Do private equity firms pay for synergies?

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ABSTRACT

Stylized facts suggest that strategic acquirers can pay for synergies whereas private equity (PE) firms cannot because of the missing operating fit with the portfolio company. However, if PE firms initiate buy and build strategies, there is potential for an operating fit between the portfolio firm and its add-on acquisitions and thus for synergistic value that could be priced in at entry. Analyzing the pricing of 1155 global PE buyouts, we find strong support for a valuation effect from buy and build strategies. Our results indicate that PE sponsors pay a premium of up to 24% at entry when the portfolio company acquirers add-ons in the same industry within a two year time window after the buyout. The effect gets stronger when the portfolio firm has acquisition experience and when the PE sponsor has pressure to invest because of dry powder or competition for deals. Consistent with synergy-based explanations, the valuation effect disappears when add-ons are outside the portfolio firm's industry and/or too distant from the entry date. These findings remain robust after addressing alternative explanations, endogenous selection as well as reverse causality and have important implications for the literature on strategic versus financial bidders in takeovers.

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1. Introduction

It is a commonly accepted view that strategic acquirers can incorporate synergistic value into their bid for targets, whereas private equity (PE) firms cannot as they lack any operating fit with the portfolio firm. Empirical evidence provides some support for this view. Bargeron, Schlingemann, Stulz & Sutter (2008) find that PE firms pay significantly less than public acquirers in cash-only deals and conjecture that this may be due to a lack of synergies. Gorbenko & Malenko (2014) bring further nuance to this conjecture. They find that valuations of strategic bidders may be higher on average but that this heavily depends on target characteristics. Their data indicates that strategic bidders have higher valuations for targets with sufficient investment opportunities where they can exploit synergies, whereas financial bidders have higher valuations when the target is poorly performing and needs restructuring advise. The notion of segmented bidding where strategic and financial acquirers do not compete for the same targets as they intend to create value differently is also in line with Fidrmuc, Roosenboom, Paap & Teunissen (2012).

However, the existing empirical support on the view that PE firms cannot pay for synergies is limited in at least two aspects. First, it only takes into account bids for public targets although auctions with competing bidders are a very frequent phenomenon among non-publicly listed firms too (Boone & Mulherin, 2007). Second, it only captures the average PE deal and does not address heterogeneity of PE value creation strategies. Recent evidence by Hammer, Knauer, Pflücke & Schwetzler (2017) suggests that PE firms make frequent use of so-called buy-and-build (B&B) strategies where the portfolio company serves as a platform for add-on acquisitions during the holding period. As Smit (2001) argues that PE firms initiate such B&B strategies to benefit from operating synergies between the platform company and its add-ons, there is synergistic potential that could be priced in by a PE firm when acquiring the platform in an initial buyout. However, when PE firms bid for public targets with the ultimate goal to take these firms private, it is unlikely that they intend to rely on a B&B strategy. Boucly, Sraer & Thesmar (2011) and Hammer et al. (2017) document that public-to-private buyouts do not spur growth and that there is at best a

negative relationship to B&B probability.[1] Against this background, it is not surprising that previous literature on public bidding processes concludes that PE firms cannot pay for synergies.

To overcome the limitations of existing literature and identify a possible valuation effect from B&B strategies, this paper studies a sample of 1155 global PE buyouts which is not restricted to public-to-private buyouts and which sufficiently captures the heterogeneity of value creation strategies in the PE market. Next to data about the valuation of these buyouts, the sample also includes detailed information about timing and industrial classification of add-on acquisitions during the holding period that we can utilize to proxy for synergy potential. In absence of observable market valuations, which are often used to estimate synergistic effects in public mergers (e.g., Ahern, Daminelly & Fracassi, 2015; Maquieira, Megginson & Lance, 1998), we rely on two identifying assumptions. First, we assume that synergy potential is in place if the portfolio firm acquirers add-ons in the same industry (the "industry restriction"). This is consistent with the idea that B&B strategies intend to create operating (not financial) synergies (Smit, 2001), which are greatest in focused mergers between firms that share the same industrial classification code (Devos, Kadapakkam & Krishnamurthy, 2009). Second, for synergy potential to be priced in, the realization of a planned add-on acquisition must be relatively certain at entry and there must be sufficient time to realize synergies until exit. We therefore assume that pricing effects from synergies are only observable if add-ons are realized within two years after the buyout (the "time restriction").

The central hypothesis of this paper is that PE firms pay higher prices for a portfolio company at entry when there is synergy potential from an intended B&B strategy. This hypothesis origins from the M&A literature, which argues that the stand-alone value of the target and associated synergy potential determine the reservation price of the buyer and that the seller aims at securing maximum benefits from the transaction by achieving a price that is as close as possible to the buyer's reservation price (e.g., Rhodes-Kropf & Viswanathan, 2004; Shleifer & Vishny, 2003). In the B&B context, synergy potential may be in place if the PE firm utilizes its proprietary deal-flow (or existing portfolio investments) so that synergies between the platform and a specific add-on target can be estimated already at entry. Even in absence of concrete synergy estimates, a price premium may be justified by the platform's strategic importance for the PE firm. Smit (2001)

[1] This is consistent with the idea that firms go public to benefit from the market for corporate control and realize growth opportunities (Brau & Fawcett, 2006; Lowry, 2003). Thus, at the time of an intended public-to-private buyout, it is likely that most of the inorganic growth potential has been exploited already. Hammer et al (2017) confirm this to some extent as they report that portfolio firms that undergo a public-to-private buyout exhibit the greatest acquisition experience of all portfolio firms in the sample at the time of the buyout.

argues that B&B strategies aim at consolidating fragmented industries to benefit from economies of scale and market power, which requires a sizeable market leader that has a scalable competitive advantage as well as sufficient capacity, resources and skill to integrate future add-ons. Once the PE firm owns such a platform, it can build on it and acquire smaller competitors of which several will be available in fragmented industries. As such, it is the initial platform investment that creates the option for industry consolidation and opens up further investment opportunities. The management of the platform company will know about its strategic importance for the B&B strategy during the negotiation for a buyout. It is thus likely that it demands a price premium to capture part of the PE firm's future value from B&B.

