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Inorganic growth strategies and the evolution of the private equity business model[*]

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Abstract

This paper investigates inorganic growth strategies in PE buyouts where the portfolio firm, which has been acquired in the initial buyout, serves as a platform for subsequent add-on acquisitions. We analyze a comprehensive sample of 9,548 buyouts and 4,937 add-on acquisitions spanning 16 years of buyout activity in 86 countries. We find that probability for add-on acquisitions is high if the PE sponsor is experienced and has reputational capital, if the portfolio firm is large, has M&A experience at entry and operates in an industry with moderate degree of fragmentation, as well as in case of favorable financing conditions. Similar factors also explain higher add-on productivity and faster add-on execution. On average, cross border/industry diversifying inorganic growth strategies are most likely if the portfolio company already draws upon international/inter-industrial M&A experience at entry and if the PE sponsor frequently invests across border/industries. Furthermore, our results indicate that add-on acquisitions increase the probability for exiting through IPO and secondary buyout. The effect on secondary buyouts is driven by deals where the subsequent PE owner continues the inorganic growth strategy of the previous buyout.

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1 Introduction

"The glory days of private equity are over: too many funds are chasing too few opportunities, and many of those will be too expensive. It won't end well."

The Wall Street Journal, March 29, 2015

Many observers of the private equity (PE) industry notice that the business model has undergone significant change in recent years. Traditionally, PE managers generated return through a combination of buying low/selling high, de-leveraging of highly indebted portfolio firms and governance improvements (e.g. Gompers et al., 2016; Guo et al., 2011; Kaplan and Strömberg, 2009). These value creation levers have come under pressure though. Increasing capital commitments to PE by institutional investors and healthy mergers and acquisitions (M&A) markets have led to more competition for deals, increasing valuations and greater fluctuation of returns (Braun et al., 2017). Access to cheap financing has furthermore proven to be volatile and, if available, it has not been a distinct source of value creation (Axelson et al., 2013). Governance improvements, finally, are more difficult to achieve as many firms advanced their governance standards in comparison to the early days of the PE industry (Kaplan, 1997). In light of the current state of the PE sector, Braun et al. (2017) argue that traditional value creation levers increasingly commoditize and, in line with this, there is a growing number of industry reports discussing the evolution of value creation strategies in PE.[1]

In this paper, we study a recently evolving value creation strategy in the PE sector where the portfolio firm, which has been acquired in the initial buyout, serves as a platform for subsequent add-on acquisitions - so called "inorganic growth" or "buy and build" strategies. Our comprehensive sample of 9,548 buyouts, spanning 16 years of buyout activity between 1997 and 2012 in 86 countries, clearly shows that these strategies have become a relevant phenomenon in the PE market. We observe 2,497 deals with at least one and up to 18 subsequent add-on

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[1] See, for example, survey data by PricewaterhouseCoopers (2015): "Pushing further in search of return: The new private equity model". Available https://www.pwc-wissen.de/pwc/de/shop/publikationen/Pushing+further+in+search+of+return:/?card=15180online.

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acquisitions and, in sum, 4,937 add-on acquisitions during the sample period. These numbers support previous survey results by The Boston Consulting Group which suggest that the use of M&A has become the single most important way to improve operations in PE buyouts.[2]

Despite the relevance of inorganic growth strategies for the PE market, there has been very limited research up to date and the few existing studies focus on small-scale evidence on the return potential of add-on acquisitions. Nikoskelainen and Wright (2007) and Valkama et al. (2013) find that deals with add-on acquisitions outperform those without in terms of internal rate of return (IRR) using a sample of 321 UK buyouts. Acharya et al. (2013) document outperformance of deals with add-on acquisitions in terms of margin and multiple improvement for a sample of 395 Western European deals.

While these studies provide evidence for the attractiveness of inorganic growth strategies, they do not enhance our understanding of the add-on acquisition market and how such acquisitions affect decision-making at the PE sponsor level. Thus, at least three important questions have been unanswered so far: (i) What are systematic drivers of add-on acquisitions at the buyout, portfolio firm, PE sponsor and industry/economy level?; (ii) Which firm-level characteristics affect the probability for cross border/industry diversifying add-on acquisitions?; and (iii) How do add-ons affect the choice of the exit channel? This paper aims at answering these research questions.

We start by analyzing systematic drivers of add-on acquisition activity at the buyout, portfolio firm, PE sponsor and industry/economy level and provide several new insights.

- *Buyout characteristics.* We first investigate whether public-to-private buyouts spur inorganic growth but cannot find evidence for a significantly higher add-on acquisition probability, most likely because target firms have already realized growth opportunities as a public firm. We find that portfolio firms in financial buyouts, i.e., in secondary/tertiary/quarternary buyouts, are significantly more likely to make add-on acquisitions but, interestingly, only if they already made add-on acquisitions under the previous PE owner. Thus, our findings

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suggest that PE sponsors in the subsequent buyout exploit left-over acquisition potential of an inorganic growth strategy that has already been initiated by the previous PE owner. Evidence regarding syndicated buyouts is mixed. In terms of management participation, our results indicate a significantly negative relationship to add-on acquisitions, which is consistent with agency-related explanations for management buyouts.

- *Portfolio firm characteristics.* We find that portfolio firms with acquisition experience at the time of the buyout are significantly more likely to make add-on acquisitions under PE ownership as compared to those without. This is reasonable given the holding period constraints of PE firms and the resulting incentive to search for platforms that are able to acquire with relatively small transaction costs. We also investigate the effect of firm size and find a positive but non-linear relationship to add-on acquisition probability, with add-ons being particularly likely for large cap buyouts in comparison to small cap, mid cap and mega buyouts. We also test for moderators but cannot find variables that offset the "liability of smallness".

- *PE firm characteristics.* Our sample documents that the market for add-on acquisitions is highly concentrated. Merely 16% of the 1,798 PE firms in the sample account for 80% of all add-on acquisitions and only 43% of PE firms are involved into the add-on market at all. We explore firm-level differences that are likely to explain the selected access to the add-on acquisition market and find that portfolio firms backed by PE sponsors with strong acquisition experience and reputational capital have significantly higher probability for add-on acquisitions. These findings are consistent with the idea that a PE firm's acquisition experience and reputation provide valuable deal-flow and network (e.g., to banks and advisors) to the portfolio firm. Because these findings could also be the result of endogenous selection, we employ instrumental variable (IV) methods and run various sub-sample regressions. However, all endogeneity tests indicate that acquisition experience and reputation of a PE sponsor provide treatment to the portfolio company's acquisition activity.

- *Industrial and economic environment.* We find that the probability for an inorganic growth strategy is particularly high if the portfolio firm operates in an industry with moderate degree of fragmentation, i.e., in an industry with Herfindahl-Hirschman Index (HHI) of 1000-

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1500, that provides room for consolidation but also a sufficient number of sizeable platforms. Furthermore, we explore the stylized fact that inorganic growth strategies, which are often referred to as "leveraged build-ups", are financed by additional debt. Our results provide empirical support for this as we find that add-on acquisitions are likely to be made when financing conditions at entry of the PE sponsor are favorable.

We provide two additional analyses to investigate whether the identified drivers of add-on acquisition activity also translate into higher add-on productivity and speed. First, we obtain similar results when regressing on productivity measures that indicate the number of add-ons per buyout/year of the holding period. Second, we use a survival analysis framework to examine the time it takes to make the first add-on acquisition. We find that the hazard rate for an add-on increases right after the entry until approximately one year and then decreases steadily as time passes. If multiple add-ons are made, the hazard rate peaks after already 7-8 months and decreases more steeply thereafter. These findings suggest that portfolio firms execute add-ons quickly after the entry of the PE sponsor and accelerate the execution of the first add-on if there are follow-on acquisitions. We carry out several multivariate analyses, including accelerated failure time (AFT), Fine and Gray (1999) competing-risks and Heckman (1979) selection models, to test for sensitivity of acquisition speed to buyout, portfolio firm and PE sponsor characteristics as well as industrial and economic conditions. For all of these estimations, we find that covariates which correlate with higher add-on acquisition probability also correlate with an acceleration of the first add-on acquisition. In sum, these findings indicate that quick add-on execution is important for an inorganic growth strategy, most likely because add-ons imply several time-consuming processes, e.g., in terms of organizational integration and monitoring, that likely delay the PE sponsor's exit if add-ons are made too late.

Next, we are interested in firm-level determinants for cross border and industry diversifying acquisitions under PE ownership. Existing literature suggests that these types of acquisitions suffer from high information asymmetries and coordination costs that can be reduced through learning gains and experience building in different country and industry contexts (e.g. Dikova et al., 2010; Hayward, 2002; Very and Schweiger, 2001). We therefore investigate how interna-

tional and inter-industrial acquisition experience at the portfolio and PE firm level affect the probability for cross border and industry diversifying acquisitions. Our results indicate that portfolio firms without any prior acquisitions at entry of the PE sponsor have significantly lower probability for cross border/industry diversifying acquisitions than firms with M&A experience. We also disentangle the impact of the type of acquisition experience and find that uninternationalized/undiversified firms, i.e., firms with domestic and intra-industrial M&A experience, have higher probability for a cross border/industry diversifying inorganic growth strategy than for no inorganic growth strategy at all. However, on average, cross border/industry diversifying inorganic growth strategies are most likely if the portfolio company already draws upon international/inter-industrial M&A experience at entry. At the PE firm level, our results indicate that experience across countries/industries increases the probability for internationalization/diversification of the portfolio firm. This is in line with existing theory suggesting that geographic/industrial diversification of PE firms creates learning gains, network advantages and possibilities for knowledge transfer among portfolio firms (e.g. Humphery-Jenner, 2013; Humphery-Jenner et al., 2016; Meuleman and Wright, 2011). In sum, we find evidence for the hypothesis that high return expectations and short investment horizons in the PE industry incentivize PE firm managers to rely on internationalization/diversification strategies if firm-level acquisition experience makes cross border/industry diversifying acquisitions relatively less costly.

Finally, we investigate how add-on acquisitions affect the choice of the exit channel. Existing literature suggests that Initial Public Offerings (IPOs) are the preferred exit route for PE firms because they provide the most return potential (Cao and Lerner, 2009; Nikoskelainen and Wright, 2007). Jenkinson and Sousa (2015) argue that financial buyouts can be attractive too because they are quicker than IPOs and entail less transaction costs and more certain proceeds. Our results indicate that add-on acquisitions increase the probability for both exit channels. Consistent with our previous findings, the effect on financial exits is driven by deals that continue the inorganic growth strategy in the subsequent buyout. Our exit channel regressions control for cross-sectional differences in add-on acquisition probability and can therefore not be

explained by non-random selection. They also hold across different types of inorganic growth strategies, i.e., independent of domestic/cross border and industry penetrating/diversifying add-on acquisitions.

This paper makes a number of contributions to existing literature.

First, we contribute to the evolving literature on the maturing of the PE industry and its impact on PE activity. Recent studies document the surge of secondary buyouts (e.g. Arcot et al., 2015; Degeorge et al., 2016; Jenkinson and Sousa, 2015), co-investments of limited partners (Fang et al., 2015) as well as declining return persistence of buyout funds (Braun et al., 2017) as a result of more liquidity and competition in the PE market. This study adds another dimension to this discussion by documenting that inorganic growth strategies have become an important feature of PE activity.

Second, we contribute to previous literature on add-on acquisitions under PE ownership (e.g. Acharya et al., 2013; Nikoskelainen and Wright, 2007; Valkama et al., 2013). Existing studies provide small-scale evidence on return potential of add-on acquisitions.[3] In contrast, we aim at understanding the add-on acquisition market including large-scale evidence on the determinants of add-ons at the buyout, portfolio firm, PE sponsor and industry/economy level. Furthermore, we provide insights into the logic of inorganic growth strategies including timing decisions for add-on acquisitions and determinants of the nature of inorganic growth strategies.

Third, we add to previous studies that shed light on the heterogeneity of buyout, portfolio firm and PE sponsor characteristics as well as industrial and economic conditions in the PE market. Several papers investigate the motivation for public-to-private buyouts (e.g. Bharath and Dittmar, 2010; Mehran and Peristiani, 2010; Renneboog et al., 2007). The findings of this study are in line with Boucly et al. (2011) and suggest that public-to-private buyouts are not driven by growth opportunities. Another literature stream aims at disentangling the rationale and determinants of secondary buyouts (e.g. Arcot et al., 2015; Bonini, 2015; Degeorge et al., 2016; Wang, 2012). We show that secondary buyouts frequently exploit unused inorganic growth

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[3] In line with these studies, we find in unreported regressions that deals with add-on acquisitions have significantly higher deal enterprise value growth.

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potential of the portfolio firm, which indicates that they are motivated by an economic rationale rather than by mere collusion. We furthermore contribute to the discussion about agency (e.g. Cotter and Peck, 2001; Weir et al., 2005) versus entrepreneurship-based (Bruining et al., 2013; Meuleman et al., 2009a; Wright et al., 2001) explanations for management buyouts, with our findings lending support for the former. In terms of PE sponsor characteristics, there is extant literature on the impact of PE sponsor reputation and experience on financing (Demiroglu and James, 2010) and performance (e.g. Alperovych et al., 2013; Nahata, 2008). We provide evidence that these sponsor characteristics also increase the probability for add-on acquisitions. Finally, this study focuses on industrial and economic drivers of inorganic growth strategies and is therefore related to studies which examine sensitivity of PE activity to industrial and economic conditions (e.g. Axelson et al., 2013; Boucly et al., 2011).

Fourth, our findings have implications for the literature on internationalization and industry specialization/diversification in the PE industry. Previous studies on internationalization focus on PE firms investing across borders (e.g. Bertoni and Groh, 2014; Cao et al., 2015; Espenlaub et al., 2015; Meuleman and Wright, 2011). We depart from these studies by analyzing portfolio firms investing across borders. There are also a number of studies that discuss specialization versus diversification across regions and industries of PE firms (e.g. Cressy et al., 2007; Gejadze et al., 2016; Humphery-Jenner, 2013; Rigamonti et al., 2016). This paper provides novel evidence that internationalization/diversification of portfolio companies benefits from investment activity of PE sponsors across border and industries. Our findings are finally related to the literature about benefits from learning gains in M&A (e.g. Aktas et al., 2013; Hayward, 2002) by showing that the probability for an inorganic growth strategy, and in particular for cross border/industry diversifying acquisitions, strongly depends on firm-level acquisition experience.

Fifth, we contribute to literature on the exit strategy of PE firms (e.g. Bertoni and Groh, 2014; Cao, 2011; Espenlaub et al., 2015; Giot and Schwienbacher, 2007; Jenkinson and Sousa, 2015; Rigamonti et al., 2016). To the best of our knowledge, this is the first paper to show that add-on acquisitions during the holding period increase the probability for IPOs and, in case there is potential for further add-ons, for financial buyouts.

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The remainder of this paper is structured as follows. Section 2 discusses the theoretical background and related literature. In Section 3, we explain the sample construction process and present descriptive and summary statistics. Section 4 discusses empirical results along our three major research questions. Section 5 concludes.

2 Theoretical background and related literature

2.1 Determinants of add-on acquisitions

A portfolio company's development under PE ownership is a function of the PE sponsor's investment strategy including the way the PE sponsor intends to create value. In the following, we review the most important determinants that are likely to affect whether PE sponsors implement inorganic growth strategies. We focus on four sets of factors: buyout characteristics, portfolio firm characteristics, PE sponsor characteristics, and industrial and economic conditions.

2.1.1 Impact of buyout characteristics

Public-to-private buyouts. Previous literature on public-to-private buyouts allows for competing hypotheses regarding the relationship to add-on acquisitions. The traditional life cycle perspective of the firm, on the one hand, suggests that firms go public to realize growth opportunities (Lowry, 2003) and benefit from the market for corporate control (Brau and Fawcett, 2006). Financing of acquisitions should also be relatively easy as a public firm because of access to capital (Celikyurt et al., 2010). Thus, at the time of the public-to-private buyout, the portfolio firm may have realized inorganic growth already, which should reduce the probability for add-on acquisitions. This line of argumentation is consistent with Boucly et al. (2011), who find that public-to-private buyouts do not spur growth. On the other hand, there is empirical evidence that firms go private if they cannot sufficiently benefit from the market for corporate control (Bharath and Dittmar, 2010) because of, e.g., lack of financial visibility (Mehran and

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Peristiani, 2010) and high agency costs (Renneboog et al., 2007). Going private through PE may therefore be a reasonable option to relieve such growth constraints and facilitate inorganic growth.

Financial buyouts. We expect that add-on acquisition probability in financial buyouts is contingent to the value creation strategy of the previous PE owner. Recent findings by Degeorge et al. (2016) provide evidence for complementary skill sets between the buyer and seller in subsequent buyouts. Accordingly, if the primary buyout relies on an inorganic growth strategy, then it would be reasonable to assume that the secondary buyout focuses on different value creation measures and vice versa. In contrast, it is also possible that secondary buyouts continue the inorganic growth strategy of a primary buyout if the primary buyout's PE sponsor does not fully exploit the platform's potential for add-on acquisitions (Wang, 2012). A PE sponsor in the primary buyout may face a trade-off between realizing the full add-on potential and exiting the investment quickly because too many add-ons in a single buyout likely prolong the holding period and are thus costly (Bacon et al., 2012). The PE sponsor in the primary buyout has therefore an incentive to not exploit the full add-on potential and leave over acquisitions to a subsequent buyout.

Syndication. We have divergent expectations on the relationship between syndication and add-on acquisition probability. On the one hand, there are arguments for an increase of add-on acquisition probability through syndication. Lockett and Wright (2001) and Meuleman et al. (2009b) suggest that syndication improves deal flow, which should be positive for the identification of a sufficient number of add-on targets. Syndicates also draw upon a greater pool of resources than stand-alone investors (Brander et al., 2002; Lockett and Wright, 2001) and can therefore devote sufficient attention to the integration of add-on acquisitions. Syndication costs, on the other hand, could impede inorganic growth strategies. For example, transaction and agency costs arise from coordination (Wright and Lockett, 2003) and moral hazard (Pichler and Wilhelm, 2001) among syndicate members. Inorganic growth strategies likely amplify syndication costs because, next to the initial platform acquisition, they require coordination with non-syndicate members (e.g. owners, lawyers, advisers, banks etc.) for every add-on acquisi-

tion. Deals with inorganic growth strategies also require active and continuous involvement of the PE sponsor, e.g., in terms of add-on origination, organizational integration and monitoring of the merged entity. They may therefore face greater potential for moral hazard than deals with less involvement into the operations and organizational structure of the portfolio firm.

