The Effects of the Specialization of Private Equity Firms on their Exit Strategy

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Abstract

We investigate how industry and stage specialization of Private Equity (PE) firms affect the likelihood to exit investments by means of trade sales, Initial Public Offerings (IPOs), or Secondary Buyouts (SBOs). Our empirical analysis relies on competing risks models. Using a sample of 818 Leveraged Buyouts (LBOs) by US and European PE firms over the period 2000-2015, we find that both industry and stage specializations of PEs increase the likelihood to exit via IPO, whereas only industry specialization positively affects the likelihood of divesting through a trade sale. Finally, SBOs are more likely for non-specialized investors.

Keywords: Private Equity; Exit Strategy; Specialization; LBOs; Competing Risks.
JEL Classification: G24, G30

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1. Introduction

A developing literature has documented performance gains for companies backed by Private Equity (PE) firms, often motivated by the fact that Leverage Buyouts (LBOs) create value through significant managerial improvements. The nature of PEs is, however, heterogeneous and several aspects affect their ability to improve the performance of their portfolio firms. Among them, the industry specialization of PE firms is found to enhance the returns to the investment and the chances of successful exit strategies (Cressy et al., 2007). However, PE firms do not only specialize industry-wise. Another key dimension is the LBO-stage specialization, i.e. the relative weight of portfolio firms acquired via LBO vis-à-vis other stages of investment such as venture (seed, start-up, early and later stage) and growth capital. To give an insight, our sample shows that about 43% of the PEs' aggregated portfolio is represented by LBOs and that 24% of the PE firms operate in more than 5 different stages of investment. Our paper investigates for the first time how both the *industry* and the *LBO-stage* specialization of PE firms affect their exit strategies.

PE funds are typically limited partnerships, where the PE firm acts as general partner, investment advisor and fund manager, and raises capital from a number of institutional investors which are referred to as limited partners (e.g. pension funds, universities, insurance companies, foundations, and high-net-worth individuals). Due to the limited contractual lifetime of the funds, which requires all the positions to be closed by the fund's expiry date, and since the return to investment can be measured only when divesting, the mode and timing of the exit from the investment become crucial (Cumming and MacIntosh, 2003; Kaplan and Stromberg, 2009).

There are three successful modes of exit available to a PE, where successful is defined as profitable and planned ahead (Gompers et al., 2008): (1) trade sale, i.e. sale to a nonfinancial

buyer, typically a competitor of the target, a supplier or a customer that aims at a synergic integration of the target (Camerlynck et al., 2005), (2) Initial Public Offering (IPO), and (3) Secondary Buyout (SBO), i.e. sale to another PE firm. Multiple exit alternatives match the heterogeneity of the PE firms, with respect to their specialization profile and the resulting ability to add value to their investments. In this paper, we investigate how industry and LBO-stage specialization affect the likelihood of each of these three exit options. Specifically, we test three hypotheses, related to each of the exit strategies in the focus of this study.

First, divesting through a trade sale requires the knowledge of products, markets and competitors of the target company, which allows shaping effective value creation plans and thus attracting the attention of potential strategic acquirers. Through its skills and expertise, the industry specialized PE firm can establish networks in a given industry and identify acquirers that can match the target's characteristics. Second, target companies taken to the public market are required to show independent profitability and long-term growth potential. Thus, beside the knowledge and information advantage about the target competitive environment, a PE aiming at divesting through an IPO has to be able to provide a substantial operative and managerial support, to improve the target's corporate governance and to ensure stability and development. These skills and attributes, which are typically at the core of buyout operations, characterize the LBO-stage specialized PEs. Third, the SBO completes the set of successful divestment options available to the PE. We argue that unspecialized PEs often lack the expertise, network, and reputation to push the target company through the extra mile before an exit in the form of sale to a strategic buyer or listing on the stock market. Indeed, the sale to another institutional investor is likely to be the most attractive divestment option to PEs that pursue a diversified investment strategy.

To measure the degree of specialization of PE firms we define a novel measure that, both at industry and stage level, combines two dimensions. The first dimension, comparative, measures whether a PE is more focused than its peers on a certain industry (or on the LBO-stage of investment) and the second, inner portfolio dimension, measures the degree of concentration of the PE firm's portfolio of investments in that industry (or in the LBO-stage of investment). Our hypotheses are validated using survival analysis by the estimation of a set of competing risks models on a sample of 818 US and European LBOs over the period 2000-2015. With this regard, this is also one of the first comparative studies on private equity markets in Europe, where PE funds compete with public equity markets for small firms (Vismara et al., 2012). Studies at single country level include Jelic (2011), which documents that in the UK buyouts sponsored by PE syndicates tend to have shorter longevity, and Bueselinck et al. (2009), that find that in Belgium PE involvement increases a firm's willingness to recognize losses more timely as compared to non-PE backed firms.

In line with our arguments, we find that the PEs' specialization by industry positively affects the likelihood of trade sales, while LBO-stage specialization does not have any statistically significant effect on this exit strategy. When concerning the IPO exit, our results show that the likelihood of this strategy increases with the PEs' specialization at both industry and LBO-stage level. Finally, we find that SBOs become more likely as the level of either industry or LBO-stage specialization decreases. The empirical analysis includes also a number of variables identified according to the literature that allow to control for the characteristics of the investor and the investee companies, as well as the market conditions at the time of the exit. Results are robust to alternative econometric specifications, as well as to style drifts.

The remainder of the paper is organized as follows. In Section 2, we develop the testable hypotheses on the relationship between the PE specialization and the exit strategies. In Section 3 we describe the data, the variables, and introduce the methodology. In Section 4 we report the descriptive statistics, empirical findings, robustness checks and a post-hoc analysis on the effects of style drifts. Finally, in Section 5 we summarize and conclude.

2. Specialization and exit strategy

The specialization, whether at industry or stage level, is a crucial strategic dimension for a PE firm. First, since it allows identifying the strengths and weaknesses, the competitive environment, and the market in which the investee companies operate, the degree of specialization represents a key determinant of the competitive and informative advantage of the PE (Cressy et al., 2007). Second, by providing experienced management and consultants who collaborate with the portfolio company's management, the PE gets more involved in the control and corporate governance of the investee companies, which in turn boost their performances. Despite this importance, however, the literature has only skimmed the surface of specialization, which does not naturally characterize the PE industry as it does with venture capital markets (Cumming and Vismara, 2016).

With respect to the choice of the exit mode, the PE firm's intermediation, certification, and communication efforts are expected to be shaped over the final buyer's objectives and need of information. In fact, the lower the information asymmetries, the higher the interest of the new owner in purchasing the company, yielding to more profitable exit outcomes from the investment (Cumming et al., 2006). In these respects, the PE specialization, both at industry and LBO-stage level, helps the PE firm to match the information level and the strategic objectives of its

counterparts. Specifically, the PE faces three types of final buyers, different in terms of interests and expectations in the acquisition, as well as in terms of information gathering capabilities and costs. On the one hand, the market investors associated to the event of an IPO do not typically have the skills and the possibility to value in full the quality and potential of the firm being sold. On the other hand, both the strategic private buyers in the event of trade sale and the institutional buyers in the case of SBO, although being different in nature and interests, are active actors capable to carry out the due diligence and to understand the strengths, weaknesses and potential of the firm (Cumming and Johan, 2008; Cumming and MacIntosh, 2003).

In what follows, we discuss how the two dimensions of industry and LBO-stage specialization are likely to affect the propensity of a PE firm to choose one of the alternative exit strategies, namely trade sales, IPOs, and SBOs.

2.1. Trade sales

The exit strategy by means of trade sale is defined as the sale of the target firm to a third non-financial buyer. The latter is typically a strategic acquirer, i.e. a large company operating in a business sector that is the same or very closely related to the object of the acquisition. For instance, the strategic acquirer is a competitor, a supplier or a customer that aims at a synergic integration of the target's products, technology, and capabilities within its own structure (Camerlynck et al., 2005; Cumming and MacIntosh, 2003).