Our baseline results provide strong evidence for a valuation effect from B&B strategies at entry. We find that PE firms pay a premium of 7% when the portfolio company acquirers add-ons in the same industry within two years after the buyout controlling for a variety of determinants of buyout pricing such as fund size, PE firm age, institutional affiliation, relative investment pressure because of unspent fund capital (also referred to as "dry powder"), different entry channels and buyout types, M&A experience and size of the portfolio firm as well as prevailing financing conditions at entry and time varying competition for targets across industries. The results also hold when including PE sponsor fixed effects into the regression models so that unobserved heterogeneity of PE manager skills is unlikely to explain our results. We furthermore employ versions of the B&B dummy that serve as a placebo test for synergy identification. The idea is that, if factors other than synergy potential drive the valuation effect from B&B strategies at entry, then estimates should be robust to relaxing the industry and/or time restriction. However, if add-ons are carried out in other industries and/or later than two years after entry, statistical and economical significance of the B&B coefficients reduce or completely disappear. We interpret this finding as being consistent with our synergy-based argumentation.

Next, we re-estimate our regressions controlling for the endogenous choice to initiate a B&B strategy. This step is necessary as B&B strategies do not occur at random and pertain to a particular set of buyout, PE firm and portfolio firm characteristics as well as industrial and economic conditions. First, we rule out any effects from endogenous selection on the basis of observable characteristics through propensity score matching. The matching model includes all major B&B determinants as reported by Hammer et al. (2017) and performs well in balancing the covariates across the B&B sub-sample and the non-B&B control group. We find that the B&B effect on entry valuation remains statistically significant. Economic significance of the results even increases and

suggests an entry premium of 13% to 24% depending on the number of nearest neighbors we apply. In addition, as endogenous selection may be the result of unobservable characteristics, we employ two-stage regressions relying on exogenous variation in the availability of B&B strategies as an instrument. We find that statistical and economic significance in the outcome equation remain significant. The insignificant correlation between the reduced form and outcome regression furthermore indicates that there is no selection effect on the basis of unobservable characteristics. We also address concerns about reverse causality, which could be in place if the PE firm engages in a B&B strategy because it overpaid at entry. If the entry valuation were to drive B&B probability, then we would expect that statistical and economic significance disappears when excluding overpriced deals from the sample. However, the results of our sub-sample regressions indicate that this is not the case.

Finally, we explore various channels that drive our results. Ahlers, Hack, Kellermanns & Wright (2016) identify competition, time pressure and expertise as key drivers of the perceived negotiation power in buyout transactions. Perceived negotiation power, in turn, likely affects the price upon which the portfolio firm and the PE investor eventually agree. We thus model these three determinants and test whether our estimates are sensitive to the inclusion of various interaction terms with our B&B indicator. First, we find that the B&B premium increases when the PE sponsor faces high competition for deals in the portfolio firm's industry because the target will be less inclined to make concessions during the negotiation when there is a substantial number of alternative PE sponsors. Second, a significantly higher B&B premium is evident if the PE sponsor has dry powder, as this coincides with relative investment pressure and thus with a weaker bargaining position. Third, we find that PE sponsors pay significantly higher premia for a B&B strategy when the portfolio firm has M&A experience at entry. This finding is consistent with the idea that platform targets can counter the GPs negotiation power and capture a greater part of the synergistic value from B&B when they have comparable M&A expertise. Buyout targets with prior M&A activity may furthermore be able to achieve higher premia because their experience in managing M&A processes enables them to acquire and integrate add-ons faster, which is attractive to PE sponsors given their holding period constraints.

This paper relates to existing literature in at least three ways.

First, our findings contribute to previous studies on strategic versus financial buyers in takeover processes. Bargeron et al. (2008) find that target shareholders receive 55% more if the acquirer is a public firm and attribute this premium to differences in managerial incentives. Gorbenko and

Malenko (2014) estimate willingness to pay in takeover auctions and find that the market is segmented, i.e. different targets appeal to different groups of buyers. The results furthermore indicate that financial bidders prefer investments in mature underperforming targets and that they are more affected by aggregate economic conditions. Dittmar, Li and Nain (2011) provide evidence that a takeover is more advantageous to corporate buyers if a financial sponsor competes in the bidding process and thus certifies the value creation potential of the target. Fidrmuc et al. (2012) investigate the selling processes of firms acquired by PE versus strategic acquirers. They find that targets with low market to book values, high cash levels and redeployable assets end up more frequently with PE buyers as they can add more value to these firms due to their restructuring abilities. In contrast to these studies, our sample is not limited to public-to-private buyouts and allows for estimating the valuation impact from B&B strategies. We are thus able to present novel evidence that PE firms can pay for synergies if the platform company acquires add-on acquisitions in the same industry within two years after the buyout.

Second, we add to existing literature on buyout pricing. Gompers and Lerner (2000) document a strong positive relationship between the valuation of buyouts and capital inflows into the private equity industry. Cumming & Dai (2011) find that there is a convex relationship between fund size and portfolio company valuations and explain this by the tradeoff between increasing negotiation power and diluted attention as capital under management grows. Wang (2012) shows that secondary buyouts are priced at a premium, which cannot be explained by target firm characteristics. Arcot et al. (2015) document that pressured buyers, who are close to the end of their investment period, pay more in secondary buyouts. Axelson et al. (2013) find that economy-wide credit conditions influence leverage and transaction prices and suggest that private equity funds overpay when access to credit is easily available. Achleitner, Braun & Engel (2011) confirm this relationship and provide further evidence that experience of the PE firm is decisive for buyout pricing. To the best of our knowledge, this paper is the first to show that B&B strategies are an important determinant of buyout pricing.

Third, our results add to literature on B&B strategies in PE. Nikoskelainen and Wright (2007) as well as Valkama et al. (2013) show that B&B deals outperform non-B&B deals in terms of their internal rates of return (IRR). Acharya et al. (2013) argue, that financial value creation in B&B deals is mainly driven by multiple expansion, where deals with add-on acquisitions outperform those without. They furthermore show that inorganic growth strategies are more likely if the general partner (GP) has investment banking background. Smit (2001) provides conceptual

background by describing the real option value from add-on acquisitions in B&B strategies. Hammer et al. (2017) analyze the probability of add-on acquisitions and add-on productivity along different fund-, portfolio firm- and industry characteristics as well as macroeconomic conditions. They document a positive influence of private equity sponsor experience, portfolio firm size and M&A experience as well as moderate industry fragmentation and access to cheap financing on add-on probability and productivity. This paper departs from existing literature by taking a new perspective and relating B&B strategies to entry pricing.