Management participation. Previous literature allows for competing hypotheses on add-on acquisitions probability in management buyouts. The traditional agency-based perspective on management buyouts suggests that add-on acquisitions are less likely to occur as compared to purely institutional buyouts. This perspective assumes that management buyouts are motivated by improved governance (Weir et al., 2005), more effective monitoring (Cotter and Peck, 2001) and the reduction of agency costs of free cash flow (Jensen, 1986). In line with this perspective, several studies indicate that management buyouts are resource-constrained (Andrade and Kaplan, 1998) and improve operating efficiency (e.g. Amess, 2002; Bull, 1989; Harris et al., 2005; Kaplan, 1989). However, there is also an entrepreneurship-based perspective on management buyouts, which argues that management buyouts enhance entrepreneurial management practices (Bruining et al., 2013) and create incentives for growth (Meuleman et al., 2009a; Wright et al., 2001). Zahra (1995) provides empirical support for this perspective by observing that portfolio firms intensified product and new venture development in management buyouts. Thus, the entrepreneurship-based perspective indicates that add-ons are more likely to occur in management buyouts as compared to purely institutional buyouts.

2.1.2 Impact of portfolio firm characteristics

Number of prior acquisitions. We formulate competing predictions on the relationship between a portfolio firm's acquisition experience and add-on acquisition probability. On the one hand, there is reason to suspect that add-on acquisition probability is high if the portfolio firm has little or no acquisition experience, as untapped inorganic growth potential likely offers high marginal return potential to a PE firm. Such firms should furthermore be less diverse and complex (Aktas et al., 2013), which reduces the probability that a PE manager's attention is distracted from the inorganic growth strategy (Humphery-Jenner, 2013). Alternatively, add-on

acquisition probability could be high in case of experienced portfolio firms because it is likely that these firms can make acquisitions faster and more efficiently. Servaes and Zenner (1996) assume that acquisition experience reduces transaction costs for subsequent acquisitions. Aktas et al. (2013) furthermore argue that time between deals of repetitive acquirers may decrease because of experience building, which should be attractive to PE sponsors given their holding period constraints (Kaplan and Strömberg, 2009).

Firm size. We expect a positive relationship between firm size and add-on acquisition probability for several reasons. First, inorganic growth strategies typically rely on a platform that has a scalable competitive advantage and known reputation for a particular service or product (Smit, 2001) and these characteristics should be more frequently in place for relatively large companies. Second, a sizeable platform provides capacity and infrastructure for the integration of subsequent acquisitions (Brown et al., 2005). Third, the industrial logic of an inorganic growth strategy relies on achieving size to benefit from scale economies, market power and improved valuation (Smit, 2001). While size can also be reached if a small platform buys up several small add-ons, we expect that a large platform can achieve the same effect faster, which is important to PE firms given their incentives to exit the deal quickly (Jenkinson and Sousa, 2015). Finally, larger firms have broader access to financing (e.g. Beck and Demirguc-Kunt, 2006; Berger and Udell, 1998). This should be advantageous because add-on acquisitions are typically financed by additional debt (Smit, 2001). However, the advantageousness of firm size may have limits. Humphery-Jenner (2013) argues that large firms require more attention from the PE sponsor. Thus, because add-on acquisitions increase firm size, there is latent risk that PE firm managers are overstretched and that attention to the portfolio firm is diluted (Cumming and Dai, 2011). In addition, it should be reasonable to assume that potential for growth decreases with firm size. We therefore expect that add-on acquisition probability is somewhat lower for mega buyouts, as compared to mid cap and large cap buyouts, but still higher than for small cap deals.

2.1.3 Impact of PE sponsor characteristics

Number of prior acquisitions. We expect that acquisition experience of the PE firm increases add-on acquisition probability. Alperovych et al. (2013) and Meuleman et al. (2009a) argue that PE firms with more acquisition experience have access to a superior deal flow and can therefore easily identify potential acquisition targets for their portfolio companies. More acquisition experience furthermore implies more frequent interaction with banks and other PE firms, which facilitates access to add-on targets beyond the proprietary deal flow (Hochberg et al., 2007; Meuleman and Wright, 2011). In terms of making and integrating add-on acquisitions, the same argumentation applies as for portfolio firms: acquisition experience likely helps to acquire at less transaction costs and integrate add-ons faster.

Reputation. We expect to observe inorganic growth strategies more frequently if the PE sponsor has strong track-record and reputational capital. Nahata (2008) argues that reputable PE firms have a broader set of investment opportunities and are more likely to have connections and network, e.g., to lawyers, advisors or investment banks, that can be valuable for the origination and execution of add-on acquisitions. Furthermore, Demiroglu and James (2010) find that reputable PE sponsors provide the portfolio firm with access to financing at favorable terms, which should be advantageous for the financing of add-on acquisitions.

2.1.4 Impact of industrial and economic conditions

Industry fragmentation. We conjecture that add-on acquisitions are likely when the portfolio firm operates in a fragmented industry with sufficient number of sizeable platforms. Fragmented industries should generally be advantageous to PE investors due to the large number of available targets and the potential for industry consolidation (Brown et al., 2005; Kaplan and Strömberg, 2004). However, we expect that the degree of fragmentation is critical because, as discussed previously, inorganic growth strategies should benefit from a sizeable platform with known reputation and sufficient capacity to integrate add-ons. Thus, PE firms may look for industries that provide both room for consolidation and large enough platforms, i.e., for industries with

a moderate degree of fragmentation.

Debt market conditions. Finally, we expect that favorable debt market conditions increase add-on acquisition probability. Axelson et al. (2013) document that availability of sufficient debt financing is an important determinant of PE activity in general. The importance of debt financing should be amplified for inorganic growth strategies, which are often referred to as "leveraged build-ups", because PE sponsors typically use debt to finance add-on acquisitions (Smit, 2001).

2.2 Nature of add-on acquisitions

Add-on acquisitions differ in terms of complexity and costs depending on whether they are made within or outside the portfolio company's country of origin and/or industry.

A plethora of existing literature suggests that cross border and industry diversifying acquisitions, i.e., acquisitions outside the platform's country/industry, are particularly costly. Before the transaction, there are information asymmetry problems as the target operates in a non-familiar context (Akerlof, 1970). The resulting uncertainty about the target's quality create costs of information acquisition (Capron and Shen, 2007; Servaes and Zenner, 1996) and can lead to adverse selection (Balakrishnan and Koza, 1993; Humphery-Jenner et al., 2016) or mispricing (Reuer and Ragozzino, 2008). Acquirers also face more contracting costs than in domestic or industry penetrating acquisitions because, with information asymmetries in place, negotiations take longer and fees to advisors accumulate for a longer period of time (Boeh, 2011; Kesner et al., 1994). In the PE context, these information asymmetry problems should be amplified as portfolio firms and add-on targets are non-listed and thus suffer from poor availability of information (Capron and Shen, 2007; Officer, 2007). After the acquisition, costs arise from additional complexity and coordination costs. For example, acquiring firms need to handle unfamiliar legal systems, accounting standards and national cultures in case of cross border acquisitions (e.g. Ahern et al., 2015; Erel et al., 2012) and manage interdependencies between different business lines in case of industry diversifying acquisitions (Zhou, 2011).

PE firms should be sensitive to additional costs from cross border/industry diversifying acqui-

sitions as such costs may jeopardize the intended return and investment horizon. We therefore expect that PE firms only rely on cross border/industry diversifying inorganic growth strategies if the marginal costs from cross border/industry diversifying acquisitions are comparatively small.

Previous literature suggests that firm-level acquisition experience, and in particular international/inter-industrial M&A experience, can effectively reduce costs associated with cross border/industry diversifying acquisitions (e.g. Aktas et al., 2013; Collins et al., 2009; Dikova et al., 2010; Hayward, 2002; Very and Schweiger, 2001).

At the portfolio firm level, firms with international/inter-industrial acquisition experience at entry draw upon previous organizational learning and the accumulated soft information on a specific country/industry context (Collins et al., 2009; Dikova et al., 2010; Very and Schweiger, 2001). This reduces transaction costs for cross border/industry diversifying acquisitions and should imply that PE firms need to allocate less resources to management and monitoring of the acquisition and integration process. As a result, PE firms face less opportunity costs and less risk of an adverse impact on return or holding period, which should make cross border/industry diversifying inorganic growth strategies more likely.

At the PE firm level, there are a number of previous studies suggesting that investment experience across countries/industries increases the probability for cross border/industry diversifying acquisitions of the portfolio firm. Meuleman and Wright (2011) argue that PE firms which frequently invest across border have lower institutional barriers because of learning gains. Humphery-Jenner and Suchard (2013) and Humphery-Jenner et al. (2016) put forth that such firms are also likely to have better local networks. Similar argumentation can be found for PE firms that frequently operate across industries (e.g. Humphery-Jenner, 2013). In addition, portfolio firms may not only directly benefit from the PE sponsor but also indirectly from knowledge sharing with other portfolio companies (Humphery-Jenner, 2013). Accordingly, a portfolio that is diversified across countries and/or industries may facilitate transfer of knowledge about country or industry specifics among portfolio firms.

2.3 Add-on acquisitions and exit channels

A PE firm can successfully exit its portfolio company by selling it to a strategic ("trade sale") or financial buyer ("financial buyout" or "secondary/tertiary/quarternary buyout") and by filing for initial public offering ("IPO"). Unsuccessful exits can furthermore occur if the portfolio company is bankrupt and needs to be liquidated ("default"). The available exit channels differ in terms of attractiveness. Several existing studies suggest that IPOs are most attractive because they generate above average rates of return (e.g. Cao and Lerner, 2009; Nikoskelainen and Wright, 2007). However, IPOs have the disadvantage of uncertain proceeds (e.g. Lowry et al., 2010), high transaction costs (e.g. Ritter, 1987) and lock-up periods that delay the PE firm's full exit (e.g. Cao, 2011). Jenkinson and Sousa (2015) therefore suggest that financial buyouts can be relatively attractive too, as they provide the opportunity for a safe, efficient and quick sale of the portfolio company.

We expect that deals with add-on acquisitions increase the probability for an exit through IPO because add-ons increase the size of the platform portfolio company. Firm size is an important determinant of IPO probability because larger firms are better able to bear the high fixed costs of an IPO and are more visible and thus more likely to attract analyst and investor interest (e.g. Brau et al., 2003; Pagano et al., 1998). Consistent with this line of argumentation, Nikoskelainen and Wright (2007) document that portfolio firms exited through IPO are, relative to portfolio firms exited through other channels, largest in size.

Analogous to our previous argumentation, we formulate two alternative hypotheses on the relationship between add-on acquisitions and financial exits. The "complementary skill hypothesis", on the one hand, suggests that add-on acquisitions correlate with a sale to a financial buyer if the inorganic growth strategy is completed so that the subsequent PE firm can focus on complementary value creation measures. The "continuation hypothesis", in contrast, assumes that add-on acquisitions correlate with a sale to a financial buyer if the portfolio firm has left-over potential for acquisitions that the subsequent PE owner can exploit, i.e., if the subsequent PE owner can continue an inorganic growth strategy from the previous buyout.

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3 Data

3.1 Sample construction

In the first step, we select all buyouts which have been completed between 1 January 1997 and 31 December 2010 using Bureau van Dijk's deal database "Zephyr".[4] We include institutional buyouts (IBO) and PE sponsor-backed management buyouts (MBO), management buy-ins (MBI) or buy-in management buyouts (BIMBOs) for which the financing is classified as either "private equity" or "leveraged buyout". We do not include venture capital buyouts and private investments in public equity (PIPEs).

In the second step, we check for exit transactions and ownership status as of 31 December 2012. We use Zephyr, LexisNexis, Google News and official PE and portfolio firm websites to verify the current status of the portfolio firm. We keep all deals with known exit channel and/or date ("exited buyouts") as well as unexited deals where we can verify PE ownership as of 31 December 2012 ("unexited buyouts"). This leaves us with 9,548 worldwide buyouts covering the period 1 January 1997 to 31 December 2012. Of these buyouts, 5,093 have known exit and holding period whereas the remainder has been in PE portfolio as of 31 December 2012.

In a third step, we identify add-on acquisitions under PE ownership for both exited and unexited buyouts. We start by obtaining the portfolio company's entire acquisition history from Zephyr and search for acquisition events that have been recorded for the period of PE ownership. We add acquisition events that we find in LexisNexis, Google News as well as on the portfolio and PE firm websites. Finally, we apply the same sampling strategy to identify mergers of portfolio companies where two (or more) individual buyouts end up in a single portfolio company. For these cases, we follow Strömberg (2008) and keep one single buyout where we treat the portfolio company that was acquired at first as the platform and all other portfolio companies that are part of the merger as add-on acquisitions. We end up with 2,497

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[4] We do not include deals that were announced but not yet completed. Because Zephyr does not always report the deal status accurately, we manually checked the status of all announced buyouts employing publicly available information sources.

deals with inorganic growth strategy, i.e., including at least one add-on, and a total of 4,937 add-on acquisitions.

3.2 Descriptive statistics

Table 1 Panel A depicts the distribution of deals and add-on acquisitions by entry (exit) and add-on acquisition year. The distribution of the overall buyout sample is relatively similar to the sub-sample of deals with add-on acquisitions. Add-on acquisition activity has been steadily growing, in absolute and relative terms, until 2007. The drop in add-on acquisition activity during the 2008-2009 Global Financial Crisis has been less severe than for the overall buyout market.

Insert Table 1 about here.

Table 1 Panel B depicts the distribution of deals and add-on acquisitions across industries.[5] Most buyouts are in "business services" (11.2%). The same holds true for deals with add-on (13.5%) and add-on acquisitions themselves (14.8%). For "business services", "computer software", "healthcare & pharma" as well as "personal services", deals with add-on and add-on acquisitions cluster more than buyouts; for "fabricated products/machinery" as well as "retail", they cluster less. "Computer software" is the most active industry when comparing deals with add-on (222) to the overall number of buyouts (612).

Table 1 Panel C depicts the distribution of deals and add-on acquisitions across countries. The United States (36.4%) account for the largest number of buyouts, followed by the United Kingdom (19.3%), France (9.5%) and Germany (7.5%). These countries also exhibit the largest number of deals with add-on and add-on acquisitions. Comparing the country distributions across the samples, we observe that deals with add-on and add-on acquisitions cluster relatively

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[5] Throughout the whole paper, we refer to an extended version of the Fama and French 30 industry classification scheme where we break down the category "services" into its individual components "personal services", "business services" and "computer software" to obtain a more balanced distribution across the industry classification codes. This procedure yields 32 different industries.

more in the United States than in other countries. Finland denotes the most active market for deals with add-on (55) relative to the overall number of buyouts in this country (133).

We believe that the distribution of our sample provides a representative picture of the global buyout market. The increasing popularity of Zephyr among PE (e.g. Rigamonti et al., 2016; Tykvová and Borell, 2012; Wang, 2012) and M&A (e.g. Erel et al., 2015; Karolyi et al., 2015) researchers also indicates that Zephyr data is reliable. Erel et al. (2015) even argue that Zephyr coverage of private firm acquisitions is better than that of traditional M&A data providers such as SDC. Because PE research often draws upon Capital IQ, we benchmark our distribution against those of Strömberg (2008) and Axelson et al. (2013), two other recent studies with worldwide coverage, in Appendix A.1. We compare the coverage across world regions to address the concern that Zephyr, as a European data provider, has inferior coverage of non-European deals. However, the distribution across the different world regions does not point at systematic differences in coverage. Western European (North American) deals account for 52.9% (40.3%) in our sample compared to 49.9% (38.3%) in Strömberg (2008) and 50.1% (49.0%) in Axelson et al. (2013). As we can only compare the coverage for the period 2001-2007, where our sample overlaps with Strömberg (2008) and Axelson et al. (2013) and where data is consistently reported in both studies, there could still be bias for the years 1997-2000. We address this concern in Section 4.1.4.

In Figure 1, we present a concentration curve depicting the distribution of add-on acquisitions over the population of PE firms in the sample. The y-axis denotes the cumulative proportion of add-on acquisitions and the x-axis the cumulative proportion of PE firms (ranked from highest to lowest number of add-on acquisition involvements). Such an illustration is useful to examine whether add-on acquisitions are equally distributed over the entire PE market, which would be indicated by a 45° line, or concentrated among a small proportion of PE firms. The curve plotted in Figure 1 is rather bent and thus indicates high concentration. Approximately 16% of the 1,798 PE firms in the sample account for 80% of all add-on acquisitions and only 43% of PE firms are involved into the add-on market at all.

Insert Figure 1 about here.

Table 2 Panel A depicts summary statistics for the dependent variables used in our regression models (see Appendix A.2 for a detailed definition of all variables).

- *Activity.* Approximately 26% of the 9,548 deals in the sample involve at least one add-on acquisition. Portfolio firms exhibit an average of 0.52 add-ons per buyout and 0.12 add-ons per year of the holding period.

- *Timing.* Deals with inorganic growth strategy make the first add-on, on average, after 1.56 years. However, timing of the (first) add-on depends on the total number of add-ons of the inorganic growth strategy. In case of only one acquisition, this acquisition is made after 1.83 years, whereas the first add-on is made after already 1.23 years if the portfolio firm makes more than one add-on.

- *Nature.* The majority of inorganic growth strategies is of domestic nature: 65% of deals with inorganic growth strategy make all add-ons in the portfolio company's country of origin (17% of all deals in the sample), whereas only 35% make at least one add-on outside the portfolio company's country of origin (9% of all deals in the sample). Approximately 53% of deals with add-on (14% of all deals in the sample) rely on an industry penetrating inorganic growth strategy where all add-ons are in the same Fama and French industry as the platform. The remaining 47% (13% of all deals in the sample) involve at least one industry diversifying acquisition, i.e., at least one acquisition outside the platform's Fama and French industry.[6]

- *Exit Channel.* We observe the exit channel for 5,093 buyouts. Trade sales, IPOs, financial

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[6] Servaes and Zenner (1996) suggest that acquisitions of firms with different industry classification code suffer from greater information asymmetries. Thus, our definition of industry diversifying inorganic growth strategies should be well-suited to investigate the hypothesis that acquisition experience is more valuable when inorganic growth strategies involve acquisitions with relatively more transaction costs. Note that our definition does not necessarily serve to differentiate between horizontal and vertical acquisitions. While acquisition within the platform's industry classification code should usually be horizontal (Capron, 1999), an acquisition of a firm with different industry classification code can be both vertical or diversifying depending on the degree of relatedness or product similarity. Hoberg and Phillips (2010) and Fan and Goyal (2006), for example, show that even two merging firms with different industry classification codes can have relatively high degree of product similarity and potential for vertical integration. A priori, it is reasonable to assume that the vast majority of industry diversifying acquisitions in our sample are related to the platform because it should be unlikely that PE firms aim at building a conglomerate of unrelated firms during the holding period. However, we cannot explicitly test for this as it is very difficult to obtain data about product similarities or input-output ratios of non-listed and PE-owned firms.

buyouts and defaults account for 47%, 7%, 36% and 10% of these exits, respectively.