We argue that a PE specialized at the industry level is better able to identify the synergic potential embedded in the target company, and to make it attractive for a strategic buyer by shaping effective value creation plans (Cressy et al., 2007; Norton and Tenenbaum, 1993). In fact, this type of investors own the skills and the tools to add value through active assistance and strategic, financial, and marketing advice (such as strategic changes or repositioning,

productivity improvements, cost-cutting, and acquisition opportunities) as well as the capability to apply effective operational improvements and management changes (Lockett and Wright, 1999).

Furthermore, through its knowledge and expertise, the industry specialized PE firm can get access to the network of the main actors in a given industry (Barry, 1994; Sahlman, 1990) and identify acquirers that can match the target's characteristics. The operative knowledge of the products, markets and competitors in that industry enables the industry specialized PE to draw the attention of strategic buyers (Hsu, 2004). The higher the PE firm's industry specialization, the easier to fit the interests and the needs of potential strategic buyers, actively bridging and matching the target and the final buyer. In other terms, specialization at the industry level has a positive impact on the likelihood and the speed of a trade sale exit. For these reasons, we postulate that:

Hypothesis H1*: Industry specialization of PEs positively affects the likelihood of a trade sale exit.*

2.2. Initial Public Offerings

The exit through IPO has been generally identified as the best choice for the PE, both in terms of returns and reputation (Gompers, 1996). However, besides its close link to the stock market conditions, this is the exit strategy that requires the highest commitment from the PE, both from managerial and certification sides. The public buyer is typically composed of dispersed investors that have access only to public information about the firm. To mitigate this information asymmetry and to gain the public market attention, the PE firm needs to provide certification about the quality of the firm being sold. Indeed, while companies sold to a strategic buyer might be attractive because of integration or synergy opportunities, the companies taken to

the public market are required to show independent profitability and growth potential. Furthermore, PE commitment and ethical managerial practices are typically enforced contractually, e.g. by a lock up clause that does not allow the PE to quit the involvement in the company for a period of six to twelve months after the IPO (Lin and Smith, 1998).

The PE superior ability in corporate governance mechanisms, peculiar of LBO operations, is a key determinant of the success of PE-backed companies, especially when the planned exit is in the form of an IPO. In fact, besides financial engineering, the PE delivers a tangible operative and managerial support, improves the corporate governance structure, and monitors the internal management of the acquired company (Kaplan and Stromberg, 2009). Typically, the PE fund managers sit on the board of directors of the investee company, either as executive or outside members. The resulting continuity, forward-looking perspective and long term planning allow for a deeper restructuring process, drive to higher operating performance, and prepare the company to access the public market. In a learning by doing perspective, we measure such operative and managerial skills of the PEs by their degree of LBO-stage specialization, as this peculiar expertise is build up and accrued over time primarily throughout LBO type of operations.

Furthermore, to successfully bring a company to the public market, a PE must gain knowledge and information advantages about the target competitive environment, e.g. end-market, competitors, suppliers, production processes, and technologies, often hiring specialized human capital with a strong operating background and industry focus (Cressy et al., 2007). A PE firm with strong expertise in a specific industry represents a certification of the competitiveness and profitability potential of the company being sold. This is particularly relevant in light of lock-in agreements, that require existing shareholders, including PEs and other institutional

shareholders, not to sell a certain percentage of their holdings for a specified length of time after the IPO (Ahmad and Jelic, 2014; Espenlaub et al., 2011).

Based on the discussion above, we argue that both industry and LBO-stage specializations are likely to positively affect the likelihood of IPOs, leading to the following hypothesis:

Hypothesis H2*: Industry specialization and LBO-stage specialization of PEs positively affect the likelihood of an IPO exit.*

2.3. Secondary Buyouts

During the 2000s, SBO deals became very popular, tickling the interest of both scholars and practitioners.[1] Among the main motivations fostering this growth, some studies highlight the SBO as an optimal solution to those PEs whose funds' life is close to maturity, especially over periods when reaching the public (IPO) or the strategic (trade sale) market seems more difficult (Cumming and MacIntosh, 2003). The high availability of funds experienced in the loan market during the 2000s is advocated as another likely incentive (Axelson et al., 2013).

Furthermore, PEs tend to collude with each other in order to facilitate the exit and enhance their returns. The confidence in the future of the target's products or technology may arouse the interest of another institutional buyer able to provide the additional funds, resources, and managerial skills that the selling PE may lack. Thus, the buying PE earns attractive equity returns as well as the selling investor (Achleitner and Figge, 2014).

We argue that a central reason for an additional round of financing through the SBO is the PE's lack of specialization at industry and LBO-stage level. In fact, complementary to the

[1] SBOs accounted for 31% of all the transaction exited between 2003 and 2005 (Kaplan and Stromberg, 2009).

reasoning in Sections 2.1 and 2.2, on the one hand the industry unspecialized PE, lacking ad-hoc knowledge of the target's market and industrial processes, is less likely to reach the public or a strategic acquirer. On the other hand, a PE unspecialized at LBO-stage level does not have the proper experience in restructuring and consolidating the corporate governance and the capital structure of the target company. Thus, being less likely to provide the necessary backing and resources for the target to grow and expand, the unspecialized PE is more likely to exit through an SBO. This discussion leads to the following hypothesis:

Hypothesis H3*: Industry specialization and LBO-stage specialization of PEs negatively affect the likelihood to exit an investment by means of SBOs.*

3. Data and Methodology

3.1. Sample and data

We extract our sample from the Zephyr database, crosschecked with Thomson OneBanker and each PE company website. We consider the deals for which the following information is available: i) timing of the investment (the date of entry and, if prior to the end of 2015, the date of exit); ii) exit route; iii) characteristics of both the target company and the PE firm. In syndicated deals, we refer exclusively to the lead investor because it is expected to exert a primary role and influence, driving the decision making of the consortium, as well as structuring and timing the deal (Barry, 1994; Gorman and Sahlman, 1989; Meuleman et al., 2009). The lead investor is identified as the PE firm that, at the date of the buyout, was explicitly mentioned as syndicate leader, or held the largest equity stake of the acquired company. Our data collection strategy leaves us with a sample of 818 LBOs initiated by 121 North American and European PE firms during the period 2000-2014 and observed until the end of 2015. Out of the 818 LBOs in our sample, 448 deals are carried out by US PEs, 242 deals by UK PEs, while the

remainder (128 deals) are carried out by Continental European PEs. The distribution of investments among European countries is in line with previous studies at a European level (Colombo et al., 2016).

Table 1 reports a breakdown of the sample by year of entry and by exit mode chosen by the PE firm. The distribution of exit types is consistent with the Kaplan and Stromberg (2009) worldwide overview of the LBO market. Out of the 818 investments in the dataset, 616 are exited by December 2015. In detail, 469 companies are divested by means of a private sale, 263 of which by trade sales (about 43% of the exited deals) and 206 by SBOs (about 33% of the exited deals); 62 companies (about 10% of the exited deals) are divested by IPOs, and 85 companies ended up as write-offs (about 14% of the exited deals). The remaining 202 companies in the sample were still part of PE's portfolio at the end of 2015. The size and composition of the sample is in line with datasets used in related research (Lerner and Schoar, 2005; Nikoskelainen and Wright, 2007, among others). Finally, the last row of Table 1 shows the average time-to-exit (in months) by exit strategy. The shortest average duration is observed for IPO exits (40 months), followed by trade sales exit (42 months) and SBOs with an average length of 47 months.[2]

[Table 1]

3.2. Variables

A listing of the variables employed in our empirical analysis, along with their definitions, is provided in Table 2, while the correlation coefficients are reported in the Appendix. To measure the degree of PE specialization, at both industry and stage level, we define a composite

[2] These figures are in line with Wright et al. (2007) which, studying PEs and management buyouts in the OECD countries, found that exit tends to take place 3-5 years after the buyout.

measure that combines a comparative and an inner portfolio dimension. Analytically, it is constructed as the interaction of two components. For the first component, i.e. the comparative dimension, we adapt the Competitive Advantage Index, borrowed from the fields of international trade and technological specialization and used in a similar context by Cressy et al. (2007). This is defined as an indicator that takes value one if the PE firm's portfolio share in the industry of the target company (or in the LBO-stage of investment) is larger than the corresponding one in the aggregate market portfolio. The second component, i.e. the inner portfolio dimension, accounts for the degree of concentration of the PE firm's portfolio of investments in that industry (or in the LBO-stage of investment). To measure the latter, we rely on the normalized Herfindahl-Hirschman Index (HHI), which is calculated by summing the squares of the PE firm's portfolio shares in each industry/stage of investment. Thus, on the one hand, a PE results to be specialized at industry level if it operates in the industry of the target more than the average peer, and, at the same time, its portfolio is concentrated in that industry. On the other hand, a PE is LBO-stage specialized if the fraction of its investments at LBO-stage (where the other options are: seed, start-up, early and later stage venture capital investments, as well as growth capital and restructuring investments) is higher than the average peer, and its portfolio is also concentrated in LBOs.

