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PRIVATE EQUITY INVESTMENT TENURE AND FINANCIAL PERFORMANCE: EVIDENCE FROM EUROPEAN PIPE TRANSACTIONS

I. V. Berezinets¹, Yu. B. Ilina², A. Z. Bobyleva³, A. N. Burov⁴

¹ HSE University,

20, ul. Myasnitskaya, Moscow, 101000, Russian Federation

² St. Petersburg State University,

7–9, Universitetskaya nab., St. Petersburg, 199034, Russian Federation

³ Lomonosov Moscow State University,

1, Leninskie gori, Moscow, 119991, Russian Federation

⁴ PJSC Bank “Saint-Petersburg”,

64A, Malookhtinsky pr., St. Petersburg, 195112, Russian Federation

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The role of private equity investments in a modern economy is growing. Private equity funds, which operate in the industry, attract capital; and distribute it across a wide range of portfolio companies. These funds hold their stakes in target companies' capital for different periods of time. Why would a private equity fund choose to invest in portfolio companies for a certain period of time and what would be the impact of such investments on a portfolio company? Is there any relationship between the tenure of investment and the performance of a target company? This paper examines the relationship between the tenure of private equity investments in public equity and financial performance of European companies. Performance is measured by cash flow growth and net debt to EBITDA ratios. Private investments in public equity transactions with public company targets located in Western European countries during a period from 2005 to 2016 were analyzed. The findings reveal the impact of private equity investor presence on the performance of target companies and confirm non-linear effects of the relationships. A non-linear relationship between private investments in public equity investment tenure and target company's performance have been found both in terms of its solvency and cash flow growth rate.

Keywords: private equity, investment tenure, private investments in public equity.

INTRODUCTION

The role of private equity (PE) investments in a modern economy substantially increased in recent years. PE funds, which operate in the industry, attract capital, and

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distribute it across a wide range of portfolio companies. The volume of deals conducted with participation of PE funds is dramatically increasing. For the first half of 2021 the value of M&A transactions closed by these funds amounted to 366 billion US dollars [Private Equity, 2021], although amount of buyout deals decreased in 2020 compared to five-year average (except for technology and telecom sectors) being affected by COVID pandemic [Global Private Equity Report 2021]. As it is suggested by many studies, private equity investments provide positive outcomes to portfolio companies, including the increase of company's overall performance due to improvement of existing management practices and supervision of resources allocation (e.g., [Koller, Goedhart, Wessels, 2010]). Private equity funds not only provide financing, but also bring professional expertise in target companies, participate in succession planning and offer post-investment support.

As in case of any investment, private equity funds hold their stakes in companies' capital for varying periods of time. Among important questions arising regarding these investments are the following — why would a PE fund choose to invest in companies for a certain period and what is the impact of such investments on a portfolio company.

This research studies private investment in public equity (PIPE) deals conducted by PE funds. In PIPE transaction private equity fund and other qualified investors acquire a share in a public company. This portion of shares is privately issued. The aim of a PIPE transaction is to attract capital, that is used for a firm growth or refinancing of existing debt. PIPEs mainly involve issuing common shares or equity-linked securities [PIPEs, 2010]. Due to a number of benefits over other forms of equity financing PIPE investments provide public companies with a relatively inexpensive financing compared to public offering [Berezinets, Ilina, 2021]. Many small public firms use this type of financing [Sjostrom, 2007]. PIPEs have become increasingly attractive in recent years. In 2017, we observed an increase of 21.4% in a number of PIPE transactions globally with total capital raised through PIPEs in amount of 81.2 billion US dollars in 1,716 deals [PrivateRaise, 2018]. D. Andriosopoulos and S. Panetsidou [Andriosopoulos, Panetsidou, 2021] documented that 36,543 PIPE transactions were conducted worldwide in 1995–2015, out of which 2,890 deals occurred in Europe, and an average annual value of transactions was 35 billion US dollars.

This empirical study is based on the theoretical background of PE investments relationship with a company performance. There are many studies devoted to PE investments impact on target company performance results (e.g., [Acharya et al., 2012; Chen et al., 2014; Battistin et al., 2017; Berezinets, Ilina, 2021]). But research covering private equity investment tenure (a period of time from initial investment to complete exit) is scarce (e.g., [Badunenko, Baum, Schäfer, 2010]). Therefore, this study investigating the link between a PE fund investment tenure and portfolio firm financial outcomes seek to contribute to academic research and provide practically relevant conclusions. The study embraces a sample of transactions with public company targets based in Western European countries during a period of 2005 to 2016.

A non-linear relationship between PIPE investment tenure and target company's performance has been found both in terms of its solvency (U-shaped), and cash flow growth rate (\cap -shaped). The research results suggest that the cash flow growth rate increases over a period of PE investment until the certain point of time, after which a decline in a cash flow growth is observed. Cash is expected to grow, but the rate of growth might increase only for some period after the investment is made, following which the growth rate could become to decrease or remain stable before the PE funds exits the portfolio firm. The solvency, measured by Net Debt/EBITDA (earnings before interest, taxes, depreciation and amortization) ratio could rise also because the target firm gains financial strength over time and could seem more stable for creditors to provide debt financing. The findings demonstrate that the growth rate of the cash flow could decrease over time, while the growth itself may continue at a slower pace.