Insert Table 2 about here.

Table 2 Panel B depicts summary statistics for the independent variables used in our regression models.

- *Buyout characteristics.* The majority of buyouts are private-to-private buyouts (43%). Divisional buyouts denote the second largest entry channel (28%). Financial and public-to-private buyouts account for 20% and 7% of buyouts, respectively. Syndicates account for 17% of the sample and approximately 16% of all deals are buyouts with management participation.

- *Portfolio firm characteristics.* The vast majority of deals (80%) involves portfolio firms without acquisitions experience at the time of the buyout. On average, portfolio firms made 0.63 acquisitions before the buyout.[7] The majority of firms with acquisition experience has not made cross border acquisitions (70% of firms with prior acquisitions; 14% of the sample) and has not acquired firms with a different Fama and French industry classification code (60% of firms with prior acquisitions; 12% of the sample) before the buyout. We report the imputed deal enterprise value as a proxy for firm size.[8] The respective average (median) deal enterprise value is 230.4 (97.3) million Euro and the majority of deals (90%) are small or mid cap deals with deal value up to 700 million Euro.[9] This is well in line with Phalippou (2014) and L'Her et al. (2016).

- *PE firm characteristics.* PE sponsors made, on average, 12.5 transactions before the buyout. Gompers and Lerner (1999) argue that returns from past funds serve as a good proxy for a

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[7] Note that the *net number of prior acquisitions* is lower because, for financial entries, this variable nets out the portfolio firm's acquisitions from the previous buyout. It is necessary to construct this variable to avoid a double count of acquisitions when also including *financial inorganic* into the regression model.

[8] For deal value imputation, we use a Heckman (1979) maximum likelihood estimation following the methodology of Strömberg (2008) and Arcot et al. (2015). The first stage regression estimates the probability for deal value disclosure, whereas the second stage regression is a maximum likelihood estimation of the natural logarithm of the deal enterprise value controlling for the inverse Mills ratio obtained from the first stage. We impute 60% of the deal values, which is roughly similar to Strömberg (2008) and Arcot et al. (2015), who impute 58% and 63% of deal values, respectively. Appendix A.3 presents results and further details.

[9] Note that deal value imputation is particularly important to make sure that smaller deals are not unrecorded. For example, without imputation, the mean deal enterprise value would be considerably higher at 343.5 million Euro.

PE firm's reputation. We therefore construct a variable *PE HEC-DJ ranked* equal to one if the PE sponsor is listed in the HEC-Dow Jones Private Equity Performance Ranking of 2011, which ranks PE firms according to their aggregated IRR of funds raised between 1998 and 2007, and zero otherwise. Accordingly, 7% of deals in the sample are backed by high reputation PE sponsors. We follow the approach of Cressy et al. (2007) and use the Index of Competitive Advantage (ICA) to construct measures of a PE firm's country and industry specialization/generalization. Accordingly, 34% of all deals are backed by PE firms without country focus, i.e., by *country generalists*, and 69% by PE firms without industry focus, i.e., by *industry generalists*.

- *Industrial and economic environment.* The average (median) option-adjusted high yield spread is at an index value of 576.9 (406.4). Industries with a Herfindahl-Hirschman Index (HHI) between 0 and 500, i.e., industries with relatively high fragmentation, account for the majority of buyouts. According to the thresholds given by the U.S. Department of Justice, virtually all buyouts (99%) are in competitive marketplaces with HHI below 1500. Portfolio firms in the sample operate in industries with an average (median) three year sales growth of 9.5% (9.2%).

4 Empirical results

4.1 Determinants of add-on acquisitions

At first, following our theoretical discussion, we are interested in the determinants of add-on acquisitions in PE buyouts to figure out systematic drivers for inorganic growth strategies at the buyout, portfolio firm, PE sponsor and industry/economy level. We discuss activity measures (i.e., what determines the occurrence of add-ons in general?), productivity measures (i.e., what determines how many add-ons are made?) and speed measures (i.e., what determines how quickly add-ons are made?) in Sections 4.1.1, 4.1.2 and 4.1.3, respectively. In Section 4.1.4, we address endogeneity, sample selection and variable construction issues.

4.1.1 Add-on acquisition activity

In Table 3, we explore determinants of general add-on acquisition activity. We run logit regressions on a dependent variable that is equal to one if the deal exhibits at least one add-on acquisition under PE ownership and zero otherwise.[10] We present several specifications that sequentially add controls and interaction effects.

Insert Table 3 about here.

In specification (1), we explore the effect of buyout and portfolio firm characteristics and control for industry, year, country and PE sponsor characteristics through fixed effects. We find that add-ons are significantly less likely to occur in public-to-private buyouts, as compared to private-to-private buyouts (the omitted category). The effect of financial buyouts is statistically insignificant. We find negative and statistically significant coefficients for syndicated buyouts and buyouts with management participation. A portfolio firm's number of prior acquisitions, which captures acquisition experience, increases the likelihood for add-on acquisitions, similar to a larger deal enterprise value, which we use to proxy for firm size.

In specification (2), we split up the indicator for an entry through financial buyout to control for the deal strategy of the previous PE sponsor. This step has two purposes. First, it allows us to investigate whether the secondary (or tertiary/quarternary) buyout continues the deal strategy of the previous buyout or focuses on complementary value creation measures. Second, the variable *LN (1 + PF # of prior acq)* could absorb the effect of a financial buyout if the portfolio firm made acquisitions in the previous buyout. This may bias the coefficient of *financial* and overestimate the effect of *LN (1 + PF # of prior acq)*. We therefore replace *financial* with

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[10] We regress on the full sample of 9,548 buyouts including both exited and unexited buyouts. The major advantage of including unexited buyouts is that we do not truncate deals and thus use more information. For example, by truncating the 4,455 deals without exit, we would omit that 1,084 of them made a total of 2,225 add-on acquisitions until the end of the observational period. Note that, because add-ons are on average made within the first two years of the holding period (see Section 3.2), it is necessary to observe at least two years of PE ownership to avoid underestimation of add-ons for unexited buyouts. Our sampling process requires that unexited buyouts have a minimum duration of two years and thus the distribution of add-ons is very similar across exited and unexited buyouts. Nevertheless, we address sensitivity of results to an exclusion of unexited buyouts in Section 4.1.4.

financial organic and *financial inorganic*, two binary variables that indicate whether we observe at least one add-on acquisition in the previous buyout (*financial inorganic*) or not (*financial organic*), and *LN (1 + PF # of prior acq)* by *LN (1 + PF net # of prior acq)*, which is equal to the portfolio firm's number of acquisitions at entry net of the acquisitions it made under the PE owner in the previous buyout. The alternative specification yields interesting results. The coefficients for both *financial organic* and *financial inorganic* are statistically significant but have opposite signs, which suggest that add-ons are more likely to occur if the portfolio firm made acquisitions in the previous buyout, as compared to private-to-private buyouts, and less likely if it did not make acquisitions. The coefficient of *LN (1 + PF net # of prior acq)* is still positive and statistically significant, but decreases by roughly 50% in comparison to *LN (1 + PF # of prior acq)* in specification (1). The magnitude of the coefficient of *public-to-private* reduces and statistical significance vanishes when controlling for the more accurate measure of portfolio firm acquisition experience. The coefficient sign, however, still suggests a negative relationship to add-on occurrence.

In specifications (3) and (4), we explore size effects in more detail by replacing *LN (deal EV)* with dummy variables for small cap, mid cap, large cap and mega buyouts. We find that mid cap, large cap and mega buyouts are significantly more likely to make add-ons, as compared to small cap buyouts. Statistical and economic significance is largest for the *large cap* coefficient. Mega buyouts are not more likely to make add-ons than mid-cap buyouts.

In specification (5), we investigate the impact of PE sponsor characteristics and therefore drop PE sponsor fixed effects. We insert *LN (1 + PE # of prior acq)* and *PE HEC-DJ ranked* to model a PE sponsor's acquisition experience and reputation. We find that both variables significantly increase the likelihood for add-on acquisitions. The coefficient of *syndicated* is now insignificantly different from zero. Other results are unaffected.

In specification (6), we investigate the impact of industrial and economic conditions and therefore drop industry and year fixed effects. We insert the natural logarithm of the average option-adjusted high yield spread in the year of the buyout, *LN (OAS)*, to control for financing conditions at entry, as well as dummies for the degree of industry fragmentation and the average

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3-year industry sales growth to control for the industrial environment. We find that unfavorable financing conditions, in terms of higher spreads, significantly decrease the likelihood for add-on acquisitions. In comparison to highly fragmented industries with HHI of up to 500, add-on acquisitions are most likely in moderately fragmented industries with HHI between 1000 and 1500. We also find that add-ons are more likely to occur in industries with high 3-year industry sales growth. All other results remain robust.

In specification (7), we employ several interaction terms to analyze the relationship between *public-to-private* and add-on acquisition probability in more detail. We hypothesized that the effect of a public-to-private buyout may depend on whether the portfolio firm participated in the market for corporate control before the buyout. To test for this, we replace *LN (1 + PF net # of prior acq)* with *PF w/o net acq exp*, a binary variable indicating whether the portfolio company did not make acquisitions before the buyout, and interact this variable with *public-to-private*. The coefficient of the interaction term turns out to be positive, yet insignificant. The stand-alone coefficient of *PF w/o net acq exp* is negative and highly significant, which confirms our previous results. While public firms should generally have better access to financing (Celikyurt et al., 2010), there is empirical evidence that firms opt out for a public-to-private buyout if they lack financial visibility and fail to attract sufficient investor interest (Mehran and Peristiani, 2010). Thus, these firms may not participate in the acquisition market because they are financially constrained. To test whether a public-to-private buyout can relieve such financial constraints, we interact *public-to-private* with *small cap*. The main idea behind this interaction term is that small public firms should have low visibility and thus problems to attract sufficient investor interest. Using *small cap* as a proxy for financial constraints is also in line with previous literature documenting that financially constrained firms are on average smaller (e.g. Angelini and Generale, 2008; Cabral and Mata, 2003). We find that the coefficient of the interaction term is negative and insignificant while coefficients of the stand alone variables remain unchanged.

In specification (8), we employ several interaction terms to test for variables that moderate the effect between firm size and add-on acquisition probability. We interact *small cap* with

financial inorganic, LN (1 + PF net # of prior acq), LN (1 + PE # of prior acq) and *PE HEC-DJ ranked*, which turned out to be buyout, portfolio firm, and PE sponsor characteristics with particularly strong relationship to add-on acquisitions, and detect a weakly significant and positive coefficient of the interaction term between *small cap* and *LN (1 + PE # of prior acq)*. However, coefficient size of the interaction term is relatively small, especially in comparison to the still negative and significant stand-alone coefficient of *small cap*.

Our main results regarding add-on acquisition activity can be summarized as follows.

- *Buyout characteristics.* We do not find convincing evidence for a statistically significant relationship between public-to-private buyouts and add-on acquisitions, most likely because portfolio firms have already realized inorganic growth opportunities as a public firm.[11] Explicit tests of the "financial constraints hypothesis" do not indicate that public-to-private buyouts help financially constrained firms to grow inorganically as a private firm. We find strong evidence for the hypothesis that add-on acquisition probability in financial buyouts is contingent to the deal strategy of the previous PE owner. In particular, the results suggest that PE sponsors in the subsequent buyout continue the inorganic growth strategy of the previous buyout. Evidence regarding syndicated buyouts is mixed. In terms of management participation, our results indicate a negative relationship to add-on acquisitions, which is consistent with the "agency perspective" on management buyouts.

- *Portfolio firm characteristics.* We find a positive and statistically significant relationship between a portfolio firm's acquisition experience and add-on acquisition probability, which is line with the transaction cost hypothesis. Our results also indicate a positive but non-linear relationship between firm size and add-on acquisition probability, with large cap buyouts having the highest add-on probability. This is in line with our expectation that large portfolio firms are particularly attractive for inorganic growth strategies because they provide a scalable platform with manageable complexity. We also tests for variables moderating the size effects but can only find weak evidence.

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[11] In line with this, our data shows that the average number of prior acquisitions at entry is by far greatest for public-to-private buyouts.

- *PE firm characteristics.* Our results indicate that acquisition experience and reputation of the PE sponsor positively affect add-on acquisition probability. This is consistent with the idea that portfolio firms benefit from deal-flow, network (e.g., to financial intermediaries and advisors) and access to financing of the PE sponsor when being active in the acquisition market.

- *Industrial and economic environment.* We find that add-on likelihood is high if the portfolio firm operates in an industry with moderate degree of fragmentation. This finding is line with our previous result that inorganic growth strategies require an at least mid-sized or even large platform, which will only be available if the industry is not too fragmented. Finally, our results indicate that implementation of an inorganic growth strategy correlates with favorable financing conditions and high 3-year industry sales growth.

4.1.2 Add-on acquisition productivity

Next, we explore determinants of add-on acquisition productivity. Productivity measures are informative because, in comparison to binary indicators for add-on activity, they should be less prone to confounding. For example, we cannot rule out that single acquisitions in the sample are the result of a suddenly appearing investment opportunity rather than of the determinants that we examine. This may affect a binary indicator that only takes into account whether add-ons are made or not. However, random incidences are unlikely to explain systematic differences in the number of add-ons per buyout/year of the holding period.

Table 4 presents regressions on two productivity measures. Specifications (1) and (2) are negative binomial regressions on the absolute number of add-ons.[12] Specifications (3) and (4) are tobit regressions on the number of add-ons relative to the holding period in years (with zero being the left censoring limit). Independent variables are similar to the regression models

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[12] We present results for negative binomial regressions because this is more appropriate than Poisson given that our data displays overdispersion. However, all results are robust to using Poisson. We also employ a zero-inflated negative binomial regression that can account for excess zeroes in the data. We model the occurrence of excess zeroes as a function of an indicator variable for unexited 2010 entries to address concerns about underestimation of add-ons for observations with a short "at risk-period". We obtain similar results.

presented in specifications (5) and (6) of Table 3.

Insert Table 4 about here.

The results regarding productivity measures are consistent with our previous findings. Coefficient estimates of buyout, portfolio firm, and PE firm characteristics have similar sign and remain statistically significant. Estimates regarding industrial and economic environment are unchanged except of *3-year industry sales growth* where coefficients are now insignificant. However, size and sign of the *3-year industry sales growth* coefficient are in line with our previous results. In sum, there is evidence that drivers of general add-on acquisition activity also translate into higher productivity.

4.1.3 Add-on acquisition speed

We are interested in the length it takes to make the first add-on acquisitions and in covariates affecting this duration. We expect that the speed with which acquisitions are executed is related to add-on activity. However, the ability to execute add-ons quickly is not identifiable from the static regressions of the previous section, as they do not take into account differences in add-on acquisition timing. Logit analyses, for example, put equal weight to add-ons that are made right after entry or just before exit and thus fail to control for each firm's period at risk (Shumway, 2001). When analyzing differences in add-on acquisition timing, one problem arises from the selected observability of add-on acquisition times. Consider the fact that our sample of 9,548 buyouts contains 2,497 deals with add-on acquisition, where the timing of the add-on is observable ("uncensored observations"), and 7,051 deals without add-on, where the time to add-on is not observable ("censored observations"). Conventional OLS or tobit regressions are inappropriate for this type of data because they can only estimate covariate effects if the time to add-on acquisition is known; i.e, they only yield estimates for the sub-sample of uncensored observations. As omission of the time to censoring can lead to a skewed distribution of add-on acquisition times, conventional OLS or tobit regressions may produce inconsistent coefficient

estimates. To resolve this problem, we make use of survival analysis methods, which are able to correct for censored observations but use information conveyed in time to censoring processes.[13]

Figure 2 depicts estimates of smoothed hazard rates for an add-on acquisition over the holding period. Hazard rates give the instantaneous probability of an add-on acquisition, conditional on not having made acquisitions up to this point in time, and include censored observations to construct a "risk-pool" for an add-on acquisition at each instant of time.[14] Panel (A) shows estimates if only one add-on acquisition is made. We observe that the hazard rate for an add-on increases right after the entry until approximately one year and then decreases relatively steadily as time passes. Panel (B) shows estimates if multiple add-ons are made. Compared to Panel (A), the hazard rate for the first add-on increases more rapidly, peaks after already 7-8 months, and decreases more steeply thereafter. In sum, these findings suggest that add-ons are made quickly after the entry and even more quickly if multiple acquisitions are made.

Insert Figure 2 about here.

Table 5 presents multivariate analyses of add-on acquisition timing in a survival-analysis framework.

In specifications (1) to (3), we utilize a parametric accelerated failure time (AFT) model following Espenlaub et al. (2015) and Giot et al. (2014) and refer to a generalized gamma density distribution to parameterize the baseline survivor function.[15] The dependent variable is equal to the natural logarithm of the time to an add-on acquisition. An apparent feature of the AFT model is its straightforward interpretation. The model contains a constant rescaling

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[13] See Giot and Schwienbacher (2007) for a detailed introduction to survival analysis.

[14] See Kiefer (1988) for a detailed introduction to hazard functions.

