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Does the tenure of Private Equity investment improve the performance of European firms? *

Oleg Badunenko, Christopher F. Baum, and Dorothea Schäfer†

Abstract

The paper investigates whether the presence and tenure of Private Equity (PE) investment in European companies improves their performance. Previous studies documented the unambiguous merit of a buyout during the 1980s and 1990s for listed firms in the US and UK markets. This study analyzes such influences in both listed and unlisted European firms during 2002−2007. Our analysis suggests that short-term PE investments have, on average, a detrimental effect on firm performance. The performance of a firm that has PE backing is lower than that of a firm without PE backing in the first year of PE investment. Such an effect disappears if PE investments remain in the firm for an uninterrupted six-year term.

Keywords: Private equity financing, corporate finance

JEL Classification: M14, G24, G34

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1 Introduction

In the late 1960s and 1970s, U.S. companies' growth strategy focused on the goals of a stable cash flow and a constant dividend (Toms and Wright (2005); Jensen (1988, 1993), and Williamson, 1967). To this end, firms became increasingly diversified. More and more new lines of business were added through internal growth or acquisition. In the early 1980s, the multi-divisional holding structure, the so-called M-form, dominated. Many companies had well over 100 individual lines of business and hundreds of subsidiaries (Toms and Wright, 2005). The characteristic feature of the U.S. industrial landscape in that era was the huge conglomerate with stable income, broad dispersion of ownership and weak management control: a scenario Jensen (1991) described as "complacent corporate America".

During the 1980s, the picture changed. A major restructuring wave arose, fed primarily through a variety of hostile takeovers financed by the innovation of "junk bonds". Mitchell and Mulherin (1996) estimate that from 1982 to 1989, 57 percent of all U.S. listed firms were targets of takeover attempts. Private equity lenders contributed substantial resources to this restructuring wave. Toms and Wright (2005) state that 32 percent of acquisitions in the 1979–1999 period involved leveraged buyouts (LBOs).

During that era of "masters of the universe" in the U.S., these massive corporate restructurings were accompanied by political debate and serious concerns were expressed in public opinion polls. The biggest resistance in the U.S. to unfettered takeover and restructuring activity came from the Business Roundtable, an association of managers of large companies, union leaders and politicians (Jensen, 1991).

The widespread debate over the organizational form of corporate America is now echoed in similar debates in Germany and other European countries. The processes of economic integration within the European Union and the Eurozone have lowered the barriers to cross-border mergers, hostile takeovers, and widespread private equity investments within Europe. Just as in the earlier American debates, the key question is whether radical changes in firms' organization and concentration of ownership will result in efficiency gains and the eventual welfare improvements that would justify the disruptive effects: especially relevant in Europe's rigid labour markets. Proponents of restrictive regulation of leveraged buyouts and takeovers argue that gains to shareholders will be more than offset by sizable losses to other stakeholders of the firm. Empirical studies have not generally supported this view, as restructured firms' performance have often led to greater returns to shareholders and stable employment in continuing lines of business.

The restructuring wave of the 1980s in the United States was a strong, singular phenomenon. Nothing comparable occurred in continental Europe at that time. However, European private equity activity increased substantially, particularly in the leveraged buyout segment, within the last decade. In 2008, as the financial crisis deepened, this cycle of private equity (PE) activity has been largely put on hold by constraints on the flow of financing. However, the normative questions embedded in the vigorous European debate over the merits of private equity activity have not been settled. In this paper, we intend to contribute to that debate with empirical evidence on the performance of a broad sample of European firms receiving PE funding. More specifically, we analyze whether the presence and tenure of Private Equity investment in European companies improves their performance. We claim that active investors need time to successfully restructure and improve the company's performance.

The existing research regarding the outcome of the U.S. restructuring wave in the 1980s has limited value to settle the European debate for several reasons. The U.S. results are generally based on data that is more than 20 years old. Institutional differences, quite distinct financial systems and the presence of a number of emerging post-Communist economies prevent a simple transfer of impact results to the modern restructuring wave initiated by European private equity funds. Furthermore, whereas the U.S. has a unified financial sector, Europe's economies are quite diverse. Different features characterize the financial systems and the capital markets of EU countries. In contrast to the U.S., active PE investors in Europe face different environments depending on the countries in which their target firms are located. Analysis of the impact of PE investors on European target firms must capture cross-country differences appropriately.

There are two different paths one might follow to investigate the impact of private equity (PE) on the target firm's performance. First, the impact of PE on the performance of the firm can be directly analyzed by comparing firms with and without PE shareholders. Second, against the backdrop of the hypothesis of asset stripping, one may compare firms that attract PE investors' entry and exit with those that do not. In this paper we follow the first path. More specifically, we estimate how two important dimensions of PE activity affect the target firm's performance. We assume 'time-to-build': the effects of active shareholders' restructuring decisions require some time to show up in suitable performance indicators. In that context, we analyse the duration of PE involvement with the firm, seeking to investigate the relation between tenure and outcomes.

We employ data from three sources. Firm-level data are taken from the 2008 (November) edition of the Amadeus data base provided by Bureau Van Dijk. The data base includes ownership history beginning in 2000. From this base, we retrieve performance measures,

financial ratios, ownership information and other firm-specific variables for companies in all European countries for the years 2000 to 2008. We bring variables to real terms using the harmonized CPI from the IMF's International Financial Statistics Database. The country-level data on the nature and evolution of the financial system is adopted from the World Bank Financial Structure Database. Our analysis suggests that in the short run, the presence of PE investors among the firm's shareholders has, on average, a negative impact on firm performance, measured by its return on assets. However, if the duration of PE involvement is long enough, its presence has a significantly positive effect on the company's performance.

