funds' portfolio companies to the performance of S&P 500 firms during the same time. The results indicate that the private equity funds sacrificed profitability (lower EBITDA/Sales) while improving efficiency (lower COGS/Sales). We do not find any significant impact of the PE funds on the growth of their portfolio firms - even including acquired growth. Looking at the final cash flows to limited partners, current reports indicate an average five percent net IRR, which is lower than in the past but which is also far away from a total shake-out.

Written under the supervision of Per Strömberg. We are very grateful for his constructive feedback. All errors are ours.

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1 Introduction

The years before the financial meltdown of 2008 were characterized by extraordinary growth in private equity (PE) investments (Kaplan and Stromberg, 2009). The ever bigger inflow of capital from institutional investors allowed general partners (GPs) to grow their fund sizes to unprecedented levels. This was attractive to the GPs because operating costs of funds do generally not grow proportionally to the management fee income of GPs. The largest funds had committed capital in excess of USD 20 bn; this capital was in search of investment opportunities in the hot market environment before 2008.

On September 15th 2008 US-based Lehman Brothers, an investment bank, collapsed and with it large parts of the world's financial activity. Future prospects for the world economy looked gloomy. During that time, Meerkatt and Liechtenstein (2008) from The Boston Consulting Group, a consultancy, and IESE, a business school, published their expectations about the future of the private equity industry. They expected meagre performances and defaults of almost 50 percent of the portfolio companies until year-end 2011.

In this paper, we will outline how the biggest private equity funds (so called 'mega-funds') fared during the crisis. After introducing the current state of research and the dataset, we continue with an analysis of the investment style of the funds (industries, geographies, deal sizes). Then we test whether and how they managed to create value and whether they were eventually able to generate cash flows to their limited partners (LPs) or whether transaction multiples collapsed so much that internal value creation was simply insufficient to add significant gains. For the value creation, we are focusing on operational improvements and overall growth of the companies. Since PE funds frequently use add-on acquisitions to generate growth, we try to account for that when comparing their growth-record to that of peers. Econometrically, we are mainly working with a Difference-in-Difference (DiD) regression design where we account for fixed effects (FE) to identify the causalities at work. As benchmarks, we use average performances of firms in the Standard & Poor's 500 (S&P 500) grouped by industries.

In real life data, it can be difficult to obtain the true unbiased causal effect. To test whether PE funds create value is especially challenging. There are simply too many different variables that determine the operating performance and growth of companies. One potential problem that arises is the omitted variable bias (OVB). If we exclude important determinants of efficiency and growth that are correlated with the variables we do include, our estimates will be biased. A possible solution to this problem is to use the DiD approach with FE mentioned above. The DiD method looks at how the trend of treated companies changes relative to the trend of selected peers.

This method relies heavily on the common trend assumption (CTA). The CTA states that in absence of treatment the portfolio companies would have had the same trend as the peers. We believe that this assumption holds fairly well - graphs of past performances to perform an eyeball-test are reported in the main part (figures 6.1 and 6.4) of the thesis and the appendix (figures 9.1 to 9.10). A difference in absolute levels of the operating measures are not a problem. The regression specification for operating measures looks as follows:

$$Y_{it} = \alpha + \lambda_t + \gamma_i + \delta D_{it} + \epsilon_{it}$$

where Y_{it} is the operating figure of interest, e.g. the earnings before interest, taxes, depreciation and amortization to sales ratio (EBITDA/Sales), γ_i is the firm FE, λ_t is the time FE and D_{it} is the causal effect of interest (the DiD estimator) that is equal to one for portfolio companies post acquisition, and zero otherwise.

Besides through operational improvements, value can be created through growth. We do a similar analysis to the above for growth of portfolio firms. Growth is a bit different to operational value improvements because funds can simply generate growth by acquiring other companies - which should be a zero net present value (NPV) transaction if the acquired company is fairly priced. In that case, a company would grow without any value added by the fund. To identify the causal effect that PE funds have on organic growth, we try to control for acquired growth when looking at the growth measures. We do this by assuming a linear relationship between growth and normalized acquired subsidiaries (the value of acquired subsidiaries minus the value of sold subsidiaries in a given period divided by the acquisition price of the portfolio firm). The regression

specification looks as follows:

$$Y_{it} = \alpha + \lambda_t + \gamma_i + \rho Netaddon_{it} + \delta D_{it} + \epsilon_{it}$$

where $Netaddon_{it}$ is the control variable for non-organic growth, and ρ is the linear effect of one unit change in $Netaddon_{it}$ that is constant across the time and firm dimensions.

We find evidence that the funds' portfolio companies actually performed worse than their peers in terms of EBITDA/Sales. They managed, however, to significantly improve the efficiency of production by curbing the cost of goods sold to sales ratio (COGS/Sales) if the most extreme outliers are excluded from the sample. These apparently contradicting results might be explained by higher costs in the selling, general and administrative expenses (SG&A) part of the income statement - such as increased spending for marketing campaigns. On the growth side, it has been difficult for the funds to grow the portfolio companies faster than their peers - with and without accounting for acquired growth. Given our results in large, it is however difficult to argue that the portfolio companies performed either better or worse than their peers.

If we look at the existing literature, the majority shows that PE funds create value as shown in the review by Kaplan and Stromberg (2009). Further, Harford and Kolasinski (2012) show that PE sponsors create value. They also show that special dividends are not correlated with the distress of portfolio companies and that PE funds do not sacrifice long term growth by under-investing. In fact, it is shown that the investment policy of portfolio companies does not differ significantly from publicly traded peers. Further, Guo et al. (2011) also find operating improvements along with tax gains. In contrast to the papers mentioned above, Cohn et al. (2012) find few if any evidence of value creation.

Looking at the net internal rate of return (IRR) for the funds which we have data for, we already see some transfer of funds to LPs (average net IRR of around five percent). This can be indicative, but the major flow of funds to LPs will take place later in the funds' life. One problem with the value creation for LPs is that the acquisition multiples that PE funds pay tend to correlate positively with the availability of debt financing (Stromberg, 2012). An argument for this can be that PE funds care more about fee hoarding than value transfer to LPs. Still, an

investment with five percent net return over the past crisis years proved better than many alternative investments into stock or bond markets. The insignificant results for efficiency gains and growth might thus be explained by the fact that PE funds have a more long term view on value creation - and actually manage to convince buyers of their firms that this is the case.

2 Literature Review and Stylized Facts

2.1 General Characteristics of PE Funds

PE, or in our case more specifically, leveraged buyout funds are usually structured as limited partnerships. In the limited partnerships, the PE firms are GPs and the investors who are either institutions or wealthy individuals are LPs (Metrick and Yasuda, 2010). The LPs, who provide most of the capital, commit their investment during the entire life of the fund. This structure gives the GPs freedom in the investment process as long as they meet the funds' covenants. These covenants can be restrictions on how much the fund can invest into a single company and what types of securities the fund can hold (Kaplan and Stromberg, 2009).

The GPs are compensated for their consulting services by the LPs with an annual management fee that varies between 1.5-2.5 percent of committed capital and a success premium (carried interest) that is around 20 percent of the profits. Most investment contracts stipulate that the carried interest is only paid out if the return of the fund has met a certain threshold, or hurdle rate, that is commonly set at eight percent per annum (Stromberg, 2012). In the past, funds have become increasingly creative in charging new fees - a popular example are monitoring fees (Kaplan and Stromberg, 2009).

The lifetimes of the limited partnerships are typically around 10-12 years and the first five years are usually referred to as the investment period (Stromberg, 2012). During this period, the PE funds invest into about 10-20 companies which they then own and develop for about four to seven years in order to increase their value. After this period, the PE funds exit the companies through an initial public offering (IPO), a sale or in some cases a default and the LPs are paid with the proceeds afterwards net of fees (Stromberg, 2012).

In its acquisition, the PE funds generally take controlling stakes in targeted companies, but only with a small proportion of equity. In fact, according to Kaplan and Stromberg (2009), PE funds generally use between 60-90 percent debt in their deals. Due to this, PE companies are more highly levered than

other private and listed companies. This suggests that portfolio companies of PE funds could be more sensitive to economic downturns. But as shown by Hamilton et al. (2006), the default rates seem to actually be lower for portfolio companies of PE funds than for other companies. On the other hand, as pointed out by Kaplan and Stromberg (2009), some distress cases might not be publicly available and therefore artificially lower the default rate. In fact, Hotchkiss et al. (2012) find no difference in default rates between portfolio companies and comparable companies when controlling for leverage. However, they do find that PE backed companies spend less time in financial distress.

In contrast to other types of funds, such as for example mutual funds, PE funds take controlling stakes in their companies. During the period in which the PE firms own a company, they take part in the management process (Fenn et al., 1995). By actively involving themselves in the portfolio companies they are able to share their expertise and thereby, for example, improve profitability or grow sales.

2.2 The Performance of PE Funds

PE and its performance has been part of extensive research. One major analysis has been done by Guo et al. (2011) who focus on value creation by PE funds. Their dataset comprises public-to-private deals in the period of the 1990s to 2007. They find that both value adding through tax shield gains and operational improvements are important as well as changes in valuation multiples. They did expect that in less favourable market environments, i.e. with lower access to cheap debt and less quickly growing (or even decreasing) market multiples, it is unlikely that operational improvements are high enough to generate returns on the extraordinary levels they observed during that time.

Another favourable study has been done by Harford and Kolasinski (2012). They also find that PE funds deliver value and that PE funds do not sacrifice long term growth for short term profits by reducing investments. In fact, Harford and Kolasinski (2012) find no difference in investing activities between portfolio companies and their peers. Further, they find no correlation between financial distress and special dividends.

A study over a similar time period as the one done by Guo et al. (2011) has been conducted by Cohn et al. (2012). The authors have access to Internal Revenue Service (IRS, an American tax authority) tax data which are not public. This allows them to circumvent the potential reporting bias inherent in most studies about PE. They find rather small if any operational improvements in the analysed firms and inconclusive evidence towards growth of the total firm. There might, however, be another bias in tax data: incentives to under-report performance in order to reduce the overall tax burden. Assuming that private equity firms are exceptionally aggressive in optimizing their tax burden, this would push the true performance of the firms upwards. This is in particular reasonable because PE funds do not have to report profits to public shareholders on a regular basis, who might be keen to see as high profits as possible (even if that means higher taxes).

Axelson et al. (2012) do investigate the relationship between leverage and returns on the fund level and find a negative correlation between leverage and returns. Further, they also find that leverage is especially high in so called "hot markets" (e.g. around 2007), when debt financing is easy to obtain. This could imply that deals done under these market conditions will be less favourable for the LPs. To the best of our knowledge, no focused research paper exists specifically on the performance of very large PE funds - mainly because the relevant data were not available in the past.

3 The Data Set

For our analysis, we construct a panel consisting of financial data of funds, the funds' portfolio companies and peer data - one entry per year per firm and peer. The funds in our sample have committed capital in excess of USD 8 bn and were raised before the Lehman bankruptcy in 2008. You can find a comprehensive list of the funds we analysed in table 9.1. Funds of which no single portfolio company had financial data reported are excluded from our sample. To have a balanced proportion of pre and post buyout data, we consider financial data in the periods from 2001 to 2012.

The main source of private company and PE fund data is the tool CapitalIQ by Standard & Poors, which provides financial and transaction data of privately held companies. We expect the available financial data to be correct on average from an accounting perspective. The transaction data could be incomplete since the firms might not publish every acquisition or sale of a subsidiary. In general, privately held companies are not required to publish financial information. Those that do usually do it either because they have publicly traded debt or because some shares remain to be publicly traded.

For 70 portfolio companies, we observe that financial reporting stopped around the buyout, while for 21 companies we observe that financial reporting only started afterwards; 87 companies continued reporting throughout. The remaining companies have no financial data reported in the years before and after the buyout. If we assume that the 87 continuous reportings are unbiased - because they have to report for some random exogenous reason - the difference of the other companies' financial data to this sub-sample could indicate manipulating by the funds. The results of this analysis are inconclusive, but at least do not indicate a strong bias if any. We therefore expect the overall reporting bias to be small.

As peers for the portfolio companies, we use performance data from S&P 500 companies accessed through Thomson Datastream - averaged by industries with equal weights. That means that, for instance, the airlines in our sample of portfolio firms have the equally weighted average performance of all airlines in the S&P

500 in a given year as benchmark. These peers are appropriate since PE firms directly compete with public companies and must be able to outperform them in order to generate persistent value. To improve the match between portfolio firms and peers, we only take into account industries that are represented in our sample of portfolio firms. We keep every industry-benchmark only once in our dataset to avoid any artificial significance boosting by doublets. We expect these data to be at least as accurate as the private company data from an accounting perspective since public companies generally face stricter publication rules than private companies. Unfortunately, the industry categories from CapitalIQ and Datastream do not match perfectly. We therefore adjust the industry data from Capital IQ manually to Datastream's INDM industry classification standard (see tables 9.3 and 9.4 in the appendix).

Performance of PE firms can be measured in a variety of ways. Among the most popular is their raw return - non risk adjusted, just plain IRR of a fund, net of fees. Usually funds avoid to publish these data to the general public. Luckily, though, some LPs have the obligation to publish these data. Among these are the California Public Employees' Retirement System, handily known as CalPERS, and the Public Employee Retirement System of Idaho, long for PERSI. These sources seem to be reliable and they happen to have invested into 16 of the 25 funds we look at. Assuming that both institutions have no particular skill in picking the best performing funds and on the other hand also assuming that the best funds are not closed to these two investors, we consider this sample to be unbiased. Besides IRR-data they also publish current market values of portfolio companies, cash-on-cash multiples and distributed cash. The performance data reported have a lag because the funds have a contractual 120-day period to report their performance data. This implies that the performance data we use capture the performance of the funds until the second quarter-end of 2012.

4 Investment Footprint

In total, we identified 25 funds with committed capital equal to and above USD 8 bn that are managed by 19 PE firms. The equally weighted average fund size is USD 12,468 mn in committed capital, with Blackstone Capital Partners V being the largest private equity fund ever to be raised at USD 21.7 billion. All funds have vintage[1] years between 2005 and 2008. We did not find any mega-funds raised before 2005 and only very few that were raised after 2008. We excluded these funds from our research because they are too new to draw reasonable conclusions and are different in the way that they are not facing a sweeping market collapse.