[15] Note that we also consider other functional forms such as exponential, Weibull, Gompertz, lognormal and loglogistic. However, log-likelihood values and the Akaike Information Criterion (AIC) clearly favor a generalized gamma distribution for our analysis. Because generalized gamma, Weibull and lognormal models are nested, we also perform a Wald test and clearly reject the null that Weibull and lognormal are appropriate. A graphical residual test using Cox-Snell residuals, finally, indicates the best model fit for a generalized gamma distribution. Because AFT models allow for overdispersion and random-effects, we also consider models with unshared frailty, where we assume the overdispersion parameter to be gamma distributed, and shared frailty, where we assume that latent common group effects are shared across different Fama and French industry classifications, entry years and countries. We find that these models yield similar results.

factor to the survival time so that covariate impact is multiplicative and can be interpreted as accelerating (negative coefficient) or decelerating (positive coefficient) the time to add-on acquisition. Specification (1) presents baseline estimates for all deals. Specifications (2) and (3) exclude, respectively, deals with multiple and single add-ons to test for sensitivity of covariate effects to the number of add-ons of the inorganic growth strategy.

In specifications (4) to (6), we present estimates for a Fine and Gray (1999) competing-risks model. This model has two advantages in comparison to AFT regressions. First, it is flexible and does not need assumptions about the functional form of the baseline sub-hazard. Second, it can account for censoring caused by so-called "competing events". In our case, a PE firm's exit constitutes a competing event to an add-on acquisition because once the PE firm sells the portfolio company it cannot initiate an inorganic growth strategy any more. This is distinct from usual right-censoring where the event of interest can still occur but is not yet observed because the observational period ends. For example, we stop observing unexited buyouts at 31 December 2012 but, if not made already, they are still "at risk" for an add-on acquisition at this point in time. The Fine and Gray (1999) model solves this problem through maximum likelihood estimation of sub-hazard rates. Note that the interpretation of coefficients is inverse to the AFT model. Positive (negative) coefficients indicate an increase (decrease) in the sub-hazard rate and thus a decrease (increase) in survival time. Specifications (4), (5) and (6) regress on the same (sub-)samples as for the AFT regressions.

Insert Table 5 about here.

Looking at specifications (1) and (4), which present estimates for the whole sample, we detect a significant acceleration of the first add-on acquisition for the same set of covariates that we found to significantly increase add-on acquisition probability. Conversely, those variables which we found to significantly decrease add-on acquisition probability, slow down add-on execution. There is furthermore no variable with significant association to add-on acquisition speed beyond those that we showed to have significant relationship to add-on activity. Note that these results are largely robust across the different regression models. Coefficients of *large cap* and *3-year*

industry sales growth are only statistically significant in the more accurate Fine and Gray (1999) model, but show correct sign and coefficient size in the AFT models too.

The comparison of the magnitude of coefficients between specifications (2) and (3) as well as (5) and (6) provides insights into the sensitivity of add-on timing to the overall number of add-ons of the inorganic growth strategy. We observe that the magnitude of the coefficients is larger when multiple add-ons are made as compared to inorganic growth strategies with a single add-on. This suggests that variables which accelerate (decelerate) the execution of an add-on acquisition, accelerate (decelerate) it more if multiple add-ons are made.

In sum, our findings underscore the relationship between acquisition speed and activity. There is evidence that factors which explain add-on acquisition probability also explain add-on acquisition speed and that execution of add-ons accelerates if several add-ons are made. This is consistent with firm-level incentives of a PE sponsor. In general, PE firm managers need to implement value creation measures quickly because PE is an illiquid asset class and a prolongation of the holding period can deteriorate return and prospects for future fundraising (Cumming et al., 2005; Jenkinson and Sousa, 2015). When relying on an inorganic growth strategy, this pressure should be amplified because add-ons imply several time-consuming processes, e.g., in terms of organizational integration and monitoring, that can be a threat to the holding period if add-ons are made too late. Thus, it is intuitive that inorganic growth strategies are only implemented if quick add-on execution is possible.

4.1.4 Endogeneity concerns and extensions

Previous literature suggests that the positive and statistically significant relationship between PE firm characteristics and add-on acquisition activity could be the result of both endogenous selection or treatment (e.g. Bottazzi et al., 2008; Nahata, 2008). Endogenous selection may take place if portfolio firms with higher ex ante add-on acquisition probability systematically match with reputable and experienced PE firms on the basis of observable or unobservable characteristics. In this case, the effect of the PE firm characteristics would not be causal and the backed portfolio firms might have made the same number of acquisitions irrespective of the

PE firm and its characteristics.

We therefore address potential endogeneity of *LN (1 + PE # of prior acq)* and *PE HEC-DJ ranked* in Table 6. We present the results of an instrumental variable (IV) probit regression in columns (1)-(2), and a seemingly unrelated bivariate probit ("biprobit") regression in columns (3)-(4), where we treat *LN (1 + PE # of prior acq)* and *PE HEC-DJ ranked* as the endogenous regressors.[16] For both approaches, the second stage is a probit model with the dependent variable being equal to one if at least one add-on is made and zero otherwise.[17] Independent variables are as in specification (6) of Table 3. The first stage regressions include additional variables that serve as instruments. We follow the approach of Berger et al. (2005), Bottazzi et al. (2008) and Hellmann et al. (2008) and use the average *local market PE sponsor experience* and the *local market share of HEC-DJ ranked* PE firms to instrument for *LN (1 + PE # of prior acq)* and *PE HEC-DJ ranked*, respectively. The idea of this approach is to use industrial and timely limitations to the availability of backing by experienced and reputable PE sponsors as a source of exogenous variation. Accordingly, if the portfolio firm operates in a local market where mostly experienced and reputable PE firms invest, then backing by an experienced or reputable PE firm is not the result of an endogenous choice of the portfolio firm, but rather of the non-availability of PE sponsors with other characteristics that cannot be affected by the portfolio company itself. To implement this, we construct 14 entry years x 32 industries = 448 local markets. The instrument *local market PE sponsor experience* measures the average number of prior acquisitions of all PE firms in each of these 448 local markets. *Local market*

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[16] We rely on a biprobit model, rather than on IV probit, to address endogeneity of *PE HEC-DJ Ranked* because this is more appropriate given that both the outcome variable and potentially endogenous regressor are of binary nature. For further examples, see Hellmann et al. (2008) or Davidson et al. (2015).

[17] Following our previous argumentation, it would be appealing to use productivity measures as the dependent variable because they should be less prone to confounding. Unfortunately, we have a relatively complex model and therefore fail to achieve numerical convergence for IV Poisson GMM and control function estimators, where we treat *LN (1 + PE # of prior acq)* as the endogenous regressor and use the number of add-ons per buyout as the dependent variable. IV tobit estimations, with the number of add-ons per holding period year as the dependent variable, yield similar results as depicted in Table 6, but can only be applied to a continuous endogenous regressor, i.e., to *LN (1 + PE # of prior acq)*. We therefore decide to present results for the activity measures, where we can consistently report results for both PE firm characteristics. Note that we later address endogeneity concerns through sub-sample regressions and use productivity measures as the dependent variable.

share of HEC-DJ ranked is equal to the fraction of deals backed by HEC-DJ ranked PE firms in the respective local market.

Insert Table 6 about here.

Estimates from the IV and biprobit models indicate that our results remain intact after controlling for possible endogeneity of PE firm characteristics. The coefficients of the instrumented variables, *LN (1 + PE # of prior acq)* and *PE HEC-DJ ranked*, in the second stage remain positive and statistically significant. Magnitude of the coefficients does not increase much or not at all, which indicates that the exclusion restriction is not violated. The instruments in the first stage have strong explanatory power, i.e., are relevant predictors of the potentially endogenous regressors, and formal tests of instrument strength do not point at a weak instrument problem.[18] Table 6 also reports ρ, the estimated coefficient for the correlation between the error terms of the outcome equation and the reduced-form equation of the endogenous regressor. This coefficient turns out to be significant at the 5% level for the IV probit regression. However, the effect of *LN (1 + PE # of prior acq)* remains intact. The significance of the coefficient of ρ is furthermore sensitive to the model specification and disappears when we insert industry and entry year fixed effects, while the coefficient of *LN (1 + PE # of prior acq)* is still positive and statistically significant in this alternative specification. For *PE HEC-DJ ranked*, there is no significant correlation between the error terms in the biprobit model at all and results are virtually unaffected. Thus, we conclude that selection bias does not drive our main findings regarding PE firm characteristics.

Table 7 presents various sub-sample regressions where we further explore concerns about endogeneity, sample selection bias and measurement error. We re-estimate the negative binomial

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[18] Note that we can formally test for a weak instrument in the IV probit framework, where the reduced form for the endogenous variable is linear. The first stage F-statistic is at a value of 72.01 with p-value of 0.000, which strongly rejects the null of a weak instrument according to thresholds of Stock et al. (2002). To the best of our knowledge, there is no such weak instrument diagnostic for the seemingly unrelated bivariate probit regression where the first stage is non-linear. Thus, as an approximation, we ignore the binary nature of *PE HEC-DJ ranked* and run an IV probit regression to test for the instrument strength of *local market share of PE HEC-DJ sponsors*. The F-statistic of 126.18 with p-value 0.000 indicates that there is no weak instrument problem.

regressions from Table 4. The dependent variable indicates the number of add-ons per buyout.[19] Independent variables contain, whenever applicable, the full set of covariates for buyout, portfolio firm and PE firm characteristics as well as industrial and economic conditions.

Insert Table 7 about here.

In columns (1)-(3), we re-estimate regressions on sub-samples that should be less subject to endogeneity concerns. We exclude all deals where the portfolio firm has acquisition experience (net of the acquisitions from the previous buyout) in specification (1).[20] The rationale is that track-record from prior acquisitions may convey information about manager's talent and ability to acquire other firms and thus allows for self-selection to experienced or reputable PE sponsors. By excluding acquisitive portfolio firms, we can test for a treatment effect of PE sponsor characteristics in absence of such matching. In specification (2), we exclude all large cap and mega buyouts. Several variables in the sample may have positive or negative correlation with a higher deal enterprise value. If large firms have better ability to make add-on acquisitions, e.g., because they have better access to financing, organizational capacity, negotiation power etc., then it may be the size effect driving our results rather than the variables of interest that are correlated with size. Finally, in specification (3), we exclude all local markets with high add-on acquisition activity. We compute the share of deals with inorganic growth strategy for each of the 448 local markets in the sample and drop those with a market share exceeding the 75th percentile. By dropping these local markets, we mitigate the concern that PE firms simply "cherry-pick" portfolio firms in acquisitive environments. The results in Table 7 indicate the our findings are robust to all of these three sub-sample estimations.

In columns (4) and (5), we address sample selection issues. We exclude all unexited buyouts in specification (4) to address concerns about underestimation of add-on acquisitions in buyouts that have not been exited at the end of the observational period. In specification (5), we

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[19] Results are also robust to using the Tobit model from Table 4.

[20] Results are also robust to excluding *financial inorganic* from the sample, which then leaves a sub-sample of portfolio firms without any prior acquisition experience.

exclude all pre-2001 buyouts to investigate whether our results are driven by possibly inferior data coverage of BvD Zephyr in these years. However, both sub-sample regressions yield robust results and confirm our previous findings.

In column (6), finally, we investigate whether our dependent variables are subject to measurement error. We consider two possible sources of measurement error. First, there may be acquisitions in the sample that are the result of opportunistic behavior rather than of an intended inorganic growth strategy.[21] We assume that opportunistic motives are rather unlikely to explain three or more acquisitions throughout the holding period and therefore exclude all deals with one or two add-on acquisitions. Second, we may incorrectly classify add-on acquisitions as part of an inorganic growth strategy if the portfolio company simultaneously divests assets. We therefore drop all deals with net negative growth, i.e., deals where the portfolio company divests more assets than it acquires. The results in column (6) do not provide evidence for bias through measurement error.

Table 8, finally, presents estimates of a Heckman (1979) maximum likelihood selection model correcting for the non-random observability of add-on acquisition timing for the sub-sample of deals with add-on acquisitions. Considering our timing analyses, it is possible that unobserved values of add-on acquisition speed bias our results. That is, PE firms with inferior ability to execute add-ons quickly may choose to not make add-ons at all, which would then lead to downward bias of the add-on acquisition times that we observe. To correct for this, we estimate a selection equation that models participation in the add-on acquisition market. We use the *local market share of inorganic growth deals*, i.e., the fraction of deals with inorganic growth strategy across 448 local markets, as the exclusion restriction. The dependent variable for the outcome equation is the natural logarithm of the time to add-on acquisition in years. In column (2), the outcome equation includes all available add-on times, whereas in columns (4) and (6), it includes, respectively, the time to add-on acquisition for deals with a single add-on and for

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[21] We point out that survey results by Gompers et al. (2016) indicate that the way the PE sponsor creates value is unlikely to change post-investment and thus it is rather unlikely that PE firms initiate add-ons although they did not intend to do so at entry. The survey results show that this holds especially true for follow-on acquisitions.

deals with multiple add-ons.

Insert Table 8 about here.

Estimates of the Heckman (1979) two-stage regression suggest that our previous findings regarding add-on timing remain intact after modelling non-random selection. In Column (2), we find similar covariate effects as for the survival analysis from Table 5. Columns (4) and (6) confirm that covariate effects are more pronounced when multiple add-ons are made. As expected, estimates of the inverse Mills ratio indicate a statistically significant selection effect. Note, however, that although the survival regressions from Table 5 do not explicitly model this selection process, they make use of the time to censoring for deals without add-on and thus correct for a possible downward bias of the observed add-on acquisition times, too. It is therefore not surprising that both approaches yield similar results.

4.2 Nature of add-on acquisitions

Next to general determinants of add-on acquisitions, we are interested in the probability for internationalization/diversification of previously (un)internationalized/(un)diversified portfolio firms and whether PE firm activity across borders/industries affects this probability.

Table 9 presents estimates of multinomial logit regressions. In Panel A, the dependent variable has three outcomes that indicate whether the portfolio company (i) does not make add-on acquisitions at all, i.e., does not pursue an inorganic growth strategy (the base category), (ii) makes add-ons but only in its country of origin, i.e., pursues a domestic inorganic growth strategy, and (iii) makes add-ons and at least one of these acquisitions occurs outside the portfolio company's country of origin, i.e., pursues a cross border inorganic growth strategy. We furthermore introduce a set of independent variables that indicate whether the portfolio firm (i) did not make any acquisitions prior to the buyout (*PF w/o acq exp*), (ii) made acquisitions but only in its country of origin (*PF uninternationalized*), and (iii) made acquisitions and at least one of them has been cross border (*PF internationalized*). We also include a variable indicating whether the PE sponsor frequently operates across countries (*PE country generalist*)

using the Cressy et al. (2007) approach to determine country generalization. Control variables capture buyout, portfolio firm and PE sponsor characteristics as well as industrial and economic conditions and country fixed effects. In Panel B, variables are defined analogously. We refer to acquisitions as industry diversifying if they have a Fama and French industry classification code (using the classification presented in Table 1) different from that of the portfolio company.

Insert Table 9 about here.

Table 9 Panel A yields four major results regarding the probability for domestic versus cross-border inorganic growth strategies. First, we find that portfolio firms without any acquisition experience have significantly lower probability for both domestic and cross border inorganic growth strategies than for no inorganic growth strategy at all or, put differently, they have highest probability for not making any acquisition. This is consistent with our previous findings. Second, firms with domestic acquisition experience at entry have significantly higher probability for a cross border inorganic growth strategy than for no inorganic growth strategy at all. Probability for a domestic inorganic growth strategy is even slightly higher. Firms with cross border acquisition experience at entry have significantly higher probability for a cross border inorganic growth strategy. Probability for a domestic inorganic growth strategy is positive and statistically significant but considerably lower. Thus, directly comparing firms with domestic and cross border acquisition experience to each other, we find that firms with domestic acquisition experience have significantly higher probability for a domestic inorganic growth strategy. However, they have only slightly lower probability for a cross border inorganic growth strategy and the effect is only weakly significant. Third, as expected, portfolio firms backed by a *PE country generalist*, i.e., by a PE firm without particular country focus, have lower probability for a domestic and higher probability for a cross border inorganic growth strategy than for no inorganic growth strategy at all. Fourth, interaction terms between *PE country generalist* and *PF w/o acq exp* as well as *PF uninternationalized* alleviate the, in comparison to *PF internationalized*, negative effects of *PF w/o acq exp* and *PF uninternationalized* on cross border probability. However, coefficients of the interaction terms turn out to be insignificant, which suggests that backing by a *PE country generalist* cannot alter the fact that

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portfolio firms with international M&A experience have higher cross border probability than uninternationalized portfolio firms and those without any acquisition experience.

Table 9 Panel B presents results regarding the probability for industry penetrating versus diversifying inorganic growth strategies. Except of few coefficients, the results are similar to Panel A and lead to identical conclusions.

In sum, we provide evidence for the importance of acquisition experience for overcoming barriers for cross border/industry diversifying acquisitions. Our findings suggest that PE backing can help to internationalize/diversify previously uninternationalized/undiversified firms if the portfolio company has some domestic/intra-industry acquisition experience. However, on average, cross border/industry diversifying inorganic growth strategies are more likely if the portfolio company already draws upon international/inter-industrial M&A experience at entry. There is also evidence that PE firm experience across countries/industries increases the probability for internationalization/diversification. This is in line with existing theory suggesting that geographic/industrial diversification of PE firms creates learning gains, network advantages and possibilities for knowledge transfer among portfolio firms.

4.3 Add-on acquisitions and exit channels

Finally, we are interested in whether add-on acquisitions affect the choice of the exit channel and whether this depends on the type of acquisitions that are made.

Table 10 presents estimates of multinomial logit regressions on a propensity score weighted sample of exited buyouts. In Panel A, the dependent variable has four possible outcomes indicating whether the portfolio firm is exited through (i) trade sale (the base category), (ii) IPO, (iii) financial, i.e., secondary/tertiary/quarternary buyout and (iv) bankruptcy or liquidation. In Panel B, we split up exits through financial buyouts into those that do not make acquisitions (*financial organic*) and those that make at least one acquisition (*financial inorganic*) in the subsequent buyout. Our main explanatory variable of interest is *add-on yes/no*, a binary indicator for add-on acquisitions. Because, in Section 4.1, we showed that there are a number of variables that systematically explain the occurrence of acquisitions under PE ownership,

we have to control for differing add-on probability among the observations in the sample. We therefore follow Bortolotti et al. (2015) and Stuart and Yim (2010) and weight each observation by the inverse probability to make an add-on acquisition. The idea is to minimize the impact of selection by assigning low (high) weights to observations with high (low) add-on probability. We derive the "propensity scores" from the logit model in specification (5) of Table 3. Note that Table 10 also contains specifications where *addon yes/no* is split up into *domestic* versus *cross border* as well as into *penetrating* versus *diversifying* to test for the impact of the type of inorganic growth strategy on the exit channel choice. Control variables capture buyout, portfolio firm and PE sponsor characteristics as well as industrial conditions and exit year group and world region fixed effects.[22]

Insert Table 10 about here.