The remainder of this paper proceeds as follows. In section 2, we discuss the sample selection and distribution as well as construction details for all variables used in the regression models. Section 3 presents baselines results, endogeneity tests and channels that drive our result. Section 4 concludes.

2. Data

2.1 Sample construction and distribution

We follow previous literature (e.g. Hammer et al., 2017; Rigamonti et al., 2016; Tykvova & Borell, 2012; Wang, 2012) on PE buyouts and base our sample on Bureau van Dijk's (BvD) Zephyr database, which is known to have good coverage of private firm acquisitions (Erel et al., 2015). We select all institutional buyouts, PE-backed management buyouts, management buy-ins and buy-in management buyouts completed between 1 January 1997 and 31 December 2010 where financing is labelled as "private equity" or "leveraged buyout". We exclude deals that are mistakenly classified as late-stage buyouts although they are corporate acquisitions, VC deals or because the deal was only announced but never completed. This leaves us with 9,548 global PE transactions.[2] Next, we complement our data with the comprehensive add-on acquisitions sample of Hammer et al. (2017), which includes 4,937 acquisition events between 1997 and 2012 sourced from Zephyr, LexisNexis and official company websites. The sample contains detailed information about the timing and industrial classification of all add-ons. To construct a measure of the entry valuation, we follow Arcot et al. (2015) and make use of enterprise value to sales (EV/Sales) multiples. We thus collect information about deal enterprise values from Zephyr and about

[2] The sampling strategy is similar to Hammer et al. (2017) who present a detailed benchmarking of the representativeness of these 9,548 buyouts in comparison to the samples of Strömberg (2008) and Axelson et al. (2013).

portfolio firm sales figures in the year of the buyout from BvD's Orbis database. After excluding deals with missing deal value or accounting information, we end up with 1,155 buyouts.[3]

Table 1 presents the sample distribution along various dimensions. Next to the overall sample distribution, we also report distributions for the sub-sample of deals that record at least one add-on in the portfolio firm's industry within a two year window after the buyout (*B&B [IR+TR]*), as well as those that do not record add-ons at all or not within the portfolio firm's industry and/or later than two years after the buyout (*Non-B&B [IR+TR]*). This distinction is important because we argue that deals in the *B&B [IR+TR]* sub-sample provide potential for synergies, which is a necessary preconditions for future acquisitions to be priced in.[4]

— Insert Table 1 about here —

Table 1 Panel A shows that the majority of the sample falls in the period 2003 to 2007. The time series indicates a first rise of buyout activity until 2000, a slight drop thereafter, a second rise until 2007, and a subsequent drop during the Global Financial Crisis. These trends mimic the overall development of the buyout market as reported by several other studies (e.g., Degeorge et al., 2016; Strömberg, 2008; Wilson et al., 2012). Deals in the *B&B [IR+TR]* and *Non-B&B [IR+TR]* sub-samples exhibit a relatively similar clustering of observations.

Table 1 Panel B reports the sample distribution across countries. We cover a total of 40 countries and a broad range of geographies. Most observations originate from Europe, and especially from the UK, because the UK is the most important non-US buyout market and disclosure regulations require all private companies to submit annual financial reports (Wang, 2012). The distribution of observations across European countries is representative of the European buyout market and in line with other studies (e.g., Achleitner et al., 2011; Lopez-de-Silanes et al., 2015). Arguably, non-European deals seem underrepresented in our sample. We therefore address sensitivity of our results to an exclusion of these deals in the robustness section. With respect to the B&B sub-samples, we observe relatively similar distributions for the *B&B [IR+TR]* and *Non-B&B [IR+TR]* sub-samples.

Table 1 Panel C presents our coverage across industries. Overall, the sample is well distributed over all industries with "business services" representing the largest cluster of observations with a share of 11.8%. The fact that most deals occur in "business services" is not surprising given that

[3] The sample is comparable in size to Arcot et al. (2015) who draw upon 1,373 entry EV/sales multiples for a sample of US and European buyouts between 1980 and 2010 from Capital IQ.
[4] We describe the rationale behind this definition in more detail in the next chapter.

services industries tend to be more fragmented (Brown et al., 2005) and that fragmented industries are generally attractive to PE firms (Kaplan & Strömberg, 2004). Thus, other PE studies report a relatively high share of services deals too (e.g., Bernstein et al, 2017). The *B&B [IR+TR]* sub-sample records somewhat more deals in "recreation" as well as "restaurants, hotels, motels" and less deals in "retail", but overall there is no indication for any undue clustering.

2.2 Variables and summary statistics

In Table 2, we present definitions of the variables that we use in our regression models, including details on the variable constructions and sources. In the following, we discuss the rationale for choosing these variables as well as construction details and summary statistics.

— Insert Table 2 about here —

2.2.1 Valuation measures

We use the EV/sales multiples at entry, winsorized at the 1% level, as our major dependent variable. Relying on EV/sales multiples rather than on enterprise value to EBIT or EBITDA multiples has the advantage that we do not lose observations because of firms with negative profitability figures. We can therefore draw upon more observations in our regressions, which increases the efficiency of our estimates. Note, however, that results are qualitatively unchanged when using EV/EBITDA multiples (not reported for brevity). Table 3 presents summary statistics and shows that the mean (median) EV/sales multiple amounts to 1.96 (1.11), which compares to, e.g., 1.36 (1.02) in Arcot et al. (2015).

— Insert Table 3 about here —

2.2.2 Buy and build (B&B) measures

B&B strategies require that the portfolio company makes at least one add-on acquisition during the holding period. However, the motives behind these acquisitions vary. Hammer et al. (2017) document that B&B strategies can involve both industry penetrating and diversifying add-ons and the timing of these acquisitions is not limited to a particular stage of the holding period. Thus, there is no reason to believe that a B&B strategy will generally induce valuation effects at entry. Further distinction is necessary to identify add-on acquisitions that create real option value to the general partner (GP). We borrow theory from the M&A literature, which suggests that synergies determine reservation prices in merger bids (e.g., Rhodes-Kropf & Viswanathan, 2004; Shleifer & Vishny, 2003). Accordingly, if the combined market value of platform and add-on exceeds the two stand-

alone market values, then the target's seller and the GP might anticipate synergistic value and account for it in the price negotiations at entry.