The structure of the paper is following. The first section provides theoretical background of private equity investments and their relationship with portfolio companies performance. The second section analyzes private equity investment strategies and specifics of PIPE transactions. The third section describes hypotheses of the empirical research. The fourth section presents the methodology used in the empirical study. The fifth section of the paper covers the sources and description of the data used in the empirical study, while sections six and seven are devoted to discussion of the results and conclusions.

PRIVATE EQUITY INVESTMENTS AND PORTFOLIO FIRM'S PERFORMANCE

Private equity today is an important instrument of alternative financing for companies that do not have easy access to new equity public issues or debt markets. Unlike publicly listed shares, private equity is an asset, that is not traded on a stock market and are is available to the broad public. Those are investments of private equity firms, intermediaries, which establish private equity funds on behalf of their investors. PE global capital raising has increased by almost 7 times from an estimate of 108 billion US dollars in 2003 to a peak of 1 085 billion US dollars in 2019 with a slight decrease in volume to 989 billion US dollars in 2020 due to a pandemic effect [Global Private Equity Report 2021]. It is an evidence of growing demand for private equity investments.

PE funds choose target companies, which shares investors could sell in some period after the deal upon the fund's exit and earn a capital gain. Targets of PE funds are often underperforming businesses. As reported in [Denes, Karpoff, McWilliams, 2017], targets in general perform poorly prior to private equity investments, both from perspective of operational and market-based performance metrics. Target firms in many cases operate with a loss or poor profitability, therefore do not possess an opportunity to raise funds at debt markets. Low profitability ratios also decrease a possibility to attract alternative sources of financing through equity markets, seeking new investors for their issues, that leads to discounts on the stock, relative to the market price. Thus, these firms become targets for private equity investors more frequently [Goranova et al., 2017; Benton, You, 2018].

Companies with low growth rates tend to put excess free cash flow to projects with a poor potential to raise value of the firm [Jensen, 1986]. Financial leverage serve as a mechanism to constrain management discretion in distribution of cash flows and reallocation of cash flows to debtholders. In leveraged buyout transactions investors, including private equity funds, use debt to enhance value creation. But, as B. Särve [Särve, 2013] reported, PIPE transactions are rarely financed by debt and normally involve minority shares acquisition [Fraser-Sampson, 2007; Särve, 2013]. This instrument differs from buyout transaction, when private equity investors get control over the portfolio firm and opportunity to impact the strategy and operating activities to decrease financial and business risks. PE funds have limited control over investees, being unable to raise the firm's leverage. But companies with high debt could become targets for private equity investors.

Among other factors, that impact PE funds choice of target companies, is the firm's level of financial risk. Risky companies often face difficulties raising external capital from debt markets, as margin of safety for such companies is heavily reduced, due to them being unable to meet debt covenants requirements, including maintenance covenants of financial institutions such as Debt/EBITDA or Net Debt/EBITDA ratios. Under such circumstances, external funding from institutional investors is an attractive alternative, especially for small- and medium-sized firms, which in addition have less access to banking loans [Särve, 2013]. To obtain bank financing a company should satisfy certain requirements in terms of the probability default threshold.

The paper by M. Jensen [Jensen, 1986] on agency costs of free cash flow provides theoretical background for a view, that private equity investments can improve company's performance. Profitability and value of the target could enhance over the tenure of PE investment, that allow selling the company further at higher value. S. Kaplan and P. Strömberg [Kaplan, Strömberg, 2009] analyzed the value creation process of private equity investors in target companies after the leveraged buyout, that is a main business for PE firms. In general, private equity firms have three main instruments to improve portfolio companies' outcomes: financial engineering, operational change, and governance change. As Kaplan [Kaplan, 1989] demonstrated, the two key elements of financial engineering are management incentive schemes and financial leverage, creating pressure on and disciplining managers, depriving them of the opportunity to ineffectively distribute and use a free cash flow. Operational engineering is realized through the industry expertise and experience of private equity firms that often specialize in one industry for many years. V. Acharya with co-authors [Acharya et al., 2012] argue that private equity firms invest in target firms for which they have ready plans for cost-cutting, spinning-off of unprofitable assets, and acquiring other companies among other initiatives.

In [Bernstein et al., 2010] the authors develop a perspective of industry-wide performance to PE investments impact. The authors conclude that target's performance might improve if PE funds specialize on the investments in this industry. Moreover, industry peers which did not receive PE investments perform better to keep their com-

petitiveness. In general authors report that PE-backed sectors of economy are less exposed to industry shocks. At the same time during stable periods of the economic cycle performance doesn't differ among industries that are backed by PE investments and sectors that do not obtain substantial amounts of PE investments. Other studies document that if a PE firm already made investments in targets from some industry it helps to increase portfolio company's performance and promotes value creation due to accumulated expertise of a PE investor in particular sector [Rigamonti et al., 2016; Gedjadze, Piot, Schwiembacher, 2017; Berezinets, Ilina, 2021].

Regarding changes to the portfolio company's governance structures, the mechanisms used are consistent with the ways of mitigating the agency problem suggested by Jensen and Meckling [Jensen, Meckling, 1976] and include such measures as board of directors' composition change, CEO replacement and other governance changes related to activism strategies employed by investors in portfolio companies [Clarkson, Pathan, Tellam, 2016; Denes, Karpoff, McWilliams, 2017; Ligterink, Martin, Boot, 2017; Guimaraes et al., 2019].