The funds included in the sample invested into 401 companies in total, with 370 unique deals and 364 unique companies (see table 4.1). Not all portfolio companies were in the same process state. The funds at the time of research (January 2013) had current investments into 261 companies. 117 companies had already been exited. That corresponds to an exit-rate of around a third. 17 acquisitions were tried but eventually cancelled and 6 acquisitions were still pending.

Table 4.1: Descriptive statistics of the funds' portfolios

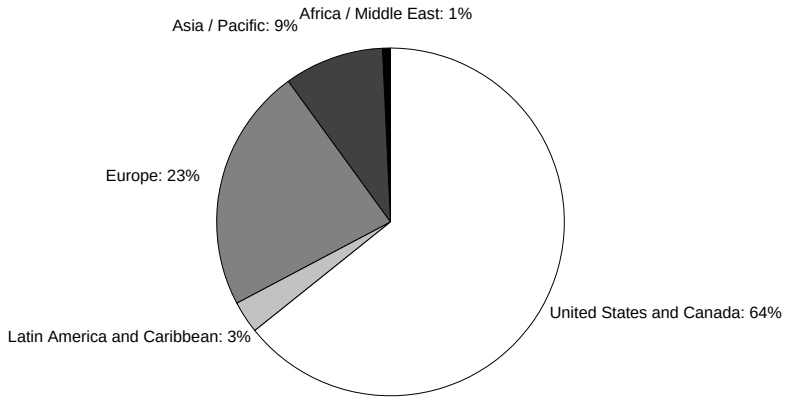
Characteristic	Value
Earliest vintage	2005
Latest vintage	2008
Portfolio companies (#)	401
Unique buyouts (#)	370
Unique portfolio companies (#)	364
Average deal size (mn USD, EW)	2,889
Std. Dev. of deal sizes (mn USD)	6,140
Minimum deal size (mn USD)	3
Maximum deal size (mn USD)	44,492

The regional focuses of the funds are clearly the developed markets of North America and Europe, accounting for 349 of the 401 targeted companies, see figure 4.1. Only 3 companies in Africa/Middle East and 12 companies in Latin

[1] In the context of PE, *vintage* refers to the year in which the investment activity of a fund started.

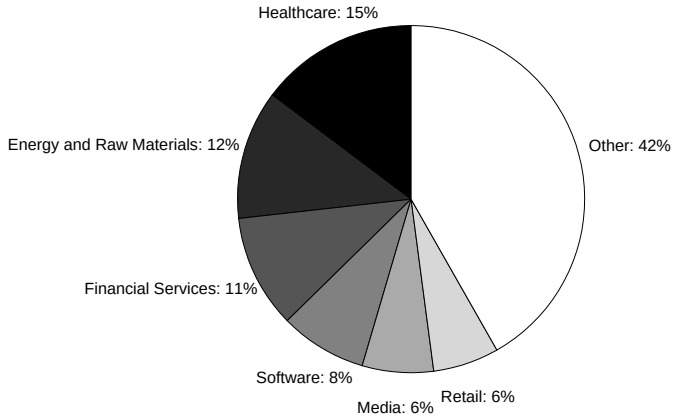
America were of interest for the funds.

Figure 4.1: Portfolio companies by country



The funds also seem to have a focus on certain industries, which can be seen in figure 4.2. Healthcare (including biotech and pharma) accounts for 15 percent of portfolio companies, equally weighted. Energy and Raw Materials come second.

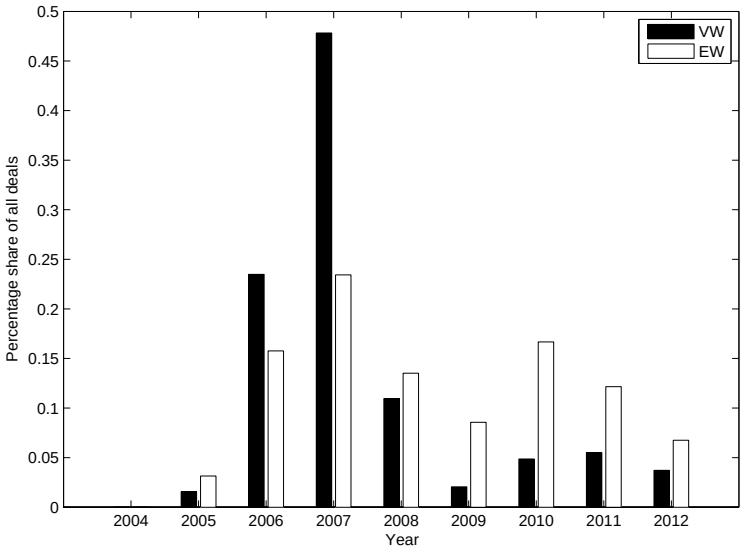
Figure 4.2: Portfolio companies by industry



The funds tended to invest in fairly big deals. The average overall deal size was USD 2.9 bn. But the dispersion is fairly large, too, with a standard deviation of around USD 6 bn. The smallest investment was just USD 3 mn in

size[2], while the biggest accounted for USD 44 bn, the biggest buyout in history[3]. The investment activity, see figure 4.3, clearly shows signs of collapse when the crisis hit, although this collapse was by far stronger in value-terms. That means that the funds made smaller rather than fewer deals. Part of this is a natural phenomenon in cooling markets (since prices drop, deals ceteris paribus automatically get smaller), but the funds still invested less overall by essentially any measure.

Figure 4.3: Relative investments by year of reported deals



[2]A venture investment into Flexuspine, Inc., a firm that aims to produce spinal segment replacements.

[3]TXU, now renamed to Energy Future Holdings, an energy company; as of writing this company was defined as 'struggling' due to the gas price collapse following the shale gas boom in the United States.

5 Econometric Issues in Panel Data

In this thesis, we want to investigate how the so called mega-funds have performed until today. One dimension of this is to look at how their portfolio companies have performed. A way to determine this is to look at the operating performance of the portfolio companies since there should be a link between value creation in the portfolio companies and value creation of the fund. As there are many factors that determine the level and development of operating performance, the effect of being acquired by a buyout fund is hard to distinguish.

One problem that we face is that we cannot observe the true operating counter-factual of an acquired company. That is, we cannot observe the operating performance for an acquired company given that it had not been acquired. Our best proxies for this counter-factual performance are peers that have not been acquired. These proxies can have a selection bias, though.

$$E[Y_i|D_i = 1] - E[Y_i|D_i = 0] = E[Y_{1i}|D_i = 1] - E[Y_{0i}|D_i = 1] \tag{5.1}$$
$$+ E[Y_{0i}|D_i = 1] - E[Y_{0i}|D_i = 0] \tag{5.2}$$

where Y_{1i} is the outcome given treatment, Y_{0i} is the outcome without treatment, D_i is a dummy variable that takes the value one if treated and zero otherwise. The selection bias as given by Angrist and Pischke (2009) is shown in equation 5.2.

In an ideal world, we would select a group of companies and from that group draw a random sample that we would tell the PE funds to invest in. In such a setting all other factors can be assumed to be the same for the treated and the untreated firms on average. The selection bias would be zero. If we compare post acquisition operating ratios of portfolio companies to comparable companies, our results might be biased. This is due to the fact that in absence of acquisition, the portfolio companies might have had ratios that were different to those of the comparable companies.

Since the authors of this thesis not yet have the authority to decide what companies the PE funds should acquire, we have to solve the problem of causality

in another fashion. When we try to determine the effect that the PE funds have on the portfolio companies, we test whether the operating performance of those companies changes as a result of the buyout. In order to capture the causality, we use the DiD approach with time and firm FE. This is a way to handle problems with omitted variables.

To exemplify this, let the true causality be described by the following equation:

$$Y_i = \alpha + \rho_x X_i + \rho_z Z_i + e_i \tag{5.3}$$

where X_i and Z_i are the only two causal variables and e_i is the uncorrelated error term. Let us further assume that Z_i has a non-zero correlation with X_i and that Z_i is unobservable. This would make it impossible to run equation 5.3 in practice. Instead, one could use the shorter equation below:

$$Y_i = \alpha + \rho_x X_i + \eta_i \tag{5.4}$$

where η_i is the new error term that equals $\rho_2 Z_i + e_i$. The population regression function (PRF) coefficient of Y_i on X_i will then be (assuming selection bias = 0):

$$\begin{aligned}
\beta_x &= \frac{Cov(Y_i, X_i)}{Var(X_i)} \\
&= \rho_x + \frac{Cov(\eta_i, X_i)}{Var(X_i)} \\
&= \rho_x + \frac{Cov(Z_i, X_i)}{Var(X_i)}
\end{aligned}$$

where the OVB is given by:

$$\frac{Cov(Z_i, X_i)}{Var(X_i)}$$

Since the performance of companies are determined by many different factors such as the state of the economy, climate change and migration, it is not ideal to throw in all those variables in a regression. There would simply be too many variables to estimate and it would be easy to forget important variables. The causal effect is therefore hard to identify.

We solve this problem by using the DiD approach. In this case, we use comparable firms that are not treated (i.e. not acquired by a buyout fund), but still affected by the same factors. If the comparable firms are similar to the portfolio companies in many aspects, it is likely that they would have similar trends in absence of treatment. This is called the CTA (Angrist and Pischke, 2009). This assumption is difficult to test, but we will present figures of past performance that indicate that this assumption does hold in the next section.

Another important assumption is the *no anticipation assumption* (NAA). As an example, this assumption states that the operating figures for prospective buyout companies are not affected by rumours of a takeover. This could be a problem if the takeover is hostile and management tries to defend their position in the company by artificially boosting accounting figures. Our view is that this is a minor problem given the data we have.

For the DiD approach, we use the following regression function:

$$Y_{it} = \alpha + \lambda_t + \gamma_i + \delta D_{it} + \epsilon_{it} \tag{5.5}$$

where Y_{it} is the operating figure of interest, γ_i is the firm FE, λ_t is the time FE and D_{it} is the causal effect of interest (the DiD estimator) that is equal to one for portfolio companies post acquisition, and zero otherwise. This means that we use dummy variables for each time period and each firm so that we allow the operating figures to vary across the time and firm spaces. Even if these variables might be hard to interpret per se, they are usually good control variables.

We can reject the null hypothesis that the operating performance of the portfolio companies are the same as their peers' if δ is significantly different from zero. If the PE funds have managed the crisis well, we would expect a significantly positive value on profitability.

6 The Performance of Mega-Funds

In the following sections, we take the above theory to the data. In the first part, we look at the effects that the buyout had on the portfolio companies' productivity and efficiency. In the second section, we show which effects they had on growth. Changes of the operating performance of portfolio companies do not necessarily lead to a good fund performance, though. If the fund entered at a too high multiple, the deal can still turn out to be bad. This could be especially problematic in 2006 and 2007, as shown by Stromberg (2012), when the credit spread was low and it was easy to get access to debt financing. Therefore, we will also look at the IRR-performance of the funds in the third section of this chapter and test whether funds with a higher IRR also managed to improve the portfolio companies' performances. Despite the flaws of these methods, combined they should give a good indication of how the mega-funds will eventually perform.

6.1 Operational Performance

6.1.1 Difference-in-Difference

In order to determine the operating performance of the companies in our sample, we mainly use four efficiency measures. The first efficiency oriented measure is EBITDA/Sales and is a good measure of how efficient and productive the firm is run from an operating perspective. This measure takes away the effect of non-operating items further down in the income statement.

The second operating ratio we look at is COGS/Sales. This measure captures how good the firm is at keeping down direct production costs excluding any sales or marketing efforts. This measure is therefore a good complement to EBITDA/Sales if PE funds try to increase/decrease long term profits at the expense/benefit of short term EBITDA.

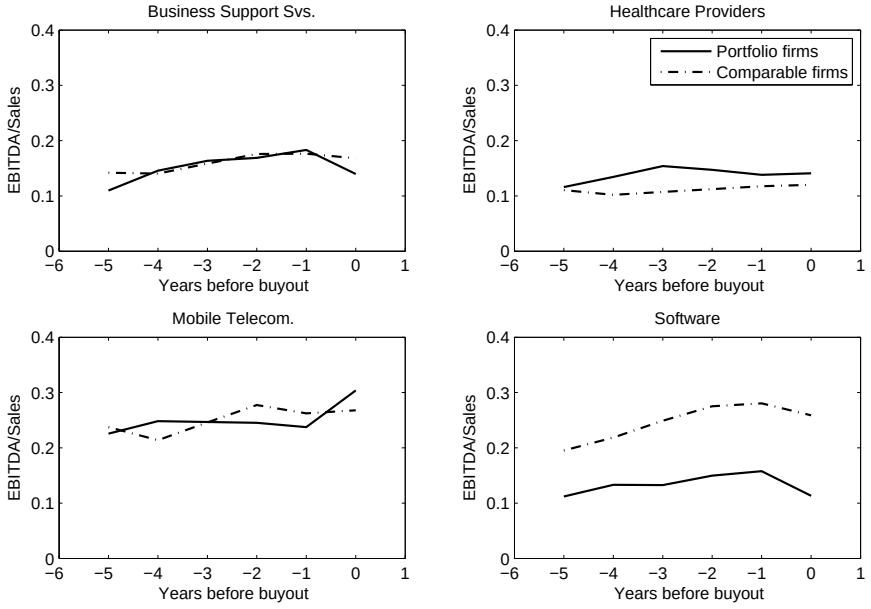
The third and fourth indicators are the Cash/Sales ratio and the Inventory Turnover. The former gives an indication of the level of cash needed to run the firm. It is usually lower if invoicing and cash collection work well. The latter tells us how often the inventory is used in a year. In general, a low inventory

turnover indicates overstocking, so in most instances a high inventory turnover is better.

In order to determine whether the PE funds manage their portfolio companies well, we compared the operating performance of the portfolio companies with equally weighted industry averages of S&P 500 companies of those industries that are actually represented in our sample of portfolio firms. Our assumption is then that in the absence of the buyouts, the portfolio companies would have had the same trend as the peers, the so called CTA.