The paper unfolds as follows. In Section 2 we briefly review the literature. Section 3 presents the data. The empirical results are presented and discussed in Section 4, while Section 5 concludes.

2 Literature review on performance studies: the impact of active PE investors from the 1980s

The literature attempts to identify the influence of private equity investors on different measures of firm performance. For example, Kaplan (1989) investigates the operating effect that 48 management buyouts had in the first half of the 1980s. He considers firms that were previously listed on the New York Stock Exchange and compares their performance before and after a large buyout: a transaction exceeding 50 million US dollars. His findings suggest a significant increase in operating returns. He claims that management buyouts generally bring positive improvements to the firm's operations and increase its value. Smith (1990) finds that between 1977 and 1986, the operating returns of 58 public firms have significantly increased from its value year before completion of buyout and the year after. Lichtenberg and Siegel (1990) utilize a much larger plant-level database of 12,000 listed as well as unlisted manufacturing firms. As in the two previous studies, they also analyzed how pre-buyout performance, measured as total factor productivity, compares to that of the after-buyout period. They suggest that the productivity is superior in the first three years after the buyout occurred, but differences vanish after the third year. Smart and Waldfogel (1994) apply a different methodology to 48 firms of Kaplan's database, but come to the same conclusions that management buyouts have a positive effect on corporate performance.

Van de Gucht and Moore (1998) look at 483 large (more than 100 million dollars) LBO transactions completed during 1980−1992 and find that share prices rise after a leveraged buyout is completed. In a sample that spans further in time to 1990s (starting in 1967), Jelic et al. (2005) assess financial performance of 167 management buyouts listed on the London

Stock Exchange. They compare management buyouts backed by venture capital with non-venture capital backed counterparts and find no significant difference in the long run. Ames (2002) analyzes UK management buyouts over the period 1986−1997. His findings suggest higher levels of post-buyout firm-level productivity.

Wright et al. (1996) compare the performance of 251 UK buyouts and 446 non-buyouts tracked for up to six years after the buyout. They find that buyouts yielded significantly larger return on assets, and display on average a 9 per cent greater productivity effect over years 2 to 6, post-buyout, compared to non-buyouts. Groh and Gottschalg (2006) scrutinize the risk-adjusted performance of 199 US buyouts during 1984–2004. Authors find that they outperform an equally risky S&P 500 Index.

Most previous research on buyout performance has focused on the first years after the buyout and has mainly concerned the measurement of changes in operating performance before and after the transaction. Thus, during the 1980s and 1990s, buyouts exhibit significant mean improvements in profitability, cash flow and productivity during the period between one year prior to the transaction and two or three years subsequent to it. Similar evidence for the beginning of the twenty-first century is scarce. In addition, the studies are mainly concentrated on analysis of the US and UK markets. One notable exception is the study by Desbrières and Schatt (2002), who investigate the French market. In a study of 161 management buyouts during 1988−1994 the authors claim that firms acquired tend to outperform their non-acquired counterparts both before and after the buyout. Moreover, only some of studies noted above have directly compared the performance of similar firms that had and had not experienced private equity investment. Filling these gaps is the aim of the present study: namely, focusing on (i) both listed and unlisted (ii) European target firms (iii) during the 2000s, and (iv) exploring the role of the duration of PE investment for the firm's performance.

Another important motivation for our study is the lack of any evidence on the broad range of PE activities in mature firms. Almost all previous analyses focus on buyouts and deal with fairly small samples. Our large data set reveals that this type of transaction covers only a limited share of the PE activity in mature firms. In our study we want to investigate whether the presence of PE investors makes a difference for the performance of their target firms even if they do not have majority ownership.

3 Data and variables

3.1 Data

The major goal of this study is to analyze how the presence of a private equity investor influences the performance of the firm. We therefore need reliable firm-specific data as well as data on the environment in which the firm operates. We use data from three different sources. The data on firm-specific variables come from the November 2008 edition of the *Amadeus* database that is compiled by Bureau van Dijk. We retrieve consolidated financial statements for firms in 22 European countries for 2002−2007. Table 1 lists countries and the number of firms available for the analysis for each year.

In our sample, consisting of 159,425 firm-years, we have included firms whose annual operating revenues are greater than 5,000 Euro. Although this is quite a low cut-off point, it does not imply these firms are necessarily tiny and unimportant. For example, the number of employees in firms whose annual turnover is between 5,000–10,000 Euros ranges from 1 to 91. Moreover, there are four occurrences of PE investment among 73 firms in that range, or 5 percent which is more than the average in the entire sample. We perform robustness checks to see if the results are invariant to the choice of this turnover threshold. Furthermore, the coverage of the information in *Amadeus* has been constantly expanding so the panel is highly unbalanced. The first year in which data can be considered comprehensive and representative for our specific purpose is 2002.

To the best of our knowledge the version of *Amadeus* database that we use provides the best currently available coverage of financial and shareholding information for both listed and unlisted European firms. We do not, however, differentiate between listed and unlisted firms as the *Amadeus* database gives only the current organization of the firm, and it is nontrivial to get information on possible transitions between public and private status on a year-by-year basis.