PRIVATE EQUITY INVESTMENT TENURE AND PIPE TRANSACTIONS

As it was already stated, for the purpose of empirical study, this paper focuses specifically on private investments in public equity (PIPE transactions). Issuers could attract new investors, well-capitalized PE firms who are ready to make investments when valuations are low. Currently with a record 1.5 trillion US dollars cash pile worldwide, PE investors search new strategic opportunities in public firms [Coming down the PIPE..., 2020].

There is a number of advantages of PIPE over other financing alternatives, including public offerings. During a PIPE deal the issue of unregistered shares takes place that helps to avoid bureaucracy and financial burden associated with registering the issue with the regulatory authorities. PIPEs are placed at the market by special placement agents, which act similar to underwriters in IPOs, but shares are sold to a small group of investors. Therefore, transaction expenses are lower than for public equity issues. In addition, a PIPE deal could be completed much faster than a public placement of stocks, which decrease uncertainty and become especially beneficial for raising funds in turbulent markets.

From the investor's perspective, PIPE transactions are also attractive [Fraser-Sampson, 2007]. Due to a lack of liquidity, PIPEs are conducted at a discount for investors. Among opportunities provided by PIPE transactions for funds is that although the target is a public firm, PIPEs offer a fixed price for the company share, that is an advantage for investors relative to public offerings. PE fund could search for potentially underpriced investments and complete the deal quickly by signing the purchase agreement.

As Andriosopoulos and Panetsidou [Andriosopoulos, Panetsidou, 2021] report, PIPE issuers experience a negative stock market performance over the year after the issue, from — 21% on traditional PIPEs in Europe to — 44% on structured PIPEs in

the US. Moreover, long-term performance of firms attracting fund through PIPE transactions globally is poor. The authors attribute this fact to the impact of financial crisis of 2008–2009, issue features, fundamentals of target companies. Country-specific institutional environments, regulatory framework, legal investors protection also matter for the valuation of PIPEs. Investment tenure of PE fund differs depending on the investment and exit strategies, as well as the industry focus of the fund and specialization of target companies. For buyout deals, which represent the biggest share of private equity transactions [Stowell, 2010], tenures vary substantially among transactions: while Guernsey-based PE fund Mid Europa Partners held an investment in Lux Med for 6 years (2007–2013), Poland-based fund Enterprise Investors has invested in Magellan for a total of over 14 years (2003–2007 and minority until 2013). Due to both targets, Lux Med and Magellan, operating in the healthcare industry, this example is evidence of the fact that target's industry is a minor determinant of investment tenure. This fact is better illustrated with comparably minor differences in average investment tenures for various target industries: while the largest tenure of 5.3 years is attributed to industrials, the lowest tenure of 4.3 years is observed for energy and utilities [Private Equity Spotlight, 2015]. Thus, we can conclude that company-specific characteristics of targets might play a larger role in determining the investment tenure. One of such could be the potential for the private equity fund to improve company's existing practices (thus, its performance) and achieve higher valuation for exit.

O. Badunenko with co-authors [Badunenko, Baum, Schäfer, 2010] investigated, how private equity investments impact performance of European companies, and how performance indicators change over the period of investment. As a measure of company's performance, return on assets was used. But since debt expenses account for a major part of company's operating expenses, return on equity seems to be an appropriate measure of performance from investors' perspective. The finding was that private equity ownership taken alone does not substantially affect target's performance in a particular year. But being combined with the investment tenure, PE ownership has significant relationship with the portfolio company's performance. The authors document that significant increase in target's performance is reported after 6 years — the longest tenure for the sample used in their study. The hypothesis about improved performance for tenures over 6 years couldn't be confirmed for their sample.

Another important issue in PIPE transactions is how external equity from private placements affects firm activities, i.e., how the capital raised is allocated inside the company. According to J. Brown and I. Floros [Brown, Floros, 2012] proceeds from private equity investments are primarily used for research and development (R&D) expenses. Analyzing the R&D activities of companies which received proceeds from PIPE transactions and other sources of funding (e.g. internal financing, debt, equity offering), the authors conclude that PIPE financing substantially impact R&D spending, as well as increase cash piles, which potentially could be used for R&D expenditures. Important finding is that on average, R&D expenditures increased more if a PIPE investor was a private equity fund, not the other type of investor (hedge fund, corporation etc.). This

conclusion could suggest that capital raised from non-private equity funds is primarily used for operational expenses rather than for strategic investments for a company's growth.