In order to get an indication whether the CTA is plausible, we compare the trends of the treated group with those of the untreated companies before the buyouts. Our trend comparison before the buyout in figure 6.1 shows that this assumption seems to hold fairly well for the four most prevalent industries in our sample for EBITDA/Sales ratios. Further graphs of this kind can be found in the appendix in figure 9.1 to figure 9.7. Unfortunately, the common trend assumption does not seem to hold too well for our Inventory Turnover data. So those results should be handled with caution.

Figure 6.1: EW EBITDA/Sales ratios for most prevalent industries before buyout



The final DiD regressions that we present in the following tables look as

follows:

$$Y_{it} = \alpha + \lambda_t + \gamma_i + \delta portafterinteraction_{it} + \epsilon_{it} \tag{6.1}$$

where λ_t is the time FE, γ_i is the firm FE, and $portafterinteraction_{it}$ is the DiD variable that is equal to one if the company is in the treated group post the acquisition date.

In table 6.1, we present regression results for the EBITDA/Sales measure. The regressions in the upper part include the entire dataset, while those in the lower part exclude the top and bottom five percent of values to reduce the effect of outliers. As one can see in boxplot 6.2, some values in the panel are very far away from the median. Removing the top and bottom five percent of values from the portfolio firm and peer data, makes the data significantly more balanced, see boxplot 6.3. Some of the extreme values might simply be reporting errors, while others are indeed stellar or horrible performances. Therefore we always report both, regressions with and without outliers.

If we start by looking at the regression with the complete data set, we see that the estimate of interest, *portafterinteraction*, is negative but insignificant for all industries (regression I). This indicates that EBITDA/Sales decreases post buyout. This effect is, however, not statistically significant. In the same table, we also present results for the industries that are most prevalent among the portfolio companies (regressions II-V). These industries are business support services, healthcare providers, mobile telecom and software. If we instead look at the individual industries, we see a significantly negative effect for the business support services, healthcare providers and software industries. The mobile telecom industry also shows a negative effect of buyout, but that effect is insignificant. We can also note that the intercept is positive, which means that the portfolio firms in our data set are more efficient than their peers on average.

In the same table, we also show the regression results without outliers since they can heavily influence our estimates. As with the complete data set, *portafterinteraction* shows a negative sign in all regressions and, in contrast to the complete data set, the all industries category shows a significant negative effect. This is despite the fact that the point estimate of the coefficient is smaller in absolute terms. In general, the regression results excluding outliers show a smaller absolute effect than the corresponding effect for the complete dataset. The only

exception is regression IV, the mobile telecom industry, which has an almost identical point estimate that is still insignificant.

Figure 6.2: Boxplots unadjusted

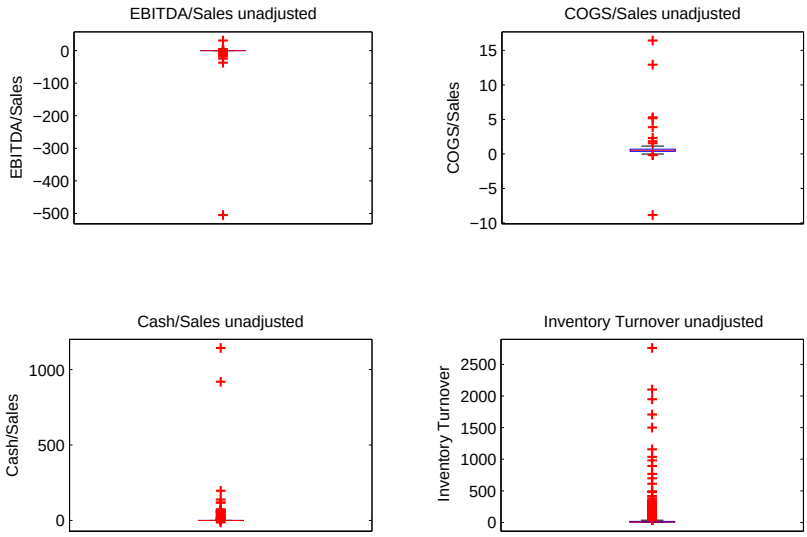


Figure 6.3: Boxplots adjusted, w/o top and bottom 5 percent

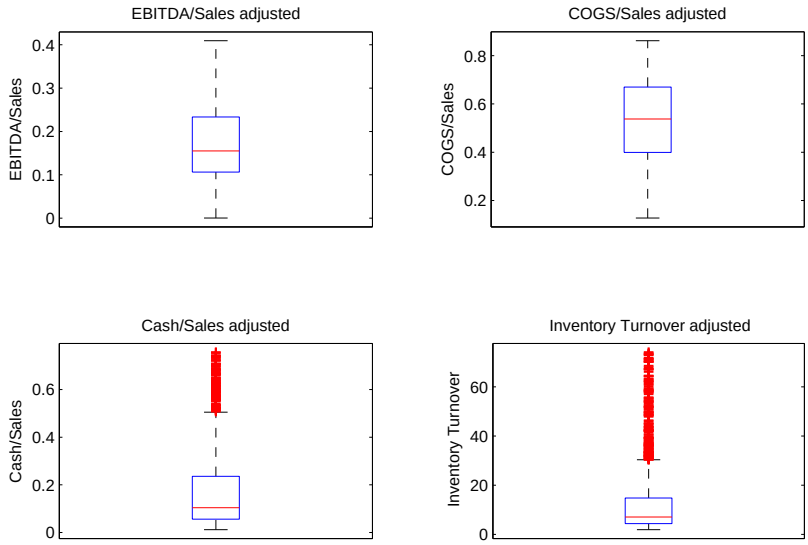


Table 6.1: DiD fixed effects regression of EBITDA/Sales with and without outliers

Notes. This table reports the regression coefficients and t-statistics of the Difference-in-Difference regressions on the EBITDA/Sales ratios using firm and time fixed effects. The upper part uses the complete data set, while the lower part is cleaned from the top and bottom five percent of values to reduce the influence of extreme values. The variable portafterinteraction is the interaction term and is one for portfolio firms after the buyout and zero otherwise.

	(I)	(II)	(III)	(IV)	(V)
	All Industries	Business Support Svs.	Healthcare Providers	Mobile Telecom.	Software
portafterinteraction	-0.932	-0.046	-0.055	-0.026	-0.095
	(1.45)	(2.61)**	(2.62)**	(1.23)	(2.03)**
_cons	0.112	0.077	0.169	0.272	0.077
	(0.75)	(3.02)***	(6.20)***	(10.79)***	(0.70)
R2	0.04	0.74	0.53	0.95	0.5
N	2,415	120	72	64	95
	All Industries	Business Support Svs.	Healthcare Providers	Mobile Telecom.	Software
portafterinteraction	-0.012	-0.022	-0.032	-0.027	-0.043
	(2.59)***	(1.58)	(2.19)**	(1.22)	(1.34)
_cons	0.151	0.111	0.175	0.227	0.214
	(25.46)***	(9.42)***	(6.33)***	(8.97)***	(3.38)***
R2	0.71	0.82	0.6	0.88	0.63
N	2,175	115	70	57	86

* p<0.1; ** p<0.05; *** p<0.01

Table 6.2: DiD fixed effects regression of COGS/Sales with and without outliers

Notes. This table reports the regression coefficients and t-statistics of the Difference-in-Difference regressions on the COGS/Sales ratios using firm and time fixed effects. The upper part uses the complete data set, while the lower part is cleaned from the top and bottom five percent of values to reduce the influence of extreme values. The variable portafterinteraction is the interaction term and is one for portfolio firms after the buyout and zero otherwise.

	(I)	(II)	(III)	(IV)	(V)
	All Industries	Business Support Svs.	Healthcare Providers	Mobile Telecom.	Software
portafterinteraction	0.049	-0.021	0.071	-0.049	0.012
	(0.82)	(0.81)	(2.62)**	(2.02)**	(0.36)
_cons	0.582	0.552	0.623	0.476	0.29
	(31.59)***	(7.66)***	(11.87)***	(14.07)***	(7.94)***
R2	0.15	0.81	0.87	0.95	0.87
N	2,248	120	70	64	95
	All Industries	Business Support Svs.	Healthcare Providers	Mobile Telecom.	Software
portafterinteraction	-0.013	-0.016	0.071	-0.049	0.038
	(1.67)*	(0.57)	(2.74)***	(2.02)**	(1.18)
_cons	0.575	0.576	0.581	0.476	0.355
	(60.80)***	(18.12)***	(12.22)***	(14.07)***	(7.50)***
R2	0.77	0.87	0.91	0.95	0.78
N	2,024	102	68	64	71

* p<0.1; ** p<0.05; *** p<0.01

Table 6.3: DiD fixed effects regression of Cash/Sales with and without outliers

Notes. This table reports the regression coefficients and t-statistics of the Difference-in-Difference regressions on the Cash/Sales ratios using firm and time fixed effects. The upper part uses the complete data set, while the lower part is cleaned from the top and bottom five percent of values to reduce the influence of extreme values. The variable portafterinteraction is the interaction term and is one for portfolio firms after the buyout and zero otherwise.

	(I)	(II)	(III)	(IV)	(V)
	All Industries	Business Support Svs.	Healthcare Providers	Mobile Telecom.	Software
portafterinteraction	2.982	-0.059	-0.042	-0.062	-0.07
	(1.53)	(1.52)	(1.41)	(1.01)	(0.63)
_cons	6.442	0.08	0.044	0.099	0.378
	(1.10)	(3.25)***	(3.13)***	(2.80)***	(4.25)***
R2	0.07	0.64	0.76	0.55	0.49
N	2,198	110	69	62	90
	All Industries	Business Support Svs.	Healthcare Providers	Mobile Telecom.	Software
portafterinteraction	-0.022	-0.056	-0.068	-0.06	-0.007
	(2.04)**	(1.25)	(1.65)	(0.98)	(0.08)
_cons	0.12	0.1	0.052	0.116	0.367
	(12.70)***	(3.44)***	(2.26)**	(2.89)***	(4.57)***
R2	0.55	0.62	0.76	0.53	0.58
N	1,980	100	57	61	79

* p<0.1; ** p<0.05; *** p<0.01

Table 6.4: DiD fixed effects regression of Inventory Turnover with and without outliers

Notes. This table reports the regression coefficients and t-statistics of the Difference-in-Difference regressions on the Inventory Turnover using firm and time fixed effects. The upper part uses the complete data set, while the lower part is cleaned from the top and bottom five percent of values to reduce the influence of extreme values. The variable portafterinteraction is the interaction term and is 1 for portfolio firms after the buyout and zero otherwise.

	(I)	(II)	(III)	(IV)	(V)
	All Industries	Business Support Svs.	Healthcare Providers	Mobile Telecom.	Software
portafterinteraction	18.201	80.742	-0.898	11.308	-111.664
	(1.52)	(1.26)	(0.48)	(2.38)**	(1.14)
_cons	28.263	36.707	22.901	46.797	24.247
	(2.91)***	(1.91)*	(5.44)***	(14.84)***	(1.01)
R2	0.46	0.49	0.91	1	0.29
N	1,744	70	55	47	79
	All Industries	Business Support Svs.	Healthcare Providers	Mobile Telecom.	Software
portafterinteraction	0.652	1.103	-0.898	11.308	-12.931
	(0.73)	(0.39)	(0.48)	(2.41)**	(1.36)
_cons	12.677	17.042	22.901	10.698	20.279
	(12.59)***	(2.53)**	(5.44)***	(3.36)***	(2.20)**
R2	0.78	0.96	0.91	0.49	0.57
N	1,570	51	55	46	74

* p<0.1; ** p<0.05; *** p<0.01

Turning to the DiD regression for COGS/Sales in table 6.2, we see a positive but insignificant effect of buyouts for all industries with the complete data set. For regressions III and IV, we find a significant positive effect of buyouts on COGS/Sales. If we exclude outliers, we see a significant negative effect for all industries (regression I). After looking at the EBITDA/sales results above and seeing a negative effect that the buyouts had, we would expect a positive effect on COGS/Sales. Our results, excluding outliers, tell us the opposite. If we look at the effect that a buyout had on all industries, it is negative and significant. This means that the PE funds have managed to reduce direct production costs in relation to sales, compared to their peers, if outliers are excluded from the sample. So one could conclude that the main source of the negative effect on EBITDA/Sales lies in other items in the income statement. Looking at the individual industries, the story is not as compelling since we see one significant positive effect for the healthcare providers industry and a significant negative effect for the mobile telecom industry.

The results for the DiD regressions for the Cash/Sales measure are shown in table 6.3. Starting with the regression in the upper part of the table including outliers, we see no significant effect in any of the regressions. For all industries the point estimate is positive, but for the individual industries we present in the same table, the results are negative. If we exclude outliers and look at the bottom regression in the same table, we see a significant negative effect in regression I. This means that if we exclude outliers, the PE funds managed to decrease Cash/Sales for their portfolio companies. The results for the individual industries are still negative and insignificant.

The final efficiency oriented operating measure is the Inventory Turnover and the results are shown in table 6.4. Starting with the complete dataset, the regression including all observations in table 6.4 shows a significant positive result of a buyout for the mobile telecom industry. This also holds if we exclude outliers. For the other regressions, we see a positive but insignificant effect in the all industries category for both datasets. For the individual industries, the results are mixed (but insignificant), and the signs do not vary between the results of the two datasets.

In order to verify that our regressions capture the buyout effect and nothing

else, we perform robustness checks with placebo treatments. The robustness checks for the efficiency measures can be found in table 9.2 in the appendix. In these regressions, the interaction term is replaced by a placebo that takes the value one in the two years before the buyout and in the year of the buyout but zero otherwise.

6.1.2 Changes over Time

To further investigate how efficiency develops for portfolio companies compared to their peers, we look at year-to-year changes of the same measures as above. We start by looking at the year-on-year EBITDA/Sales changes and adjusted EBITDA/Sales changes for the portfolio companies as shown in table 6.5. For the adjusted changes, we used the difference of the performance data of the portfolio firms and the equal weighted S&P 500 industry averages, to identify 'abnormal' changes. If we start by looking at the unadjusted changes they are around zero, or slightly positive, until the acquisition date and then turn slightly negative for the post acquisition period. The only significantly negative change is observed in period t=+5 to t=+6. If we instead turn to the adjusted changes in EBITDA/Sales in table 6.5, we see mostly negative but insignificant changes. However, in the last period, the change is both positive and significant.