3.2 Variables

Our major challenge is to identify whether one or more investors in a firm is a private equity fund. The *Amadeus* database contains ownership data on the history of shareholders starting in 2000. The database enables us to identify the type of the shareholder, although the classification of PE investment may be ambiguous. We made three rounds of classification comparisons from the September, October, and November editions of the *Amadeus* database

Table 1: Sample characteristics

	Country	2002		2003		2004		2005		2006		2007		Total	
		N[a]	N_{PE}[b]	N	N_{PE}	N	N_{PE}	N	N_{PE}	N	N_{PE}	N	N_{PE}	N	N_{PE}
1	Austria	1		58		195	2	246	3	20				520	5
2	Belgium	1109	43	1571	53	1930	56	2831	67	4144	92	1857	65	13442	376
3	Czech Republic	143		189		170		204		215	1	33		954	1
4	Denmark	22	2	1432	22	722	19	577	15	1922	33	1996	38	6671	129
5	Estonia	31		136	1	81		108	1	130	1	162		648	3
6	Finland	199	3	588	5	338	6	445	16	871	19	619	22	3060	71
7	France	1929	15	3852	166	3088	58	5061	106	7854	161	8688	394	30472	900
8	Germany	716	8	654	2	897	12	2931	42	1338	37	919	75	7455	176
9	Greece	84		109		745	3	496	2	858	3	818	11	3110	19
10	Hungary	20		59		228		206		232				745	
11	Ireland	43		41	1	26		24	1	34	10	27	17	195	29
12	Italy	1212	9	818	2	1492	4	3923	18	4677	100	2117	6	14239	139
13	Latvia	1		6		3		4		6		3		23	
14	Luxembourg	11		21	1	35	3	34	3	72	4	15		188	11
15	Netherlands	153	3	263	10	608	14	830	16	419	19	425	47	2698	109
16	Poland	204	1	260		371	1	376	1	693	4	160		2064	7
17	Portugal	364	4	198	4	650	3	1131	11	1241	11			3584	33
18	Romania	345	2	100	1	705	2	623	3	624				2397	8
19	Slovakia	25		34		48		54		68		8		237	
20	Spain	1483	6	794	7	5601	93	7152	105	7797	143	65	4	22892	358
21	Sweden	321	8	2227	30	884	26	1045	34	3869	63	4194	68	12540	229
22	United Kingdom	4979	33	2483	78	3968	147	8560	254	5130	412	6171	754	31291	1678
	Total	13394	137	15836	383	22648	447	36810	697	42440	1116	28297	1501	159425	4281

[a] N is total number of observations;
[b] N_{PE} is number of observations with at least one PE investor.

by defining PE presence in the firm in accordance with each investor's NACE code.[1] Additionally, we checked the names of investors with the established list of PE firms from PEI Services Ltd.[2]

To control for potential differences in the environment in which the firm operates, we utilize an indicator of country-specific financial development proxied by the stockmarket capitalization-to-GDP ratio. This indicator was retrieved from the *World Bank Financial Structure Database*.[3] Finally, we obtain the six-month London Interbank Offered Rate (LIBOR) and harmonized CPI for each country from the IMF's *International Financial Statistics* (IFS), 2009.

Table 2: Variable descriptive statistics

year	mean	sd	p25	p50	p75	N
Return on Assets, percent						
2002	4.64	17.23	-0.35	3.71	11.09	13394
2003	4.72	17.49	-0.43	3.74	11.36	15836
2004	5.22	16.82	-0.05	3.78	11.2	22648
2005	5.44	16.51	-0.04	3.85	11.23	36810
2006	6.06	16.54	0.12	4.19	11.79	42440
2007	7.58	17.48	0.61	5.57	14.22	28297
Total	5.81	16.92	0.05	4.18	11.91	159425
PE investor (0/1)						
2002	0.01	0.1	0	0	0	13394
2003	0.02	0.15	0	0	0	15836
2004	0.02	0.14	0	0	0	22648
2005	0.02	0.14	0	0	0	36810
2006	0.03	0.16	0	0	0	42440
2007	0.05	0.22	0	0	0	28297
Total	0.03	0.16	0	0	0	159425

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[1]The investor is considered to be a Private Equity fund if its activity is described as Activities auxiliary to financial intermediation, except insurance and pension funding (6710), Administration of financial markets (6711), Security broking and fund management (6712), Activities auxiliary to financial intermediation n.e.c. (6719), Activities auxiliary to insurance and pension funding (6720), Activities auxiliary to insurance and pension funding (6720), Business and management consultancy activities (7414), Management activities of holding companies (7415), Call center activities (7486), or Other business activities n.e.c. (7487).

[2]A subscription to "*private equity info*" was acquired at http://www.privateequityinfo.com.

[3]For a detailed description of these data see Beck et al. (2000) and http://go.worldbank.org/X23UD9QUX0.