A major task for variable construction is to find a version of the B&B dummy that captures synergy potential sufficiently well. Existing literature on public mergers proxies for synergy gains using measures of individual and combined market valuations of the target and acquirer (e.g., Ahern et al., 2015; Maquieira et al., 1998), long-term abnormal operating performance (e.g., Healy et al., 1992; Maksimoviv & Phillips, 2001) or present values of cash flow forecasts (Devos et al., 2009), but such measures are typically not available in a PE setting where both the acquirer and target are non-listed. As B&B strategies aim at operating synergies (Smit, 2001), we can instead rely on explanations for synergy potential that relate to industry similarities between the acquirer and target.[5] Devos et al. (2009) point out that operating synergies are the result of enhanced productive efficiencies such as savings from reductions in investments. They find that operating synergies are greatest in focused mergers that involve firms with similar industrial classification code. Another explanation for operating synergies bases on advantages of size and economies of scale, which may increase market power, e.g. in terms of higher prices charged to customers and lower prices paid to suppliers, especially in fragmented industries where acquisitions of competitors effectively reduce competition (e.g. Kim & Singal, 1993; Sapienza, 2002). A necessary precondition for achieving market power is that target and acquirer exhibit operating similarities, which holds true if both operate in the same industry.[6] Thus, we assume that synergy potential, be it driven by productive efficiencies, market power, or both, is in place if the platform company of the B&B strategy acquirers an add-on within its industrial classification code.[7] To account for this argumentation, we impose an industry restriction (*"IR"*) to our B&B dummy.

[5] Smit (2001) describes the rationale of B&B strategies as follows (p. 82): "In a buy-and-build strategy, the investor acts as an industry consolidator, with the aim of transforming several smaller companies into an efficient large-scale network. The initial platform acquisition generates the option for further acquisitions. Additional value is created through the consolidation of synergistic acquisitions as operations become integrated, cost efficiencies are realized, and market share increases."

[6] See Brown et al. (2005) and Devos et al. (2009) for examples of studies that suggest market power or economies of scale arguments and assume these to apply for intra-industry mergers.

[7] The degree to which this assumption is valid likely depends on the granularity of the classification scheme. For example, when using a rather undetailed scheme such as FF5 or FF10, the portfolio firm's classification code may not only capture related industries but also unrelated ones. A very detailed classification scheme such as FF48 may lead to the contrary, i.e., to too many related industries being not captured by the portfolio firm's classification code. We therefore decide for the FF30 scheme, which lies inbetween these two extremes. Similar to Hammer et al. (2017), we make use of an extended version of FF30 where we break down the rather broad "services" category into its FF38 components. This provides us with a more heterogeneous distribution than FF30 and avoids that our B&B dummy contains too few observations, as it is the case for more granular industry classification schemes.

In addition, for synergy potential to be priced in, the realization of a planned add-on acquisition must be relatively certain at entry and there must be sufficient time to realize synergies until exit. However, these two conditions may not always be met. The data indicates that some buyouts conduct add-ons at a very late stage of the holding period or even right before exit. Such add-ons are unlikely to be part of the entry valuation, as this would require that the GP anticipates concrete synergistic effects many years in advance. Also, the closer add-ons are to the exit, the more difficult it is for the GP to capitalize on synergies, as they may not yet be reflected in operational improvements when the GP intends to sell. Late add-ons could therefore be the result of motives other than synergy realization. For example, some PE sponsors may utilize signaling effects (Humphery-Jenner et al., 2017) or put unused fund capital to work before the fund's investment period ends (Arcot et al., 2015). To rule out that such motives confound an otherwise existing valuation effect from synergies, we impose a time restriction ("*TR"*) to our B&B dummy that indicates whether the first add-on is made within a two-year time window after buyout entry. Considering the relatively long time span between deal initiation and closure[8], most add-ons that have been realized within this two year time window must have been initiated very soon after the entry. This increases the probability that they have been part of the GP's investment case and entry valuation. In light of an average PE holding period of four years (Jenkinson & Sousa, 2015), the two year time window furthermore ensures that there is sufficient time to integrate add-on's into the organizational structure of the platform and realize operating improvements until exit.

Next to our major explanatory variable for synergistic value, *B&B [IR + TR]*, we also employ alternative definitions that serve as a placebo test. The idea is that, if explanations other than synergistic value lead to a valuation effect at entry, then this effect should be robust to relaxing the industry and/or time restriction. For example, in the sense of Chen, Cohen & Lou (2016), GPs may rely on a B&B strategy to exploit valuation differences across industries and reposition a low-valuation platform to a more favorably priced segment. If such "window dressing" is priced in at entry, it should be observable when relaxing the industry restriction and replacing *B&B [IR + TR]* by *B&B [TR]*. To acknowledge the theoretical possibility of a valuation effect from late add-on acquisitions, we also construct a variable *B&B [IR]* that relaxes the time restriction, as well as a variable *B&B* that relaxes both restrictions. As Table 3 shows, around 11% of buyouts acquire add-

[8] For example, Aktas et al. (2013) report that acquisition processes take up to 14 months until completion even if the acquirer is experienced.

ons within two years in the same industry. This number increases to 15% (20%) when relaxing the time (industry) restriction. 28% of buyouts make use of any kind of add-on acquisition during the holding period, which aligns well with Hammer et al. (2017) who report 26% for a global sample of 9548 buyouts.

2.2.3 Control variables

Table 3 also presents summary statistics for several control variables, which can be clustered into three groups: PE firm characteristics, portfolio firm and deal characteristics as well as investment conditions.

2.2.3.1 PE firm characteristics

Previous literature suggests that it is important to control for the fund's size as a determinant of buyout pricing. Cumming & Dai (2011) find that there is a convex relationship between fund size and portfolio company valuations. As funds under management grow, the GP's negotiation power increases, which initially allows to enforce lower prices for investments. However, if funds become unnecessarily large, GPs suffer from adverse monetary incentives[9] and diluted attention, which increases the probability for inflationary pricing. We therefore collect data about fund sizes from Thomson One and include *LN (fund size)* as a control variable in all regressions. The average (median) fund in the sample has a volume of $1550 million ($501 million), which compares to $938 million ($456 million) in Jenkinson & Sousa (2015) and $1420 million ($700 million)[10] in Harris et al. (2014).