If we exclude the outliers for EBITDA/Sales and look at table 6.6, we see a significant negative change just prior to the takeover (t=-1 to t=0) for the unadjusted changes. In period t=+3 to t=+4 we see a significant positive result for the same measure. The more interesting statistic is, of course, the adjusted EBITDA/Sales changes. For this measure, there is one significant positive result for the period t=+1 to t=+2.

The period to period changes in COGS/Sales including outliers are shown table 6.5. According to these results, there is only one significant unadjusted change in COGS/Sales. This is a significantly negative change in t=-3 to t=-2. For the adjusted changes, we see one significant positive change in period t=+5 to t=+6.

The results for COGS/Sales excluding outliers are shown in table 6.6. In contrast to the case when we looked at the complete dataset, we observe one significantly positive change for the unadjusted statistic prior to buyout. For the

adjusted equivalent, we see a significant positive change in t=+5 to t=+6.

Changes in Cash/Sales and Inventory Turnover are also shown in tables 6.5 and 6.6 (with and without outliers, respectively). The unadjusted changes including outliers for cash/sales and inventory turnover show no significance in the complete dataset in table 6.5. Excluding the outliers, we see a significant negative change in period t=+2 to t=+3 for the unadjusted cash/sales statistic. For the unadjusted changes in inventory turnover in the same table, we see three significant positive changes prior to the buyout. Looking at the adjusted changes in inventory turnover, we see one significant positive change in period t=+4 to t=+5.

In the tables 6.5 and 6.6, we also present changes for t=-4 to t=0 and t=0 to t=+4 grouped together to capture the overall effect around the buyout. Despite seeing some significant changes for individual time periods, none of these changes show any significant results.

Table 6.5: Average changes of Key Ratios pre and post buyout with outliers

Notes. This table reports the average year-on-year changes of the respective performance ratios of the portfolio companies. The adjusted values have been reduced by the average performance of the comparable industries in the equivalent years, and then averaged by time periods over all industries. The reported t-statistics indicate the significance of the difference of the data from zero. This table comprises the entire set without removing extreme values.

	EBITDA/Sales	t(stat)	N	Adj. EBITDA/Sales	t(stat)	N	COGS/Sales	t(stat)	N	Adj. COGS/Sales	t(stat)	N
-3 to -2	0.00	(0.54)	145	-3.52	(1.01)	145	-0.02	(1.72)*	136	-0.01	(1.28)	133
-2 to -1	0.04	(1.43)	155	-0.15	(1.18)	155	0.00	(0.53)	146	0.00	(0.86)	142
-1 to 0	0.19	(0.86)	139	0.20	(0.88)	138	-0.08	(1.11)	132	-0.08	(1.16)	128
0 to +1	-0.33	(1.19)	110	-0.34	(1.21)	109	0.08	(0.94)	100	0.09	(1.00)	99
+1 to +2	-0.05	(1.22)	102	-0.04	(0.85)	102	0.02	(1.10)	97	0.03	(1.23)	96
+2 to +3	-0.37	(0.84)	78	-0.38	(0.87)	78	0.19	(0.95)	74	0.20	(0.99)	73
+3 to +4	0.55	(0.96)	62	0.54	(0.95)	62	-0.26	(1.03)	61	-0.26	(0.99)	60
+4 to +5	-0.03	(0.77)	46	-0.01	(0.36)	45	0.00	(0.56)	45	0.02	(1.63)	45
+5 to +6	-0.01	(1.67)*	24	0.03	(1.86)*	24	0.01	(1.16)	23	0.08	(2.83)***	23
-4 to 0	0.27	(1.04)	118	-4.36	(1.01)	117	-0.14	(1.45)	111	-0.14	(1.47)	108
0 to +4	-0.65	(1.11)	55	-0.67	(1.13)	55	0.19	(1.00)	53	0.19	(0.98)	52
	Cash/Sales	t(stat)	N	Adj. Cash/Sales	t(stat)	N	Inv. Turn.	t(stat)	N	Adj. Inv. Turn.	t(stat)	N
-3 to -2	-0.19	(0.72)	124	9.26	(0.99)	122	1.47	(0.51)	95	0.92	(0.32)	91
-2 to -1	0.48	(0.85)	137	0.26	(1.01)	135	11.27	(1.15)	103	10.42	(1.07)	99
-1 to 0	-0.09	(0.33)	125	0.09	(0.42)	124	7.19	(1.46)	94	5.03	(0.77)	89
0 to +1	-0.55	(0.91)	91	0.03	(0.17)	90	-2.71	(0.46)	69	-4.05	(0.66)	64
+1 to +2	0.04	(0.18)	90	0.13	(0.67)	89	6.85	(0.60)	69	7.42	(0.59)	63
+2 to +3	1.36	(0.96)	72	1.37	(0.95)	71	45.19	(1.16)	54	48.29	(1.15)	50
+3 to +4	-2.02	(1.03)	58	-2.01	(1.03)	58	-17.39	(0.59)	45	-19.00	(0.60)	42
+4 to +5	0.14	(0.89)	44	0.14	(0.91)	44	14.48	(1.13)	35	19.09	(1.32)	31
+5 to +6	-0.01	(1.29)	22	0.01	(0.81)	22	2.70	(0.97)	16	5.02	(1.43)	13
-4 to 0	0.67	(1.07)	105	13.19	(1.18)	104	6.15	(0.82)	79	-0.70	(0.08)	76
0 to +4	0.40	(1.04)	47	0.37	(0.97)	47	13.21	(0.37)	39	12.97	(0.35)	38

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

Table 6.6: Average changes of Key Ratios pre and post buyout without outliers

Notes. This table reports the average year-on-year changes of the respective performance ratios of the portfolio companies. The adjusted values have been reduced by the average performance of the comparable industries in the equivalent years, and then averaged by time periods over all industries. The reported t-statistics indicate the significance of the difference of the data from zero. For this table the top and bottom five percent values of the portfolio firms have been removed in order to exclude extreme values.

	EBITDA/Sales	t(stat)	N	Adj. EBITDA/Sales	t(stat)	N	COGS/Sales	t(stat	N)	Adj. COGS/Sales	t(stat)	N
-3 to -2	0.00	(0.85)	132	-3.86	(1.01)	132	-0.01	(1.32)	119	0.00	(0.15)	117
-2 to -1	0.00	(1.48)	139	-0.20	(1.50)	139	0.00	(0.20)	131	0.00	(1.01)	128
-1 to 0	-0.01	(1.78)*	126	0.00	(0.45)	125	0.00	(0.12)	118	0.00	(0.89)	115
0 to +1	0.00	(0.32)	96	0.00	(0.38)	96	-0.01	(1.09)	86	0.00	(0.11)	86
+1 to +2	0.01	(1.82)	86	0.02	(2.61)***	86	0.00	(0.45)	82	0.01	(0.78)	82
+2 to +3	0.00	(0.62)	63	-0.02	(1.46)	63	0.00	(0.14)	62	0.01	(1.16)	62
+3 to +4	0.01	(1.99)**	51	0.00	(0.22)	51	-0.01	(2.65)***	51	0.00	(0.33)	51
+4 to +5	0.00	(0.42)	40	0.01	(1.04)	39	0.00	(0.68)	41	0.02	(1.44)	41
+5 to +6	-0.01	(1.50)	20	0.03	(1.51)	20	0.01	(1.20)	21	0.09	(3.06)***	21
-4 to 0	0.00	(0.32)	106	-5.03	(1.05)	105	-0.01	(0.96)	97	-0.01	(0.69)	95
0 to +4	0.01	(1.20)	47	0.00	(0.10)	47	0.00	(0.46)	45	-0.01	(0.85)	45
	Cash/Sales	t(stat)	N	Adj. Cash/Sales	t(stat)	N	Inv. Turn.	t(stat)	N	Adj. Inv. Turn.	t(stat)	N
-3 to -2	-0.02	(1.05)	105	0.13	(1.28)	104	2.24	(1.72)*	85	1.94	(1.40)	83
-2 to -1	-0.01	(0.94)	115	0.19	(0.94)	114	2.38	(1.70)*	92	1.62	(0.99)	90
-1 to 0	0.01	(1.06)	106	0.01	(0.44)	106	1.51	(1.68)*	81	-0.76	(0.17)	78
0 to +1	-0.01	(0.75)	77	-0.01	(0.39)	77	0.98	(0.53)	59	-0.51	(0.26)	56
+1 to +2	-0.02	(2.00)**	80	-0.03	(1.93)	80	-1.26	(1.11)	60	-1.33	(0.97)	56
+2 to +3	0.00	(0.03)	65	-0.02	(1.04)	65	1.97	(1.46)	48	1.64	(0.72)	45
+3 to +4	-0.02	(1.60)	52	-0.01	(0.76)	52	1.96	(1.42)	39	1.63	(1.34)	37
+4 to +5	0.01	(0.72)	38	0.01	(0.99)	38	1.38	(0.94)	30	3.89	(2.24)**	27
+5 to +6	-0.01	(1.29)	22	0.01	(0.81)	22	-0.02	(0.08)	12	2.13	(1.52)	11
-4 to 0	0.02	(1.40)	85	16.04	(1.18)	85	1.05	(0.38)	68	-5.93	(1.00)	66
0 to +4	0.00	(0.03)	42	-0.03	(1.18)	42	3.04	(1.21)	33	2.22	(0.92)	33

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

6.2 Growth

6.2.1 Difference-in-Difference with Fixed Effects

Productivity and efficiency improvements are one part of value-creation, growth is the other. After looking at efficiency measures such as EBITDA/Sales and Inventory Turnover, we now turn our attention to growth measures. There are two ways to achieve growth: growing organically and growing through acquisitions. Only growth net of acquired growth should be considered for true value creation since for the acquired growth the funds typically had to pay a fair-value up front, making the deal a zero-NPV transaction. To adjust for that, we introduce a new variable, *netaddon* which is defined in the following way:

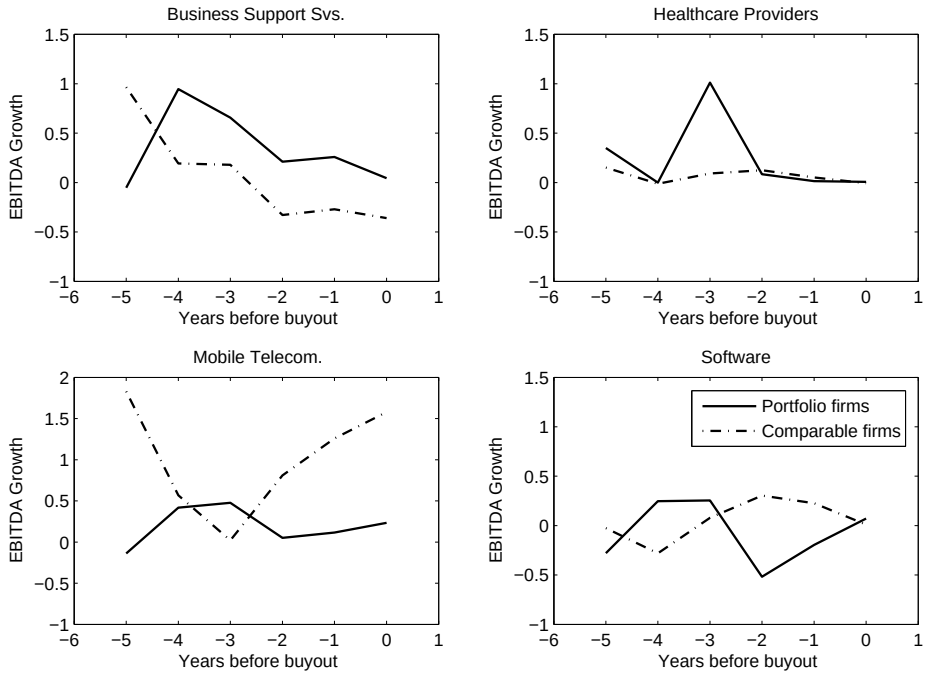
$$netaddon_{it} = \frac{MV\ of\ acquired\ subsidiaries_{it} - MV\ of\ sold\ subsidiaries_{it}}{MV\ portfolio\ firm_i}$$

where MV stands for market value. We assume the MV of the portfolio firms to be constantly equal to the acquisition price. If not all of the data were available in a given year for a given firm, we assumed *netaddon* to be zero.

Since we have data about acquisitions and spin-offs and know the acquisition price of most of the portfolio firms, we can include this variable in our regressions if we assume that the acquired growth of the peers is insignificant. Unfortunately, we have no indication on how comprehensive the acquisition data are, so there is a significant source of error and the results should be handled in that way. Simply removing outliers from the growth data is likely to exclude some acquired growth, too, so both measures together should control for a good portion of the acquired component of growth. The regressions including *netaddon* will then capture the linear effect that this variable has on overall growth. This assumes a linear relationship between growth and normalized acquired subsidiaries.

Also for the growth data we provide graphs of past performance to do an eyeball-test of the CTA (see figure 6.4). Further graphs of this kind for growth data can be found in figures 9.8 to 9.10 in the appendix. As common with real-life data, the graphs do not show an ideal co-movement, but they seem to be good enough to continue.

Figure 6.4: EW EBITDA Growth for most prevalent industries before buyout



Again we report regressions with and without outliers. As for the productivity data, there are some very extreme values among the portfolio firms and the peers as can be seen in figure 6.5 and 6.6.

In table 6.8, we present the regression results for EBITDA growth using the complete dataset. In the top regression, we look at all growth, and in the regression at the bottom, we control for acquired growth. For the complete dataset, we observe no significant effect in any of the regressions. However, in the all industries category (regression I), the point estimate is positive which indicates that the portfolio firms grow faster than their peers as a result of the buyout. This result also holds for the healthcare provider and mobile telecom industries. Looking at the same regressions excluding outliers in table 6.7 we see similar results and also a significant positive effect for the healthcare providers industry. This is true even after controlling for acquired growth. Another interesting fact to mention is that the sign for the *netaddon* estimate is expected to be positive since acquiring a company should boost EBITDA, and it is positive for all industries except for healthcare providers. In this industry, the *netaddon* estimate might be correlated with another event that has an opposite effect.