HYPOTHESES STATEMENT

As suggested by [Kaplan, Strömberg, 2009] using strategies of value creation — financial, governance, or operational improvements, PE funds enhance the target company's value, that enables to sell the company at a gain in future. As it was noted, Badunenko with co-authors [Badunenko, Baum, Schäfer, 2010] documented an increase in portfolio companies' performance over longer tenures of private equity investors. Although PIPE transactions are associated with minority shareholding and PIPE investor's control over portfolio firm is limited [Dai, 2011], providing capital is critical for the survival of financially distressed businesses. It could provide opportunities for future growth. It is reflected in the relationship between a tenure of PE investment and growth of portfolio company's cash flow. Commonly used approach to assess a company value is based on discounted cash flow (DCF) model. The paper by P. Gompers with co-authors [Gompers, Kaplan, Mukharlyamov, 2015] confirms this fact for a case of PIPE transactions. The authors conducted a survey and reported that private equity funds initially estimate their exit value based on the DCF method that captures potential opportunities to generate cash flows in future. This approach allows estimation of the fundamental value of business as opposite to market valuation with market multiples, which depends on the equity market uncertainty. In DCF method the terminal (exit) value is sensitive to the cash flow growth rate and its changes. Therefore, it is expected that private equity funds select portfolio firms with a potential to grow in value and improvement of performance measures. Investing in target companies, PE funds tend to impact their performance in direction of achievement of higher cash flows, and enhancing the target's valuation [Gatti et al., 2015]. But it is crucial to emphasize that positive changes in firm's performance need some "time to build" effect. It is reported by Badunenko with co-authors [Badunenko, Baum, Schäfer, 2010], i.e., improvements in performance metrics would gradually appear over a period of investment. Nevertheless, an opposite effect could also be assumed. Cash flow, as one of important operational performance measures, could be expected to rise, while the rate of the growth might increase for some period after the investment is made, when PE investor attempts to take all the efforts to improve the target performance. The authors in [Brunzell, Liljeblom, Vaihekoski, 2015] report the substantial increase in capital investments upon the acquisition of the ownership stake in a target company. Over time, the growth rate could decrease or remain stable. Thus, a non-linear relation of private equity investment tenure to cash flow growth might be hypothesized.

Hypothesis H1. There is a nonlinear relationship (\cap -shaped) between private equity investment tenure and performance of target companies measured by the cash flow growth.

As it was noted, portfolio companies in PIPE transactions frequently are financially distressed firms [Dai, 2011; Särve, 2013] with poor external debt funding alternatives, caused by difficulties to meet the debt covenants and solvency requirements. As for creditors, banks could require an early repayment of debt in case of the fail to meet covenants, approved for the whole term of the loan.

World leading rating agencies base their assessment of companies' credit ratings on commonly used solvency measures. These ratings directly affect the cost of debt and pricing of a debt instruments issue. Attracting capital through PIPE deal, firms might overcome a problem of inaccessible debt markets and improve their solvency during an investment tenure of a private equity fund. Following this evidence, it could be expected a positive relation between the investment tenure and companies' solvency measures. But the process of improvements could take some time over the investment period until the financial statement of the company will be recovered. Several studies demonstrated that PE investors did not manage to improve target's operational performance in a short-term. Mietzner and Schweizer [Mietzner, Schweizer, 2008] and Badunenko with co-authors [Badunenko, Baum, Schäfer, 2010] found that operational outcomes tended to decrease in a short-term perspective, while increased over a longer term. Effect of PE investments on portfolio company's performance depends on the size of investment [Battistin et al., 2017]. While sales and profitability were improved with minority shareholdings, in case of obtaining a control ownership stake EBITDA of a target company decreased. Based on the considerations above we hypothesize the following:

Hypothesis H2. There is a non-linear relationship (U-shaped) between a private equity investment tenure and performance of target companies measured by the solvency.

Based on the theoretical background provided and hypotheses stated the empirical study was conducted to investigate the investment tenure relation to the performance of target companies. Next session presents the methodology of research.

METHODOLOGY

To test research hypotheses on the relationship between the private equity investment tenure and target company's growth and solvency, the following regression models were used:

$$CF_growth_t = \beta_0 + \beta_1 Tenure_t + \beta_2 Tenure_t^2 + \beta_3 Risk_t + \beta_4 Profit_t + \beta_5 Debt_t + \beta_6 Size_t + \beta_7 Country_t + \beta_8 Sector_t + \varepsilon_t \quad (1)$$

$$NED_EBITDA_t = \beta_0 + \beta_1 Tenure_t + \beta_2 Tenure_t^2 + \beta_3 Risk_t + \beta_4 Profit_t + \beta_5 CF_t + \beta_6 Size_t + \beta_7 Country_t + \beta_8 Sector_t + \varepsilon_t \quad (2)$$

In equations (1) and (2), $\beta_0, \beta_1, \dots, \beta_6$ are unknown scalars, β_7 and β_8 are the vectors of unknown coefficients of dimension $(1 \times q)$ and $(1 \times m)$ respectively. Description of the variables used in models (1) and (2) is provided in Table 1.

Table 1. Description of variables used in regression analysis

Variable	Description
<i>Dependent variables</i>	
CFG_t	Company's free cash flow growth rate in the given year. Calculated by dividing the given year's free cash flow by previous year's free cash flow of the firm $CFG_t = FCF_t / FCF_{t-1}$
NFD_EBITDA_t	A measure of company's solvency. Calculated by dividing net debt by earnings before interest, taxes, depreciation, and amortization (EBITDA): $NFD_EBITDA_t = \frac{Interest\ Bearing\ Liabilities_t - Cash_t}{EBITDA_t}$
<i>Independent variables</i>	
$Tenure_t$	The tenure of a PIPE investor. Calculated as a cumulative number of months, for which the private equity investor held the firm's ownership stake, divided by 12
$Risk_t$	The company's overall risk as measured by Altman's Z-Score
$Prof_t$	Measured by net profit margin: $Prof_t = \frac{Net\ Income\ After\ Taxes_t}{Revenue_t}$
$Debt_t$	The variable measures company's financial leverage in the given year. Calculated by dividing company's total debt by total assets, as reported on the firm's balance sheet: $Debt_t = \frac{Debt\ obligations_t}{Total\ assets_t}$
$Size_t$	Natural logarithm of the company's sales revenue in the given year t
CF_t	Company's cash flow
<i>Country</i>	Country variables*
<i>Sector</i>	Industry variables**

Notes: * — list of countries is presented in Table 3; ** — list of industries is presented in Table 4.