Experience is likely to be another important control variable at the PE firm level. Gompers (1996) documents the grandstanding phenomenon for young PE firms, which creates incentives to quickly realize deals at the expense of lengthy negotiations and attractive prices. Young PE firms are furthermore inexperienced and lack reputation, which should coincide with lack of negotiation skill and power (Achleitner et al., 2011). To account for these arguments, we construct an indicator variable *Novice* that is equal to one if the PE firm age is less than six years at the time of the

[9] Adverse monetary incentives can be in place if funds grow to levels where the fixed management fee creates sufficient financial renumeration, so that GPs may be tempted to conduct riskier investments.
[10] Harris et al. (2014) report these numbers for the 2000s, which represent the vast majority of vintage year in our sample.

buyout.[11] Data about the foundation years of the PE firms is collected from Bloomberg Businessweek's private company database, Thomson One and official PE firm websites.

We also control for relative investment pressure because of unspent fund capital, also referred to as "dry powder". Axelson et al. (2009) and Arcot et al. (2015) suggest that dry powder creates incentives to realize deals that GPs would otherwise have rejected. In terms of pricing, dry powder may lead to adverse selection in the sense that GPs accept overpriced deals. Our indicator variable *dry powder* controls for these effects by comparing a fund's investment behavior to peers. Accordingly, we complement our dataset with information about fund vintage years from Thomson One and cluster funds according to vintage year and size using three size segments. We then set the *dry powder* indicator to one if the total number of a fund's investments at buyout entry is less than 75% of the average number of investments of funds from the same cluster. The rationale behind this definition is that funds of similar size class have comparable capital endowment and will, on average, target investments of similar size.[12] Thus, trailing behind the average number of realized investments of peers with similar vintage year and size should indicate an unusual amount of unspent capital and relative investment pressure.

Finally, we follow previous literature (e.g., Arcot et al., 2015; Cressy et al., 2007; Scellato & Ughetto, 2012) and control for different institutional backgrounds of PE firms. The indicator variable *affiliation* equals one if the PE sponsor is related to a bank, insurance company, pension fund, family office, governmental institution or an industrial corporation, and zero otherwise. Affiliation to these institutions may imply that PE managers pursue goals aside from pure IRR maximization, e.g., stimulating regional private equity activity in case of affiliation to the government (Cumming et al., 2017) or establishing lending relationships in case of affiliation to a bank (Fang et al., 2013). Thus, it is likely that PE managers of affiliated funds are less sensitive to pricing and willing to accept higher entry valuations.

[11] The six year defintion ensures that the PE fund is in the investment period (also called commitment period) of the first fund.

[12] Humphery-Jenner (2012) provides empirical and theoretical justification for this assumption. He finds that large funds are significantly more likely to invest in large portfolio companies and vice versa. For example, the findings indicate that only 1.16% of funds whose size is in the bottom 25% of the underlying sample have an average investment size in the top 25% of the sample. The explanation for these findings rest on the idea that large funds can only utilize their competitive advantages when they invest in large firms and suffer from diseconomies of scale otherwise.

2.2.3.2 Portfolio firm and deal characteristics.

At the portfolio firm level, we first control for M&A experience at entry. Hammer et al. (2017) find that B&B strategies are significantly more likely if the portfolio company already made acquisitions before the buyout. Thus, not controlling for M&A experience may lead to omitted variable bias if M&A experience is simultaneously correlated with entry pricing. We expect that this could be the case and control for *LN(previous net acquisition experience)* in our regression models, where *previous net acquisition experience* indicates the portfolio firm's total number of acquisition before the buyout as in BvD Zephyr, net of all acquisitions from a previous buyout if there is one (we control for these acquisitions separately). The rationale is that repetitive acquirers gain experience and improve deal-making skills so that the target may secure more benefits for itself and force the GP to accept higher prices (Mohite, 2016).

The size of the portfolio firm is an additional determinant of entry pricing that needs to be controlled for. Achleitner et al. (2011) provide evidence that larger firms are associated with higher entry valuations. This is also consistent with the idea that larger firms obtain more leverage, which is positively correlated with buyout pricing (Axelson et al., 2013; Demiroglu & James, 2010). We therefore cluster portfolio firms according to their deal enterprise value and include dummies for *small cap, mid cap* and *large cap* buyouts into all our regression models. As Table 3 indicates, the vast majority of deals (86%) is from the small and mid-cap segment, which is in line with previous literature (e.g., L'Her et al., 2016; Hammer et al., 2017; Phalippou, 2014).

We furthermore include a control variable at the deal level that indicates *management participation*. The dummy is equal to one if the buyout is labelled as a management buyout (MBO), buy-in (MBI) or buy-in management buyout (BIMBO) in BvD Zephyr. Controlling for management participation is important because of the "underpricing hypothesis" (Lowenstein, 1985; Kaplan, 1989), which suggests that managers have private information about the company and may thus be able to enforce lower prices.

A final set of control variables at the deal level comprises different entry channels. Respective dummy variables indicate whether the seller is a publicly listed entity (*public-to-private*), a larger corporation that spins-off a business unit (*divisional*) or another PE firm, where we, following Hammer et al. (2017), further distinguish between those that did not rely on a B&B strategy in the previous buyout (*financial organic*) and those that did (*financial inorganic*). Previous literature suggests that pricing could be contingent to these different entry routes. Achleitner & Figge (2014) argue that financial buyouts are overpriced because the selling PE sponsor will exercise market

timing and negotiation skill. This may especially hold true if there is left-over value creation potential from B&B strategies that a subsequent PE owner can extract (Hammer et al., 2017). Officer (2007) reports price discounts for the acquisition of corporate subsidiaries because of liquidity constraints of the corporate parent. The findings of Renneboog, Simons & Wright (2007), finally, suggest that it is important to control for public-to-private buyouts as they may be motivated by undervaluation.