If we turn to the buyout effect on sales growth in table 6.9, we see a significant effect in the healthcare providers industry if we do not control for net add-ons. This also holds when we control for non-organic growth. However, as with the *netaddon* estimate in the EBITDA growth regressions, the sign is negative but insignificant. In table 6.10, we show the regression results for the acquisition effect on sales growth without outliers. If we do not control for acquired growth, we see a significant positive effect of being acquired by a PE fund in the healthcare providers industry. This significance remains if we control for net acquisitions. As with the efficiency oriented measures, we provide robustness checks for growth regressions in table 9.2.

Figure 6.5: Boxplots for growth data unadjusted

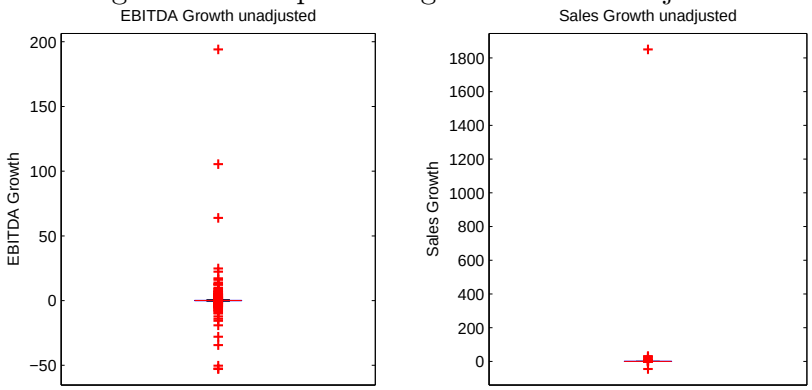


Figure 6.6: Boxplots for growth data adjusted - w/o top and bottom 5 percent

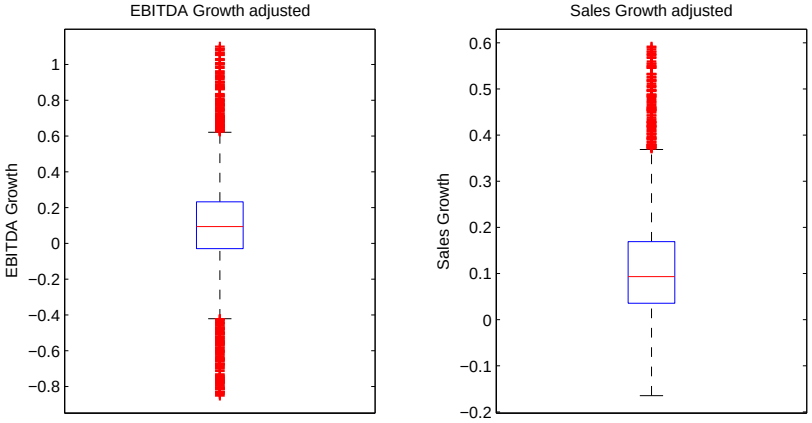


Table 6.7: DiD fixed effects regression of EBITDA growth with outliers

Notes. This table reports the regression coefficients and t-statistics of fixed effects regressions on EBITDA growth data. All reported regressions account for time and firm fixed effects. The results are based on the entire dataset. The netaddon variable is defined by the difference of the total value of acquisitions and the value of spin-offs of a portfolio company in a specific year, divided by the total market value of the portfolio company as defined by its acquisition price.

	(I)	(II)	(III)	(IV)	(V)
	All Industries	Business Support Svs.	Healthcare Providers	Mobile Telecom.	Software
portafterinteraction	0.859	-0.241	0.457	0.126	-0.789
	(1.29)	(0.55)	(1.06)	(0.32)	(1.00)
_cons	0.212	0.255	0.148	-0.195	-0.567
	(0.41)	(1.87)*	(1.04)	(0.86)	(1.59)
R2	0.07	0.1	0.15	0.26	0.32
N	2,167	107	66	56	83
	All Industries	Business Support Svs.	Healthcare Providers	Mobile Telecom.	Software
portafterinteraction	0.862	-0.162	0.457	0.045	-0.824
	(1.29)	(0.38)	(1.06)	(0.11)	(1.03)
netaddon	0.114	0.576	0.001	1.621	-0.04
	(1.17)	(2.68)***	(0.00)	(1.11)	(0.41)
_cons	0.205	0.261	0.148	-0.22	-0.565
	(0.40)	(1.81)*	(1.02)	(1.00)	(1.57)
R2	0.07	0.13	0.15	0.27	0.32
N	2,167	107	66	56	83

* p<0.1; ** p<0.05; *** p<0.01

Table 6.8: DiD fixed effects regression of EBITDA growth without outliers

Notes. This table reports the regression coefficients and t-statistics of fixed effects regressions on EBITDA growth data. All reported regressions account for time and firm fixed effects. The data are cleaned from the top and bottom five percent of values to reduce the effect of extreme values. The netaddon variable is defined by the difference of the total value of acquisitions and the value of spin-offs of a portfolio company in a specific year, divided by the total market value of the portfolio company as defined by its acquisition price.

	(I)	(II)	(III)	(IV)	(V)
	All Industries	Business Support Svs.	Healthcare Providers	Mobile Telecom.	Software
portafterinteraction	0.027	0.172	0.281	-0.188	-0.011
	(0.91)	(1.26)	(2.67)**	(0.97)	(0.05)
_cons	0.108	0.255	0.157	-0.195	0.086
	(3.65)***	(2.45)**	(1.45)	(0.70)	(0.33)
R2	0.2	0.28	0.53	0.36	0.3
N	1,951	95	61	55	65
	All Industries	Business Support Svs.	Healthcare Providers	Mobile Telecom.	Software
portafterinteraction	0.027	0.125	0.268	-0.259	-0.033
	(0.89)	(0.92)	(2.63)**	(1.18)	(0.16)
netaddon	0.031	0.565	-0.106	1.432	-0.015
	(1.69)*	(1.60)	(0.67)	(1.22)	(0.26)
_cons	0.107	0.254	0.158	-0.217	0.086
	(3.63)***	(2.44)**	(1.47)	(0.78)	(0.33)
R2	0.2	0.31	0.53	0.38	0.3
N	1,951	95	61	55	65

* p<0.1; ** p<0.05; *** p<0.01

Table 6.9: DiD fixed effects regression of Sales growth with outliers

Notes. This table reports the regression coefficients and t-statistics of fixed effects regressions on Sales growth data. All reported regressions account for time and firm fixed effects. The results are based on the entire dataset. The netaddon variable is defined by the difference of the total value of acquisitions and the value of spin-offs of a portfolio company in a specific year, divided by the total market value of the portfolio company as defined by its acquisition price.

	(I)	(II)	(III)	(IV)	(V)
	All Industries	Business Support Svs.	Healthcare Providers	Mobile Telecom.	Software
portafterinteraction	2.779	-0.093	0.355	-0.026	-0.046
	(0.99)	(0.85)	(3.76)***	(0.21)	(0.64)
_cons	0.122	0.056	0.198	-0.101	0.306
	(0.23)	(0.72)	(4.73)***	(1.15)	(4.75)***
R2	0.03	0.27	0.69	0.49	0.31
N	2,181	107	63	56	83
	All Industries	Business Support Svs.	Healthcare Providers	Mobile Telecom.	Software
portafterinteraction	2.782	-0.024	0.347	-0.061	-0.011
	(0.99)	(0.43)	(3.76)***	(0.43)	(0.16)
netaddon	0.089	0.501	-0.057	0.707	0.039
	(0.99)	(15.27)***	(0.36)	(1.04)	(3.23)***
_cons	0.116	0.061	0.198	-0.112	0.304
	(0.25)	(1.02)	(4.77)***	(1.38)	(4.22)***
R2	0.02	0.68	0.69	0.5	0.34
N	2,181	107	63	56	83

* p<0.1; ** p<0.05; *** p<0.01

Table 6.10: DiD fixed effects regression of Sales growth without outliers

Notes. This table reports the regression coefficients and t-statistics of fixed effects regressions on Sales growth data. All reported regressions account for time and firm fixed effects. The data are cleaned from the top and bottom five percent of values to reduce the effect of extreme values. The netaddon variable is defined by the difference of the total value of acquisitions and the value of spin-offs of a portfolio company in a specific year, divided by the total market value of the portfolio company as defined by its acquisition price.

	(I)	(II)	(III)	(IV)	(V)
	All Industries	Business Support Svs.	Healthcare Providers	Mobile Telecom.	Software
portafterinteraction	-0.004	0.027	0.182	-0.013	-0.051
	(0.33)	(0.54)	(3.45)***	(0.15)	(0.95)
_cons	0.107	0.128	0.15	-0.047	0.289
	(10.74)***	(3.69)***	(5.61)***	(1.23)	(4.74)***
R2	0.38	0.47	0.69	0.55	0.5
N	1,963	102	59	47	82
	All Industries	Business Support Svs.	Healthcare Providers	Mobile Telecom.	Software
portafterinteraction	-0.003	-0.012	0.18	-0.002	-0.02
	(0.21)	(0.27)	(3.41)***	(0.02)	(0.39)
netaddon	0.017	0.609	-0.018	-0.299	0.035
	(3.14)***	(4.94)***	(0.24)	(0.91)	(3.22)***
_cons	0.106	0.121	0.15	-0.041	0.287
	(10.46)***	(3.40)***	(5.58)***	(0.91)	(4.20)***
R2	0.38	0.59	0.69	0.56	0.54
N	1,963	102	59	47	82

* p<0.1; ** p<0.05; *** p<0.01

6.2.2 Changes over Time

In the tables above, we present average results within the pre and post buyout periods. In table 6.11, we present year-on-year changes of growth based on the time of acquisition. The adjusted values are again based on the difference of performance ratios of the portfolio companies and the peers, to account for identical effects. Starting with the upper part of the table including the entire dataset, we see that there are three significant values for unadjusted EBITDA growth. In period t=+3 to t=+4, we see a significant positive change, but in the periods t=-2 to t=-1 prior to buyout and t=+4 to t=+5 post buyout there are significant negative effects. The EBITDA growth adjusted by the mean peer growth shows only one significant result. This is for period t=-2 to t=-1 where there is a significant negative result. Given these results, it is difficult to argue that PE funds have added value through increasing the growth of their portfolio companies. If we group together changes into pre buyout (t=-4 to t=0) and post buyout (t=0 to t=+4), we see that the unadjusted EBITDA growth of the portfolio companies were negative pre buyout.

Unadjusted EBITDA growth excluding outliers in the bottom table show significant negative changes for t=-1 to t=-0, t=+2 to t=+3 and t=+4 to t=+5. The adjusted growth show significant negative results prior to buyout in time period t=-2 to t=-1 and a significant positive effect post buyout between t=0 to t=+1.

Sales growth including the complete dataset in the same table shows a significant positive change prior to buyout in t=-2 to t=-1. The adjusted equivalent shows no significant effect but the post buyout results are generally positive. The sales growth excluding outliers in the bottom table shows two significantly negative results for the unadjusted statistic. Those are for the periods t=-1 to t=0 and t=+4 to t=+5. The adjusted statistic shows significant results for the same time periods, but the period t=+4 to t=+5 has now turned positive.

Table 6.11: Average changes of growth rates pre and post buyout

Notes. This table reports the average year-on-year changes of growth data of the portfolio companies. The adjusted values have been reduced by the average growth of the comparable industries in the equivalent years, and then averaged by time periods over all industries. The reported t-statistics indicate the significance of the difference of the data from zero. The upper part uses the complete data set, while the lower part is cleaned from the top and bottom five percent of values of the portfolio firms to reduce the effect of extreme values.

	EBITDA Gr.	t(stat)	N	Adj. EBITDA Gr.	t(stat)	N	Sales Gr.	t(stat)	N	Adj. Sales Gr.	t(stat)	N
-3 to -2	-0.29	(1.22)	136	-0.53	(1.19)	136	-0.13	(1.63)	139	-0.07	(0.00)	139
-2 to -1	-0.76	(1.86)*	145	-0.89	(2.14)*	145	0.21	(0.89)	148	12.63	(1.01)	148
-1 to 0	0.26	(0.59)	137	0.30	(0.69)	136	-0.64	(1.65)*	139	-0.59	(1.51)	139
0 to +1	0.10	(0.35)	99	0.10	(0.29)	99	0.58	(1.10)	100	0.62	(1.19)	100
+1 to +2	2.16	(1.07)	97	2.30	(1.13)	97	-0.60	(1.61)	98	-0.54	(1.43)	98
+2 to +3	-2.79	(1.11)	77	-2.82	(1.12)	77	0.02	(0.33)	79	0.01	(0.21)	79
+3 to +4	0.43	(2.05)**	62	0.31	(1.40)	62	0.31	(1.09)	64	0.28	(1.00)	64
+4 to +5	-0.45	(2.55)**	45	-0.25	(1.06)	44	-0.01	(0.12)	46	0.06	(1.25)	46
+5 to +6	0.01	(0.02)	24	-0.14	(0.50)	24	-0.07	(1.49)	24	0.08	(1.34)	24
-4 to 0	-0.49	(2.22)**	110	-0.37	(1.42)	109	-0.51	(1.25)	112	-0.42	(1.01)	112
0 to +4	0.28	(0.60)	50	0.20	(0.42)	50	0.11	(0.29)	51	0.17	(0.46)	51

	EBITDA Gr.	t(stat)	N	Adj. EBITDA Gr.	t(stat)	N	Sales Gr.	t(stat)	N	Adj. Sales Gr.	t(stat)	N
-3 to -2	-0.04	(1.00)	117	-0.44	(1.00)	117	-0.02	(0.99)	116	0.06	(0.00)	116
-2 to -1	-0.03	(0.71)	123	-0.16	(1.68)*	123	0.00	(0.18)	120	-0.06	(0.88)	120
-1 to 0	-0.15	(3.97)***	116	-0.09	(0.91)	115	-0.06	(3.09)***	112	0.01	(0.08)	112
0 to +1	0.01	(0.12)	80	0.25	(2.26)**	80	-0.03	(1.36)	79	0.01	(0.37)	79
+1 to +2	-0.06	(1.19)	77	-0.14	(0.74)	77	-0.07	(2.37)**	79	-0.01	(0.35)	79
+2 to +3	-0.11	(2.09)**	62	-0.14	(0.60)	62	0.00	(0.13)	62	0.00	(0.05)	62
+3 to +4	0.04	(0.74)	53	0.13	(0.97)	53	-0.01	(0.28)	51	-0.03	(0.81)	51
+4 to +5	-0.18	(2.24)**	40	0.01	(0.03)	39	0.00	(0.13)	41	0.07	(1.86)*	41
+5 to +6	0.02	(0.15)	20	-0.16	(0.65)	20	-0.07	(1.49)	24	0.08	(1.34)	24
-4 to 0	-0.19	(3.49)***	92	-0.03	(0.13)	91	-0.04	(1.89)*	93	0.04	(0.49)	93
0 to +4	0.04	(0.53)	42	0.01	(0.06)	42	-0.07	(2.13)**	43	-0.01	(0.38)	43

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

6.3 Raw Returns

Finally, we analyse the situation of the mega-funds from the perspective of LPs. We find that the funds have already distributed around a third of the invested capital to the LPs. Analysing the reported market values of the assets shows that current market values and distributed money combined yield 1.15 of money invested. This implies a 15 percent return on investment over the entire time since vintage. From PERSI and CalPERS, we obtained internal rate of return data for the funds, net of all fees. Looking at the net IRRs, we do find fairly high divergence. The highest IRR in our sample is 19.4 percent and the lowest -4.9 percent, with a median of 5 percent. To put this into perspective, an investment into the S&P 500 in 2006 would have yielded 1.6 percent IRR until the second quarter 2012, see table 6.12. Unfortunately, we do not have time series data to apply public market equivalent (PME) methods as suggested by Kaplan and Schoar (2005) and have no covariance data of the returns which would be needed to apply asset pricing models such as the capital asset pricing model.