Table 2—Continued

year	mean	sd	p25	p50	p75	N
Spell of PE, years, for cases where PE is present						
2002	1	0	1	1	1	137
2003	1.17	0.38	1	1	1	383
2004	1.47	0.64	1	1	2	447
2005	1.67	0.86	1	1	2	697
2006	1.78	1.03	1	1	2	1116
2007	1.78	1.16	1	1	2	1501
Total	1.65	0.98	1	1	2	4281
Ultimate owner (0/1)						
2002	0.7	0.46	0	1	1	13394
2003	0.66	0.48	0	1	1	15836
2004	0.58	0.49	0	1	1	22648
2005	0.57	0.49	0	1	1	36810
2006	0.56	0.5	0	1	1	42440
2007	0.62	0.49	0	1	1	28297
Total	0.6	0.49	0	1	1	159425
Size: logarithm of turnover						
2002	9.5	2.05	8.18	9.44	10.77	13394
2003	9.2	2.09	7.81	9.06	10.51	15836
2004	9.07	2.11	7.71	9	10.36	22648
2005	9.14	2.03	7.84	9.07	10.39	36810
2006	8.96	1.98	7.68	8.85	10.16	42440
2007	9.15	1.93	7.83	9.03	10.34	28297
Total	9.12	2.02	7.8	9.03	10.36	159425
Risk: probability of default						
2002	2.79	5.24	0.2	0.64	1.99	13394
2003	3.05	5.8	0.2	0.71	2.46	15836
2004	2.74	5.59	0.17	0.56	1.98	22648
2005	2.82	5.6	0.18	0.6	2.09	36810
2006	3.05	6.18	0.18	0.61	2.17	42440
2007	3.76	7.29	0.28	0.96	3.46	28297

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Table 2—Continued

year	mean	sd	p25	p50	p75	N
Total	3.06	6.09	0.2	0.64	2.24	159425
Cash flow, normalized by total assets						
2002	0.07	0.14	0.02	0.06	0.13	13394
2003	0.07	0.14	0.02	0.06	0.13	15836
2004	0.07	0.14	0.02	0.06	0.13	22648
2005	0.07	0.13	0.02	0.06	0.13	36810
2006	0.08	0.13	0.02	0.06	0.13	42440
2007	0.09	0.13	0.02	0.07	0.14	28297
Total	0.08	0.13	0.02	0.07	0.13	159425
Debt: current liabilities normalized by total assets						
2002	0.52	0.32	0.27	0.51	0.74	13394
2003	0.49	0.3	0.25	0.47	0.71	15836
2004	0.49	0.31	0.25	0.47	0.71	22648
2005	0.5	0.31	0.25	0.48	0.71	36810
2006	0.5	0.3	0.26	0.48	0.71	42440
2007	0.5	0.3	0.27	0.5	0.72	28297
Total	0.5	0.31	0.26	0.48	0.71	159425
Stockmarket Capitalization / GDP						
2002	0.85	0.39	0.59	0.74	1.29	13394
2003	0.68	0.28	0.49	0.65	0.78	15836
2004	0.82	0.34	0.56	0.81	1.25	22648
2005	0.9	0.38	0.45	0.85	1.34	36810
2006	0.91	0.32	0.75	0.94	0.94	42440
2007	1.07	0.3	0.88	1.02	1.34	28297
Total	0.9	0.35	0.6	0.88	1.25	159425
LIBOR, 6 month rate, percent						
2002	1.81	0	1.81	1.81	1.81	13394
2003	1.16	0	1.16	1.16	1.16	15836
2004	1.72	0	1.72	1.72	1.72	22648
2005	3.72	0	3.72	3.72	3.72	36810
2006	5.26	0	5.26	5.26	5.26	42440

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Table 2—Continued

year	mean	sd	p25	p50	p75	N
2007	5.26	0	5.26	5.26	5.26	28297
Total	3.7	1.61	1.81	3.72	5.26	159425

Our measure of performance is Return on Assets (ROA), taken directly from the *Amadeus* database. Some firms' ROA values seem unrealistically huge. In order to reduce the impact of such outlying observations we winsorized this variable at one percent from the top and the bottom of its empirical distribution.[4] Table 2 reports the firm return on assets averaged across all countries for each year as well as average across the entire sample.

In order to analyze the effect that private equity investors have on firm performance, we construct the dummy variable 'PE' equal to one for each year in which at least one private equity fund is among the firm's shareholders. PE is equal to one in 4281 firm-years (2.7 percent of the sample). Table 1 shows that the number of such occurrences has grown steadily from 137 cases in 2002 to 1501 in 2007. We also observe that the United Kingdom, France, Spain, Belgium, Germany, Sweden and Italy are the major recipients of PE investment. The share of firms that had at least one PE investor has grown from 1 percent in 2002 to 2.7 percent in 2007.

We also want to investigate if the duration of PE presence has an influence of firms' return on assets. We thus create a variable 'Spell of PE', set equal to one if PE entry has occurred in a particular year or if PE is present in the first observed year. An interruption in PE investment implies a break in the spell. For example, if we observe PE in 2002 among the shareholders, 'Spell of PE' is 1. If a PE investor remains on the firm's list of shareholders in the next year, 'Spell of PE' increases by one each year. Therefore 'Spell of PE' is non-zero when PE is non-zero and can be seen as an interaction between these two variables. It also worth noting that we do not account for changes in the identity of PE investors. If PE fund 'A' invested in year t but left in year $t+1$, while PE fund 'B' invested in year $t+1$ we still assign 2 to 'Spell of PE' in year $t+1$. Clearly the descriptive statistics for 'Spell of PE' and 'PE' in 2002 are identical, but in later years 'Spell of PE' becomes larger and more dispersed. Table 3 reports the frequencies of 'Spell of PE' by years. The total number of non-zero 'Spell of PE' observations in the sample is equal to 4281 which is identical to the total number of non-zero values of 'PE.'

[4] We have first identified the sample of firms with non-missing values for all included variables. We calculated the 1^{st} and 99^{th} percentiles of the empirical distribution of return on assets. We then have replaced values of return on assets smaller (larger) than the 1^{st} (99^{th}) percentile with the value of the 1^{st} (99^{th}) percentile.