In line with previous literature, we include a number of the PE firms' and investee companies' characteristics as control variables. With respect to the PE firm, on the one hand larger and more experienced firms may take advantage of economies of scale, reputation, and raise larger funds (Kaplan and Schoar, 2005; Cumming and Dai, 2010; Cumming and Dai, 2011). On the other hand, young investors tend to exit their portfolio companies faster, especially through a sale on the public market, in order to establish a reputation and raise capital for new funds (Gompers,

1996; Espenlaub et al., 2015). We therefore include the age and the size, proxied respectively by the years of experience (*PE Age*) and the amount of capital under management in billions of dollars of the lead PE (*PE Size*) at the time of the investment. As PEs affiliated to institutions are less involved in the management and organization of their investee companies, and are less oriented to return-maximisation (Tykvova, 2006), we add the *PE Captive* dummy, equal to 1 for PE firms affiliated to a bank, insurance or government, and 0 otherwise. Furthermore, the literature outlines several rationales regarding the PE syndication, such as the response to the need of risk diversification, investment certification, and accessing a competitor's firm-specific resources, as well as the potential costs and conflicts related to this form of inter-PE firm alliance (Bertoni and Groh, 2014; Giot and Schwienbacher, 2007; Lockett and Wright, 1999). We therefore control for syndicated investments by means of the dummy variable *Syndication*, that is equal to 1 when the lead PE firm is supported by other PE partners, and 0 otherwise, and the *Co-investment* dummy variable, equal to 1 if the PE firm invests in the target company by using more than one fund, and 0 otherwise. To control for the investor's country specificities and the distance between the investor and the target company, we control for the *Legality indices* (Berkowitz et al., 2003; La Porta, R., et al., 2000) and *Cross-border* investments. This is in line with Cumming and Dai (2010), showing that the distance from portfolio companies impact on the value adding capacity of the PE. To account for the investee company's characteristics, appeal, and potential at the time of the buyout, we include the following controls (Nikoskelainen and Wright, 2007): the size, in terms of number of employees (*Target Size*); the age in years (*Target Age*); and a dummy identifying whether the target company belongs to a high-technology sector (*Target High-tech*).

While, so far, we paid attention to include in our models only independent variables that are likely to be exogenous with respect to the exit decision, a different approach is needed when taking into account a measure of efficiency. We adopt the methodology proposed by Bernile et al. (2007), employing a two-stage empirical design. In a first analysis, we study the determinants of a "normal" (or expected) number of investees per manager, as a function of a set of parameters that should help in considering the several degrees of complexity of this measure, namely the Number of funds of the PE firm, the PE Age, a dummy variable identifying captive PEs, and two dummy variables for the US and UK contexts.[3] Thus, we use the results of this first stage to define our variable of *PE Efficiency*, as the difference between the current ratio between number of investees and managers, and the predicted value from the above fitted by the model estimated in the first stage. This "efficiency" level is positive if the current value is higher than expected (i.e. the PE firm is "efficient", it allocates a high number of investees per manager), and negative in the opposite case.

Finally, to take into account the equity market performance at the time of exit, we use the one-year return on the Morgan Stanley Capital International annual index *(MSCI return*), which is a free float-adjusted market capitalization weighted index (Cressy et al., 2007). To further control for the macroeconomic environment, we also consider a dummy variable capturing the effect of the recent financial distress. This variable, *Financial crisis,* covers the period August 2007-December 2009, according to the National Bureau of Economic Research (NBER) Business Cycles.

[Table 2]

[3] This specification is in line with Cumming et al. (2011). According to our results, the Number of funds of the PE firm, the PE Age, the dummy variable identifying whether the PE is captive, and the dummy variable for the US context, are all positive and statistically significant determinants of the expected number of investees per manager.

3.3. Methodology

The empirical analysis relies on competing risks models. Specifically, our results are estimated by the proportional hazards model for sub-distribution of Fine and Gray (1999), which constitutes a powerful tool for the analysis of survival data when the latter is right censored (i.e. outcomes for some individuals are not yet observed at the time the data is collected) and more than one type of risk event can take place. The Fine and Gray (1999) competing risks model allows to estimate the impact of model covariates on the hazard of a given outcome, e.g. *A*, while taking into account not only the time-at-risk, but also that the occurrence of a different competing (i.e. mutually exclusive) outcome, e.g. *B*, can prevent from observing *A* at a future time. We distinguish between four mutually exclusive risk events: the three successful exit strategies object of our study, i.e. trade sale, IPO, and SBO, plus the write-off. The latter, which cannot be considered as an exit choice from a purely strategic standpoint, is unlikely to be explained by the same covariates. Hence, though being considered as a competing cause of exit from the sample, it is not explicitly modelled.

Survival analysis has been used extensively in PE exit strategy analysis (Bertoni and Groh, 2014; Giot and Schwienbacher, 2007, among others). In particular, the Fine and Gray (1999) model is particularly suited to our setup for several reasons. First, as mentioned, it provides estimates of the impact of covariates on the hazard of divesting through a specific route, e.g. IPO, while taking into account the competing exit possibilities (trade sale, SBO and write-off). Second, it allows estimating different magnitudes for the effect of a given covariate, e.g. industry specialization, on the hazards of trade sale, IPO, and SBO considered individually. Third, the model is semiparametric in that the baseline sub-hazard function (i.e. where the covariates are set to zero) of the different modes of exit is left unspecified (i.e., estimated non-

parametrically), while the effects of the covariates are assumed to be proportional. Fourth, the model does not require the exit events to be observed at discrete equally spaced intervals, but rather assumes that the exit may occur at any point in continuous time. Finally, because proportionality holds for cumulative sub-hazards as well, assessing the covariates' effects on the cumulative incidence function is rather simple and thus the interpretation of the results becomes straightforward. A positive (negative) coefficient means that the effect of an increase of that covariate is to increase (decrease) the sub-hazard and thus increase (decrease) the cumulative incidence function. Moreover, coherently with the issues discussed in the work of Petersen (2009), we run our models clustering the standard errors by the year of the LBO, as the PE behavior is historically wave driven (e.g. Kaplan and Stromberg, 2009).

Besides the competing risks analysis, to ensure robustness of our results we rely on the different, though complementary, multinomial logit approach. This modelling strategy fits our setup in that the dependent variable, which is required to be unordered and categorical, is defined as an exit indicator with mutually exclusive outcomes.[4]

[4] It is worth stressing that the multinomial approach is, nonetheless, suboptimal in our setup because: i) it does not allow the data to be right censored i.e., the deals that at the end of the period of observations are still in PEs' portfolio have to be gathered in a (spurious) no-exit category, ii) it assumes that the exits occur at discrete equally spaced intervals, iii) the model is less flexible and the coefficients difficult to interpret in that, to achieve identification, the effect of covariates on the probability of a given exit has to be interpreted relative to the probability of the baseline event to occur, iv) it does not directly model time-at-risk to an event, v) the model is fully parametric, i.e. the shape of the hazard function has to be explicitly modelled and incorporated in the logistic regression (i.e., parametrically), to closely replicate the shape of a non-parametric estimate of the exit modes' hazard rate.

4. Analysis and Results

4.1. Descriptive statistics

Table 3 provides the mean value of the variables used in the analysis, with a breakdown by exit strategy. PE firms involved in trade sales show a high level of industry specialization, with an average index value of about 0.11, the oldest (about 23 years old), the smallest in terms of capital under management (about 16 Bln $), and do not usually co-invest. The targets involved in trade sales are on average 30 years old and have an average of 1,700 employees. About one third of these deals involve a high-tech target. The average return on the stock market, calculated over the last year of PE backing, is about 8%, and about one fourth of the trade sales occurred during the period of financial distress.