Company's free cash flow growth rate (CFG_t) represents changes in company's core performance in a given year t .

NFD_EBITDA_t is used by credit rating agencies as one of the main solvency ratios for assessment of a firm's credit rating.

$Tenure_t$ of PE fund investment is an indicator of the period for which a PIPE investor entered the firm to complete its investment as a project.

$Size_t$ is measured by logarithm of the volume of sales revenue. This method of measuring company's size is more appropriate, than other indicators (logarithm of total assets, capitalization), as it related to company's operations and products [Dang, Li, Yang, 2018]. Moreover, the sample contains companies from technology-intensive and service sectors, which possess lower amounts of assets, and revenue is more relevant measure of the size.

$Risk_t$ is overall risk of the company as measured by Altman's Z-Score according to the approach by A. Damodaran, based on multiple ratios [Damodaran, 2016]. This method of measuring risk is more appropriate, as estimating risk based solely on the ratios, could cause missing of important financial information. The $Risk_t$ variable is calculated in a following way:

$$Risk_t = 1.2A_t + 1.4B_t + 3.3C_t + 0.6Dt + 1.0E_t. \quad (3)$$

The components of the variable $Risk_t$ are described in Table 2.

Table 2. Altman's Z-Score components

Component	Description
$A_t = \frac{Working\ Capital_t}{Total\ Assets_t}$	Measures company's liquid assets share of total assets
$B_t = \frac{Retained\ Earnings_t}{Total\ Assets_t}$	Measures company's earning power
$C_t = \frac{EBIT_t}{Total\ Assets_t}$	Measures company's operating efficiency
$D_t = \frac{Market\ Value\ of\ Equity_t}{Total\ Liabilities_t}$	Indicates if stock price fluctuations are relatively risky comparing to company's liabilities as they are reported on the balance sheet
$E_t = \frac{Revenue_t}{Total\ Assets_t}$	Measures company's asset turnover, representing efficiency in utilizing assets

$Prof_t$ ratio measures company's profitability, as estimated by net profit margin representing a percentage of revenues turned into net income.

$Debt_t$ is the variable representing financial leverage, that. is calculated by dividing total debt by total assets, as reported on the balance sheet.

CF_t is the variable representing company's cash flow, generated from operations. This metric is normalized by company's total assets to avoid size effects.

Next section of the paper presents the sample of empirical research, describes its key characteristics, and provides statistics of variables used in empirical analysis.

SAMPLING

Thomson Eikon database was used to derive data on companies that received PIPE investments between 2005 and 2016. Those companies in which the private equity fund increased its share in the company were removed from the sample, and only companies with initial PIPE investments were left. As a result, the number of transactions decreased to 225. At the next stage we excluded transactions with portfolio companies from Turkey, Cyprus and some European countries where capital markets are more volatile and considerably differ from perspective of legislation and institutional background compared to other European countries. In addition, companies from the financial sector were excluded from the sample. Each company was considered as a target until the private equity fund exit from this portfolio firm. As a result, the sample includes 886 firm-years. Distribution of PIPE target companies by countries is presented in Table 3.

Table 3. PIPE target companies' distribution by countries

Country	France	Germany	Spain	United Kingdom	Sweden	Belgium	Italy	Netherlands	Ireland	Austria	Switzerland
Percent of observations, %	49	11	10	10	4	3	3	3	3	2	2

Such domination of France (49% of initial PIPE investments) is explained by high PIPE activity in the country. The portion of targets in Germany was 11%, while percentage for Spain and the United Kingdom was 10% for each country. This finding differs from [Badunenko, Baum, Schäfer, 2010] evidence on prevailing number of companies with a private equity investor to be located in Ireland (14.9%) and much less in France (6%). While in this study we observed only 3% of deals that took place in Ireland. The reason for such inconsistencies could lie in a shift of the period under the study (from 2002–2007 in [Badunenko, Baum, Schäfer, 2010] to 2005–2016 in this research).

Table 4 presents industry distribution of PIPE target companies, which match the sample forming criteria. Targets for PIPE deals were most frequently operating in information technology sector (26%) or healthcare (18%) and consumer discretionary (19%). This finding — the relative attractiveness of companies, which operate in technology-intensive sectors — is similar to such of Brown and Floros [Brown, Floros, 2012], who have also found that PIPE transactions frequently involve target companies that use the investment proceeds for strategic intangible investments (like increasing research and

development expenses), as opposed to immediate operating needs, i.e., target companies that represent technology sector.

Table 4. PIPE target companies' distribution by sectors

Sector	Information technology	Healthcare	Consumer discretionary	Industrials	Consumer staples	Materials	Telecommunication services
Percent of observations, %	26	18	19	14	12	9	2

In most transactions acquisition of a minority stake took place (Table 5). This result is consistent with findings of [Fraser-Sampson, 2007; Dai, 2011; Brown, Floros, 2012; Särve, 2013].

Table 5. PIPE transactions distribution by the ownership stake obtained

Portion of shares obtained	[0; 25%]	(25%; 50%]	(50%; 75%]	(75%; 100%]
Percent of companies in the sample, %	94	4	1	1

Table 6 presents distribution of transactions by a holding period.