Table 6.12: Comparable Asset Classes Performance, Jan 2005-June 2012

Asset	IRR
S&P 500	1.68 percent
Dow Jones	2.47 percent
OMX Stockholm 30	4.21 percent
US Treasuries	3.94 percent[a b]

[a] 7-year yield as of January 2005, interpolated using a cubic spline model
[b] From the Treasury Department

To test whether the operating measures really capture value at the fund level, we compare the internal value-creation of the best and worst performing funds. We would expect that the funds with an above median IRR also managed to create more value internally than the funds with a below-median IRR. By splitting the sample depending on the IRR performance of the fund, we compare the operating performances in tables 6.13 to 6.16. As it seems, the best and worst funds do not differ significantly with respect to internal value creation. This might imply that the standard measures of value improvements do not capture the true performance of PE ownership, but since the IRR is based on relatively few exited companies more insights about this are to come. In the long run, the funds that can manage their portfolio companies best should deliver the highest return to their LPs.

Table 6.13: DiD fixed effects regression of EBITDA/Sales and COGS/Sales - divided by fund performance

Notes. This table reports the regression coefficients and t-statistics of the Difference-in-Difference regressions on the EBITDA/Sales and COGS/Sales ratios using firm and time fixed effects. For the 'Top'-regressions, the dataset has been reduced to only include the portfolio firms of the top-8 performing funds, for the 'bottom'-regressions the same has been done for the 8 funds below the median net-IRR. The variable portafterinteraction is the interaction term and is one for portfolio firms after the buyout and zero otherwise.

	(I)	(II)	(III)	(IV)
EBITDA/Sales	Top All Industries	Bottom All Industries	Top All Industries (w/o outliers)	Bottom All Industries (w/o outliers)
portafterinteraction	-0.837	-0.946	-0.013	0.002
	(1.07)	(1.13)	(1.88)*	(0.30)
_cons	0.061	0.07	0.157	0.153
	(0.19)	(0.17)	(30.30)***	(22.37)***
R2	0.06	0.1	0.74	0.64
N	1,220	1,283	1,098	1,155
COGS/Sales	Top All Industries	Bottom All Industries	Top All Industries (w/o outliers)	Bottom All Industries (w/o outliers)
portafterinteraction	-0.01	-0.011	-0.029	-0.022
	(0.47)	(0.47)	(3.18)***	(1.98)**
_cons	0.531	0.543	0.528	0.547
	(37.41)***	(31.67)***	(55.62)***	(51.55)***
R2	0.22	0.24	0.84	0.8
N	1,143	1,181	1,029	1,063

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

Table 6.14: DiD fixed effects regression of Cash/Sales and Inventory Turnover - divided by fund performance

Notes. This table reports the regression coefficients and t-statistics of the Difference-in-Difference regressions on the Cash/Sales ratios and Inventory Turnover using firm and time fixed effects. For the 'Top'-regressions, the dataset has been reduced to only include the portfolio firms of the top-8 performing funds, for the 'bottom'-regressions the same has been done for the 8 funds below the median net-IRR. The variable portafterinteraction is the interaction term and is one for portfolio firms after the buyout and zero otherwise.

	(I)	(II)	(III)	(IV)
Cash/Sales	Top All Industries	Bottom All Industries	Top All Industries (w/o outliers)	Bottom All Industries (w/o outliers)
portafterinteraction	3.56	3.867	-0.048	-0.033
	(1.50)	(1.57)	(3.65)***	(2.06)**
_cons	10.134	9.999	0.111	0.106
	(1.23)	(1.08)	(9.61)***	(9.92)***
R2	0.21	0.11	0.62	0.63
N	1,168	1,187	1,052	1,069
Inventory Turnover	Top All Industries	Bottom All Industries	Top All Industries (w/o outliers)	Bottom All Industries (w/o outliers)
portafterinteraction	-0.275	51.721	-1.121	1.483
	(0.09)	(1.40)	(0.92)	(1.66)*
_cons	16.696	16.061	13.578	11.345
	(3.40)***	(2.34)**	(13.56)***	(11.55)***
R2	0.93	0.6	0.74	0.6
N	919	990	829	892

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

Table 6.15: DiD fixed effects regression of EBITDA growth - divided by fund performance

Notes. This table reports the regression coefficients and t-statistics of fixed effects regressions on EBITDA growth data. All reported regressions account for time and firm fixed effects. For the 'Top'-regressions, the dataset has been reduced to only include the portfolio firms of the top-8 performing funds, for the 'bottom'-regressions the same has been done for the 8 funds below the median net-IRR. The netaddon variable is defined by the difference of the total value of acquisitions and the value of spin-offs of a portfolio company in a specific year, divided by the total market value of the portfolio company as defined by its acquisition price.

	(I)	(II)	(III)	(IV)
	Top All Industries	Bottom All Industries	Top All Industries (w/o outliers)	Bottom All Industries (w/o outliers)
portafterinteraction	0.322	2.302	0.044	0.041
	(1.36)	(1.12)	(1.12)	(0.96)
_cons	0.111	0.216	0.077	0.084
	(0.36)	(0.62)	(2.69)***	(2.70)***
R2	0.1	0.08	0.19	0.17
N	1,107	1,160	997	1,044
	Top All Industries	Bottom All Industries	Top All Industries (w/o outliers)	Bottom All Industries (w/o outliers)
portafterinteraction	0.236	2.272	0.035	0.046
	(1.06)	(1.13)	(0.87)	(1.12)
netaddon	0.69	-0.537	(0.10)	0.085
	(2.03)**	(0.53)	(2.02)**	(1.38)
_cons	0.108	(0.22)	0.078	0.083
	(0.35)	(0.65)	(2.71)***	(2.68)***
R2	0.1	(0.08)	0.19	0.18
N	1,107	1,160	997	1,044

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

Table 6.16: DiD fixed effects regression of Sales growth - divided by fund performance

Notes. This table reports the regression coefficients and t-statistics of fixed effects regressions on Sales growth data. All reported regressions account for time and firm fixed effects. For the 'Top'-regressions, the dataset has been reduced to only include the portfolio firms of the top-8 performing funds, for the 'bottom'-regressions the same has been done for the 8 funds below the median net-IRR. The netaddon variable is defined by the difference of the total value of acquisitions and the value of spin-offs of a portfolio company in a specific year, divided by the total market value of the portfolio company as defined by its acquisition price.

	(I)	(II)	(III)	(IV)
	Top All Industries	Bottom All Industries	Top All Industries (w/o outliers)	Bottom All Industries (w/o outliers)
portafterinteraction	3.218	3.862	-0.008	-0.009
	(0.94)	(1.01)	(0.45)	(0.51)
_cons	0.055	0.154	0.062	0.071
	(0.04)	(0.13)	(5.20)***	(5.82)***
R2	0.05	0.05	0.3	0.32
N	1,103	1166	993	1,050
	Top All Industries	Bottom All Industries	Top All Industries (w/o outliers)	Bottom All Industries (w/o outliers)
portafterinteraction	3.307	3.837	-0.009	0.159
	(0.94)	(1.01)	(0.47)	(2.27)**
netaddon	-0.699	-0.468	0.006	0.191
	(0.64)	(0.51)	(0.20)	(0.50)
_cons	0.058	0.161	0.062	0.107
	(0.04)	(0.13)	(5.20)***	(1.88)*
R2	0.05	0.05	0.3	0.78
N	1,103	1,166	993	33

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

7 Comparison to Existing Literature

According to our results, the PE funds managed to improve operational efficiency compared to their publicly traded peers during the crisis years, while they sacrificed EBITDA/Sales. Growth was not faster than for the peers. Earlier research focusing on value creation has shown that PE funds actually have managed to deliver value. Kaplan and Stromberg (2009) review current research and find that buyouts have a positive effect on operating performance in large. Harford and Kolasinski (2012) show that PE funds create value and that they do not sacrifice long term growth prospects by reducing investments. In fact, they see no difference in investing activities between portfolio companies and publicly traded peers. Further, they do not find any correlation between special dividends and financial distress. Other research such as Guo et al. (2011) also find improvements in operating performance along with tax shield gains. Cohn et al. (2012) on the other hand, find few if any evidence of improvements in operating performance.

Even if there is no perfect consensus in existing literature, there is still a majority of research that indicates that PE funds are value-creating owners. Our research might therefore not be perfectly congruent with 'research in large'. Reasons for this could be that PE funds have few incentives to boost the accounting numbers for their portfolio companies, except just prior to exit. In fact, the incentives for tax reasons are the opposite. Another possible explanation can be that worse deals are done in hot markets as the mega-funds are fee hoarders rather than value creators. As further portfolio companies are exited, the approximation towards truth will become more accurate.

Looking at the fund level value creation, we see some returns to investors (5 percent net IRR on average), but these results are by no means final since most of the cash flows to LPs will take place at a later date. Previous research on this area is not exclusively positive. According to Stromberg (2012), the acquisition prices that PE funds pay for their portfolio companies tend to positively correlate with the availability of debt financing. So, in times when debt financing is easy to obtain, the funds might overpay for their portfolio companies and thus hurt future returns.

We have mainly focused on the operational aspect of the portfolio companies. Further research might be done on the financial aspects. Since the portfolio companies of PE funds are usually more levered than comparable firms, EBITDA comparisons are unlikely to give a comprehensive view. While we try to compensate this by not only looking at efficiency ratios such as EBITDA/Sales, but also EBITDA growth, there might still be more to gain by including financing costs.

8 Conclusion

The mega-funds had a tough time. They bought companies during the hot market environment of 2005-2007 at high prices and subsequently saw market multiples collapsing. In our analysis we have shown that they managed to improve direct production efficiency relative to comparable firms from the S&P 500 if outliers are excluded, but did not keep up with EBITDA/Sales. Actually, the development of EBITDA/Sales was significantly worse than for their peers. This might be explained by more marketing and sales investments that potentially allow the portfolio companies to perform better in future. In order to fully understand these somewhat contradicting results, further research is required. A closer investigation of other operational cost items in the income statement is likely to provide an answer.

Another possible reason for the rather poor performance in EBITDA/Sales for the portfolio companies can be that the mega-funds care more about hoarding fees than the operating performance. The PE funds have incentives to take on too much committed capital because management fees are growing proportionally with it. In order to invest this capital, the funds might have to invest outside their main investment sphere where they have their core operating expertise. This idea is, however, somewhat contradicted by the fact that the PE funds managed to lower the direct production costs.

On the growth side, we find no difference between the portfolio firms and their peers for both EBITDA and sales growth. These results also seem to hold if we account for the non-organic growth from add-on acquisitions. This means that we cannot show that the PE funds have managed to create value in their portfolio companies in the growth dimension.

Looking from an LPs' perspective, we find that investments into other asset classes with a similar risk profile might have performed slightly better. But taking together the positive current market values of the not yet exited portfolio companies and an average fund IRR of five percent, net of fees, brings the funds clearly far away from the total shake-out that some had foreseen when the crisis hit.

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9 Appendices

Table 9.1: List of mega-funds

PE Firm	PE Fund	Fundsize (USD mn)	Vintage
Advent International Corporation	Advent International Global Private Equity Fund VI, L.P.	10,390	2008
Apax Partners	Apax Europe VII	15,400	2006
Apollo Global Management	Apollo Investment Fund VI, L.P.	10,138	2005
Apollo Global Management	Apollo Investment Fund VII, L.P.	14,700	2007
BC Partners	BC European Capital VIII, L.P.	8,450	2005
Bain Capital Private Equity	Bain Capital Fund IX, L.P.	8,000	2006
Bain Capital Private Equity	Bain Capital Fund X, L.P.	11,500	2007
The Blackstone Group	Blackstone Capital Partners V, L.P.	21,700	2006
CVC Capital Partners	CVC European Equity Partners V, L.P.	14,115	2008
The Carlyle Group	Carlyle Partners V, L.P.	13,700	2007
First Reserve Corporation	First Reserve Fund XII, L.P.	8,800	2008
Goldman Sachs Group	GS Capital Partners V, L.P.	8,500	2005
Goldman Sachs Group	Goldman Sachs Capital Partners VI, L.P.	20,335	2006
Hellman & Friedman	Hellman & Friedman Capital Partners VI, L.P.	8,400	2006
Hellman & Friedman	Hellman & Friedman Capital Partners VII, L.P.	8,900	2008
Kohlberg Kravis Roberts	KKR 2006 Fund, L.P.	17,642	2006
Permira Advisers Ltd.	Permira IV, L.P.	13,574	2006
Providence Equity Partners LLC	Providence Equity Partners VI, L.P.	12,100	2006
Silver Lake Partners	Silver Lake Partners III, L.P.	9,300	2006
TPG Partners	TPG Partners V, L.P.	15,000	2006
TPG Partners	TPG Partners VI, L.P.	19,800	2008
Cinven Limited	The Fourth Cinven Fund, L.P.	8,160	2006
Thomas H. Lee Partners, L.P.	Thomas H. Lee Equity Partners VI, L.P.	10,100	2005
Warburg Pincus LLC	Warburg Pincus Private Equity IX, L.P.	8,000	2005
Warburg Pincus LLC	Warburg Pincus Private Equity X, L.P.	15,000	2007

Table 9.2: Robustness Check: Placebo DiD fixed effects regressions

Notes. This table reports the regression coefficients and t-statistics of fixed effects regressions of the main regressions of this thesis, but with a different interaction term. For this version, portfolio firms in the 2 years before the buyout and the year of the buyout itself have been set to 'treated' while all other years and all peers remain 'untreated'. The variable portafterinteraction is thus one for portfolio firms in year -2, -1 and 0 around the buyout and zero otherwise. All reported regressions account for time and firm fixed effects. The upper part uses the complete data set, while the lower part is cleaned from the top and bottom five percent of values to reduce the influence of extreme values.