The PE firms involved in IPOs are the most specialized, with average values of industry and LBO-stage specialization of about 0.14 and 0.27, respectively. These firms are young on average (around 18 years old), have a large average size (18 Bln $ of capital under management) and less often affiliated to institutional investors. The deals exited through IPO are in highest part syndicated, and co-invested in about 15% of the cases. As far as the target features are concerned, the IPOs involve the oldest and largest target companies (on average 39 years old and with more than 9,000 employees), of which about one third belongs to high-tech sectors. The average return on the stock market over the year before the listing is about 10%, and only 11% of the deals terminated through IPO occur during the financial crisis.

Finally, the PE firms involved in SBOs are on average the least specialized both in terms of industry and LBO-stage, with average values of 0.05 and 0.15, respectively. The average size of these PEs is relatively large (about 19 Bln $ of capital under management), more than one fourth of them are affiliated to another entity, and about 45% of these deals are co-financed. The

average target is a 35 years old firm with about 3,000 employees. In the case of SBOs, the average one-year return on the MSCI is about 9%, and about 23% of the exits have been observed during the financial crisis.

[Table 3]

4.2. Competing risks analysis

Table 4 presents the estimation results of the competing risks models. The table reports the factors that increase the likelihood of, and reduce the time for, reaching one of the three alternative exits, i.e. trade sale, IPO, and SBO.[5] We run two regressions for each exit mode (the three competing risks). The first regression *(model I)* applies the Fine and Gray methodology to censored data where the hazard of divesting through a given route depends on all covariates discussed in Section 3 except those which are observable only for the exited deals, i.e. MSCI return and Financial crisis. The effect of market conditions variables is thus investigated, for each of the alternative exits, in a second regression *(model II)* where we apply the competing risks analysis to complete data, i.e. a reduced sample including only the deals for which an exit is observed before the end of the observation period. The results for the complete data setup are not individually discussed except for the variables representing the market conditions. This is because, when compared to the censored sample, the complete data setup is somewhat less informative as it requires a substantial reduction of the sample. However, for all the common covariates the results remain unchanged, with some effects more pronounced and others less so.

[5] The competing risks model allows estimating the impact of model covariates on the hazard of a given exit mode, while taking into account the time-at-risk and the occurrence of competing and mutually exclusive events. Thus, even when conditioning on the same set of covariates, results for different exit modes are estimated independently, and therefore they cannot be directly compared.

In the next sections the results are illustrated as follows: for each exit mode, the covariates are presented in groups, namely specialization variables, PE characteristics, target characteristics, and market conditions.

4.2.1. Trade sales

Results in the first column of Table 4 show that, while the degree of industry specialization of the PE increases the likelihood and the speed of the exit, the degree of LBO specialization does not have any statistically significant effect. As explained in Section 3, while the direct interpretation of the coefficients can be difficult, quantifying the effect of the covariates in terms of shifts in the Cumulative Incidence Function (CIF) becomes straightforward. *Figure 1.a* shows the CIF evaluated at 0 for the dummy variables and at the sample median for all the continuous variables but the industry specialization.[6] The latter is set at the first quartile (solid line) for a representative weakly industry specialized PE and at the third quartile (dashed line) for a representative highly industry specialized PE. Ceteris paribus, as the degree of industry specialization increases, the probability (cumulative incidence) of exiting through trade sales goes up for any given time horizon. For instance, the probability of exiting thought trade sales within 5 years (60 months) for a weakly industry specialized PE is 25.9%. This probability, over the same horizon, increases to 38.7% for the highly industry specialized PE. The lack of a significant effect of the coefficient associated to the LBO-stage specialization is reflected in *Figure 1.b*. In fact, ceteris paribus, we do not observe any substantial shift of the CIF of a representative highly LBO-stage specialized PE (third quartile - dashed line) when compared to

[6] The CIFs in Figure 1 are calculated using the parameter estimates from the competing risks regression with censored data. CIFs based on complete data are qualitatively the same and are not reported to save space.

that of a representative weakly LBO-stage specialized PE (first quartile - solid line).[7] This results support Hypothesis H1.

[Figure 1]

As far as the remaining PE firm-related variables are concerned, large PE firm size, high efficiency, and the affiliation with institutional investors decrease the hazard of trade sales, and thus increase the time-to-exit. Also the practice of co-investing in the target company by using more than one fund has a negative impact on the likelihood of this exit. The typical target company exited through trade sale is smaller than the average target exited by means of the other exit strategies, as shown in the descriptive statistics (Table 3). Hence, for its purchase, the PE requires a comparatively lower amount of capital, which is typically withdrawn from one single fund. As presented in the next section, the opposite happens in the case of the IPO exit, where due to the large size of the initial investment the PE may need to get capital from more than one fund. Further variables such as PE age, its geographical location, and the syndication of the investment do not impact the likelihood of trade sales.

When observing the characteristics of the investee companies, we find that companies belonging to high-technology sectors have a higher likelihood to be divested through trade sales. This result is in line with the common finding that high-tech firms are appealing to strategic buyers, as the latter are typically interested in acquiring patents, intellectual property rights, and

[7] The representative weakly (highly) LBO-stage specialized PE is defined by setting to 0 the dummy variables, and to the sample median all the continuous variables except the LBO-stage specialization. The latter is set to the first quartile for the representative weakly LBO-stage specialized PE (solid line), and to the third quartile for the representative highly LBO-stage specialized PE (dashed line), respectively.

specific know-how. The size and age of the investee company, however, do not affect the trade sale exit mode. Finally, results concerning the market conditions presented in the second column of Table 4 *(model II)* show that while the 1-year return on the MSCI has a positive impact on the likelihood of exiting via trade sales, the control variable for the financial distress do not show any significant effect.

4.2.2. Initial Public Offerings

When focusing on the IPO exit, we find that both the degree of industry and LBO-stage specialization have a positive impact on the likelihood and decrease the time-to-exit. Defining the representative weakly (highly) industry or LBO-stage specialized PE as in Section 4.2.1, our results show that the CIF (*Figures 1.c* and *1.d*) moves upward as the degree of either type of specialization increases, for any time horizon. To give an example, if we consider the industry specialization, the probability of exiting through IPO within 5 years for a highly specialized PE is 1.5 times the one of a weakly specialized PE. We find quantitatively similar results also in the case of LBO-stage specialization, where the probability of an IPO exit of a highly LBO-stage specialized PE is three times the one of a weakly specialized PE. These results strongly support hypothesis H2.

Given the linear-exponential form of the model and the proportionality of the CIF, we can also quantify the rate of substitution between industry and LBO-stage specialization, i.e. how much one of the two types of specialization has to decrease in response to a unit increase of the other one in order to maintain the cumulative incidence unaltered. For any given level of cumulative incidence, the rate of substitution is obtained as the opposite of the ratio of the

coefficients associated to the two specialization covariates.[8] In the case of IPO exit, the rate of substitution equals to -(4.044/2.352) = -1.72, which means that in response to an increase of LBO-stage specialization, the corresponding CIF-preserving degree of industry specialization has to decrease by a factor of 1.72.

Besides specialization, the results show that young and large PE firms are more likely to exit via IPO. This result is not surprising, as coherent with the literature discussed in section 3.2 and the fact that IPO operations are complex from the managerial point of view and necessitate a mitigation of information asymmetries with the public market. Thus, to be successful, the IPO requires an experienced and reputable sponsor that can undertake a reliable certification of the firm being sold. Furthermore, the likelihood of this type of exit increases significantly if the investment is syndicated and the lead PE invests in the target company using more than one of its funds. In fact these two elements are signals of an expected profitable and successful outcome for the deal as well as of the PE commitment.