The results in Table 10 confirm our hypotheses regarding the relationship between add-on acquisitions and exit channel choice. In Panel A, we find that deals involving add-on acquisitions have significantly higher probability for an IPO and for a financial buyout as compared to trade sales (the base category). Panel B shows that the significantly positive relationship to financial buyouts is driven by deals where the inorganic growth strategy is continued in the subsequent buyout. This is consistent with our previous findings. Specifications (2)-(3), (5)-(6) and (8)-(9) show that these results hold across different types of inorganic growth strategies, i.e., independent of whether add-ons are made within or outside the portfolio company's country of origin/industry classification code. For defaults, coefficients are negative and mostly insignificant.

In sum, these findings confirm the hypotheses that add-ons increase probability for an IPO and that probability for a sale to another PE sponsor depends on whether the portfolio company has left-over add-on potential that can be exploited by a subsequent owner.

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[22] We also test specifications with exit year and country fixed effects but fail to achieve numerical convergence with this large number of fixed effects.

5 Conclusion

This paper provides the first large-scale investigation of determinants of add-on acquisition activity, productivity and speed at the buyout, portfolio firm, PE sponsor and industry/economy level. It furthermore explores firm-level determinants for cross border and industry-diversifying acquisitions under PE ownership and the impact of add-on acquisitions on exit channels. Our sample bases on 9,548 buyouts and 4,937 add-on acquisitions spanning 16 years of buyout activity in 86 countries.

Our results are as follows. We first examine entry determinants for add-on activity. We find that public-to-private buyouts do not spur inorganic growth. Add-on acquisition probability is high for financial buyouts if the portfolio firm already made add-on acquisitions under the previous PE owner. Management buyouts turn out to be less likely to make add-ons. In terms of portfolio firm characteristics, add-on acquisition probability is particularly high if the portfolio firm is large and has M&A experience at entry. We also investigate the market for add-on acquisitions and find that few PE sponsors in the sample account for the vast majority of add-ons. Differences in experience and reputation explain the heterogenous access to the add-on market. In addition, we show that inorganic growth strategies frequently occur in industries with moderate degree of fragmentation and when financing conditions are favorable. These factors also explain higher add-on productivity during the holding period and faster add-on execution. Next, we examine firm-level determinants for cross border and industry diversifying acquisitions. Our results indicate that acquisition experience is important for overcoming barriers for cross border/industry diversifying acquisitions in the PE context. Firms without any acquisition experience have lowest probability for cross border/industry diversifying acquisitions, whereas portfolio companies with international/inter-industrial M&A experience at entry have highest probability. PE firm experience across countries/industries is furthermore positive for internationalization/diversification of the portfolio firm. Finally, we examine the relationship between add-on acquisitions and the exit strategy. We find that add-on acquisitions increase the probability for exiting through IPO and secondary buyout, with the effect on secondary buyouts being driven by deals where the subsequent PE owner continues the inorganic growth

strategy of the previous buyout.

Our study has several implications for future research. The results presented in this paper document that the use of M&A activity during the holding period has become an important component of PE buyouts. This is relevant for future research on, e.g., accounting performance of portfolio companies , deal pricing, PE returns, holding periods or exit channels, because add-on acquisitions are likely to affect these variables and, given the importance of inorganic growth strategies for buyout activity, ignoring the use of add-on acquisitions may cause considerable distortions in results. The large number of add-on acquisitions that we report also suggests that PE-backed inorganic growth strategies could largely affect the competitive environment in terms of market power of individual firms, entry barriers or information opacity. This merits future research on the impact of PE activity and inorganic growth strategies on industry consolidation. Finally, our results have also implications for research on general M&A activity because we show that acquirers may frequently be backed by PE firms, which likely affects deal negotiations, pricing and post-acquisition performance.

Table 1: Sample distribution

Panel A: Distribution by deal entry (exit) year and add-on acquisition year

Year	All deals N	All deals %	Deals with add-on N	Deals with add-on %	Deals w/o add-on N	Deals w/o add-on %	Add-on acquisitions N	Add-on acquisitions %
1997	129 (-)	1.4 (-)	34 (-)	1.4 (-)	95 (-)	1.3 (-)	1	0.0
1998	241 (7)	2.5 (0.1)	67 (-)	2.7 (-)	174 (7)	2.5 (0.2)	32	0.6
1999	349 (43)	3.7 (0.8)	92 (12)	3.7 (0.8)	257 (31)	3.6 (0.8)	71	1.4
2000	396 (86)	4.1 (1.7)	118 (16)	4.7 (1.1)	278 (70)	3.9 (1.9)	105	2.1
2001	368 (104)	3.9 (2.0)	96 (12)	3.8 (0.8)	272 (92)	3.9 (2.5)	113	2.3
2002	378 (125)	4.0 (2.5)	101 (27)	4.0 (1.9)	277 (98)	3.9 (2.7)	156	3.2
2003	576 (179)	6.0 (3.5)	165 (45)	6.6 (3.2)	411 (134)	5.8 (3.6)	176	3.6
2004	796 (322)	8.3 (6.3)	228 (77)	9.1 (5.4)	568 (245)	8.1 (6.7)	241	4.9
2005	1072 (457)	11.2 (9.0)	312 (106)	12.5 (7.5)	760 (351)	10.8 (9.5)	393	8.0
2006	1216 (572)	12.7 (11.2)	380 (139)	15.2 (9.8)	836 (433)	11.9 (11.8)	578	11.7
2007	1592 (697)	16.7 (13.7)	412 (216)	16.5 (15.3)	1180 (481)	16.7 (13.1)	718	14.5
2008	1077 (501)	11.3 (9.8)	232 (129)	9.3 (9.1)	845 (372)	12.0 (10.1)	618	12.5
2009	548 (358)	5.7 (7.0)	86 (90)	3.4 (6.4)	462 (268)	6.6 (7.3)	388	7.9
2010	810 (521)	8.5 (10.2)	174 (159)	7.0 (11.3)	636 (362)	9.0 (9.8)	486	9.8
2011	- (610)	- (12.0)	- (187)	- (13.2)	- (423)	- (11.5)	552	11.2
2012	- (511)	- (10.0)	- (198)	- (14.0)	- (313)	- (8.5)	309	6.3
Total	9548 (5093)	100 (100)	2497 (1413)	100 (100)	7051 (3680)	100 (100)	4937	100

Panel B: Distribution by industry

Industry	All deals N	All deals %	Deals with add-on N	Deals with add-on %	Deals w/o add-on N	Deals w/o add-on %	Add-on acquisitions N	Add-on acquisitions %
Business services	1066	11.2	336	13.5	730	10.4	733	14.8
Construction	690	7.2	139	5.6	551	7.8	267	5.4
Computer software	612	6.4	222	8.9	390	5.5	499	10.1
Fabricated products/machinery	570	6.0	122	4.9	448	6.4	175	3.5
Wholesale	570	6.0	183	7.3	387	5.5	376	7.6
Retail	564	5.9	116	4.7	448	6.4	173	3.5
Healthcare & pharma	488	5.1	172	6.9	316	4.5	374	7.6
Food products	403	4.2	97	3.9	306	4.3	162	3.3
Banking/insurance/real estate	394	4.1	80	3.2	314	4.5	185	3.7
Business equipment	386	4.0	89	3.6	297	4.2	162	3.3
Personal services	362	3.8	112	4.5	250	3.6	289	5.9
Transportation	361	3.8	111	4.5	250	3.6	240	4.9
Everything else	350	3.7	95	3.8	255	3.6	199	4.0
Consumer goods	276	2.9	33	1.3	243	3.5	67	1.4
Recreation	257	2.7	66	2.6	191	2.7	137	2.8
Printing & publishing	254	2.7	89	3.6	165	2.3	188	3.8
Chemicals	248	2.6	60	2.4	188	2.7	108	2.2
Restaurants, hotels, motels	248	2.6	49	2.0	199	2.8	87	1.8
Automobiles & trucks	240	2.5	53	2.1	187	2.7	72	1.5
Communication	219	2.3	69	2.8	150	2.1	119	2.4
Business supplies/containers	210	2.2	48	1.9	162	2.3	84	1.7
Electrical equipment	154	1.6	27	1.1	127	1.8	43	0.9
Apparel	131	1.4	18	0.7	113	1.6	25	0.5
Steel works etc	112	1.2	20	0.8	92	1.3	41	0.8
Utilities	101	1.1	20	0.8	81	1.2	23	0.5
Petroleum & natural gas	88	0.9	22	0.9	66	0.9	38	0.8
Aircraft/ships/railroad equipment	84	0.9	26	1.0	58	0.8	29	0.6
Textiles	82	0.9	13	0.5	69	1.0	25	0.5
Beer & liquor	28	0.3	10	0.4	18	0.3	12	0.2
Metals & mining	0	0.0	0	0.0	0	0.0	5	0.1
Coal	0	0.0	0	0.0	0	0.0	0	0.0

Tobacco products	0	0.0	0	0.0	0	0.0	0	0.0
Total	9548	100	2497	100	7051	100	4937	100

Panel C: Distribution by country

	All deals		Deals with add-on		Deals w/o add-on		Add-on acquisitions	
Country	N	%	N	%	N	%	N	%
United States	3478	36.4	1049	42.0	2429	34.5	2011	40.7
United Kingdom	1843	19.3	462	18.5	1381	19.6	906	18.4
France	904	9.5	220	8.8	684	9.7	341	6.9
Germany	713	7.5	143	5.7	570	8.1	241	4.9
Netherlands	312	3.3	86	3.4	226	3.2	153	3.1
Italy	258	2.7	51	2.0	207	2.9	88	1.8
Sweden	244	2.6	78	3.1	166	2.4	121	2.5
Spain	197	2.1	57	2.3	140	2.0	106	2.1
Canada	191	2.0	47	1.9	144	2.0	135	2.7
Denmark	135	1.4	41	1.6	94	1.3	63	1.3
Finland	133	1.4	55	2.2	78	1.1	140	2.8
Australia	125	1.3	20	0.8	105	1.5	66	1.3
Belgium	114	1.2	27	1.1	87	1.2	67	1.4
Switzerland	111	1.2	27	1.1	84	1.2	41	0.8
RoW	110	1.2	11	0.5	99	1.4	92	1.9
Norway	70	0.7	28	1.1	42	0.6	55	1.1
Austria	66	0.7	10	0.4	56	0.8	17	0.3
Japan	64	0.7	4	0.2	60	0.9	8	0.2
Poland	61	0.6	10	0.4	51	0.7	38	0.8
Czech Republic	46	0.5	13	0.5	33	0.5	30	0.6
Ireland	35	0.4	11	0.4	24	0.3	24	0.5
New Zealand	30	0.3	8	0.3	22	0.3	17	0.3
South Africa	30	0.3	4	0.2	26	0.4	10	0.2
Portugal	25	0.3	-	-	25	0.4	15	0.3
Romania	24	0.3	3	0.1	21	0.3	8	0.2
Brazil	22	0.2	2	0.1	20	0.3	24	0.5
Mexico	21	0.2	4	0.2	17	0.2	21	0.4
Israel	18	0.2	3	0.1	15	0.2	6	0.1
India	17	0.2	3	0.1	14	0.2	19	0.4
Luxembourg	17	0.2	7	0.3	10	0.1	4	0.1
Russian Federation	16	0.2	-	-	16	0.2	11	0.2
Turkey	16	0.2	1	0.0	15	0.2	9	0.2
Lithuania	15	0.2	1	0.0	14	0.2	3	0.1
Republic of Korea	14	0.2	1	0.0	13	0.2	3	0.1
Singapore	14	0.2	1	0.0	13	0.2	6	0.1
Bulgaria	13	0.1	3	0.1	10	0.1	10	0.2
United Arab Emirates	11	0.1	1	0.0	10	0.1	4	0.1
Egypt	10	0.1	1	0.0	9	0.1	0	0.0
Chile	9	0.1	1	0.0	8	0.1	3	0.1
China	9	0.1	1	0.0	8	0.1	10	0.2
Hungary	7	0.1	2	0.1	5	0.1	11	0.2
Total	9548	100	2497	100	7051	100	4937	100

This table presents the distribution of deals and add-on acquisitions by year (Panel A), industry (Panel B) and country (Panel C). For Panel A, numbers (in parentheses) represent the number of buyout entries (exits) in the respective year or the number of add-on acquisitions.

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Table 2: Summary statistics

Panel A: Dependent variables

	N	Mean	S.D.	Q1	Median	Q3
Activity measures						
Add-on yes/no	9,548	0.26	0.44	0.00	0.00	1.00
Productivity measures						
Number of add-ons per buyout	9,548	0.52	1.23	0.00	0.00	1.00
Number of add-ons / holding period	9,548	0.12	0.31	0.00	0.00	0.13
Timing						
Time to add-on acquisition (in years)	2,497	1.56	1.39	0.58	1.17	2.12
Time to add-on acquisition (in years): Single add-on	1,393	1.83	1.49	0.71	1.42	2.60
Time to add-on acquisition (in years): Multiple add-ons	1,104	1.23	1.17	0.47	0.91	1.62
Nature						
No inorganic growth strategy	9,548	0.74	0.44	0.00	1.00	1.00
Domestic	9,548	0.17	0.38	0.00	0.00	0.00
Cross border	9,548	0.09	0.29	0.00	0.00	0.00
Industry penetrating	9,548	0.14	0.34	0.00	0.00	0.00
Industry diversifying	9,548	0.13	0.33	0.00	0.00	0.00
Exit channel						
Trade sale	5,093	0.47	0.50	0.00	0.00	1.00
IPO	5,093	0.07	0.26	0.00	0.00	0.00
Financial	5,093	0.36	0.48	0.00	0.00	1.00
Default	5,093	0.10	0.30	0.00	0.00	0.00

Panel B: Independent variables

	N	Mean	S.D.	Q1	Median	Q3
Buyout characteristics						
Private-to-private	9,548	0.43	0.50	0.00	0.00	1.00
Public-to-private	9,548	0.07	0.26	0.00	0.00	0.00
Divisional	9,548	0.28	0.45	0.00	0.00	1.00
Privatization	9,548	0.00	0.05	0.00	0.00	0.00
Financial	9,548	0.20	0.40	0.00	0.00	0.00
Financial organic	9,548	0.13	0.34	0.00	0.00	0.00
Financial inorganic	9,548	0.06	0.24	0.00	0.00	0.00
Receivership	9,548	0.02	0.14	0.00	0.00	0.00
Syndicated	9,548	0.17	0.38	0.00	0.00	0.00
Management participation	9,548	0.16	0.37	0.00	0.00	0.00
Portfolio firm characteristics						
PF # of prior acq	9,548	0.63	3.52	0.00	0.00	0.00
PF net # of prior acq	9,548	0.50	3.46	0.00	0.00	0.00
PF w/o acq exp	9,548	0.80	0.40	1.00	1.00	1.00
PF w/o net acq exp	9,548	0.85	0.36	1.00	1.00	1.00
PF uninternationalized	9,548	0.14	0.35	0.00	0.00	0.00
PF internationalized	9,548	0.06	0.24	0.00	0.00	0.00
PF undiversified	9,548	0.12	0.33	0.00	0.00	0.00
PF diversified	9,548	0.08	0.27	0.00	0.00	0.00
(Imputed) deal EV (in Mio €)	9,548	230.38	466.98	55.39	97.31	201.44
Small cap	9,548	0.10	0.30	0.00	0.00	0.00
Mid cap	9,548	0.80	0.40	1.00	1.00	1.00
Large cap	9,548	0.08	0.28	0.00	0.00	0.00
Mega	9,548	0.01	0.12	0.00	0.00	0.00
PE firm characteristics						
PE # of prior acq	9,548	12.46	25.54	1.00	4.00	12.00

PE HEC-DJ ranked	9,548	0.07	0.26	0.00	0.00	0.00
PE country generalist	9,548	0.34	0.47	0.00	0.00	1.00
PE industry generalist	9,548	0.69	0.46	0.00	1.00	1.00
Industrial and economic environment						
OAS (index value)	9,548	576.92	279.73	351.93	406.43	639.51
Industry HHI score 0-500	9,548	0.72	0.45	0.00	1.00	1.00
Industry HHI score 500-1000	9,548	0.19	0.39	0.00	0.00	0.00
Industry HHI score 1000-1500	9,548	0.08	0.27	0.00	0.00	0.00
Industry HHI score >1500	9,548	0.01	0.11	0.00	0.00	0.00
3-year industry sales growth (in %)	9,548	9.53	6.82	5.73	9.24	12.81

This table presents summary statistics for the dependent variables (Panel A) and independent variables (Panel B) used in this paper. Variables are explained in Appendix A.2.