Table 3: Persistence of PE investment*

year	Spell in years						Total
	1	2	3	4	5	6	
2002	137	0	0	0	0	0	137
2003	318	65	0	0	0	0	383
2004	272	139	36	0	0	0	447
2005	384	183	104	26	0	0	697
2006	611	261	146	80	18	0	1116
2007	868	338	142	80	60	13	1501
Total	2590	986	428	186	78	13	4281

* The spell of PE investment is equal to one if PE entry has occurred or if PE is present in the first observed year. Interruption in PE investment implies break in the spell.

We also include firm- and country-specific characteristics to control for the intrinsic heterogeneity of firms and the environments in which they operate. We include the variable 'Ultimate Owner' which is equal to one if the *Amadeus* database identifies either an ultimate domestic or ultimate foreign owner, and zero otherwise. Table 1 shows the frequency of this variable by years and countries. We measure size of the firm by the logarithm of the firm's turnover, measured in EUR. 'Risk' reflects the relative probability of default, that is, the default probability of the firm divided by the probability of default of a peer group.[5] To calculate the probability of default, Bureau van Dijk uses the MORE rating,[6] which is calculated using a unique model that uses the company's financial data to create an indication of the company's financial risk level. Furthermore, Bureau van Dijk claims that the ratings are comparable across countries: two companies from different countries with the same rating have the same creditworthiness. We also include 'Cash Flow' and 'Debt' which are constructed as ratios of cash flow and current liabilities to total assets respectively.

The variables 'Total Assets,' 'Operating Revenue or Turnover,' 'Cash Flow,' and 'Current Liabilities' were divided by their countries' harmonized CPI values to express them in real terms. The variables 'Size,' 'Risk,' 'Cash Flow,' and 'Debt' were winsorised in the same way as was return on assets (see footnote 4).

In addition, we include a country-specific time-varying control variable, 'Capitalization', to account for differences in countries' financial development. We also include the six month LIBOR rate to control for business cycle factors.

[5] Defined in the *Amadeus* database.

[6] See http://www.modefinance.com for details.

4 Performance of firms

4.1 The econometric model

Our econometric approach tests the impact of private equity presence among shareholders on firm performance. In particular, we estimate a panel performance model in which the presence of 'PE' in year t impacts the 'Return on Assets' in the same year t. We estimate a firm fixed-effects model and calculate standard errors that are robust and corrected for clustering at the firm level.

The basic performance equation we estimate is:

$$\begin{aligned} \mathsf{ROA}_{it} &= \alpha + \beta_{PE}\mathsf{PE}_{it} + \\ &+ \beta_{UO}\mathsf{Ultimate\ Owner}_{it} + \beta_{Size}\mathsf{Size}_{it} + \beta_{Risk}\mathsf{Risk}_{it} + \beta_{Cash}\mathsf{Cash\ Flow}_{it} + \\ &+ \beta_{Debt}\mathsf{Debt}_{it} + \beta_{Capitalization}\mathsf{Capitalization}_{it} + \beta_{LIBOR}\mathsf{LIBOR}_{it} + \mu_i + \nu_{it}, \quad (1) \end{aligned}$$

where the subscripts refer to the i^{th} firm at time t. Specification (1) implies that the marginal effect of private equity on firm performance is solely determined by coefficient β_{PE}.

We expect a firm's performance to exhibit a significant relationship with the duration of private equity investment. That is, the longer PE investors are among the firm's shareholders, the larger should be their impact on the firm's performance. Davis et al. (2008), for example, found that firms run by private equity funds lay off more employees than their peers two years after a buy-out. To that end, we include both the 'PE' indicator and 'Spell of PE.'

$$\begin{aligned} \mathsf{ROA}_{it} &= \alpha + \beta_{PE}\mathsf{PE}_{it} + \beta_{Spell}\mathsf{PE}_{it}\cdot(\mathsf{Spell\ of\ PE})_{it} + \\ &+ \beta_{UO}\mathsf{Ultimate\ Owner}_{it} + \beta_{Size}\mathsf{Size}_{it} + \beta_{Risk}\mathsf{Risk}_{it} + \beta_{Cash}\mathsf{Cash\ Flow}_{it} + \\ &+ \beta_{Debt}\mathsf{Debt}_{it} + \beta_{Capitalization}\mathsf{Capitalization}_{it} + \beta_{LIBOR}\mathsf{LIBOR}_{it} + \mu_i + \nu_{it}. \quad (2) \end{aligned}$$

Given the inclusion of an interaction terms between 'PE' and 'Spell of PE", the sensitivity of firm's performance to presence of private equity becomes:

$$\partial\mathsf{ROA}/\partial\mathsf{PE} = \beta_{PE} + \beta_{Spell}(\mathsf{Spell\ of\ PE}), \quad (3)$$

Thus, depending on the sign of β_{Spell}, the duration of a private equity presence among the firm's shareholders may increase or reduce its performance over time.

4.2 Results

4.2.1 Presence of private equity

Table 4 presents the estimation results for Models (1) and (2). According to the first column of Table 4, the effect of presence of private equity in a particular year has no significant effect on the firm's performance in the same year. When we interact the 'PE' variable with 'Spell of PE' (column 2 of Table 4), however, the effect of a private equity presence becomes significant. This finding implies that the effect of private equity depends on how long the private equity fund has been investing in the firm. When we do not control for such duration, in Model (1) the effects of long- and short-term PE investment cancel each other out and on average the effect is not statistically significant. Model (1) therefore might be misspecified and we proceed only with the model incorporating duration of the PE spell (Eq. (2)).