The remaining variables, i.e. the PE efficiency and its affiliation with a bank or insurance institution do not impact the likelihood of an IPO, nor does the PE geographical location. Concerning the investee-related variables, the company size represents an important factor to reach the public market (Nikoskelainen and Wright, 2007; Wright et al., 1995), together with the high-tech industrial sector. Conversely, the company's age do not affect the likelihood of an IPO

[8] Analytically, let β_1 and β_2 be the coefficients associated to the pair of covariates of interest (e.g. x_1 and x_2), while γ is the vector of coefficients associated to the residual set of covariates z. Denote $\overline{CIF}$ ($0 \leq \overline{CIF} \leq 1$) and $\bar{z}$ a given fixed level of cumulative incidence and for the covariates z, respectively. Finally, let $H_0(t)$ be the baseline cumulative incidence function (depending only on time t). Given that $\overline{CIF} = 1 - \exp\left(-\exp(x_1\beta_1 + x_2\beta_2 + \gamma z)\, H_{0,t}\right)$, it follows that $\frac{\partial x_1}{\partial x_2} = -\frac{\beta_2}{\beta_1}$.

outcome. Finally, though the likelihood of an IPO is not significantly affected by the state of the market, the financial crisis has, as expected, a negative impact on this exit mode.

4.2.3. Secondary Buyouts

In the case of SBO exit, we find that both the degrees of industry and LBO-stage specialization have significant negative impacts on the likelihood and the time-to-exit, which result in a downward shift of the CIF for any exit horizon in response to the increase of either industry or LBO-stage specialization (see *Figures 1.e* and *1.f*). To give an example, the probability of exiting thought SBO within 5 years for a highly industry specialized PE is 1/2 that of the weakly industry specialized PE. If we then consider the LBO-stage specialization, the probability of SBO exit over the same time horizon for a highly LBO-stage specialized PE is 3/4 that of the weakly specialized PE. These results validate hypothesis H3. As in Section 4.2.2, we can compute the CIF-preserving rate of substitution between the two types of specializations. Results show that an increase of the degree of LBO-stage specialization requires a reduction of the degree of industry specialization by a factor of 0.26, i.e. -(-1.094/-4.249) to maintain the CIF unchanged.

Our results also show that bank, insurance, and governmental based funds are more likely to end their investments with a SBO. This is in line with previous literature defining the captive PEs less return-maximization oriented and less involved in the corporate governance and monitoring of the companies they finance (Cumming and MacIntosh, 2006; Tykvova, 2006). SBO is instead more likely for the PE firms located in countries with lower legality conditions, as a less efficient legal system is expected to trigger the investors' outcomes (Berkowitz et al.,

2003). The remaining variables, i.e. the PE age, size, efficiency, syndication, and co-investment do not impact the likelihood of a SBO, nor does the cross-border control.

As far as the characteristics of the investee companies are concerned, the age represents a significant factor enhancing the likelihood of a SBO outcome. In fact, the complexity of business restructuring is higher for mature companies, which typically have an already established product or service able to generate revenues, but they may need additional resources to grow or expand. As a result, the SBO often represents the (possibly) last round of investment before an exit in the form of an IPO or acquisition by a strategic partner. The SBO exit is also more likely for those companies lacking a high-tech industrial profile, which as discussed before is more appealing to the market. Furthermore, the hazard of SBO is, as expected, higher when the market conditions are favourable, due to the general higher availability of funds in periods of positive capital market returns. Finally, we observe an increase in the likelihood of SBO also when concerning the deals exited during the financial crisis. This is because the stock markets distress and the recessing economy, together with the need of divesting within the limited contractual lifetime of the PE funds, make this type of exit a more appealing, feasible, and profitable strategy when compared to the alternatives.

[Table 4]

4.3. Robustness analysis

To ensure robustness of our results, we perform a number of checks. Since the model of Fine and Gray (1999) relies on the assumption of proportionality of the sub-hazard, which implies that relative sub-hazards are fixed over time, we validate our model by testing for time

invariance of the latter. Test results indicate that the time invariant relative sub-hazard assumption is not violated, confirming the appropriateness of the method. [9]

An additional check regarding the potential effect of the financial crisis on the study, other than controlling for it through the related dummy variable as in *Models (II)* of Table 4 and 5, we confirmed the robustness of the analysis excluding the time-span August 2007-December 2009 from the model. We also repeated the analysis clustering the errors by country and industry, as well as applying the robust variance estimator, and the results remain unchanged. The tables related to these checks are not reported for brevity reasons.

As mentioned in the methodology section 3.3, we also run two sets of multinomial logit regressions, adapted to the censored and complete data setup, respectively. Following Bertoni and Groh (2014), in the censored data case, the exit indicator takes values 1 for trade sale, 2 for IPO, 3 for SBO, 4 for write-off and 0 for the baseline case of no exit. In the complete data case, where the observations with no exit are dropped from the sample, we set the write-off exit as the baseline category. Since the multinomial logit applied to survival data requires a function of the time-to-exit to be explicitly modelled, we estimate the smoothed hazard contributions of each type of exit using a weighted kernel density. Results, reported in Figure 2, suggest the inclusion of a quadratic form in the logarithm of the duration to replicate the non-linear shape of the hazard rate. Table 5 reports the average marginal effect of each covariate on the probability of observing a given outcome. The multinomial logit yields qualitatively similar results to those obtained using the competing risks model. Our results hold independently from the sampling scheme used.

[Figure 2 and Table 5]

[9] Test results are not reported for the sake of brevity, but available upon request.

4.4. Post hoc analysis

The analysis discussed so far presents a static definition of PE stage specialization. In this post hoc analysis, we extend our investigation introducing the stage drift as a further feature of PE stage specialization. Stage drift, introduced to PE literature by Cumming et al. (2009), is defined as a deviation from the stated objective in terms of the firm development stage focus of the fund. Strictly related to reputation, future investment opportunities, and diversification benefits, this practice is particularly interesting in the study of PE investment as it might affect also the choice of the exit strategy and its success. Cumming et al. (2009) find a positive relation between style drifting and investment performance. This is of particular interest to our paper, as in our setting style drifts are essentially ex-post observation of changes in specialization.

Observing the manager's stated focus of the fund used to invest in the target in object, we distinguish from LBOs funded from specific buyout allocated funds and LBOs initiated as style drifts of a fund explicitly destined to other stages of entrepreneurial development, e.g. early stage investments. Table 6 reports the results of the post hoc analysis. First, it is worth noticing that the findings discussed in the previous section are robust to the introduction of the stage drift control, supporting our hypotheses. Second, we find that the stage drift has a negative impact on the likelihood of the exit though SBO. These results suggest that the behavior of a PE that decides to style drift is aligned with the LBO specialized investor, i.e. is less likely to need a further round of funding to exit its deals. This is coherent with the insights by Cumming et al., 2009, where the PE seemed to style drift only those investments that were more likely to yield favorable results, which are in the present study represented by successful exits.

[Table 6]

5. Conclusions

This paper sheds light on how the degree of PE specialization, in terms of both industry and stage, affects the dynamics of trade sale, IPO, and SBO competing exit strategies. Our hypotheses are based on the argument that the PEs foster specialization as an instrument to match the information level and the strategic objectives of potential counterparts, establishing networks and developing specific expertise and skills. Our contribution is twofold. On the one hand, we propose a new measure of PE specialization (both at industry and stage level) which combines a comparative and an inner portfolio dimension. On the other hand, to account simultaneously for the two main aspects of the PE exit decision, i.e. the exit strategy and its timing, we estimate a set of competing risks models on a sample of 818 US and European LBOs over the period 2000-2015.

We obtain the following results. First, we show that a PE with industry specialization in the sector in which the target operates is more likely to divest by means of trade sale. Expertise and deep market knowledge allow the PE firms to better shape value creation plans for the target and attract potential strategic buyers, whose main goal is typically the synergic integration of the acquired technology or the target's products with their own structure after the acquisition (Camerlynck et al., 2005).

Second, we show that the PE specialization, whether at industry or LBO-stage level, increases the likelihood and reduce the time-to-exit of an IPO. In fact, besides the industrial expertise discussed above, we find that the skills in managing LBO operations through operational reengineering and corporate governance that the PE accrues over time increase its ability to certificate the quality and the independent growth potential of the investee company. The latter, hence, are more likely to reach the public market.

Finally, to complete the set of divestment opportunities available to the PEs, our results show that both industry and LBO-stage specializations negatively affect the likelihood of a SBO. The diversified investor often lacks the experience, skills, reputation, and network that are typically accrued through specialization, and therefore is less likely to reach the final market by a trade sale or an IPO exit. However, the unspecialized PE succeeds in gaining returns to the investment selling the target to another institutional investor, which will provide the investee company with an additional round of financing.