Table 3: Determinants of add-on acquisition activity

	Dependent variable: Add-on yes/no							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Public-to-private	-0.723***	-0.168	-0.106	-0.106	-0.112	-0.083	-0.024	-0.081
	(0.13)	(0.12)	(0.12)	(0.12)	(0.10)	(0.10)	(0.12)	(0.10)
Divisional	0.003	0.003	0.031	0.031	0.004	0.053	0.047	0.053
	(0.08)	(0.08)	(0.08)	(0.08)	(0.06)	(0.06)	(0.06)	(0.06)
Privatization	0.458	0.555	0.583	0.583	0.505	0.689	0.707	0.690
	(0.57)	(0.54)	(0.54)	(0.54)	(0.46)	(0.43)	(0.43)	(0.43)
Financial	-0.018							
	(0.10)							
Financial organic		-0.891***	-0.810***	-0.810***	-0.721***	-0.775***	-0.804***	-0.772***
		(0.11)	(0.11)	(0.11)	(0.10)	(0.10)	(0.10)	(0.10)
Financial inorganic		2.277***	2.355***	2.355***	2.182***	2.171***	2.162***	2.188***
		(0.15)	(0.15)	(0.15)	(0.11)	(0.11)	(0.11)	(0.11)
Receivership	-0.507*	-0.432	-0.465*	-0.465*	-0.472*	-0.614**	-0.634**	-0.607**
	(0.27)	(0.27)	(0.28)	(0.28)	(0.25)	(0.25)	(0.25)	(0.25)
Syndicated	-0.293***	-0.291***	-0.212***	-0.212***	0.000	0.020	0.024	0.022
	(0.07)	(0.08)	(0.08)	(0.08)	(0.06)	(0.06)	(0.06)	(0.06)
Management participation	-0.197*	-0.197*	-0.208**	-0.208**	-0.335***	-0.286***	-0.291***	-0.292***
	(0.11)	(0.10)	(0.10)	(0.10)	(0.08)	(0.08)	(0.08)	(0.08)
LN (1 + PF # of prior acq)	1.026***							
	(0.07)							
LN (1 + PF net # of prior acq)		0.471***	0.491***	0.491***	0.462***	0.443***		0.439***
		(0.07)	(0.07)	(0.07)	(0.06)	(0.06)		(0.06)
PF w/o net acq exp							-0.540***	
							(0.08)	
LN (deal EV)	0.154***	0.181***						
	(0.04)	(0.04)						
Small cap				-0.270**	-0.412***	-0.348***	-0.340***	-0.568***
				(0.11)	(0.09)	(0.09)	(0.09)	(0.16)
Mid cap			0.270**					
			(0.11)					
Large cap			0.572***	0.301**	0.200**	0.224**	0.261***	0.235**
			(0.15)	(0.12)	(0.10)	(0.09)	(0.09)	(0.09)
Mega			0.407*	0.136	-0.123	-0.130	0.004	-0.111
			(0.25)	(0.23)	(0.19)	(0.19)	(0.19)	(0.19)
LN (1 + PE # of prior acq)					0.091***	0.067***	0.070***	0.056***
					(0.02)	(0.02)	(0.02)	(0.02)
PE HEC-DJ ranked					0.266***	0.335***	0.337***	0.320***
					(0.10)	(0.10)	(0.10)	(0.10)
LN (OAS)						-0.328***	-0.325***	-0.330***
						(0.06)	(0.06)	(0.06)
Industry HHI score 500-1000						0.049	0.044	0.050
						(0.09)	(0.09)	(0.09)
Industry HHI score 1000-1500						0.335***	0.342***	0.338***
						(0.09)	(0.09)	(0.09)
Industry HHI score >1500						-0.077	-0.114	-0.073
						(0.18)	(0.18)	(0.18)
3-year industry sales growth						1.032**	1.003**	1.024**
						(0.44)	(0.44)	(0.44)
Public-to-private * PF w/o net acq exp							0.199	
							(0.19)	
Public-to-private * small cap							-0.284	
							(0.40)	
Financial inorganic * small cap								-0.560
								(0.67)
LN (1 + PF net # of prior acq) * small cap								0.311
								(0.28)

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LN (1 + PE # of prior acq) * small cap								0.127*
								(0.08)
PE HEC-DJ ranked * small cap								0.452
								(0.50)
Industry FE	Yes	Yes	Yes	Yes	Yes	No	No	No
Entry year FE	Yes	Yes	Yes	Yes	Yes	No	No	No
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sponsor FE	Yes	Yes	Yes	Yes	No	No	No	No
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	9,548	9,548	9,548	9,548	9,548	9,548	9,548	9,548

This table presents estimates from logit regressions. The dependent variable is a binary indicator that is equal to one if the portfolio company makes at least one add-on acquisition under PE ownership and zero otherwise. Omitted categories are *private-to-private* for the entry channels and *industry HHI score 0-500* for the industry concentration measures. Independent variables are explained in Appendix A.2. Standard errors are clustered by country and industry and shown in parentheses. Statistical significance is represented at the 10% (*), 5% (**), and 1% (***) level.

Table 4: Determinants of add-on acquisition productivity

	Dependent variable: Number of add-ons per buyout		Dependent variable: Number of add-ons / holding period	
	(1)	(2)	(3)	(4)
Public-to-private	-0.134	-0.085	-0.032	-0.028
	(0.09)	(0.10)	(0.05)	(0.05)
Divisional	0.032	0.061	0.028	0.039
	(0.07)	(0.07)	(0.03)	(0.03)
Privatization	0.657**	0.739**	0.233	0.294*
	(0.29)	(0.31)	(0.18)	(0.18)
Financial organic	-0.591***	-0.672***	-0.277***	-0.312***
	(0.11)	(0.11)	(0.04)	(0.04)
Financial inorganic	1.161***	1.160***	0.710***	0.729***
	(0.06)	(0.06)	(0.04)	(0.04)
Receivership	-0.442*	-0.524**	-0.175*	-0.226**
	(0.24)	(0.26)	(0.10)	(0.10)
Syndicated	0.024	0.040	0.020	0.028
	(0.06)	(0.06)	(0.03)	(0.03)
Management participation	-0.316***	-0.288***	-0.131***	-0.120***
	(0.07)	(0.07)	(0.03)	(0.03)
LN (1 + PF net # of prior acq)	0.456***	0.428***	0.223***	0.223***
	(0.05)	(0.05)	(0.03)	(0.03)
Small cap	-0.467***	-0.427***	-0.182***	-0.161***
	(0.09)	(0.09)	(0.04)	(0.04)
Large cap	0.168**	0.201***	0.068*	0.076**
	(0.08)	(0.08)	(0.04)	(0.04)
Mega	0.001	0.045	-0.046	-0.051
	(0.15)	(0.16)	(0.08)	(0.08)
LN (1 + PE # of prior acq)	0.087***	0.066***	0.043***	0.038***
	(0.02)	(0.02)	(0.01)	(0.01)
PE HEC-DJ ranked	0.203***	0.281***	0.109***	0.135***
	(0.07)	(0.07)	(0.03)	(0.03)
LN (OAS)		-0.330***		-0.119***
		(0.05)		(0.02)
Industry HHI score 500-1000		0.131		0.024
		(0.10)		(0.04)
Industry HHI score 1000-1500		0.253***		0.135***
		(0.08)		(0.04)
Industry HHI score >1500		0.048		0.080
		(0.29)		(0.13)
3-year industry sales growth		0.670		0.279
		(0.42)		(0.19)
Industry FE	Yes	No	Yes	No
Entry year FE	Yes	No	Yes	No
Country FE	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes
N	9,548	9,548	9,548	9,548

This table presents estimates from negative binomial regressions in specifications (1) and (2) where the dependent variable is the number of add-on acquisitions that the portfolio company makes under PE ownership. In specifications (3) and (4), this table presents estimates from tobit regressions (with zero as the left censoring limit) where the dependent variable is the number of add-ons under PE ownership divided by the holding period (in years). Omitted categories are *private-to-private* for the entry channels, *mid cap* for the portfolio firm size measures and *industry HHI score 0-500* for the industry concentration measures. Independent variables are explained in Appendix A.2. Standard errors are clustered by country and industry and shown in parentheses. Statistical significance is represented at the 10% (*), 5% (**), and 1% (***) level.

Table 5: Determinants of add-on acquisition speed - survival analysis

	Dependent variable for AFT regression: LN (time to add-on acquisition)			Dependent variable for competing-risks regression: Sub-hazard rate for add-on		
	All deals	Single add-on & no add-on	Multiple add-ons & no add-on	All deals	Single add-on & no add-on	Multiple add-ons & no add-on
	(1)	(2)	(3)	(4)	(5)	(6)
Public-to-private	-0.066	-0.141	-0.023	-0.027	0.071	-0.106
	(0.16)	(0.19)	(0.37)	(0.09)	(0.12)	(0.16)
Divisional	-0.129	-0.168	-0.123	0.043	0.081	0.015
	(0.10)	(0.12)	(0.20)	(0.05)	(0.07)	(0.08)
Privatization	-1.172**	-0.818	-2.187**	0.402	0.319	0.608
	(0.59)	(0.83)	(0.88)	(0.32)	(0.45)	(0.42)
Financial organic	1.217***	0.929***	2.048***	-0.659***	-0.542***	-0.894***
	(0.18)	(0.20)	(0.38)	(0.09)	(0.11)	(0.15)
Financial inorganic	-2.402***	-2.581***	-3.717***	1.443***	1.674***	1.732***
	(0.13)	(0.18)	(0.25)	(0.07)	(0.09)	(0.09)
Receivership	0.900*	0.626	1.683*	-0.560**	-0.458	-0.795**
	(0.47)	(0.50)	(0.88)	(0.23)	(0.28)	(0.36)
Syndicated	-0.006	-0.028	0.039	0.030	0.025	0.040
	(0.10)	(0.12)	(0.18)	(0.05)	(0.07)	(0.07)
Management participation	0.491***	0.416***	0.700***	-0.241***	-0.224**	-0.267***
	(0.13)	(0.15)	(0.24)	(0.07)	(0.09)	(0.10)
LN (1 + PF net # of prior acq)	-0.504***	-0.295***	-0.995***	0.352***	0.214***	0.526***
	(0.06)	(0.09)	(0.12)	(0.04)	(0.06)	(0.05)
Small cap	0.615***	0.412**	1.261***	-0.337***	-0.262***	-0.527***
	(0.16)	(0.18)	(0.39)	(0.08)	(0.10)	(0.15)
Large cap	-0.174	-0.100	-0.316	0.113*	0.025	0.182*
	(0.11)	(0.17)	(0.22)	(0.07)	(0.11)	(0.10)
Mega	0.042	0.161	0.013	-0.143	-0.152	-0.141
	(0.25)	(0.37)	(0.43)	(0.14)	(0.20)	(0.20)
LN (1 + PE # of prior acq)	-0.106***	-0.076**	-0.167***	0.059***	0.045**	0.070***
	(0.03)	(0.04)	(0.05)	(0.02)	(0.02)	(0.02)
PE HEC-DJ ranked	-0.288**	-0.186	-0.516**	0.199***	0.145	0.275***
	(0.13)	(0.16)	(0.25)	(0.07)	(0.10)	(0.11)
LN (OAS)	0.267***	0.143	0.692***	-0.216***	-0.137**	-0.374***
	(0.09)	(0.11)	(0.19)	(0.05)	(0.07)	(0.07)
Industry HHI score 500-1000	-0.079	0.043	-0.342	0.057	-0.008	0.162
	(0.13)	(0.15)	(0.22)	(0.07)	(0.09)	(0.10)
Industry HHI score 1000-1500	-0.447***	-0.379***	-0.769***	0.285***	0.255***	0.375***
	(0.12)	(0.12)	(0.27)	(0.06)	(0.08)	(0.11)
Industry HHI score >1500	0.096	0.355	-0.314	-0.069	-0.242**	0.146
	(0.20)	(0.22)	(0.64)	(0.15)	(0.11)	(0.32)
3-year industry sales growth	-0.984	-0.966	-1.657	0.793**	0.809*	0.987*
	(0.69)	(0.72)	(1.37)	(0.38)	(0.43)	(0.58)
Industry FE	No	No	No	No	No	No
Entry year FE	No	No	No	No	No	No
Country / world region FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes
No. of deals with add-on	2,497	1,393	1,104	2,497	1,393	1,104
No. of censored deals	7,051	7,051	7,051	3,371	3,371	3,371
No. of competing events	-	-	-	3,680	3,680	3,680
N	9,548	8,444	8,155	9,548	8,444	8,155

This table presents estimates from duration and competing-risks models. Specifications (1)-(3) present coefficients in accelerated failure-time metric from a parametric survival model with generalized gamma distribution. The dependent variable is the natural logarithm of the time to the (first) add-on acquisition in years. All deals without add-on acquisition are treated as censored. Specifications (4)-(6) present coefficients from a Fine and

Gray (1999) competing-risks regression. The dependent variable is the sub-hazard rate for an add-on acquisition. Deals without add-on and exit are treated as censored. Deals without add-on but with exit are treated as competing-risk events. Specifications (1) and (4) regress on all available deals. Specifications (2) and (5) exclude deals with multiple add-ons. Specifications (3) and (6) exclude deals with single add-ons. Omitted categories are *private-to-private* for the entry channels, *mid cap* for the portfolio firm size measures and *industry HHI score 0-500* for the industry concentration measures. Independent variables are explained in Appendix A.2. Standard errors are clustered by country and industry and shown in parentheses. Statistical significance is represented at the 10% (*), 5% (**), and 1% (***) level.

Table 6: The effect of PE sponsor characteristics - IV approach

	Dependent variables for IV probit		Dependent variables for bivariate probit	
	1st stage: LN (1 + PE # of) prior acq	2nd stage: Add-on yes/no	1st stage: PE HEC-DJ ranked	2nd stage: Add-on yes/no
	(1)	(2)	(3)	(4)
Local market PE sponsor experience	0.044***			
	(0.01)			
Local market share of PE HEC-DJ sponsors			7.029***	
			(0.28)	
Public-to-private	-0.043	-0.037	0.249*	-0.040
	(0.08)	(0.08)	(0.15)	(0.07)
Divisional	0.053	0.032	0.183**	0.032
	(0.06)	(0.06)	(0.09)	(0.06)
Privatization	0.213	0.366	-0.280	0.394
	(0.19)	(0.24)	(0.65)	(0.25)
Financial organic	0.185***	-0.444***	0.078	-0.434***
	(0.03)	(0.07)	(0.10)	(0.07)
Financial inorganic	0.289***	1.304***	0.032	1.322***
	(0.05)	(0.10)	(0.07)	(0.10)
Receivership	-0.293***	-0.329**	0.098	-0.345**
	(0.10)	(0.15)	(0.12)	(0.15)
Syndicated	-0.180***	0.024	0.224***	0.010
	(0.05)	(0.03)	(0.04)	(0.03)
Management participation	0.121	-0.165***	-0.264***	-0.158***
	(0.12)	(0.04)	(0.07)	(0.04)
LN (1 + PF net # of prior acq)	0.259***	0.250***	0.018	0.265***
	(0.03)	(0.03)	(0.05)	(0.03)
Small cap	-0.402***	-0.175**	-0.182**	-0.196***
	(0.03)	(0.07)	(0.09)	(0.07)
Large cap	0.708***	0.098	0.383***	0.124*
	(0.11)	(0.08)	(0.09)	(0.08)
Mega	0.742***	-0.113	0.535***	-0.082
	(0.18)	(0.14)	(0.12)	(0.14)
LN (1 + PE # of prior acq)		0.090***	0.407***	0.038***
		(0.02)	(0.03)	(0.01)
PE HEC-DJ ranked	0.962***	0.150*		0.249**
	(0.04)	(0.08)		(0.10)
LN (OAS)	0.019	-0.195***	0.020	-0.192***
	(0.03)	(0.04)	(0.04)	(0.04)
Industry HHI score 500-1000	-0.031	0.027	0.002	0.024
	(0.02)	(0.04)	(0.06)	(0.04)
Industry HHI score 1000-1500	0.093**	0.191***	0.040	0.195***
	(0.04)	(0.03)	(0.10)	(0.03)
Industry HHI score >1500	-0.258***	-0.051	0.065	-0.040
	(0.08)	(0.08)	(0.16)	(0.09)
3-year industry sales growth	-0.695***	0.635***	0.719**	0.596***
	(0.19)	(0.17)	(0.34)	(0.16)
ρ		-0.061**		-0.028
		(0.03)		(0.07)
Industry FE	No	No	No	No
Entry year FE	No	No	No	No
Country FE	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes
N	9,548	9,548	9,548	9,548

This table presents maximum likelihood estimates from instrumental variable (IV) probit regressions in specifications (1) and (2) where *LN (1 + PE # of prior acq)* is instrumented by *local market PE sponsor experience*. In

specifications (3) and (4), this table presents maximum likelihood estimates from seemingly unrelated bivariate probit regressions where *PE HEC-DJ ranked* is instrumented by *local market share of PE HEC-DJ sponsors*. The dependent variable for the 2nd stage of both IV probit and bivariate probit is a binary indicator that is equal to one if the portfolio company makes at least one add-on acquisition under PE ownership and zero otherwise. Omitted categories are *private-to-private* for the entry channels, *mid cap* for the portfolio firm size measures and *industry HHI score 0-500* for the industry concentration measures. Independent variables are explained in Appendix A.2. Standard errors are clustered by country and industry and shown in parentheses. Statistical significance is represented at the 10% (*), 5% (**), and 1% (***) level.

Table 7: Sub-sample regressions

	Dependent variable: Number of add-ons per buyout					
	No portfolio firms with net prior acquisitions	No large cap and mega buyouts	No local markets with high add-on activity	No unexited buyouts	No pre-2001 buyouts	No deals with 1-2 add-ons and negative net growth
	(1)	(2)	(3)	(4)	(5)	(6)
Public-to-private	0.075	-0.051	-0.129	-0.083	-0.141	0.011
	(0.14)	(0.11)	(0.13)	(0.14)	(0.13)	(0.22)
Divisional	0.081	0.014	0.080	0.023	0.055	0.141
	(0.07)	(0.08)	(0.08)	(0.08)	(0.08)	(0.17)
Privatization	0.759**	0.330	-0.145	0.107	1.026***	1.584**
	(0.35)	(0.37)	(0.68)	(0.50)	(0.33)	(0.63)
Financial organic	-0.580***	-0.707***	-0.525***	-0.793***	-0.635***	-0.897***
	(0.12)	(0.12)	(0.12)	(0.13)	(0.11)	(0.23)
Financial inorganic	1.268***	1.161***	1.286***	1.111***	1.172***	2.029***
	(0.06)	(0.07)	(0.08)	(0.09)	(0.06)	(0.14)
Receivership	-0.676**	-0.531**	-0.383	-0.389	-0.514**	-0.451
	(0.27)	(0.26)	(0.27)	(0.30)	(0.26)	(0.51)
Syndicated	0.057	-0.038	0.032	-0.005	0.050	0.145
	(0.07)	(0.08)	(0.07)	(0.08)	(0.06)	(0.14)
Management participation	-0.255***	-0.255***	-0.290***	-0.173*	-0.266***	-0.538***
	(0.08)	(0.07)	(0.09)	(0.10)	(0.08)	(0.19)
LN (1 + PF net # of prior acq)		0.407***	0.494***	0.526***	0.424***	0.684***
		(0.07)	(0.06)	(0.08)	(0.05)	(0.10)
LN (deal EV)		0.128***				
		(0.03)				
Small cap	-0.440***		-0.505***	-0.436***	-0.348***	-1.105***
	(0.10)		(0.11)	(0.11)	(0.10)	(0.24)
Large cap	0.236**		0.146	0.291***	0.175**	0.455**
	(0.11)		(0.10)	(0.11)	(0.08)	(0.21)
Mega	0.023		-0.184	-0.392	0.075	0.112
	(0.29)		(0.20)	(0.29)	(0.17)	(0.35)
LN (1 + PE # of prior acq)	0.071***	0.080***	0.080***	0.051**	0.080***	0.092*
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.05)
PE HEC-DJ ranked	0.316***	0.295***	0.291***	0.323***	0.270***	0.506***
	(0.09)	(0.10)	(0.10)	(0.10)	(0.08)	(0.17)
LN (OAS)	-0.360***	-0.330***		-0.158**	-0.343***	-0.695***
	(0.06)	(0.05)		(0.07)	(0.05)	(0.13)
Industry HHI score 500-1000	0.149	0.130		0.061	0.155	0.286
	(0.12)	(0.11)		(0.11)	(0.11)	(0.19)
Industry HHI score 1000-1500	0.281***	0.294***		0.200**	0.316***	0.588***
	(0.09)	(0.09)		(0.09)	(0.08)	(0.19)
Industry HHI score >1500	0.281	0.157		0.121	0.034	-0.149
	(0.34)	(0.34)		(0.28)	(0.29)	(0.62)
3-year industry sales growth	0.767*	0.629		0.582	0.427	0.114
	(0.46)	(0.47)		(0.44)	(0.50)	(1.00)
Industry FE	No	No	Yes	No	No	No
Entry year FE	No	No	Yes	No	No	No
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes
N	8,113	8,611	7,347	5,093	8,433	7,301

This table presents estimates from negative binomial regressions where the dependent variable is the number of add-on acquisitions under PE ownership. Specification (1) excludes all portfolio firms which made at least one acquisition before PE entry (in case of a primary buyout) or at least one acquisition before the previous PE buyout (in case of secondary or later stage buyouts). Specification (2) excludes all large cap and mega

buyouts, i.e., all deals with enterprise value in excess of 700 million Euro. Specification (3) excludes all local markets where the share of deals with inorganic growth strategy exceeds the 75th percentile of all 448 local market shares. Specification (4) excludes all unexited buyouts, i.e., all buyouts without exit until 31 December 2012. Specification (5) excludes all buyouts entered between 1997 and 2000. Specification (6) excludes all deals with one or two add-on acquisitions and deals with negative net growth, i.e., deals where the portfolio company divests more assets than it acquires. Omitted categories are *private-to-private* for the entry channels, *mid cap* for the portfolio firm size measures and *industry HHI score 0-500* for the industry concentration measures. Independent variables are explained in Appendix A.2. Standard errors are clustered by country and industry and shown in parentheses. Statistical significance is represented at the 10% (*), 5% (**), and 1% (***) level.