Table 6. PIPE transactions distributed by tenure

Tenure, years	0	1	2	3	4	5	6	7	8	9
Percent of observations, %	55	10	9	8	7	5	3	1	1	1

As it follows from Table 6, in more than half of deals private equity investors exit portfolio companies within one year after the initial investment. Long periods of investments beyond 6 years are almost absent among transactions.

Table 7 presents the descriptive statistics of variables used in econometric analysis.

Negative minimum estimates of risk and profitability ratios are consistent with conclusions from previous studies about targets of PIPE investments being financially distressed firms [Dai, 2011; Särve, 2013]. Companies with the Z-Score below 1.1 account

for 18.4% of observations and 19.6% of companies bear losses. A number of companies are both financially distressed and not profitable at the same time. 47.2% of observations are in the “safe zone” having Z-score above 2.4 account. Although the sample includes companies with a debt ratio up to 84.2%, on average, the mean debt to total assets ratio is 21.8%. Net Debt/EBITDA ratio also seems to be moderate on average, being equal to 1.63.

Table 7. Descriptive statistics of variables

Variable	Sample mean	Sample standard deviation	Minimum value	Maximum value
CFG	-0.0881	0.4977	-2.9698	1.7707
NFD_EBITDA	1.6278	3.6915	-12.6731	15.5185
Tenure	1.4045	1.9945	0	9
Size	18.3469	2.6895	8.2611	25.2033
Risk	2.5925	2.3927	-6.9382	11.9286
Prof	0.0201	0.1157	-0.4416	0.4590
Debt	0.2177	0.1810	0	0.8416
CF	0.0104	0.1669	-0.6143	0.6823

The mean tenure is approximately 1.4 years as presented in the Table 7. Examining tenure for deals that have already experienced investor exits (32 of those were observed in the dataset) is also representative. PE funds with PIPE investments exited their targets within 6 years after the transaction in 84% of observations. This result corresponds to findings in [Badunenko, Baum, Schäfer, 2010].

Findings from the descriptive statistics are quite similar to those related to the determinants of private equity investments: companies under study were experiencing volatile earnings, high risks, some companies had a heavy debt burden [Clifford, 2008; Denes, Karpoff, McWilliams, 2017; Benton, You, 2018]. In most cases, however, such companies were technology-intensive (belonging to healthcare and information technology industries).

REGRESSION ANALYSIS RESULTS

Below the results of regression analysis of the relationship between investment tenure and performance of target companies are presented (Table 8). Fixed effects regression was proved to be adequate for models 1 and 2.

The panel on which the parameters of the models were estimated was unbalanced. The imbalance of the panel was not associated with the omission of variables, for each year the set of companies was formed exogenously, the change in the number of companies was due to the entry, and, respectively, the exit of the fund from the target company.

All the necessary tests were carried out related to the choice of the model of the correct specification and the fulfillment of the Gauss-Markov conditions, including the test for endogeneity. As a result, pooled regression models were selected. Model parameters were estimated using the Stata statistical package, using cluster-robust standard errors. The resulting parameter estimates are presented in Table 8. Models of all specifications presented in Table 8 (columns (1.1) – (2.3)) are statistically significant.

Table 8. Regression analysis results

Variable	CFG (1.1)	CFG (1.2)	CFG (1.3)	NFD_EBITDA (2.1)	NFD_EBITDA (2.2)	NFD_EBITDA (2.3)
<i>Risk</i>	0.022*	0.0269*	0.0281*	–0.5041***	–0.5154***	–0.5147***
<i>Debt</i>	–0.1759	–0.1689	–0.1541			
<i>Size</i>	0.0172*	0.0155*	0.0161*	0.2693***	0.2673***	0.2517***
<i>Prof_{it}</i>	0.9589***	0.9536***	0.9314***	–0.9819	–0.6500	–0.6239
<i>France</i>		0.0310			–0.2272	
<i>Tenure</i>			0.0474**		–0.0902**	–0.5018**
<i>Tenure²</i>			–0.0064*			0.0732*
<i>CF</i>				–4.6514**	–4.3998**	–4.3186**
<i>Country</i>			No			No
<i>Sector</i>			Yes			Yes
<i>cons</i>	–0.4258**	–0.4204**	–0.4677**	–1.9288	–1.6000	–1.1420
<i>R²</i>	0.1234	0.1331	0.1413	0.1337	0.1623	0.1720
<i>F statistics</i>	17.44	15	11.25	12.43	14.95	13.04
<i>p-value</i>	0	0	0	0	0	0

Note: *, **, and *** represent level of significance at 10%, 5%, and 1% respectively.

Columns (1.1) and (2.1) contain estimates of the parameters of the baseline models for models 1 and 2, respectively. Then we added the binary variable *France* to each base model, with the help of which we controlled the predominance of companies from this country. The estimation results are presented in columns (1.2) and (2.2). Columns (1.3) and (2.3) show the results of estimating the parameters of models 1 and 2, respectively. According to the results obtained for the *CFG* model (1.3), investment tenure, target's Size, Risk, and Prof variables were statistically significant, while the relationship between the dependent variable and target's leverage turned to be insignificant.

Concerning the *NFD_EBITDA* model (2.3), investment tenure, target's Size, Risk, and CF (cash flow ratio), are found to have statistically significant relationship with the dependent variable. It should also be mentioned that for some of the coefficients before variables have opposite signs for two models used. This fact is logical, as while higher cash flow growth takes place in a company, a net debt to EBITDA ratio could be lower. It is due to either the reduction in debt or increase in operating profit, which captures both leverage and coverage effects.