In this study, we limit our sample to LBO operations. Future work could address the impact of the specialization of PE firms on their exit strategies from other stages of investment. For example, it would be interesting to investigate differences and commonalities between LBO and venture stage of investment. Furthermore, prior research found cross-border LBO investments to be correlated to countries' creditor rights level (Cao et al., 2015). A subject of future work could ascertain which country dimensions matter most for PE deals and exit strategies. For example, the recent events related to Brexit may play a role in future studies, as well as other legal changes may evolve.

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Table 1 – Sample

Entry year	Deals	Exited by				Not-exited
		Trade sale	IPO	SBO	Write-off	
2000	78	22	8	13	35	0
2001	60	23	8	15	14	0
2002	42	17	2	17	6	0
2003	74	30	10	24	6	4
2004	67	28	4	23	5	7
2005	59	25	4	22	4	4
2006	71	31	4	26	1	9
2007	83	28	4	27	4	20
2008	30	6	4	8	2	10
2009	31	8	2	4	3	14
2010	57	27	3	8	2	17
2011	55	14	3	13	2	23
2012	38	3	3	4	1	27
2013	35	1	2	2	0	30
2014	38	0	1	0	0	37
Total	818	263	62	206	85	202
% of total sample	100%	32.15%	7.58%	25.18%	10.39%	24.69%
% of exited sample	-	42.69%	10.06%	33.44%	13.80%	-
Average time to exit (months)	43.26	41.92	39.69	47.23	40.63	-

Notes: This table reports the sample breakdown by year of entry and by exit strategy of the PE firm. The sample consists of 818 LBOs carried out by US and European PE firms over the period 2000-2014, observed until 31/12/2015. We tracked all the possible exit modes observed in our sample: trade sales, IPOs, SBOs, and write-offs. Deals not yet exited at the end of the observation period are included in the breakdown too. The last row shows the average time to exit, in months, by exit strategy.

Table 2 – Variables definition

PE variables	
Industry specialization	A composite measure that proxies the degree of PE specialization in the industry in which the target company operates
LBO-stage specialization	A composite measure that proxies the degree of PE specialization in the LBO-stage of investment
PE Age	The age in years of the lead PE firm at the year of the LBO (log transformed in the regression analysis)
PE Size	The amount of capital under management in billions of dollars of the lead PE at the year of the LBO (log transformed in the regression analysis)
PE Efficiency	We adopt the methodology proposed by Bernile et al. (2007), employing a two-stage empirical design
Captive PE	A dummy variable equal to 1 if the investor is bank, insurance or government affiliated and 0 elsewhere
Syndication	A dummy variable equal to 1 if the deal is syndicated and 0 elsewhere
Co-investment	A dummy variable equal to 1 if the lead PE invested in the deal using more than one of its fund and 0 elsewhere
Legality index	Legality indices for the PE's country, as constructed in Berkowitz et al. (2003).
Cross-border	A dummy variable equal to 1 if the investment is cross-border and 0 elsewhere
Fund Stage Drift	A dummy variable equal to 1 if the PE fund did a style drift in terms of stage of development (e.g. invested in a LBO using an early-stage fund) and zero otherwise (i.e. invested in a LBO using an Buyout specific fund)
Target variables	
Target Age	The age in years of the target at the time of LBO (log transformed in the regression analysis)
Target Size	The number of the employees of the target (log transformed in the regression analysis)
Target High-tech	A dummy variable equal to 1 if the target belongs to a high-tech industry (defined at 4-digit SIC code) and 0 elsewhere
Market conditions	
MSCI return	The Morgan Stanley Capital International annual world index (MSCI) return in the year prior to exit
Financial Crisis	A dummy variable that takes value 1 if the exit occurs over the period August 2007-December 2009 and 0 elsewhere (Financial crisis period defined according to the National Bureau of Economics Research - NBER - Business Cycles)

Table 3 - Descriptive statistics

	Observations	*Sample*	*Trade sales*	*IPOs*	*SBOs*
PE variables					
Industry Specialization	818	0.081	0.107	0.136	0.053
LBO-Stage Specialization	818	0.168	0.165	0.271	0.151
PE Age (years)	818	22.956	23.236	17.839	22.684
PE Size (Bln $)	818	19.338	16.546	18.205	18.879
PE Efficiency (value)	818	0.000	-0.066	-0.075	-0.062
PE Captive (%)	818	20.782	16.350	11.290	27.184
Syndication (%)	818	48.166	46.768	66.129	45.631
Co-investment (%)	818	7.824	5.703	14.516	5.825
PE_US (%)	818	54.768	46.768	59.677	48.544
PE_UK (%)	818	29.584	33.080	32.258	30.097
PE_Continental Europe (%)	818	15.648	20.152	8.065	21.359
Legality index (value)	818	20.582	20.598	20.527	20.538
Cross-border (%)	818	43.399	46.008	41.935	48.058
Fund Stage Drift (%)	818	39.976	40.684	29.032	30.097
Target variables					
Target Age (years)	818	29.726	30.293	39.581	34.519
Target Size (Employees)	818	2,962	1,720	9,086	2,919
Target High-tech (%)	818	25.061	30.418	30.645	13.107
Market conditions					
MSCI return (%)	616	6.772	8.234	9.891	9.073
Financial crisis (%)	616	20.942	18.251	11.290	21.845

Notes: This table presents descriptive statistics (mean value or percentage), breakdown by the three exit strategies object of our study, i.e. trade sales, IPOs, and SBOs. The sample statistics for the PE and the target related variables are calculated on the censored data (818 observations), while the statistics for the Market conditions are calculated on the sample of complete data, i.e. the reduced sample including the 616 deals for which an exit is observed before the end of the observation period. Variables are defined in Table 2.

Table 4 – Trade sales, IPOs, and SBOs: Competing risks models

	Trade Sale		IPO		SBO	
	(I)	*(II)*	*(I)*	*(II)*	*(I)*	*(II)*
PE variables						
Industry Specialization	1.721***	1.561***	2.352***	2.797***	-4.249***	-5.484***
	(0.420)	(0.483)	(0.622)	(0.707)	(1.512)	(1.734)
LBO-Stage Specialization	-0.467	-0.094	4.044***	4.725***	-1.094**	-0.779**
	(0.583)	(0.595)	(0.836)	(1.050)	(0.507)	(0.356)
PE Age	0.032	0.090	-0.281**	-0.136	-0.039	0.022
	(0.091)	(0.072)	(0.111)	(0.138)	(0.116)	(0.095)
PE Size	-0.098**	-0.078*	0.128*	0.163*	-0.021	0.001
	(0.046)	(0.042)	(0.077)	(0.098)	(0.048)	(0.047)
PE Efficiency	-0.402***	-0.240*	-0.190	0.253	-0.177	-0.032
	(0.154)	(0.138)	(0.370)	(0.352)	(0.173)	(0.168)
PE Captive	-0.440**	-0.342**	-0.746	-0.495	0.394*	0.522***
	(0.178)	(0.152)	(0.605)	(0.475)	(0.211)	(0.186)
Syndication	-0.104	-0.221	0.509*	0.301	-0.015	-0.113
	(0.167)	(0.139)	(0.271)	(0.261)	(0.112)	(0.115)
Co-investment	-0.416**	-0.528***	0.646***	0.628**	-0.292	-0.360*
	(0.210)	(0.190)	(0.229)	(0.290)	(0.225)	(0.216)
Legality index	-0.023	0.011	0.004	0.006	-0.142*	-0.120
	(0.071)	(0.091)	(0.227)	(0.264)	(0.085)	(0.097)
Cross-border	0.084	0.026	0.049	0.029	0.101	0.013
	(0.182)	(0.166)	(0.310)	(0.292)	(0.160)	(0.155)
Target variables						
Target Age	0.038	0.008	0.071	-0.001	0.258***	0.240***
	(0.133)	(0.117)	(0.133)	(0.171)	(0.062)	(0.047)
Target Size	-0.042	-0.045	0.455***	0.533***	-0.003	-0.013
	(0.041)	(0.042)	(0.076)	(0.084)	(0.025)	(0.027)
Target High-tech	0.322***	0.215**	0.609***	0.499**	-0.711***	-0.833***
	(0.111)	(0.098)	(0.202)	(0.230)	(0.274)	(0.259)
Market conditions						
MSCI return		0.812*		1.173		2.249*
		(0.489)		(2.174)		(1.180)
Financial Crisis		-0.156		-0.955*		0.347*
		(0.119)		(0.581)		(0.215)
Observations	818	616	818	616	818	616
Log-likelihood	-1637.02	-1595.25	-350.71	-339.98	-1259.53	-1213.13
Wald test (chi-squared)	58.63***	48.78***	100.68***	102.53***	78.54***	97.18***