Table 8: Determinants of add-on acquisition speed - Heckman selection model

	All deals		Deals with single add-on		Deals with multiple add-ons	
	Selection: Add-on yes/no	Outcome: LN (time to add-on acquisition	Selection: Add-on yes/no	Outcome: LN (time to add-on acquisition	Selection: Add-on yes/no	Outcome: LN (time to add-on acquisition
	(1)	(2)	(3)	(4)	(5)	(6)
Local market share of inorganic growth deals	0.315***		0.367***		0.383***	
	(0.05)		(0.05)		(0.08)	
Public-to-private	-0.045	0.359	0.049	-0.227	-0.125*	0.969*
	(0.06)	(0.33)	(0.08)	(0.41)	(0.08)	(0.50)
Divisional	0.010	-0.056	0.047	-0.207	-0.019	0.046
	(0.04)	(0.20)	(0.04)	(0.22)	(0.05)	(0.32)
Privatization	0.089	-0.818	0.061	-0.731	0.165	-1.820
	(0.17)	(0.95)	(0.25)	(1.32)	(0.23)	(1.47)
Financial organic	-0.408***	2.334***	-0.294***	1.693***	-0.509***	3.095***
	(0.05)	(0.30)	(0.06)	(0.33)	(0.07)	(0.51)
Financial inorganic	0.837***	-4.454***	0.996***	-5.186***	0.945***	-5.999***
	(0.04)	(0.30)	(0.06)	(0.47)	(0.06)	(0.49)
Receivership	-0.307**	1.869***	-0.186	1.285	-0.413**	2.687**
	(0.12)	(0.72)	(0.15)	(0.82)	(0.16)	(1.13)
Syndicated	0.027	-0.162	-0.004	0.047	0.046	-0.504
	(0.04)	(0.21)	(0.04)	(0.23)	(0.05)	(0.34)
Management participation	-0.134***	0.759***	-0.118**	0.653**	-0.147**	0.917**
	(0.04)	(0.25)	(0.05)	(0.29)	(0.06)	(0.40)
LN (1 + PF net # of prior acq)	0.181***	-1.035***	0.090**	-0.511**	0.282***	-1.836***
	(0.03)	(0.15)	(0.04)	(0.21)	(0.03)	(0.24)
Small cap	-0.173***	1.069***	-0.130**	0.816**	-0.241***	1.532***
	(0.06)	(0.32)	(0.06)	(0.36)	(0.08)	(0.53)
Large cap	0.054	-0.197	0.018	0.064	0.121**	-0.605
	(0.04)	(0.24)	(0.06)	(0.31)	(0.06)	(0.38)
Mega	-0.115	0.609	-0.083	0.479	-0.105	0.792
	(0.09)	(0.52)	(0.13)	(0.70)	(0.12)	(0.80)
LN (1 + PE # of prior acq)	0.040***	-0.264***	0.031**	-0.184**	0.042***	-0.351***
	(0.01)	(0.06)	(0.01)	(0.07)	(0.01)	(0.10)
PE HEC-DJ ranked	0.109**	-0.489*	0.061	-0.212	0.188***	-0.939**
	(0.05)	(0.25)	(0.06)	(0.31)	(0.06)	(0.41)
LN (OAS)	-0.194***	0.994***	-0.131***	0.530**	-0.232***	1.571***
	(0.03)	(0.19)	(0.04)	(0.22)	(0.04)	(0.32)
Industry HHI score 500-1000	0.028	-0.242	0.000	-0.107	0.067	-0.519
	(0.04)	(0.21)	(0.04)	(0.24)	(0.05)	(0.32)
Industry HHI score 1000-1500	0.150***	-1.051***	0.131**	-0.987***	0.164**	-1.468***
	(0.05)	(0.29)	(0.06)	(0.35)	(0.06)	(0.44)
Industry HHI score >1500	-0.051	0.049	-0.249*	1.053	0.166	-0.992
	(0.14)	(0.78)	(0.14)	(0.76)	(0.18)	(1.24)
3-year industry sales growth	0.555***	-2.152*	0.519**	-1.915	0.545**	-2.260
	(0.20)	(1.13)	(0.23)	(1.29)	(0.28)	(1.84)
λ		-5.642***		-5.421***		-6.607***
		(0.26)		(0.36)		(0.44)
Industry FE	No	No	No	No	No	No
Entry year FE	No	No	No	No	No	No
World region FE	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes
N	9,548	2,497	8,444	1,393	8,155	1,104

This table presents estimates from a Heckman (1979) maximum likelihood selection model controlling for the selected observability of add-on acquisition speed for the sub-sample of deals with at least one add-on acquisition.

The dependent variable for the selection equation is a binary indicator that is equal to one if the portfolio company makes at least one add-on acquisition under PE ownership and zero otherwise. The dependent variable for the outcome equation is the natural logarithm of the time to the (first) add-on acquisition in years. The *local market share of inorganic growth deals* is used as the exclusion restriction and is equal to the fraction of deals with inorganic growth strategy in 14 entry years x 32 industries = 448 local markets. Omitted categories are *private-to-private* for the entry channels, *mid cap* for the portfolio firm size measures and *industry HHI score 0-500* for the industry concentration measures. Independent variables are explained in Appendix A.2. Standard errors are clustered by country and industry and shown in parentheses. Statistical significance is represented at the 10% (*), 5% (**), and 1% (***) level.

Table 9: Determinants of the nature of the inorganic growth strategy

Panel A: Domestic versus cross border inorganic growth strategy

	Domestic				Cross border			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PF w/o acq exp		-0.475***	-0.478***	-0.476***		-1.364***	-1.331***	-1.364***
		(0.14)	(0.15)	(0.14)		(0.13)	(0.14)	(0.13)
PF uninternationalized	1.358***	0.883***	0.883***	0.856***	1.105***	-0.260*	-0.254*	-0.263*
	(0.08)	(0.15)	(0.15)	(0.15)	(0.11)	(0.14)	(0.14)	(0.15)
PF internationalized	0.475***				1.364***			
	(0.14)				(0.13)			
PE country generalist	-0.307***	-0.307***	-0.320**	-0.330***	0.165*	0.165*	0.219	0.166*
	(0.07)	(0.07)	(0.13)	(0.08)	(0.09)	(0.09)	(0.14)	(0.10)
PF w/o acq exp * PE country generalist			0.020				-0.086	
			(0.15)				(0.17)	
PF uninternationalized * PE country generalist				0.107				0.013
				(0.16)				(0.20)
Buyout controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Portfolio firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PE sponsor controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry & economy controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	9,548	9,548	9,548	9,548	9,548	9,548	9,548	9,548

Panel B: Industry penetrating versus industry diversifying inorganic growth strategy

	Industry penetrating				Industry diversifying			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PF w/o acq exp		-0.753***	-0.692***	-0.751***		-1.245***	-1.201***	-1.241***
		(0.12)	(0.16)	(0.12)		(0.11)	(0.15)	(0.11)
PF undiversified	1.494***	0.741***	0.745***	0.676***	1.061***	-0.184	-0.180	-0.313*
	(0.09)	(0.13)	(0.13)	(0.16)	(0.10)	(0.12)	(0.12)	(0.16)
PF diversified	0.753***				1.245***			
	(0.12)				(0.11)			
PE industry generalist	0.016	0.016	0.079	-0.004	0.215***	0.215***	0.261**	0.174**
	(0.07)	(0.07)	(0.12)	(0.08)	(0.08)	(0.08)	(0.12)	(0.08)
PF w/o acq exp * PE industry generalist			-0.092				-0.065	
			(0.14)				(0.15)	
PF undiversified * PE industry generalist				0.110				0.214
				(0.16)				(0.18)
Buyout controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Portfolio firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PE sponsor controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry & economy controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	9,548	9,548	9,548	9,548	9,548	9,548	9,548	9,548

This table presents estimates from a multinomial logit regression. In Panel A, the dependent variable has three outcomes that indicate whether the portfolio company (i) does not make add-on acquisitions at all, i.e., does not pursue an inorganic growth strategy, (ii) makes add-ons but only in its country of origin, i.e., pursues a domestic inorganic growth strategy, and (iii) makes add-ons and at least one of these acquisitions occurs outside the portfolio company's country of origin, i.e., pursues a cross border inorganic growth strategy. In Panel B, outcomes indicate whether the portfolio company (i) does not make add-on acquisitions at all, (ii) makes add-ons

but only within its Fama and French industry classification code, i.e., pursues an industry penetrating inorganic growth strategy, and (iii) makes add-ons and at least one of these acquisitions occurs outside the portfolio company's Fama and French industry classification code, i.e., pursues an industry diversifying inorganic growth strategy. For both Panels, the base outcome is no inorganic growth strategy. Buyout controls include *public-to-private*, *divisional*, *privatization*, *financial*, *receivership*, *syndicated* and *management participation*. Portfolio firm controls include *LN (deal EV)*. PE sponsor controls include *LN (1 + PE # of prior acq)* and *PE HEC-DJ ranked*. Industry and economy controls include *LN (OAS)*, *industry HHI score 500-1000*, *industry HHI score 1000-1500*, *industry HHI score >1500* and *3-year industry sales growth*. Omitted categories are *private-to-private* for the entry channels and *industry HHI score 0-500* for the industry concentration measures. Independent variables are explained in Appendix A.2. Standard errors are in parentheses. Statistical significance is represented at the 10% (*), 5% (**), and 1% (***) level.

Table 10: Add-on acquisitions and exit channels

Panel A: Baseline

	IPO			Financial			Default		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Add-on yes/no	0.611***			0.408***			-0.214		
	(0.14)			(0.08)			(0.14)		
Domestic		0.540***			0.413***			-0.154	
		(0.17)			(0.09)			(0.17)	
Cross border		0.713***			0.400***			-0.341	
		(0.21)			(0.12)			(0.24)	
Penetrating			0.644***			0.361***			-0.119
			(0.18)			(0.10)			(0.19)
Diversifying			0.573***			0.456***			-0.325*
			(0.20)			(0.11)			(0.20)
Buyout controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Portfolio firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PE sponsor controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exit year group FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
World region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	5,093	5,093	5,093	5,093	5,093	5,093	5,093	5,093	5,093

Panel B: Breakup of financial exits

	IPO			Financial organic			Financial inorganic			Default		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Add-on yes/no	0.636***			0.131			1.060***			-0.219		
	(0.14)			(0.09)			(0.12)			(0.14)		
Domestic		0.564***			0.145			1.045***			-0.158	
		(0.17)			(0.11)			(0.14)			(0.17)	
Cross border		0.738***			0.108			1.084***			-0.346	
		(0.21)			(0.14)			(0.17)			(0.24)	
Penetrating			0.661***			0.166			0.851***			-0.124
			(0.18)			(0.11)			(0.15)			(0.19)
Diversifying			0.604***			0.092			1.252***			-0.330*
			(0.20)			(0.13)			(0.15)			(0.20)
Buyout controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Portfolio firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
PE sponsor controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Exit year group FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
World region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	5,093	5,093	5,093	5,093	5,093	5,093	5,093	5,093	5,093	5,093	5,093	5,093

This table presents estimates from a multinomial logit regression on a propensity score weighted sample. Panel A reports baseline estimates where the dependent variable has four possible outcomes indicating whether the portfolio firm is exited through (i) trade sale, (ii) IPO, (iii) financial, i.e., secondary/tertiary/quarternary buyout and (iv) bankruptcy or liquidation. In Panel B, we split up financial exits according to their deal strategy. *Financial organic* refers to financial exits where the subsequent PE owner does not initiate add-on acquisitions, whereas *financial inorganic* refers to portfolio firms that make at least one acquisition in the subsequent buyout. For both Panels, the base outcome is *trade sale*. Each observation is weighted by the inverse propensity to make add-on acquisitions to control for non-random selection processes. The propensity scores

are obtained from the logit regression model in specification (5) of Table 3. Buyout controls include *public-to-private*, *divisional*, *privatization*, *financial organic*, *financial inorganic*, *receivership*, *syndicated* and *management participation*. Portfolio firm controls include *small cap*, *large cap*, *mega* and *LN (1 + PF net # of prior acq)*. PE sponsor controls include *LN (1 + PE # of prior acq)* and *PE HEC-DJ ranked*. Industry controls include *industry HHI score 500-1000*, *industry HHI score 1000-1500*, *industry HHI score >1500* and *3-year industry sales growth*. Omitted categories are *private-to-private* for the entry channels, *mid cap* for the portfolio firm size measures and *industry HHI score 0-500* for the industry concentration measures. Independent variables are explained in Appendix A.2. Exit year group fixed effects control for exits in the years 1997-2001 (dot-com), 2002-2004 (post dot-com), 2005-2006 (buyout growth), 2007-2008 (buyout peak), 2009-2010 (financial crisis) and 2011-2012 (post financial crisis). World region fixed effects control for exits in Asia, Australia, Central Europe, Eastern Europe, Scandinavia, U.K., U.S., Canada and Rest of World. Standard errors are in parentheses. Statistical significance is represented at the 10% (*), 5% (**), and 1% (***) level.

**Figure 1: Concentration of add-on acquisitions**
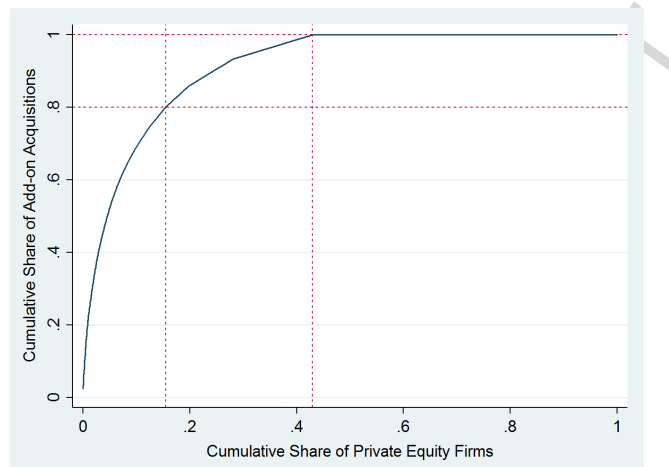
This figure presents the cumulative proportion of add-on acquisition involvements on the y-axis (in %) and the cumulative proportion of PE firms accounting for it (ranked from highest to lowest number of add-on acquisition involvements) on the x-axis (in %). A a 45° line would indicate a perfectly equal distribution of add-on acquisitions over all PE firms in the sample. For syndicates, we assign add-on acquisitions equally to all syndicate members.

Figure 2: Hazard rates for add-on acquisitions

(A) Smoothed hazard rate for add-ons: Deals with single add-on
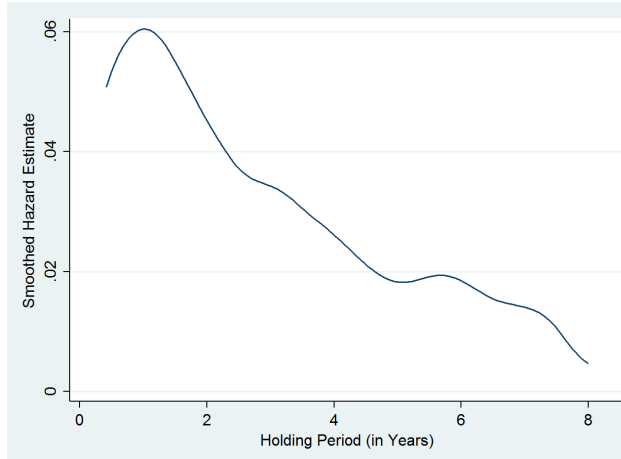
(B) Smoothed hazard rate for add-ons: Deals with multiple add-ons
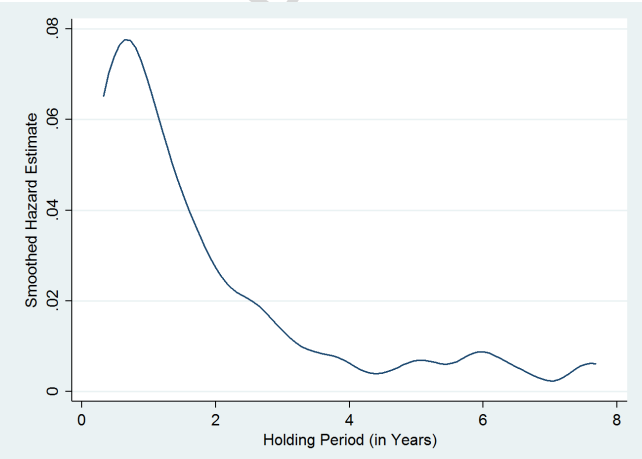
This figure illustrates hazard functions over the holding period. Panel A (B) presents the smoothed hazard rate for an add-on acquisition for deals with a single (multiple) add-on(s), treating all deals without add-on as censored. The hazard rate is the instantaneous probability of an add-on acquisition given that no add-on has been made at that specific point of time and is calculated using a Gaussian kernel function.