2.2.3.3 Investment conditions

In terms of investment conditions, we control for the PE firm's competitive pressure at buyout entry. Gompers & Lerner (2000) provide evidence that competition for targets leads to increasing valuations and rising prices. To account for this, we first compute industry market shares for each country and entry year as well as their year-on-year variations. We then construct an indicator variable *competitive pressure* that is equal to one if the market share of the portfolio company's industry increased by more than 50% in the year before the buyout.

We finally control for financing conditions at buyout entry. Axelson et al. (2013) provide evidence that economy-wide credit conditions affect leverage in buyouts and that acquirers pay higher prices when access to credit is easier. Achleitner et al. (2011) and Demiroglu & James (2010) find similar results. We therefore include the average *LIBOR* rate as an additional control to our regression models.

3. Results

3.1 Univariate results

Table 4 shows univariate results comparing entry EV/Sales multiples depending on the different B&B definitions.

— Insert Table 4 about here —

Panel A of table 4 documents that the mean entry EV/Sales multiple for *B&B [IR + TR]* deals is 35% higher than for *Non-B&B [IR + TR]* deals. The difference in entry sales multiples between B&B and non-B&B deals is highly statistically significant. Panels B, C and D of table 4 show that both the difference in entry EV/Sales multiples between *B&B* and *Non-B&B* observations and the statistical significance decrease when we relax either the industry *[IR]* or the time restriction *[TR]*. The effect is even more pronounced when we relax both restrictions. Univariate results for medians point in the same direction as the results based on means.

3.2 Multivariate results

3.2.1 Baseline results

In this sub-section we aim to investigate the influence of our four B&B definitions developed in section 3.1 on entry EV/Sales multiples. For each B&B definition we apply a PE sponsor fixed effects model (1) as well as a model including the control variables developed in chapter 2.2:

$$Y_i = \alpha + \beta_1 \, x \, B\&B_i + \beta_2 \, x \, \gamma_i + \epsilon_{it} \quad (1)$$

$$Y_i = \alpha + \beta_1 \, x \, B\&B_i + \beta_3 \, x \, \overrightarrow{\delta_i} + \epsilon_{it} \quad (2)$$

where Y_i is the entry EV/Sales multiple of buyout i winsorized at the 1% level; $B\&B_i$ is an indicator variable identifying buyouts that follow a B&B strategy (based on the four B&B definitions developed in section 2.2.1); γ_i denotes time-invariant private equity firm effects; $\overrightarrow{\delta_i}$ is a vector of the control variables developed in section 2.2.3, including PE firm characteristics, portfolio firm- and deal characteristics as well as investment conditions. In addition, both the sponsor fixed effects model and the model including the control variables include entry year fixed effects, country fixed effects and industry fixed effects. Table 5 presents multivariate analyses of the influence of the four different B&B definitions on entry valuations, i.e., entry EV/Sales multiples.

— Insert Table 5 about here —

Table 5 documents a very strong and significant effect of B&B on entry pricing based on the definition. In specification (1), the sponsor fixed effects model, the entry valuation of *B&B [IR + TR]* deals is 13.2% higher than of *Non-B&B [IR + TR]* deals and specification (2), which includes the set of control variables, documents a 7.8% price premium of *B&B [IR + TR]* deals vs. *Non-B&B [IR + TR]* deals. When we relax the time and/or industry restriction of our main B&B definition *B&B [IR + TR]* both the size of the effect and the statistical significance decrease. When we relax the time restriction and apply the *B&B [IR]* definition the B&B effect is no longer statistically significant in the sponsor fixed effects model - specification (3) – and the size of the effect decreases sharply in specification (4), the model including the controls. We find similar results when we relax the industry restriction and apply the *B&B [TR]* definition. In specification (5), the sponsor fixed effects model, the effect is significantly less pronounced and the statistical significance is lower as for the *B&B [IR + TR]* definition. In specification (6), the model including

the set of controls, we do not find a statistically significant effect of *B&B [TR]* on entry valuations. Relaxing both, the time and the industry restriction and applying the *B&B* definition, we only find limited statistical significance and a relatively small effect size in specification (7), the sponsor fixed effects model, and no statistical significance in specification (8), the model including the set of controls. These results indicate that the B&B price premium is indeed driven by the search for synergistic gains as it only materializes if we apply a narrow industry definition, i.e., the business models of the merging firms are sufficiently similar and operating synergies exist, and include the time restriction, i.e., the first add-on had already been in the pipeline at the time of the initial buyout and potential synergies had been priced in.

The coefficients of the controls in specification (2), (4), (6), and (8) mostly confirm our hypotheses and the findings of previous studies. In line with Arcot et al. (2015) we document a positive influence of *fund size* on entry pricing. We confirm the findings of Gompers (1996) sowing that *novice* funds (PE firm age less than six years at the time of the buyout) pay higher entry prices. Regarding relative investment pressure our results are in line with Axelson et al. (2009) and Arcot et al. (2015) showing that *dry powder* exercises a positive influence on entry prices. However, we cannot confirm our hypothesis that *affiliated* funds are less sensitive to pricing and accept higher entry valuations as well as the hypothesis that entry valuations for portfolio firms with *previous net acquisition experience* are higher. In line with Achleitner et al. (2011) we show that larger portfolio firms are associated with higher prices with *mid cap* firms having higher entry valuations than *small cap* firms and *large cap* firms having higher entry valuations than *mid cap* firms. Furthermore, we confirm the "underpricing hypothesis" (Lowenstein, 1985; Kaplan, 1989) by showing the *management participation* impacts entry valuations negatively. In line with Renneboog, Simons & Wright (2007) we show that public-to-private buyouts experience lower entry valuations. Moreover, we add to the findings of Achleitner & Figge (2014) and Hammer et al. (2017) showing that targets sold by another PE firm that already employed a B&B strategy (*financial inorganic*) exhibit higher entry valuations. Regarding investment conditions we confirm the findings of Gompers & Lerner (2000) showing that *competitive pressure* leads to increasing entry valuations as well as the findings of Axelson et al. (2013), Achleitner et al. (2011) and Demiroglu & James (2010) documenting a negative relation between economy-wide credit conditions (*LIBOR*) and entry valuations with prices increasing as access to credit gets easier.