Notes: This table presents the estimation results of the competing risks models fit by maximum likelihood according to the method of Fine and Gray (1999). The estimated coefficients are reported for trade sale, IPO, and SBO exit strategies. The risk of write-off exit is considered in the analysis as a competing event (as discussed in Section 3.3,

the related results are not reported). For each exit strategy, models *(I)* and *(II)* refer to the censored (818 observations) and the complete data (616 observations), respectively. In the censored sample, non-exited deals are treated as right-censored at 31/12/2015. The complete data sample of only exited deals is extracted to allow the market conditions at the exit time to be considered in the estimations. The errors, clustered by the year of the LBO, are reported in brackets. Variables are defined in Table 2. ***, ** and * indicate that the coefficient is significant at the 1%, 5% and 10% respectively.

Table 5 – Robustness analysis

	Trade Sale		IPO		SBO	
	(I)	*(II)*	*(I)*	*(II)*	*(I)*	*(II)*
PE variables						
Industry Specialization	0.758***	0.964***	0.214***	0.292***	-0.637***	-1.309***
	(0.166)	(0.223)	(0.059)	(0.072)	(0.195)	(0.276)
LBO-Stage Specialization	-0.164	-0.105	0.271***	0.377***	-0.282***	-0.225*
	(0.114)	(0.140)	(0.055)	(0.075)	(0.108)	(0.129)
PE Age	-0.009	0.027	-0.025**	-0.016	-0.027	0.007
	(0.023)	(0.026)	(0.011)	(0.014)	(0.021)	(0.024)
PE Size	-0.029***	-0.029***	0.010	0.013	-0.009	-0.002
	(0.008)	(0.009)	(0.007)	(0.008)	(0.007)	(0.008)
PE Efficiency	-0.090***	-0.054	-0.002	0.020	-0.030	-0.004
	(0.035)	(0.043)	(0.025)	(0.030)	(0.028)	(0.038)
PE Captive	-0.114***	-0.098**	-0.035	-0.033	0.073**	0.134***
	(0.041)	(0.049)	(0.028)	(0.032)	(0.037)	(0.043)
Syndication	-0.035	-0.079**	0.039**	0.041*	0.008	-0.012
	(0.032)	(0.040)	(0.016)	(0.023)	(0.030)	(0.037)
Co-investment	-0.010	-0.048	0.051**	0.050*	-0.021	-0.068
	(0.064)	(0.073)	(0.023)	(0.028)	(0.059)	(0.067)
Legality index	0.010	0.023	-0.001	-0.000	-0.017	-0.025
	(0.022)	(0.028)	(0.013)	(0.017)	(0.019)	(0.025)
Cross-border	0.047	0.024	0.012	0.009	0.040	0.012
	(0.032)	(0.038)	(0.016)	(0.020)	(0.030)	(0.035)
Target variables						
Target Age	0.010	-0.002	0.012	0.009	0.053***	0.058***
	(0.018)	(0.021)	(0.009)	(0.012)	(0.016)	(0.018)
Target Size	-0.006	-0.012	0.028***	0.040***	0.002	-0.004
	(0.008)	(0.011)	(0.005)	(0.007)	(0.009)	(0.011)
Target High-tech	0.094**	0.114**	0.035*	0.040	-0.130***	-0.181***
	(0.037)	(0.047)	(0.020)	(0.026)	(0.040)	(0.045)
Market conditions						
MSCI return		-0.007		0.072		0.473***
		(0.155)		(0.103)		(0.151)
Financial Crisis		-0.020		-0.063*		0.104**
		(0.053)		(0.038)		(0.049)
Log(duration)	-1.433***	0.313**	-0.251***	0.034	-1.667***	-0.154
	(0.319)	(0.126)	(0.086)	(0.051)	(0.293)	(0.113)
Log(duration)^2	0.171***	-0.051**	0.025**	-0.011	0.221***	0.034*
	(0.043)	(0.020)	(0.013)	(0.009)	(0.039)	(0.018)
Observations	818	616	818	616	818	616
Log-likelihood	-975.93	-564.08	-975.93	-564.08	-975.93	-564.08
Wald test (chi-squared)	298.74***	240.10***	298.74***	240.10***	298.74***	240.10***

Notes: This table reports the results of the multinomial logit regression fit by maximum likelihood. The average marginal effects are reported for the case of trade sales, IPOs, and SBOs. For each exit strategy, models *(I)* and *(II)* refer to the censored (818 observations) and the complete (616 observations) data, respectively. In model *(I),* the deals exited by means of write-off are taken into account in the estimation, as well as the baseline category of no exit (related results not reported for brevity). In model *(II)*, the sample of complete data, including only exited deals, is extracted to allow the market conditions at the exit time to be considered in the estimations. In this case, the write-off exit is set as baseline category. The errors, clustered by the year of the LBO, are reported in brackets. Variables are defined in Table 2. A ***, ** and * indicate that the coefficient is significant at the 1%, 5% and 10%, respectively.