A non-linear relation of the tenure to the performance measured by both cash flow growth and solvency ratio was hypothesized. Both hypotheses *H1* and *H2* could be confirmed. A non-linear relationship between PIPE investment tenure and target company's performance has been found both in terms of its solvency (U-shaped), and cash flow growth rate (\cap -shaped).

The research results suggest that the cash flow growth rate increases over time of PE investment until a certain period, namely 3.8 years of holding a portion of shares in a target company. After 3.8 years tenure a decrease in a cash flow growth could be reported. Some studies find substantial increase in capital investments upon the acquisition of the ownership stake in a target company. Although Badunenko with co-authors [Badunenko, Baum, Schäfer, 2010] have found empirical evidence of increase in companies' performance over longer tenures of private equity investors, while in the short-run a ROA experienced a decrease, it could be assumed that over time the growth rate could become to decrease or remain stable before the PE funds exits the portfolio firm.

Estimation results demonstrate that the solvency *NFD_EBITDA*, measured by Net Debt/EBITDA, is decreasing during 3.4 years of holding target's shares by PE fund, after which the indicator tends to increase. These findings are consistent with an idea that the PE investor entering the firm is interested in higher growth to prepare the company for exit. The cash flow growth potential could become depleted over a period of investment that eventually would lead to exit of the investor. The growth opportunities and resources could decrease over time, that could be reflected in lower growth rate, higher debt, and lower operating profit. Nevertheless, the results of previous studies documented the improvement of long-term performance while operational results could deteriorate in a short run [Mietzner, Schweizer, 2008]. The findings of this study could still imply that the growth rate of the operational results could decrease, although the growth itself is expected to sustain. A found relationship could also demonstrate that as tenure grows (over four years), the debt burden on portfolio companies increases. We could consider

the Net Debt/EBITDA ratio not only as a measure of financial stability (solvency), but as an alternative measure of leverage. Accordingly, for investment terms of more than 4 years, we can assume that companies are becoming more attractive for raising debt. Before they had to seek money from PE funds, and while they become more financially stable, these firms can also be financed through loans and bonds (which leads to an increase in Net Debt/EBITDA).

Other findings from empirical analysis also worth to mention. It was found that a positive relationship between the cash flow growth rate and a company's risk, measured by the Altman Z-score, takes place. The estimated coefficient is positive, but Altman's Z-Score higher values correspond to lower levels of risk [Altman, 2013]. A negative relation between a solvency ratio and risk measure is reported. These results seem to be justified. PE investors prefer targets with lower risk and avoid putting money in investees approaching a bankruptcy. Choosing these companies, PE funds might expect to enjoy high performance outcomes in terms of the cash flow growth, as well as higher solvency because of higher values of EBITDA and/or lower amount of debt obligations. PE funds try to impact a strategy of target companies and decrease operational and financial risks during a period of the investment. By providing capital to companies, which lack opportunities to get external financing otherwise private equity investors tend to improve performance of distressed businesses. In other case high risky companies would go bankrupt or become a target of a buyout transaction.

The relationship between *CFG* variable and a company's profitability is found to be positive. This result is consistent with a general logic of company's performance estimation. If a firm is profitable in terms of the profit margin, that is measured through the relation of the net profit to revenues, then company could experience a higher growth of a cash flow, since a main source of a free cash flow is sales revenues. At the same time, the relationship between Net Debt/EBITDA ratio and net profit margin turned out to be not statistically significant. Due to the nature of this indicator, it could increase or decrease both due to the debt amount rise or reduction, or operating profit decline or increase. Therefore, it is not evident that this indicator, that depends on company's financial policy in raising debt capital, as well as its business risk in generating operating profit, should be necessarily related to the profitability.

The relation between the company's size and both cash flow growth and Net Debt/EBITDA ratio was found to be positive. It could be justified by the fact, that larger companies have more opportunities to attract financing at financial markets, that potentially increase their debt, but from the other perspective also enhance growth opportunities. While a free cash flow rises at a relatively high rate, company becomes larger that opens new ways to raise financing and generate profits. Presumably, the bigger a company is, the larger is amount of debt, that in turn could lead to higher Net Debt/EBITDA ratios.

A negative relationship between a cash flow and a debt coverage ratio is found. It could be assumed, that the higher is cash flow generated by the company the less is its need in debt financing. One of the directions of a free cash flow use is financing of company's future growth.

Finally, the relation between cash flow growth and debt ratio turned to be insignificant. As was mentioned earlier in this paper, PE investors normally purchase minority ownership share in portfolio companies in PIPE transactions, therefore they have limited impact on a debt policy. Although their infusion of equity capital supports targets' growth. Therefore, the leverage and increase of debt could be unrelated to the cash flow growth that could be financed from other sources.

CONCLUSIONS

A study of the relationship between private equity investment tenure and target company's performance and solvency allows making conclusions, if improvements in companies' solvency and performance take place during the investment period. We found such relationships to be non-linear. This research revealed positive link between a solvency ratio and PE tenure for investment periods over 3.4 years. Therefore, private equity funds search for targets with a potential of debt repayment, opportunity to increase their solvency and eventually to get an access to a broader debt market. This is also the case for improvements in cash flow growth rate, which is one of the main goals of private equity funds [Gatti et al., 2015], thus, might contribute to company's attractiveness for equity capital markets.