We first wish to test whether the marginal effect of private equity presence on the firm's performance is statistically significant. We do so by reporting linear combinations of the estimates for 'PE' and 'Spell of PE.' Given the results of column 2 in Table 4, $\partial \mathsf{ROA}/\partial \mathsf{PE}$ for the average firm is equal to -0.73 with standard error of 0.29.[7] This finding suggests that when we account for the PE investment horizon, the duration of private equity presence, has on average a detrimental effect on firm performance as the effect on ROA is negative and statistically significant.

As our 'Spell of PE' variable can take values from 0 to 6, such an average effect is not a complete answer to the question of how private equity presence influences the firm's performance. We break down this average effect of PE presence into six effects that are determined by the length of private equity presence among the firm's investors. Table 5 presents individual yearly effects and their standard errors, while Figure 1 plots these point and interval estimates.

Most remarkably, when the negative and statistically significant average marginal effect is evaluated over the duration of private equity presence, none of these effects appear to be strongly statistically significant. Only at the time of initial entry (the 6th year of PE tenure) is the negative (positive) effect distinguishable from zero at the 90% level of confidence. We therefore claim that when the length of private equity presence in a firm is taken into account, the firm's performance cannot be statistically distinguished from the performance of a comparable firm without private equity investors, except for the longest tenure of PE in our sample.

[7] Note that the average 'Spell of PE' from Table 2 is 1.65 years, conditional on PE; 97 percent of firm-years have a 'Spell of PE' of zero.

Table 4: Regression results. Dependent variable is 'Return on Assets'

	Model (1)	Model (2)
PE	−0.303	−0.746**
	(0.1709)	(0.0129)
PE × Spell of PE		0.352**
		(0.0258)
Ultimate Owner	0.273	0.274
	(0.7313)	(0.7307)
Size	1.106***	1.106***
	(<.0001)	(<.0001)
Risk	−0.243***	−0.243***
	(<.0001)	(<.0001)
Cash Flow	92.350***	92.333***
	(<.0001)	(<.0001)
Debt	−0.387	−0.391
	(0.1871)	(0.1821)
Capitalization	0.852***	0.847***
	(<.0001)	(<.0001)
LIBOR, months	0.105***	0.101***
	(<.0001)	(<.0001)
Constant	−11.735***	−11.719***
	(<.0001)	(<.0001)
Firm fixed effects	yes	yes
R-squared	0.683	0.683
N	159425	159425

Notes: p-values in parentheses based on robust standard errors that are corrected for clustering at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% test levels, respectively

4.2.2 Other findings

We have included a number of control variables in Eq. (2) to ensure that we compare two firms with and without private equity presence whose other characteristics are similar. Ultimate ownership does not imply superior firm performance; when the firm has an ultimate owner, its return on assets is not statistically different from that of its peers. Additionally we find that larger firms systematically outperform smaller firms. Not surprisingly, firms with high cash flow have statistically larger ROAs than firm with low cash flow—and the magnitude of the cash flow impact is colossal. It is also worth noting that firms with higher probability of default tend to perform significantly worse than their less risky peers. Our results also suggest that the firm's return on assets is independent of the level of debt. Fur-

Table 5: Marginal effect of private equity presence on return on assets *vs.* duration of private equity presence[a]

'Spell of PE',	Marginal	Standard	Confidence interval			
year(s)	effect[b]	error[c]	lower 95%	lower 90%	upper 90%	upper 95%
1	−0.3941	0.2257	−0.8364	−0.7653	−0.0229	0.0482
2	−0.0424	0.2484	−0.5292	−0.4509	0.3662	0.4444
3	0.3094	0.3496	−0.3758	−0.2657	0.8844	0.9946
4	0.6612	0.4822	−0.2840	−0.1320	1.4544	1.6063
5	1.0129	0.6266	−0.2152	−0.0178	2.0436	2.2411
6	1.3647	0.7762	−0.1567	0.0879	2.6415	2.8861
Average	−0.7303	0.2952	−1.3090	−1.2160	−0.2447	−0.1516

[a] *Model (2) is:* $\mathsf{ROA} = \alpha + \beta_{\mathrm{PE}}\mathsf{PE} + \beta_{\mathrm{Spell}}\mathsf{PE} \cdot (\text{Spell of PE}) + \ldots$
[b] $\partial\mathsf{ROA}/\partial\mathsf{PE} = \beta_{\mathrm{PE}} + \beta_{\mathrm{Spell}}(\text{Spell of PE})$.
[c] Variance of marginal effect $= Var(\beta_{\mathrm{PE}}) + Var(\beta_{\mathrm{Spell}}) \cdot (\text{Spell of PE})^2 + 2 \cdot cov(\beta_{\mathrm{PE}}, \beta_{\mathrm{Spell}}) \cdot (\text{Spell of PE})$.

thermore, it is on average easier to achieve larger ROAs in boom years of corporate activity (as signalled by higher LIBOR values), and firms in more financially developed economies perform better than their counterparts in less developed economies. We have also controlled for the level of PE shareholding, but shareholding is insignificant for all defined ranges.