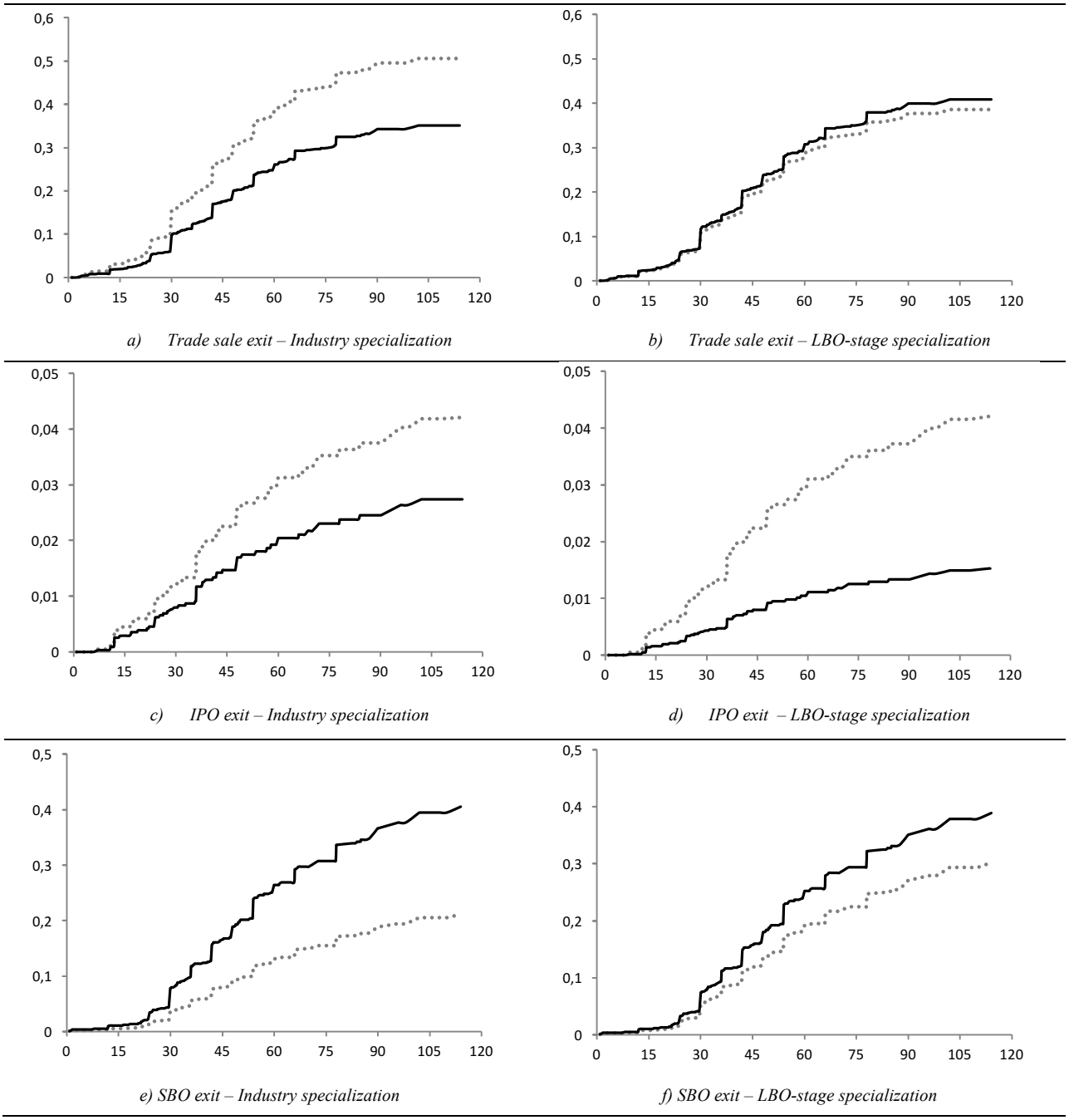
Table 6 – Post-hoc analysis

	Trade Sale	IPO	SBO
PE variables			
Industry Specialization	1.692***	2.359***	-4.409***
	(0.399)	(0.637)	(1.615)
LBO-Stage Specialization	-0.331	4.030***	-1.371**
	(0.622)	(0.803)	(0.553)
Fund Stage Drift	0.147	-0.054	-0.448***
	(0.112)	(0.263)	(0.162)
PE Age	0.034	-0.282**	-0.048
	(0.091)	(0.110)	(0.109)
PE Size	-0.102**	0.127	-0.010
	(0.045)	(0.086)	(0.045)
PE Efficiency	-0.415***	-0.177	-0.160
	(0.149)	(0.369)	(0.184)
PE Captive	-0.444**	-0.731	0.391*
	(0.177)	(0.629)	(0.218)
Syndication	-0.095	0.507*	-0.031
	(0.167)	(0.270)	(0.104)
Co-investment	-0.431**	0.658***	-0.259
	(0.208)	(0.218)	(0.238)
Legality index	-0.037	0.012	-0.098
	(0.071)	(0.243)	(0.081)
Cross-border	0.085	0.052	0.081
	(0.184)	(0.299)	(0.160)
Target variables			
Target Age	0.047	0.068	0.258***
	(0.132)	(0.132)	(0.067)
Target Size	-0.039	0.454***	-0.012
	(0.039)	(0.077)	(0.025)
Target High-tech	0.320***	0.603***	-0.665**
	(0.111)	(0.206)	(0.293)
Observations	818	818	818
Log-likelihood	-1,636.47	-350.69	-1,255.43
Wald test (chi-squared)	58.37***	101.43***	82.93***

Notes: In addition to the set of variables discussed in Table 4 and Table 5, this Post-hoc analysis tests the impact of the dummy Fund Stage Drift on the exit strategies. The estimation results of the competing risks models fit by maximum likelihood according to the method of Fine and Gray (1999) are presented in the table. The estimated coefficients are reported for trade sale, IPO, and SBO exit strategies. The risk of write-off exit is considered in the analysis as a competing event (as discussed in Section 3.3, the related results are not reported). Non-exited deals are treated as right-censored at 31/12/2015. The errors, clustered by the year of the LBO, are reported in brackets.

Variables are defined in Table 2. ***, ** and * indicate that the coefficient is significant at the 1%, 5% and 10% respectively.

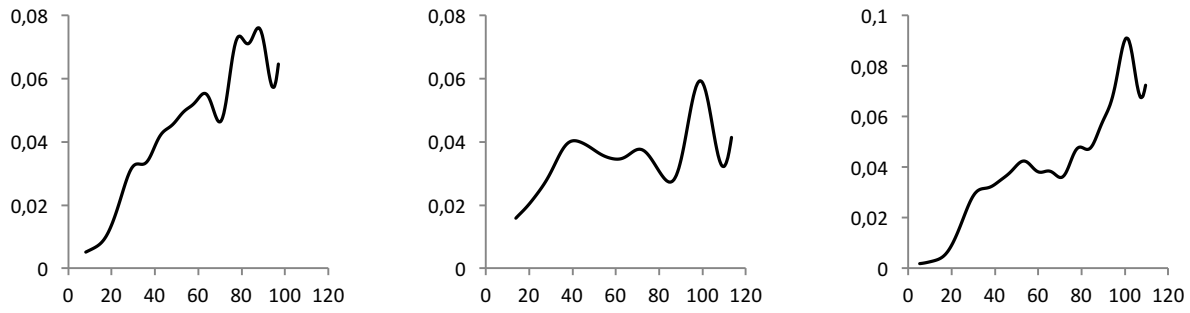
Figure 1 – Cumulative Incidence Functions



Notes: This figure shows the Cumulative Incidence Function (CIF) for the three exit strategies object of the analysis, i.e. trade sales (Panels *a* and *b*), IPOs (Panels *c* and *d*), and SBOs (Panels *e* and *f*). For each exit strategy, the impact of the industry and the LBO-stage specialization is shown in the left and in the right Panel, respectively. The CIFs, calculated using the parameter estimates from the competing risks regression with censored data, are estimated by setting to 0 all the dummy variables, and to the sample median the continuous variables but the two PE

specializations. The CIFs are evaluated at the first quartile (solid line) for a representative weakly specialized PE and the third quartile (dashed line) for a representative highly specialized PE. CIFs based on complete data are qualitatively the same and are not reported to save space. The horizontal axis reports durations measured in months.

Figure 2 – Baseline Smoothed Hazard Rate for Trade sales, IPOS, and SBOs



a) Trade sale *b) IPO* *c) SBO*

Notes: This figure shows the smoothed hazard rate for the three exit strategies object of the analysis, i.e. trade sales, IPOs, and SBOs. The hazard is calculated as a weighted kernel-density estimate using the estimates hazard contributions. Competing exits are excluded from estimations. The horizontal axis reports durations measured in months.

Appendix - Correlation matrix

	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Industry Specialization	1														
2	LBO Specialization	0.11*	1													
3	PE Age	-0.13*	-0.24*	1												
4	PE Size	-0.13*	-0.15*	0.23*	1											
5	PE Efficiency	0.04	-0.05	0.00	-0.10*	1										
6	PE Captive	0.06	-0.02	-0.11*	-0.12*	-0.02	1									
7	Syndication	0.07*	-0.04	0.03	-0.03	0.01	-0.02	1								
8	Co-investment	-0.02	-0.08*	0.05	0.05	0.06	0.00	0.24*	1							
9	Legality index	-0.10*	-0.10*	0.07	0.03	-0.07*	-0.17*	0.02	-0.02	1						
10	Cross-border	-0.11*	-0.14*	0.13*	0.07*	-0.07*	-0.09*	-0.09*	0.07*	-0.01	1					
11	Target Age	-0.04	0.18*	-0.04	-0.01	-0.10*	0.00	-0.01	-0.11*	0.01	0.01	1				
12	Target Size	-0.03	0.14*	-0.11*	0.07*	-0.11*	-0.02	-0.08*	-0.04	0.07*	0.03	0.26*	1			
13	Target High-tech	0.11*	-0.09*	0.01	0.08*	0.06	-0.05	0.10*	0.05	0.04	0.01	-0.24*	-0.17*	1		
14	MSCI return	0.06	0.07*	-0.05	-0.06	-0.02	-0.03	-0.06	0.01	0.02	0.05	0.11*	0.04	0.02	1	
15	Financial Crisis	0.04	-0.04	-0.14*	-0.02	-0.01	0.01	0.00	-0.02	-0.06	-0.01	-0.03	0.05	-0.01	-0.32*	1

Notes: This table presents the correlation coefficients between the variables used in the empirical analysis. Variables are defined in Table 2.
* indicates statistical significance at the 5% level.