3.2.2 Identification

B&B strategies do not occur by coincidence but are a deliberate choice of the respective private equity fund. Hence, the results of our base model could give rise to endogeneity concerns. We use a propensity score matching (PSM) estimator and a two-stage endogenous treatment-regression in order to control for self-selection to treatment and in order to obtain an unbiased estimate of the effect of B&B on entry prices.

First, we apply a PSM estimator, which estimates the probability of treatment assignment to mimic the characteristics of a randomized control trial ensuring similar covariates between treated and untreated subjects. In panel A of table 6 we present matching diagnostics and show the results of probit regressions on the *B&B [IR + TR]* indicator on the unmatched and matched sample. Panel B of table 6 presents the average treatment effects on the treated (ATET) for PSM estimators. In order to account for the tradeoff between efficiency (high number of nearest neighbors) and accuracy (low number of nearest neighbors) we show results for the ATET based on 1, 5, 10, and 50 nearest neighbors. Since we only have a relatively low number of degrees of freedom for a PSM model, we do not include fixed effects. Instead, we add additional control variables, which capture country-, industry, and time-dependent effects. Specifically, we include *3yr Tobin's Q*, a *high industry concentration* dummy and *moderate industry concentration* dummy, a measure of relative buyout intensity and 3yr average GDP growth (all variables defined in table 2).

— Insert Table 6 about here —

Panel A of table 6 presents results of probit regressions on the unmatched and matched sample that we apply to test the conditional independence assumption. While the covariates in the regression on the unmatched sample statistically discriminate across B&B vs. non-B&B, there are no statistically significant differences when regressing on the matched sample. This result indicates that PSM performs well in balancing both groups. Panel B of table 6 shows the PSM results and confirms a causal effect of *B&B [IR + TR]* on entry valuations. Depending on the number of required nearest neighbors we find that *B&B [IR + TR]* increases entry valuations by a minimum of 12.9% and a maximum of 23.6% depending on the number of nearest neighbors. The ATET estimation is highly significant across the different specifications indicating a causal increase of entry valuations through *B&B [IR + TR]*.

As PSM only provides causal inference if self-selection occurs on the basis of observable characteristics we also apply a Heckman (1979) endogenous treatment-regression to account for

potential unobservable characteristics that correlate with B&B and entry pricing. The Heckman (1979) endogenous treatment-regression estimates the probability of treatment in a first regression and controls for self-selection on the basis of unobservable characteristics in a second regression. Following the literature on endogeneity concerns in private equity research (e.g., Siming, 2014), we use the *local market B&B share* as an instrument to capture the local availability of B&B. We construct local markets based on entry years, entry countries, and extended FF30 industry codes. For each of these markets we calculate the share of *B&B [IR + TR]* deals and use this variable – the *local market B&B share* – as an explanatory variable in the first regression. We do so, as we assume that the *local market B&B share* correlates with the choice of a B&B strategy while the *local market B&B share* should not have an impact on the pricing of a particular buyout. In essence we assume that - while the *B&B [IR + TR]* dummy might be a result of endogenous matching - the *local B&B market share* is exogenous to the portfolio firm. Table 7 shows the results of the first stage regression, which predicts B&B treatment as well as the results of the second stage regression on entry EV/sales multiples.

— Insert Table 7 about here —

The results of the first stage regression provide strong evidence for instrument validity both in terms of economic and statistical significance of the coefficient of the *local market B&B share*. The second stage regression shows that the *B&B [IR + TR]* indicator is also positive and highly statistically significant when we control for unobservable characteristics. The size of the coefficient is slightly lower than in the baseline estimation suggesting an increase of entry valuations through B&B by 7.1%. In summary, our endogeneity checks support the hypothesis that a causal increase in entry valuations is indeed driven by B&B, even after controlling for unobservable characteristics.

So far, we have interpreted our results in the following way: PE funds are willing to pay a price premium in the initial buyout if they follow a B&B strategy as they can price in future synergistic gains from subsequent add-on acquisitions. However, one could also argue that the direction of causality is the other way around, i.e., private equity funds that initially overpaid engage in B&B more frequently in order to bring down multiples through add-ons with relatively low entry multiples. To address these potential reverse causality concerns (i.e., the hypothesis that add-on acquisitions are not motivated by synergies but opportunistically driven in order to lower multiples) we run a sub-sample regression and exclude observations with high entry valuations. To detect overvaluation, we define local markets based on extended FF30 industry codes and entry year

clusters[13]. Afterwards, we exclude all deals that are within the highest valued 30% of deals in the respective local market. This procedure leaves us with 775 observations. Table 8 presents multivariate analyses of the influence of the four different B&B definitions on entry valuations, i.e., entry EV/Sales multiples for the sub-sample, which excludes overvalued buyouts. As in our baseline model, we apply a private equity sponsor fixed effects model as well as a model including the control variables developed in chapter 3.2. Again, both models include entry year fixed effects, country fixed effects and industry fixed effects.

— Insert Table 8 about here —

Table 8 shows that the B&B premium also exists when we exclude the highest valued 30% of deals in the respective local market. Applying the *B&B [IR + TR]* definition, we find a 10.7% (vs. 13.2% in the full sample) B&B premium in specification (1), the sponsor fixed effects model, and a 13.8% (vs. 7.8% in the full sample) B&B premium in specification (2), the model including the set of controls. Hence, for *B&B [IR + TR]*, the findings are in line with our baseline results both in terms of effect size and statistical significance. The same holds true for our alternative B&B definitions *B&B [IR]*, *B&B [TR]*, and *B&B*. Our results show that the B&B price premium is not driven by overvalued buyouts but also manifests when we exclude overvalued buyouts. Thus, the direction of causality corresponds to our initial hypothesis (i.e., PE funds deliberately pay a premium when they acquire a platform company and expect to benefit from future synergistic gains through subsequent add-on acquisitions) and not to the reverse interpretation (i.e., PE funds that initially overpaid engage in B&B more frequently to bring down multiples through add-on acquisitions with low entry multiples).