4.2.3 Robustness

As mentioned earlier, we have included only those firms into our sample that have a turnover of at least 5,000 Euro. This cut-off point seems to indicate that the firm is tiny and inclusion of such firms might have driven our results. Therefore, next we reran the specification given in Eq. (2), but restricted our sample to those firms whose turnover is greater than 100,000 Euro. The estimation results as well as marginal effects depending on duration of private equity stay in a firm are shown in column 1 of Table 6 under the heading 'Check 1.' This restriction has reduced our sample from 159425 to 157036 firm-years. The coefficients are somewhat different from those in Table 4, but this sample restriction has not produced qualitative changes in the results.

Next, we have restricted our sample to firms with operating turnover over 400,000 Euros, which has reduced the number of observations by roughly 8,000 firm-years or five percent of the initial sample. The results appear in column 2 of Table 6 under the heading 'Check 2.' The coefficients remain virtually the same, while the significance of coefficients at 'PE' and 'Spell of PE' sees some small improvement, which is also reflected in an increased sig-

Table 6: Regression results and marginal effects. Dependent variable is 'Return on Assets'

	Check 1[a]	Check 2[b]	Check 3[c]	Check 4[d]
PE	−0.712**	−0.773***	−0.722**	−0.746***
	(0.0176)	(0.0074)	(0.0157)	(0.0094)
PE × Spell of PE	0.322**	0.370**	0.340**	0.355**
	(0.0409)	(0.0116)	(0.0315)	(0.0158)
Ultimate Owner	0.211	0.166	0.229	0.135
	(0.7875)	(0.8271)	(0.7623)	(0.8563)
Size	1.327***	1.465***	1.127***	1.513***
	(<.0001)	(<.0001)	(<.0001)	(<.0001)
Risk	−0.249***	−0.256***	−0.254***	−0.264***
	(<.0001)	(<.0001)	(<.0001)	(<.0001)
Cash Flow	92.135***	91.988***	91.410***	91.511***
	(<.0001)	(<.0001)	(<.0001)	(<.0001)
Debt	−0.417	−0.331	−0.366	−0.384
	(0.1605)	(0.2760)	(0.2257)	(0.2167)
Capitalization	0.827***	0.900***	0.810***	0.857***
	(<.0001)	(<.0001)	(<.0001)	(<.0001)
LIBOR, months	0.098***	0.097***	0.121***	0.112***
	(<.0001)	(<.0001)	(<.0001)	(<.0001)
Constant	−13.723***	−15.226***	−11.880***	−15.615***
	(<.0001)	(<.0001)	(<.0001)	(<.0001)
Firm fixed effects	yes	yes	yes	yes
R-squared	0.685	0.686	0.674	0.680
N	157036	151265	152357	145169
'Spell of PE,' years	Marginal effects			
1	-0.390*	-0.403*	-0.382*	-0.391*
	(0.0837)	(0.0696)	(0.0888)	(0.0763)
2	-0.068	-0.033	-0.042	-0.036
	(0.7841)	(0.8928)	(0.8661)	(0.8796)
3	0.254	0.338	0.298	0.318
	(0.4654)	(0.3095)	(0.3939)	(0.3386)
4	0.577	0.708	0.638	0.673
	(0.2304)	(0.1183)	(0.1865)	(0.1385)
5	0.899	1.079*	0.978	1.027*
	(0.1504)	(0.0658)	(0.1193)	(0.0803)
6	1.221	1.449**	1.318*	1.382*
	(0.1149)	(0.0455)	(0.0902)	(0.0570)
Average	-0.698**	-0.757***	-0.706**	-0.729***
	(0.0182)	(0.0078)	(0.0163)	(0.0099)

Notes: p-values in parentheses based on robust standard errors that are corrected for clustering at the firm level; *p-values* in parentheses for marginal effects. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% test levels, respectively

[a] EU−27 and annual operating revenues are greater than 100 thousand Euro.

[b] EU−27 and annual operating revenues are greater than 400 thousand Euro.

[c] EU−15 and annual operating revenues are greater than 5 thousand Euro.

[d] EU−15 and annual operating revenues are greater than 400 thousand Euro.