A Appendices

A.1 Comparison of sample distributions across world regions for the period 2001-2007

	This sample		Strömberg (2008)		Axelson et al. (2013)	
	N	%	N	%	N	%
North America	2,417	40.3%	5,164	38.3%	387	49.0%
Western Europe	3,175	52.9%	6,728	49.9%	395	50.1%
RoW	406	6.8%	1,590	11.8%	7	0.9%
Total	5,998	100.0%	13,482	100.0%	789	100.0%
Data source	BvD Zephyr		Capital IQ		Capital IQ	

This table compares the sample distribution across different world regions to Strömberg (2008) and Axelson et al. (2013). Numbers base on the period 2001-2007 because all three studies overlap in this time period and data is consistently available.

A.2 Variable definitions and sources

Panel A: Dependent variables	
Variable	Definition
Activity measures	
Add-on yes/no	Binary variable equal to one if the deal records at least one add-on acquisition under PE ownership, and zero otherwise. Source: Zephyr, LexisNexis, PE Sponsor Websites.
Productivity measures	
Number of add-ons per buyout	Variable indicates the buyout's total number of add-on acquisitions under PE ownership. Source: Zephyr, LexisNexis, PE Sponsor Websites.
Number of add-ons / holding period	Number of add-ons per buyout divided by the holding period in years. Source: Zephyr, LexisNexis, PE Sponsor Websites.
Timing	
Time to add-on acquisition (in years)	Variable measures the number of days between the buyout entry date and the date of the first add-on acquisition divided by 365 days. Source: Zephyr, LexisNexis, PE Sponsor Websites.
Time to add-on acquisition (in years): Single add-on	Time to add-on acquisition (in years) for deals with a single add-on acquisition. Source: Zephyr, LexisNexis, PE Sponsor Websites.
Time to add-on acquisition (in years): Multiple add-ons	Time to the first add-on acquisition (in years) for deals with multiple add-on acquisitions. Source: Zephyr, LexisNexis, PE Sponsor Websites.
Nature	
No inorganic growth strategy	Category of a multinomial variable for the nature of the inorganic growth strategy. Indicates whether the portfolio company does not record add-on acquisitions under PE ownership. Source: Zephyr, LexisNexis, PE Sponsor Websites.
Domestic	Category of a multinomial variable for the nature of the inorganic growth strategy. Indicates whether all add-on acquisitions have the same country of origin as the platform company. Source: Zephyr, LexisNexis, PE Sponsor Websites.
Cross border	Category of a multinomial variable for the nature of the inorganic growth strategy. Indicates whether at least one add-on acquisition does not have the same country of origin as the platform company. Source: Zephyr, LexisNexis, PE Sponsor Websites.
Industry penetrating	Category of a multinomial variable for the nature of the inorganic growth strategy. Indicates whether all add-on acquisitions have the same industry classification code (extended version of Fama and French 30 as in Table 1) as the platform company. Source: Zephyr, LexisNexis, PE Sponsor Websites.
Industry diversifying	Category of a multinomial variable for the nature of the inorganic growth strategy. Indicates whether at least one add-on acquisition does not have the same industry classification code (extended version of Fama and French 30 as in Table 1) as the platform company. Source: Zephyr, LexisNexis, PE Sponsor Websites.
Exit channel	
Trade sale	Category of a multinomial variable for the exit channel. Indicates whether the PE sponsor sells the portfolio company to a private and non-financial company. Only calculated for exited buyouts. Source: Zephyr.
IPO	Category of a multinomial variable for the exit channel. Indicates whether the portfolio company is exited through an initial public offering (IPO). Only calculated for exited buyouts. Source: Zephyr.
Financial	Category of a multinomial variable for the exit channel. Indicates whether the PE sponsor sells the portfolio company to another PE sponsor. *Financial inorganic* and *financial organic* are versions of this category indicating whether the portfolio company records at least one add-on acquisition in the subsequent buyout or not. Only calculated for exited buyouts. Source: Zephyr.
Default	Category of a multinomial variable for the exit channel. Indicates whether the portfolio company is exited because of liquidation or bankruptcy. Only calculated for exited buyouts. Source: Zephyr.

Panel B: Independent variables

Variable	Definition
Buyout characteristics	
Private-to-private	Binary variable equal to one if the portfolio has been an independent private firm before the buyout event, and zero otherwise. Source: Zephyr.
Public-to-private	Binary variable equal to one if the portfolio firm has been a publicly listed entity before the buyout event, i.e., the buyout is a going-private transaction, and zero otherwise. Source: Zephyr.
Divisional	Binary variable equal to one if the portfolio firm has been a corporate division or subsidiary before the buyout event, and zero otherwise. Source: Zephyr.
Privatization	Binary variable equal to one if the portfolio firm has been a government owned firm before the buyout event, and zero otherwise. Source: Zephyr.
Financial	Binary variable equal to one if the portfolio firm has been owned by another PE sponsor before the buyout event, and zero otherwise. This includes secondary buyouts (SBOs), tertiary buyouts (TBOs) and quaternary buyouts (QBOs). Source: Zephyr.
Financial organic	Binary variable equal to one if the portfolio firm has been owned by another PE sponsor before the buyout event and has not made add-on acquisitions under the previous PE owner, and zero otherwise. Source: Zephyr.
Financial inorganic	Binary variable equal to one if the portfolio firm has been owned by another PE sponsor before the buyout event and has made at least one add-on acquisition under the previous PE owner, and zero otherwise. Source: Zephyr.
Receivership	Binary variable equal to one if the portfolio firm has been held by a receiver before the buyout event, i.e., if the firm failed to meet its financial obligations and entered bankruptcy restructuring, and zero otherwise. Source: Zephyr.
Syndicated	Binary variable equal to one if more than one PE sponsor backs the deal, and zero otherwise. Source: Zephyr.
Management participation	Binary variable equal to one if the management invests along a PE firm, and zero otherwise. This includes management buyouts (MBOs), buy-ins (MBIs) and buy-in management buyouts (BIMBOs). Source: Zephyr.
Portfolio firm characteristics	
PF # of prior acq	Variable indicates the total number of acquisitions that the portfolio company has made before the buyout event. Source: Zephyr.
PF net # of prior acq	Variable indicates the total number of acquisitions that the portfolio company has made before the buyout event in case of primary buyouts and the total number of acquisitions that the portfolio company has made before the previous buyout event in case of secondary (tertiary/quarternary) buyouts. For example, for secondary (tertiary) buyouts this variable is equal to the total number of acquisitions the portfolio company has made before the primary (secondary) buyout. This variable nets out the acquisition activity of the previous buyout to avoid double count of acquisitions because *financial inorganic* already implies the acquisitions from the previous buyout. Source: Zephyr.
PF w/o acq exp	Binary variable equal to one if the portfolio company has not made acquisition before the buyout event, and zero otherwise. Source: Zephyr.
PF w/o net acq exp	Binary variable equal to one if the portfolio company has not made acquisition before the previous buyout event, and zero otherwise. Variable is equal to *PF w/o acq exp* for primary buyouts. Source: Zephyr.
PF uninternationalized	Binary variable equal to one if the portfolio company has acquisition experience before the buyout event but all acquisitions have been domestic, i.e., occurred in the portfolio company's country of origin, and zero otherwise. Source: Zephyr.
PF internationalized	Binary variable equal to one if the portfolio company has acquisition experience before the buyout event and at least one of these acquisitions has been cross border, i.e., occurred outside the portfolio company's country of origin, and zero otherwise. Source: Zephyr.

PF undiversified	Binary variable equal to one if the portfolio company has acquisition experience before the buyout event but all acquisitions have been industry penetrating, i.e., occurred within the portfolio company's (extended) Fama and French 30 (as in Table 1) industry classification code, and zero otherwise. Source: Zephyr.
PF diversified	Binary variable equal to one if the portfolio company has acquisition experience before the buyout event and at least one acquisitions has been industry diversifying, i.e., occurred outside the portfolio company's (extended) Fama and French 30 (as in Table 1) industry classification code, and zero otherwise. Source: Zephyr.
(Imputed) deal EV (in Mio €)	Equal to the disclosed deal enterprise value or the imputed deal enterprise value from the Heckman (1979) maximum likelihood estimation (see Appendix A.3) if no enterprise value was disclosed. Source: Zephyr, Heckman (1979) maximum likelihood estimation.
Small cap	Binary variable equal to one if the (imputed) deal EV is less than 25 million Euro, and zero otherwise. Source: Zephyr, Heckman (1979) maximum likelihood estimation.
Mid cap	Binary variable equal to one if the (imputed) deal EV is equal to or larger than 25 million Euro and less than 700 million Euro, and zero otherwise. Source: Zephyr, Heckman (1979) maximum likelihood estimation.
Large cap	Binary variable equal to one if the (imputed) deal EV is equal to or larger than 700 million Euro and less than 2,000 million Euro, and zero otherwise. Source: Zephyr, Heckman (1979) maximum likelihood estimation.
Mega	Binary variable equal to one if the (imputed) deal EV is equal to or larger than 2,000 million Euro, and zero otherwise. Source: Zephyr, Heckman (1979) maximum likelihood estimation.

PE firm characteristics

PE # of prior acq	Variable indicates the total number of acquisitions that the PE sponsor has made before the buyout event. In case of syndicated buyouts, the total number of acquisitions is averaged over all syndicate members. Source: Zephyr.
PE HEC-DJ ranked	Indicates whether the PE-sponsor is ranked within the HEC-DowJones Private Equity Performance Ranking. The ranking, provided by HEC School of Management and DowJones, lists the world's top PE sponsors in terms of aggregate performance based on all funds raised between 1998 and 2007. Binary variable equal to one if at least one PE-sponsor involved in the buyout is ranked within the HEC-DowJones ranking, and zero otherwise. Source: HEC-DowJones Performance Ranking.
PE country generalist	Binary variable equal to one if the PE sponsor's Index of Competitive Advantage (ICA) on country basis is less than one, and zero otherwise. The ICA measures the degree of specialization relative to other PE sponsors, i.e., a high (low) ICA value indicates much (little) country specialization. The ICA is given by $ICA_{ij} = (C_{ij}/C_{.j})/(C_{i.}/C_{..})$ where a dot indicates summation over the relevant subscript. C_{ij} is the number of transactions of PE firm i in country j prior to the buyout. $C_{.j}$ is the total number of transactions of all PE firms in country j prior to the buyout. $C_{i.}$ is the total number of transactions of PE firm i prior to the buyout. $C_{..}$ is the total number of transactions of all PE firms prior to the buyout. Calculations are analogous to Cressy et al. (2007). Source: Zephyr.
PE industry generalist	Binary variable equal to one if the PE sponsor's Index of Competitive Advantage (ICA) on (extended) FF30 basis is less than one, and zero otherwise. The ICA measures the degree of specialization relative to other PE sponsors, i.e., a high (low) ICA value indicates much (little) industry specialization. The ICA is given by $ICA_{ij} = (C_{ij}/C_{.j})/(C_{i.}/C_{..})$ where a dot indicates summation over the relevant subscript. C_{ij} is the number of transactions of PE firm i in industry j prior to the buyout. $C_{.j}$ is the total number of transactions of all PE firms in industry j prior to the buyout. $C_{i.}$ is the total number of transactions of PE firm i prior to the buyout. $C_{..}$ is the total number of transactions of all PE firms prior to the buyout. Calculations are analogous to Cressy et al. (2007). Source: Zephyr.

Industrial and economic environment

OAS (index value)	Variable indicates the index value of the BofA Merrill Lynch Global High Yield Option-adjusted Spread (OAS) in the year of the buyout. Source: BofA Merrill Lynch Global Research.

Industry HHI score 0-500	Binary variable equal to one if the Herfindahl-Hirschman Index (HHI) of the portfolio firm's (extended) Fama and French 30 industry (as in Table 1) ranges between 0 and 500 in the year of the buyout, and zero otherwise. Basis for the calculation are sales figures of all companies in the S&P Global Broad Market Index in each buyout year. Source: Datastream, S&P Global Broad Market Index.
Industry HHI score 500-1000	Binary variable equal to one if the Herfindahl-Hirschman Index (HHI) of the portfolio firm's (extended) Fama and French 30 industry (as in Table 1) ranges between 500 and 1000 in the year of the buyout, and zero otherwise. Basis for the calculation are sales figures of all companies in the S&P Global Broad Market Index in each buyout year. Source: Datastream, S&P Global Broad Market Index.
Industry HHI score 1000-1500	Binary variable equal to one if the Herfindahl-Hirschman Index (HHI) of the portfolio firm's (extended) Fama and French 30 industry (as in Table 1) ranges between 1000 and 1500 in the year of the buyout, and zero otherwise. Basis for the calculation are sales figures of all companies in the S&P Global Broad Market Index in each buyout year. Source: Datastream, S&P Global Broad Market Index.
Industry HHI score >1500	Binary variable equal to one if the Herfindahl-Hirschman Index (HHI) of the portfolio firm's (extended) Fama and French 30 (as in Table 1) industry is greater than 1500 in the year of the buyout, and zero otherwise. Basis for the calculation are sales figures of all companies in the S&P Global Broad Market Index in each buyout year. Source: Datastream, S&P Global Broad Market Index.
3-year industry sales growth (in%)	Indicates the average (extended) Fama and French 30 industry (as in Table 1) sales growth for the three years before the buyout event. Source: Datastream, S&P Global Broad Market Index.

This table presents variable definitions and sources for the variables used in this paper.

A.3 Heckman selection model for deal enterprise value imputation

	LN (deal EV)			Deal value yes/no		
	Coeff	S.E.		Coeff	S.E.	
Private-to-private	-0.930	(0.23)	***	-1.449	(0.06)	***
Divisional	-0.655	(0.11)	***	-0.670	(0.06)	***
Financial	1.501	(0.64)	**	-1.174	(0.74)	
Privatization	-0.056	(0.33)		-0.099	(0.27)	
Receivership	-1.345	(0.20)	***	-0.692	(0.12)	***
IBO transaction	1.573	(0.61)	**	-0.337	(0.73)	
Syndicated transaction	0.383	(0.06)	***	0.081	(0.04)	**
Public investment fund	-0.135	(0.07)	**	0.122	(0.05)	**
LN(age of financial sponsor)	0.052	(0.03)	*	0.038	(0.02)	**
Sponsor with >20 deals	0.182	(0.05)	***			
Sponsor ranked in PEI50 Index	1.185	(0.08)	***	0.412	(0.04)	***
Asia	0.468	(0.28)	*	-0.311	(0.18)	*
Australia	0.183	(0.26)		0.212	(0.18)	
Continental Europe	0.288	(0.24)		-0.429	(0.14)	***
Canada	0.331	(0.29)		-0.463	(0.17)	***
Eastern Europe	-0.834	(0.27)	***	-0.067	(0.18)	
Latin America	0.108	(0.32)		-0.120	(0.21)	
Scandinavia	0.138	(0.26)		-0.477	(0.15)	***
UK	-0.521	(0.23)	**	0.388	(0.15)	***
US	0.450	(0.24)	*	-0.475	(0.14)	***
LBO 2000 - 2001 (dot-com)				0.184	(0.07)	**
LBO 2002 - 2004 (post dot-com)				0.074	(0.06)	
LBO 2005 - 2006 (buyout growth)				0.070	(0.06)	
LBO 2007 - 2008 (buyout peak)				-0.158	(0.06)	**
LBO 2009 - 2010 (financial crisis)				-0.491	(0.07)	***
λ	-0.483	(0.25)	*			
Industry FE	Yes			No		
Time FE	Yes			No		
Constant	Yes			Yes		
N	3,773			9,548		

This table presents estimates from a Heckman (1979) maximum likelihood estimation that is used to impute deal enterprise values for observations without disclosed deal value. The dependent variable for the first stage probit regression is an indicator variable equal to one if we observe a deal value for the respective buyout and zero otherwise. The dependent variable for the second stage OLS regression is the natural logarithm of the disclosed deal enterprise value. The second stage controls for the inverse Mills ratio, obtained from the first stage, to account for non-random deal value observability and is used to predict deal values for observations with missing information. Procedure and variables are analogous to Strömberg (2008) and Arcot et al. (2015). Variables specifically constructed for the regressions in this table include: *IBO transaction*, an indicator variable equal to one if the buyout is labelled in Zephyr as a purely institutional buyout, i.e., no MBO, MBI or BIMBO; *public investment fund*, an indicator variable equal to one if the PE sponsor is listed at a stock exchange; *LN (age of financial sponsor)*, the natural logarithm of the difference between the buyout entry year and the PE firm's foundation year; *Sponsor with >20 deals*, an indicator variable equal to one if the PE sponsor has made more than 20 deals before the buyout; *sponsor ranked in PEI 50 Index*, an indicator variable equal to one if the PE sponsor is ranked in the Private Equity International (PEI) Top 50 Index, which ranks PE firms according to their capital under management, in the respective buyout year; indicator variables equal to one if the buyout occurs in *Asia*, *Australia*, *Continental Europe*, *Canada*, *Eastern Europe*, *Latin America*, *Scandinavia*, *UK* and *US* with the omitted category being *Africa & Middle East*; as well as indicator variables equal to one for buyouts in the years 2000-2001 (dot-com), 2002-2004 (post dot-com), 2005-2006 (buyout growth), 2007-2008 (buyout peak) and 2009-2010 (financial crisis) with buyouts in 1997-1999 being the omitted category. Standard

errors are in parentheses. Statistical significance is represented at the 10% (*), 5% (**), and 1% (***) level.

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