	(I)	(II)	(III)	(IV)	(V)	(VI)
	EBITDA/Sales	COGS/Sales	Cash/Sales	Inventory Turnover	EBITDA Growth	Sales Growth
portafterinteraction	0.023	-0.038	1.353	2.69	-0.757	-0.939
	(0.15)	(1.15)	(1.78)*	(0.38)	(1.73)*	(1.04)
_cons	0.08	0.582	6.554	18.011	0.247	0.226
	(0.32)	(31.55)***	(1.35)	(3.94)***	(0.48)	(0.22)
R2	0.1	0.18	0.23	0.64	0.07	0.1
N	2,415	2,248	2,198	1,744	2,167	2,181
	EBITDA/Sales	COGS/Sales	Cash/Sales	Inventory Turnover	EBITDA Growth	Sales Growth
portafterinteraction	0	-0.006	-0.004	1.445	-0.037	-0.006
	(0.06)	(1.76)*	(0.47)	(2.04)**	(1.61)	(0.63)
_cons	0.152	0.574	0.124	12.641	0.111	0.108
	(27.74)***	(78.79)***	(14.61)***	(13.81)***	(3.77)***	(10.83)***
R2	0.8	0.9	0.72	0.83	0.22	0.4
N	2,175	2,024	1,980	1,570	1,951	1,963