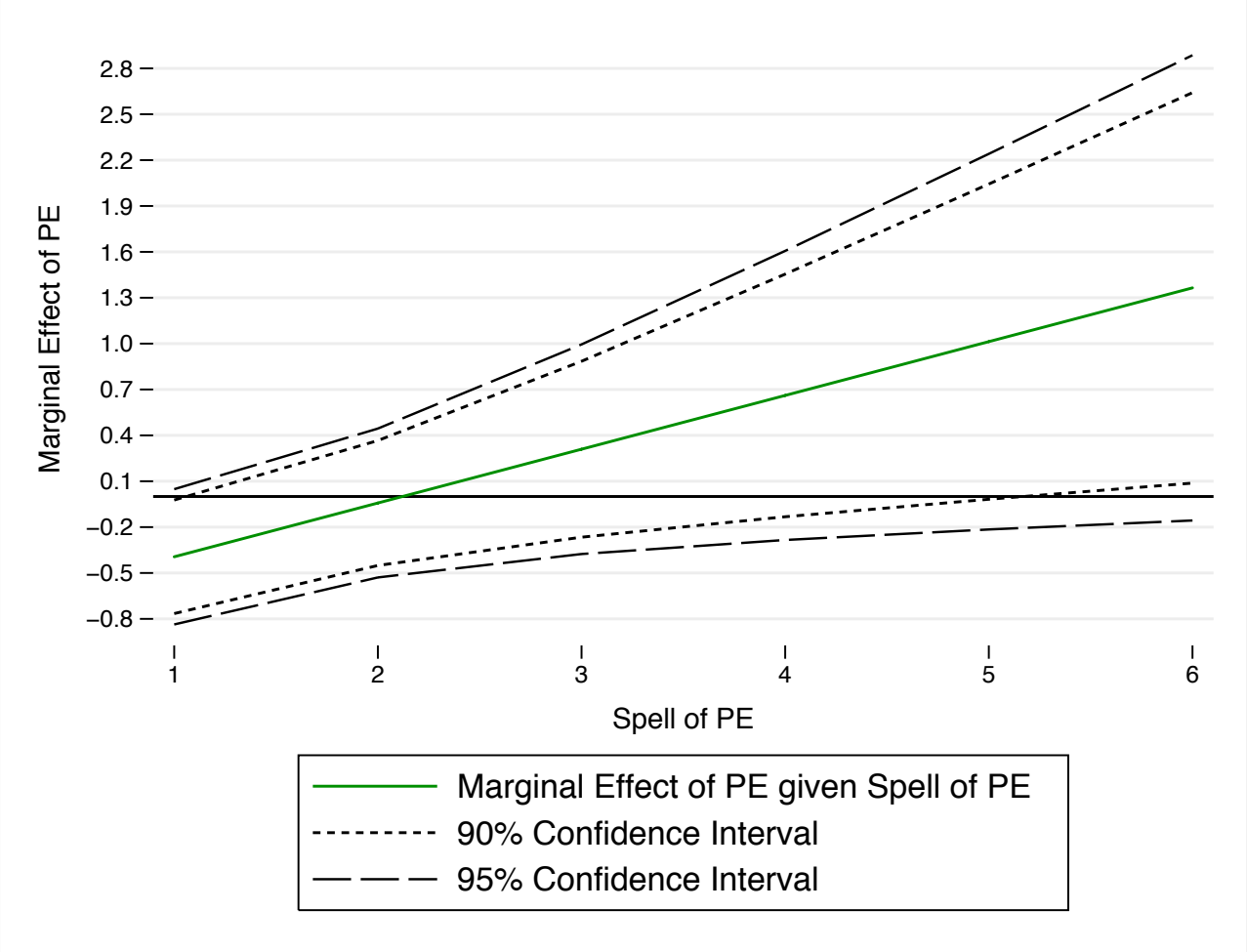

Figure 1: Marginal Effect of PE on ROA as Spell of PE changes

Marginal effect is $\partial \text{ROA}/\partial \text{PE} = \beta_{\text{PE}} + \beta_{\text{Spell}}(\text{Spell of PE}) + \beta_{\text{Spell2}}(\text{Spell of PE})^2$. Solid horizontal line is $\partial \text{ROA}/\partial \text{PE} = 0$;

nificance of the marginal effect of 'PE' when 'Spell of PE' is equal to one. Nonetheless, this much higher turnover threshold has also no effect on our previous conclusions.

Although new European member states comprise only a small fraction of the entire sample (about five percent: see Table 1), there are reasons to believe that they are so different that might have influenced the results. Therefore, we repeat the exercise on a sample that contains only firms from the original EU−15 and whose operating revenue is larger than 5,000 Euro. Column 3 of Table 6 under the heading 'Check 3.' shows the results. As the table suggests, our conclusions are invariant to this change of composition of the sample. Finally, the results of 'Check 4' which restricts the sample to firms from the original EU−15 and whose operating revenue is larger than 400,000 Euro appear in the fourth column of Table 6.

Although these checks have revealed some minor differences, we suggest that the main results of this paper are reasonably robust.

5 Concluding remarks

In recent years, policymakers have become increasingly concerned with reconciling two contradicting views on the role of PE for the economy in general and the companies in which they invest in particular. On the one hand, PE investors claim to implement a superior business model which involves better alignment of managers' and owners' interests. On the other hand, private equity is viewed as operators with an increasingly shorter investment horizon aiming at stripping the firm's assets and bailing out. However, to the best of our knowledge, tests of these opposing hypotheses with good quality, recent data are broadly absent from the literature.[8]

Recently, Stephen Kaplan said that one of the advantages of the PE industry over other shareholders is the sensible duration that matches the investment horizon of 10 years.[9] This paper provides empirical evidence from tests of whether the tenure of private equity presence in a firm improves this firm's performance by looking at (i) both listed and unlisted (ii) European target firms (iii) during the 2000s. We measure the performance of the firm by its return on assets. We find that the performance of a firm with at least one private equity investor among its shareholders is significantly negatively affected by the average duration of private equity presence. However, breaking down this effect into years of uninterrupted presence, we find ambiguous effects for all but the shortest and longest durations. There is a positive impact on performance if the PE involvement is uninterrupted for six years.

Our findings suggest several avenues for future research. First, it would be interesting to look at the impact of PE presence on firm performance against the backdrop of the economic crisis of 2007–2009. Second, it is important to explore other aspects of firm performance, such as defaults of portfolio firms, firms' innovativeness, and sustainable employment.

[8] A recent study of Bernstein et al. (2010) explored the impact of aggregate PE activity within an industry on industry performance. They claim that industries where PE funds have invested in the past five years experience higher growth, and that PE activity has not caused a higher exposure of the industry to aggregate shocks.

[9] http://www.chicagobooth.edu/news/2009-05-29-pe.aspx.

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