This conclusion is corresponding with the finding that the time for positive relationship between investment tenure and the chosen performance is until 3.8 years of PE investment period, after which companies might be willing to consider seeking either recurring PIPE investments or alternative sources of financing once 3.8 years have elapsed from initial private equity investment. Up to this moment the benefits from the granted capital are realized and private equity funds might consider investing in targets with comparatively lower risks to prevent undesirable consequence with an extreme being target company going bankrupt. PE funds provide opportunities for growth putting their capital in investees that lead to a positive relation of tenure to the cash flow growth. Later private equity funds might be willing to consider seeking alternative targets or re-investing after the lapse of 3.8 years. For investment tenures beyond this, positive impact of the invested funds is exhausted. In case the company's solvency still didn't improve enough to raise capital on debt capital markets or through bank loans, maybe because of inability to generate enough operating income, additional equity capital infusion might be required to make further improvements and to reclaim access to such financing alternatives.

Over longer investment horizon effects of capital injection are not observed, while positive results from PIPE investment could be achieved during a medium-term tenure. It could be due to the fact that capital investments from private equity funds use up their potential to trigger the growth of a target company. But upon achievement of improved performance results investee could be able to gain capital from other financing alternatives. And such opportunities could be found at debt markets, not only through PIPE investments, as suggested by research findings on the solvency.

Regarding the target companies' solvency, it is an evidence of increase in the ratio after the PIPE transaction during the investment tenure. Nevertheless, positive effects seem to exhaust after 3.4 years of holding the share in a target by PE investor. Since solvency improvements are not observed over this period, it could be a signal for a portfolio company to search for new sources of funding. Alternatively, from perspective of financial leverage it could be expected that companies gain financial strength over several years of investment period of PE firm and get more accessibility to debt financing, that increases Net Debt/EBITDA ratio, but eventually could lead to higher growth and value creation.

This paper contributes to research on the topic. Previous studies did not differentiate between investments of specific private equity funds and analyzed the general presence of any private equity investor. In addition, this study attempted to capture non-linear relationships between the investment tenure and target performance. As for practical implications, based on the research findings one may conclude that PE investors should seek for target companies to invest for approximately 3.5–4 years after which they tend to exit and release capital for new attractive investments.

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Contact information

Irina V. Berezinets — PhD in Physics and Mathematics, Associate Professor; iberezinets@hse.ru
Yulia B. Ilina — PhD in Economics, Associate Professor; jilina@gsom.spbu.ru
Alla Z. Bobyleva — Dr. Sci. in Economics, Professor; bobyleva@spa.msu.ru
Alexander N. Burov — axburov@gmail.com

СРОК ИНВЕСТИРОВАНИЯ ФОНДОВ ЧАСТНЫХ ИНВЕСТИЦИЙ И ФИНАНСОВАЯ РЕЗУЛЬТАТИВНОСТЬ: ИССЛЕДОВАНИЕ ЕВРОПЕЙСКИХ СДЕЛОК ПО ЧАСТНЫМ ИНВЕСТИЦИЯМ В ПУБЛИЧНЫЕ КОМПАНИИ

И. В. Березинец¹, Ю. Б. Ильина², А. З. Бобылева³, А. Н. Буров⁴

¹ Национальный исследовательский университет «Высшая школа экономики», Российская Федерация, 101000, Москва, ул. Мясницкая, 20

² Санкт-Петербургский государственный университет, Российская Федерация, 199034, Санкт-Петербург, Университетская наб., 7–9

³ Московский государственный университет им. М. В. Ломоносова, Российская Федерация, 119991, Москва, Ленинские горы, 1

⁴ ПАО «Банк Санкт-Петербург», Российская Федерация, 195112, Санкт-Петербург, Малоохтинский пр., 64А

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Фонды частных инвестиций играют значительную и растущую роль в современной экономике, привлекая капитал и распределяя его среди широкого круга портфельных компаний. Эти инвесторы владеют долей в капитале целевых компаний в течение различного периода времени. Почему фонд предпочитает инвестировать в портфельные компании

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на определенный срок и каково влияние таких инвестиций на портфельную компанию? Существует ли взаимосвязь между сроком инвестирования и эффективностью деятельности объекта инвестиций? В данной статье исследуется взаимосвязь между результативностью деятельности, измеряемой ростом денежного потока и отношением чистого долга к EBITDA, и сроком владения долей собственности в компании. Анализируются сделки с публичными компаниями-мишенями в странах Западной Европы в период с 2005 по 2016 г. Полученные данные позволяют сделать выводы о влиянии присутствия частных инвесторов на результаты деятельности целевых компаний и фиксируют нелинейные эффекты взаимосвязей. Выявлена нелинейная зависимость между сроком владения долей собственности в компании и показателями деятельности целевой компании с позиции как ее платежеспособности, так и темпов роста денежного потока.

Ключевые слова: фонды частных инвестиций, период инвестирования, частные инвестиции в публичные компании.

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Контактная информация

Березинец Ирина Владимировна — канд. физ.-мат. наук, доц.; iberezinets@hse.ru

Ильина Юлия Борисовна — канд. экон. наук, доц.; jilina@som.spbu.ru

Бобылева Алла Зиновьевна — д-р экон. наук, проф.; bobyleva@spa.msu.ru

Буров Александр Николаевич — axburov@gmail.com