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

Figure 9.1: EW COGS/Sales ratios for most prevalent industries before buyout

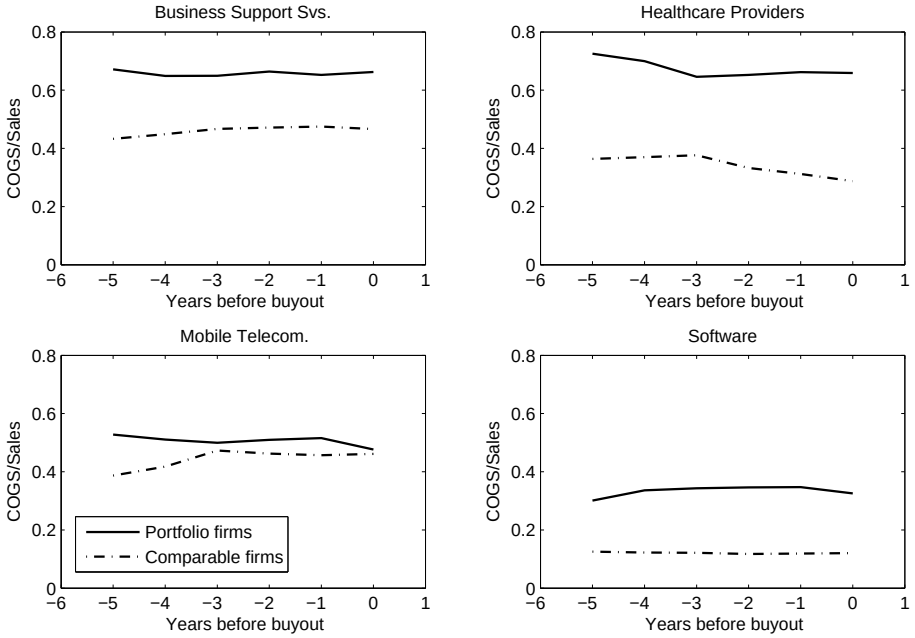

Figure 9.2: EW Cash/Sales ratios for most prevalent industries before buyout

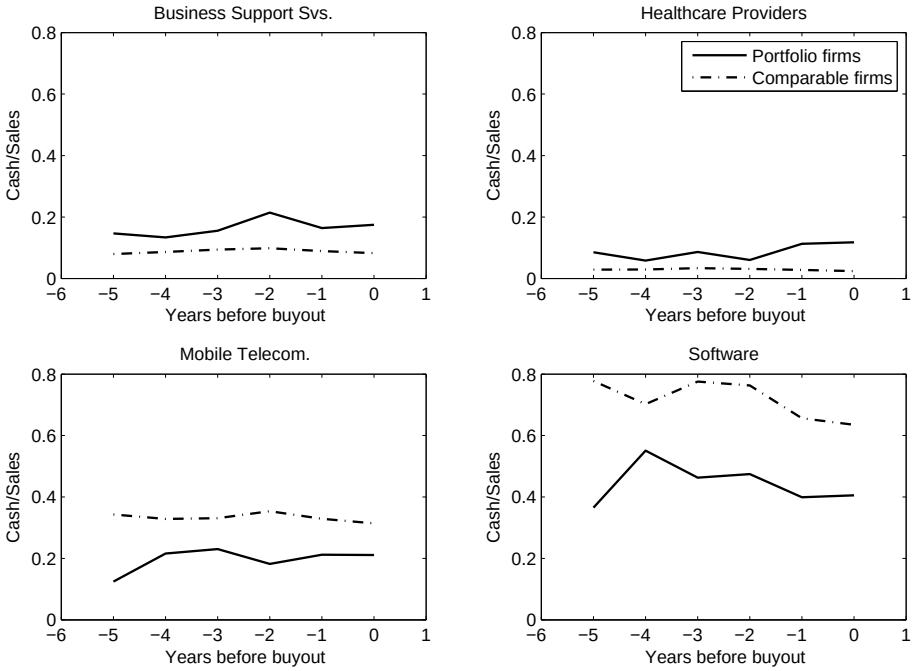

Figure 9.3: EW Inventory Turnover for most prevalent industries before buyout

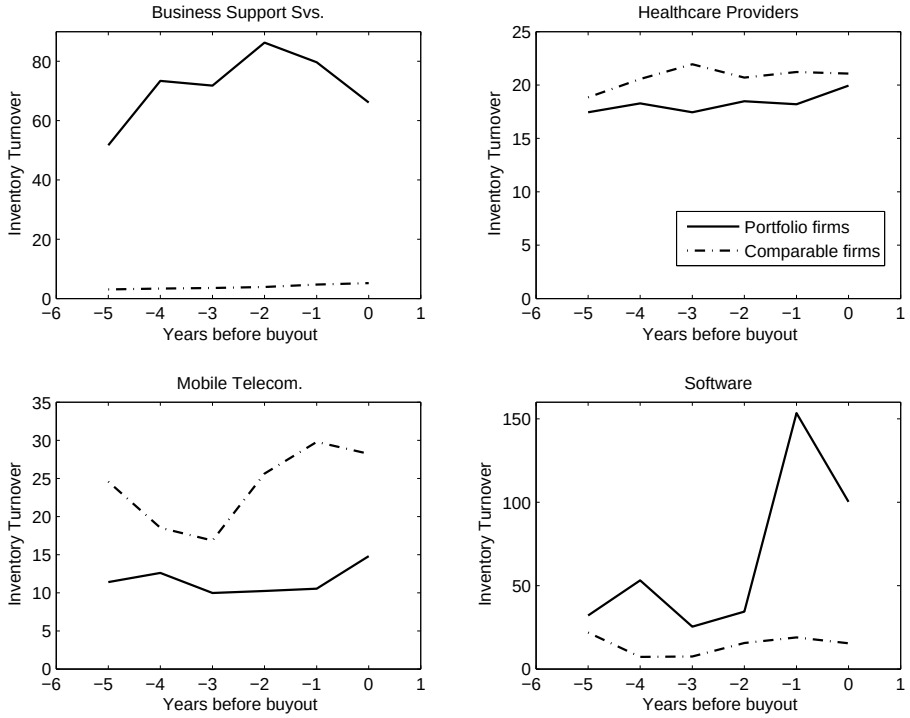

Figure 9.4: EW EBITDA/Sales ratios for most prevalent industries 2001-2005

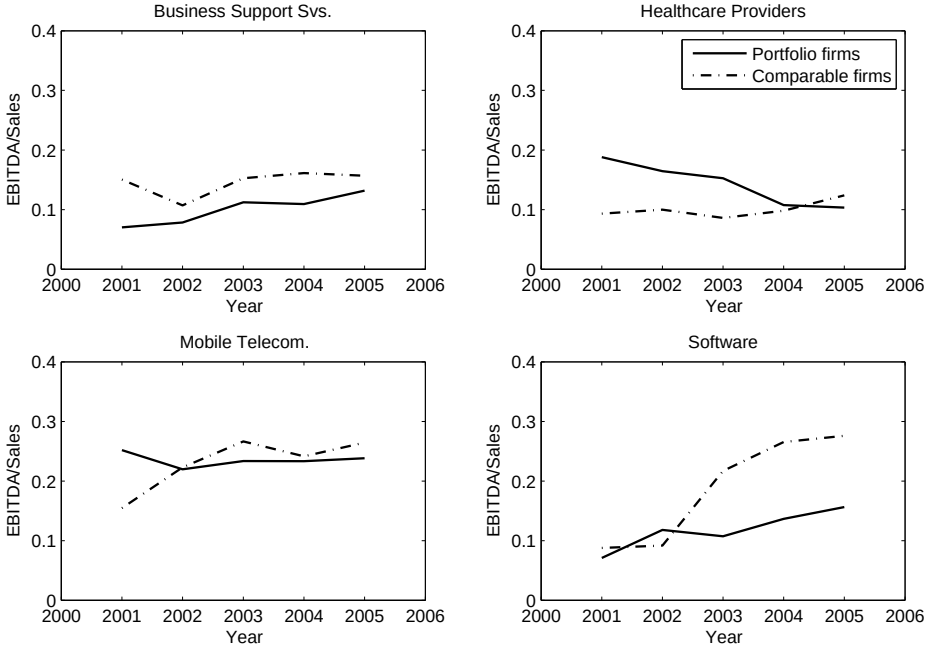

Figure 9.5: EW COGS/Sales ratios for most prevalent industries 2001-2005

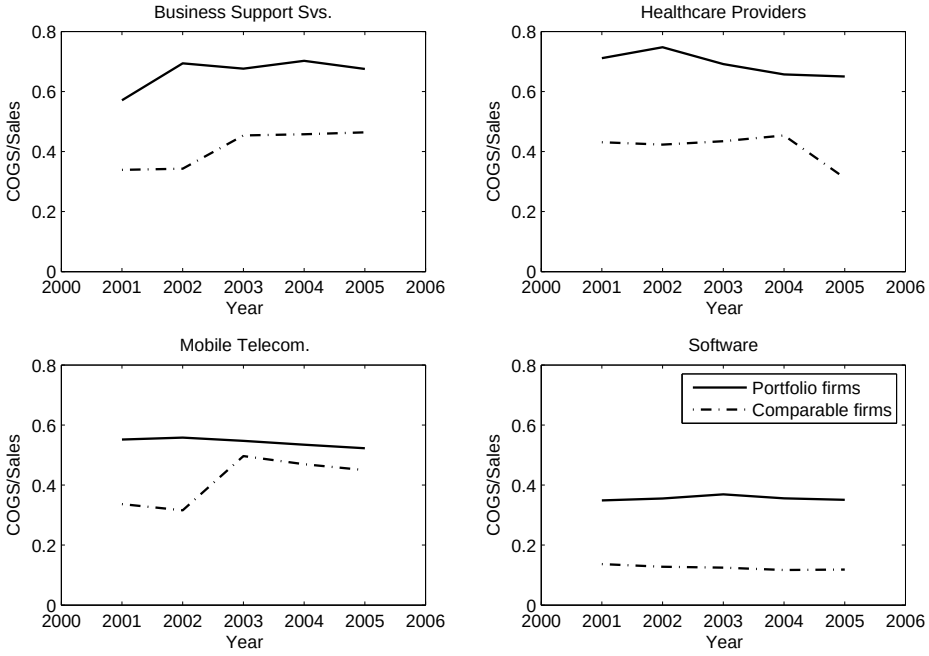

Figure 9.6: EW Cash/Sales ratios for most prevalent industries 2001-2005

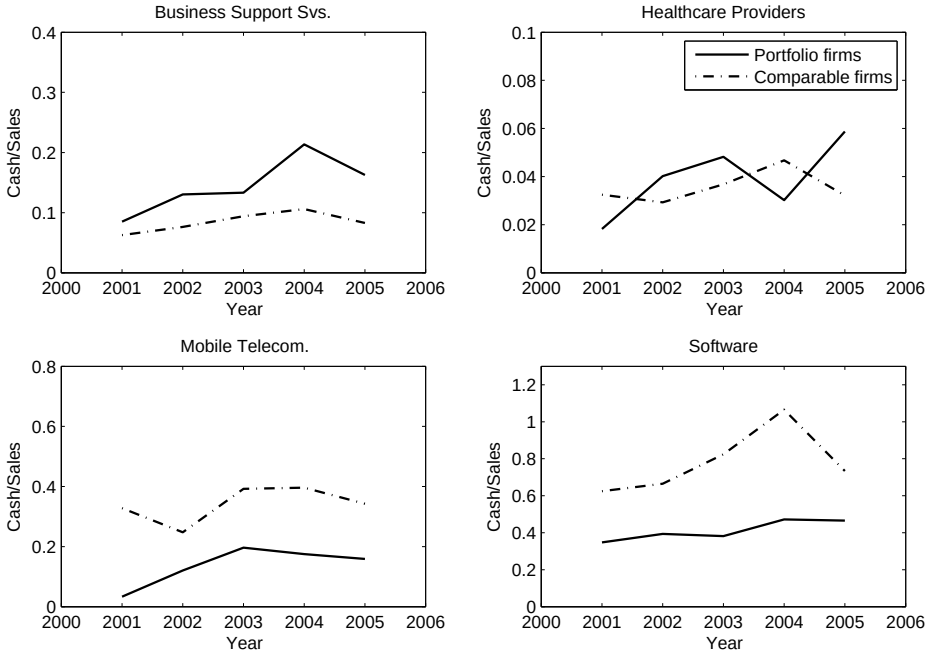

Figure 9.7: EW Inventory Turnover for most prevalent industries 2001-2005

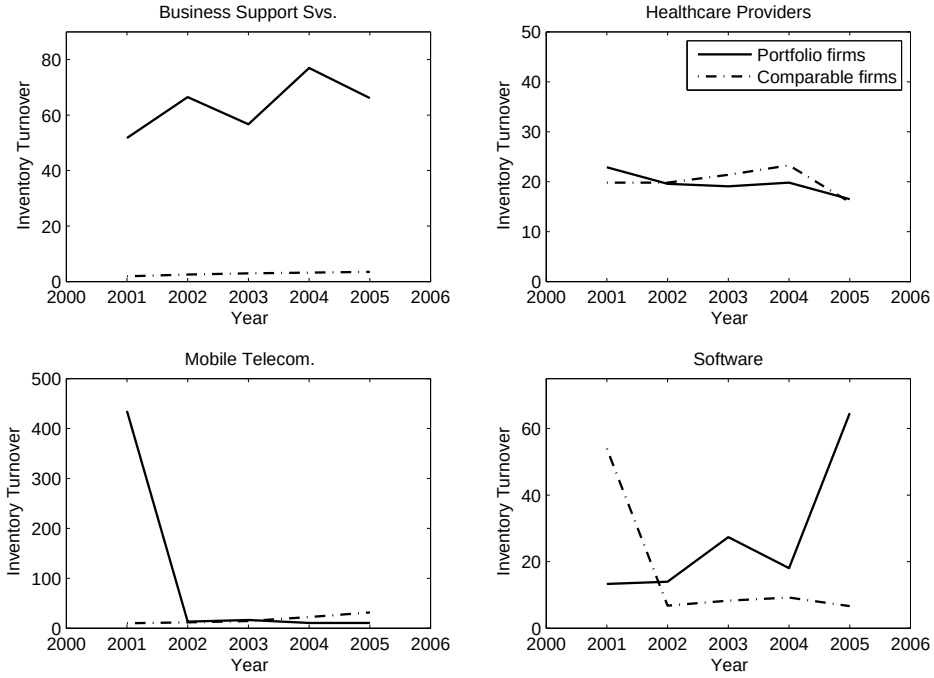

Figure 9.8: EW Sales Growth for most prevalent industries before buyout

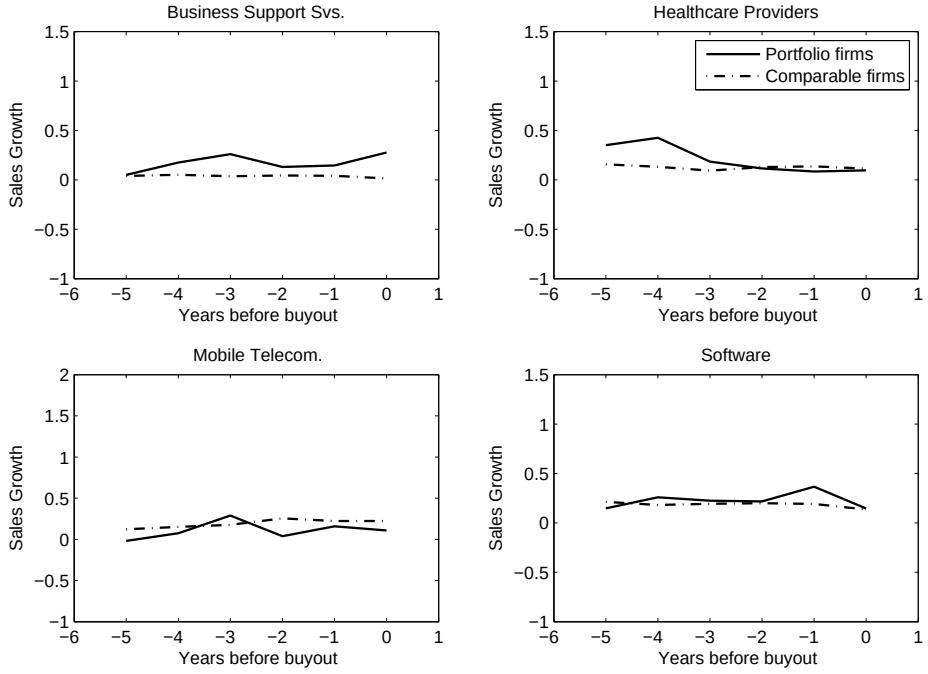

Figure 9.9: EW EBITDA Growth for most prevalent industries 2002-2005

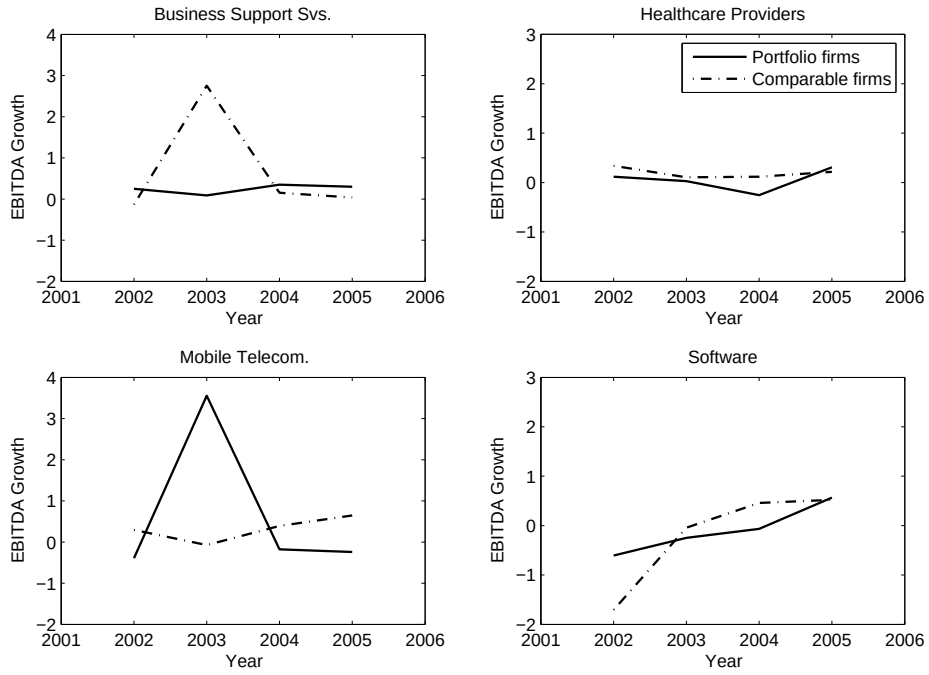

Figure 9.10: EW Sales Growth for most prevalent industries 2002-2005

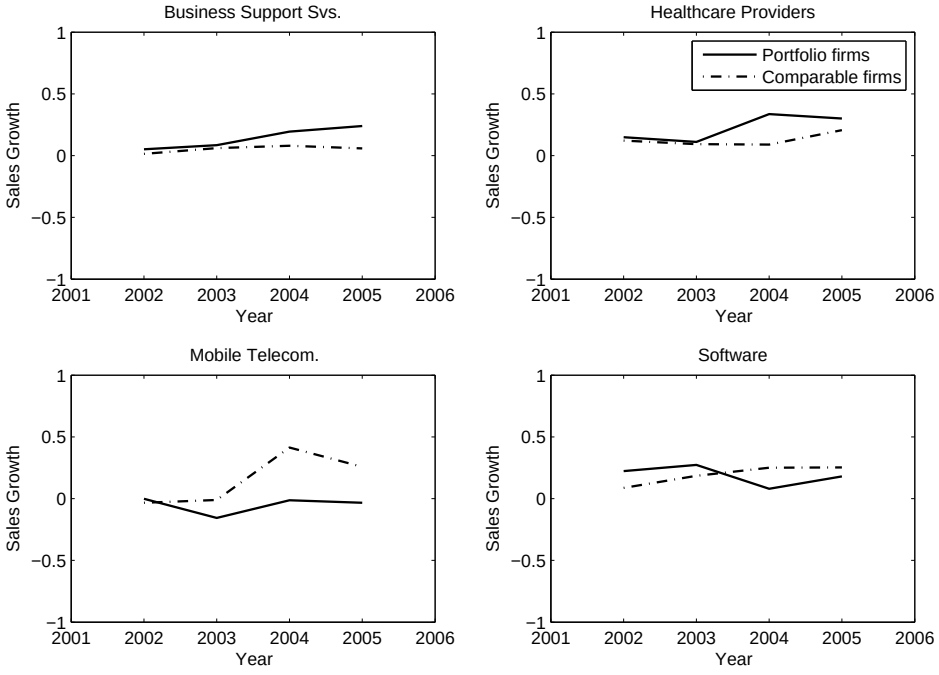

Table 9.3: List of matched Industries (1/2)

Capital IQ	INDM (matched)
Advertising	Media Agencies
Aerospace and Defense	Defense
Agricultural Products	Farming & Fishing
Air Freight and Logistics	Transport Services
Airlines	Airlines
Airport Services	Transport Services
Alternative Carriers	Mobile Telecom.
Aluminum	Aluminum
Apparel Retail	Apparel Retailers
Apparel, Accessories and Luxury Goods	Apparel Retailers
Application Software	Software
Asset Management and Custody Banks	Asset Managers
Auto Parts and Equipment	Auto Parts
Automobile Manufacturers	Automobiles
Biotechnology	Biotechnology
Broadcasting	Broadcast & Entertain
Building Products	Building Mat.& Fix.
Cable and Satellite	Broadcast & Entertain
Casinos and Gaming	Gambling
Catalog Retail	Broadline Retailers
Coal and Consumable Fuels	Coal
Commodity Chemicals	Commodity Chemicals
Communications Equipment	Mobile Telecom.
Computer and Electronics Retail	Specialty Retailers
Computer Storage and Peripherals	Computer Hardware
Construction and Farm Machinery and Heavy Trucks	Comm. Vehicles,Trucks
Construction Materials	Building Mat.& Fix.
Consumer Electronics	Consumer Electronics
Consumer Finance	Consumer Finance
Data Processing and Outsourced Services	Computer Services
Department Stores	Broadline Retailers
Distributors	Delivery Services
Diversified Banks	Banks
Diversified Chemicals	Specialty Chemicals
Diversified Metals and Mining	Nonferrous Metals
Diversified Real Estate Activities	Real Estate Services
Diversified Support Services	Business Support Svs.
Education Services	Business Support Svs.
Electric Utilities	Electrical Equipment
Electrical Components and Equipment	Electrical Equipment
Electronic Components	Electronic Equipment
Electronic Equipment and Instruments	Electronic Equipment
Environmental and Facilities Services	Business Support Svs.
Fertilizers and Agricultural Chemicals	Commodity Chemicals
Food Distributors	Food Retail,Wholesale
Food Retail	Food Retail,Wholesale
General Merchandise Stores	Broadline Retailers
Health Care Technology	Medical Equipment
Healthcare Distributors	Healthcare Providers
Healthcare Equipment	Medical Equipment
Healthcare Facilities	Healthcare Providers
Healthcare Services	Healthcare Providers

Table 9.4: List of matched Industries (2/2)

Capital IQ	INDM (matched)
Healthcare Supplies	Medical Supplies
Heavy Electrical Equipment	Electrical Equipment
Home Furnishing Retail	Furnishings
Home Improvement Retail	Furnishings
Hotels, Resorts and Cruise Lines	Hotels
Human Resource and Employment Services	Business Support Svs.
Hypermarkets and Super Centers	Broadline Retailers
Independent Power Producers and Energy Traders	Multiutilities
Industrial Conglomerates	Divers. Industrials
Industrial Machinery	Industrial Machinery
Industrial REITs	Ind. & Office REITs
Insurance Brokers	Insurance Brokers
Integrated Telecommunication Services	Fixed Line Telecom.
Internet Software and Services	Internet
Investment Banking and Brokerage	Investment Services
IT Consulting and Other Services	Business Support Svs.
Leisure Facilities	Travel & Tourism
Life and Health Insurance	Life Insurance
Life Sciences Tools and Services	Biotechnology
Managed Healthcare	Healthcare Providers
Marine	Transport Services
Marine Ports and Services	Transport Services
Metal and Glass Containers	Containers & Package
Movies and Entertainment	Broadcast & Entertain
Office Services and Supplies	Business Support Svs.
Oil and Gas Drilling	Integrated Oil & Gas
Oil and Gas Equipment and Services	Oil Equip. & Services
Oil and Gas Exploration and Production	Exploration & Prod.
Oil and Gas Refining and Marketing	Integrated Oil & Gas
Oil and Gas Storage and Transportation	Gas Distribution
Other Diversified Financial Services	Specialty Finance
Packaged Foods and Meats	Food Products
Paper Packaging	Paper
Personal Products	Personal Products
Pharmaceuticals	Pharmaceuticals
Property and Casualty Insurance	Prop. & Casualty Ins.
Real Estate Development	Real Estate Services
Real Estate Services	Real Estate Services
Regional Banks	Banks
Reinsurance	Reinsurance
Research and Consulting Services	Business Support Svs.
Restaurants	Restaurants & Bars
Security and Alarm Services	Real Estate Services
Semiconductors	Semiconductors
Specialized Finance	Specialty Finance
Specialty Chemicals	Specialty Chemicals
Specialty Stores	Specialty Retailers
Systems Software	Software
Textiles	Clothing & Accessory
Trading Companies and Distributors	Trucking
Wireless Telecommunication Services	Mobile Telecom.