Hitherto, we have argued that PEs are willing to pay a premium for platform companies, which are suitable for B&B, as they can benefit from future synergies through add-on acquisitions. However, one question remains: Why are private equity funds willing to give away part of the future value creation in the initial buyout (in contrast to not paying a premium and collecting all future synergies for themselves)? We argue that, with respect to the distribution of future merger gains, acquisitions conducted by financial sponsors are not different from acquisitions conducted by strategic investors. The rich literature on the distribution of merger gains in classical mergers between public companies shows that wealth increases are greater for target firm shareholders than for bidder firm shareholders (e.g., Bradley et al., 1988; Maquieira et al., 1998), i.e. shareholders of

[13] 1997-1999; 2000-2002; 2003-2006; 2007-2010

target firms are well aware of future synergistic gains and demand their share. As in classical merger situations, we expect the same to happen when a private equity fund acquires a platform company: The seller is well aware of the option value of a target that is suitable for B&B and demands a share of the future value creation. However, since neither the buyer's nor the seller's valuations are observable - only the actual transaction price - we cannot test whether sellers manage to receive a significant share of the future value creation.

3.2.3 Channels

The results of the previous sections suggest that private equity funds pay a premium in the initial buyout when they follow a B&B strategy and plan to conduct subsequent add-on acquisition through which they benefit from synergies. In this section we investigate channels through which B&B increases entry valuations.

As outlined by Axelson et al. (2009) and Arcot et al. (2015) dry powder creates incentives to invest wherefore adverse selection in the sense that GPs accept overpriced deals might occur. We argue that this effect could be even larger for B&B deals, since they provide the opportunity to invest larger sums of *dry powder* through subsequent add-on acquisitions. As outlined by Devos et al. (2009), synergistic gains in merger situations are mainly driven by operational synergies. Consequently, we also focus on channels that increase the likelihood of synergy realization and mitigate potential roadblocks. We hypothesize that portfolio firms with *previous net acquisition experience* have an edge over unexperienced portfolio firms in terms of synergy realization due to advantages in managing a post-merger-integration. Additionally, we want to test whether unexperienced private equity firms exhibit different characteristics when they acquire a platform company. Specifically, we test whether the B&B premium is more pronounced for *Novice* PE firms (age less than six years at the time of the buyout) in order to investigate whether less experienced firms with little track record and potentially less bargaining power might pay more and thus transfer an increased share of future value creation to the seller. Last but not least, we test whether *competitive pressure* has an impact on the B&B premium.

Table 9 presents multivariate analyses of the influence *B&B [IR + TR]* and the respective interaction terms on entry valuations, i.e., entry EV/Sales multiples. We apply a model including the control variables developed in chapter 2.2.3, which includes entry year fixed effects, country fixed effects and industry fixed effects.

— Insert Table 9 about here —

Table 9, specification (1) documents a very strong and highly statistically significant B&B premium for funds with *dry powder* with the interaction term between *B&B [IR + TR]* and *dry powder* being highly statistically significant. Specification (2) shows that the B&B premium is especially pronounced if a private equity fund acquires a platform company with previous acquisition experience. This result supports the hypothesis that the B&B effect is driven by the search for synergies as portfolio companies with previous acquisition experience should have an edge over unexperienced portfolio companies in terms of post-merger integration and ultimately in terms of synergy realization. Specification (3) shows that *Novice* PE firms do not pay significantly more than experienced firms. Hence, little track record and potentially less bargaining power are factors that do not lead to private equity firms' overpaying. Specification (4) documents that private equity funds pay higher B&B price premiums if there is competitive pressure.

Overall these results show that the relative bargaining power of the PE sponsor vis-à-vis the platform company is an important driver of the B&B premium. Factors lowering the relative bargaining power of the PE sponsor, i.e., high competition for deals (*competitive pressure*), high internal investment pressure (*dry powder*) and M&A experience of the portfolio firm (*previous net acquisition experience*) lead to higher B&B premia as the platform company secures a greater part of future synergistic gains.

4. Conclusion

This paper is to our best knowledge the first paper which investigates the influence of B&B strategies on entry valuations of private equity buyouts. It furthermore revisits the paradigm that financial sponsors cannot benefit from synergies. Our analyses are based on a sample of 1,155 buyouts for which both the entire acquisition history as well as sales figures in the year of the buyout are available.

Our results are as follows. We first investigate whether private equity firms pay a price premium for the buyout of a platform company when they follow a B&B strategy. For our main B&B definition *B&B [IR + TR]*, which includes a time and an industry restriction (i.e., first add-on is conducted within two years after the acquisition of the platform company and all add-ons are within the same extended FF30 industry) we find a large B&B premium. When we relax the time restriction, the industry restriction or both restrictions, both the statistical significance and the size of the B&B price premium decrease. This indicates that the B&B price premium is driven by expected synergetic gains through subsequent add-on acquisitions as it only materializes if the

business models of the merging firms are sufficiently similar and the first add-on had already been in the pipeline at the time of the initial buyout and potential synergies had been priced in. Our endogeneity checks confirm the causal effect of B&B on entry valuations. Afterwards, we address potential reverse causality concerns and show that we also find a B&B price premium when we exclude buyouts with a high entry valuation from our sample, i.e., add-on acquisitions are not conducted in order to bring down multiples if the initial valuation was high. The investigation of channels through which B&B impacts entry valuations shows that the B&B price premium is especially pronounced for private equity funds with *dry powder*, portfolio firms with *previous net acquisition experience* and for investment conditions with significant *external pressure*.

Our results are particularly interesting for future research comparing strategic and financial buyers. Our findings show that private equity investors that engage in B&B take synergies into account. Hence, B&B buyouts are more similar to transactions conducted by strategic investors, as synergies play an important role in both cases. Consequently, future research should consider the differences between B&B and non-B&B buyouts when comparing transactions conducted by financial sponsors and strategic investors. It would be particularly interesting to investigate whether systematic differences in entry pricing between financial sponsors and strategic investors disappear, if only B&B transactions of financial sponsors are included in the sample.

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Table 1: Sample distribution

This table presents the sample distribution along various dimensions. Panel A shows the sample distribution across buyout entry years. Panel B shows the sample distribution by home country of the portfolio company. Panel C shows the sample distribution by industry of the portfolio company.

Panel A: Distribution by entry year

	Total sample		B&B [IR+TR]		Non-B&B [IR+TR]	
Entry year	N	%	N	%	N	%
1997	17	1.5	2	1.6	15	1.5
1998	39	3.4	6	4.7	33	3.2
1999	63	5.5	4	3.1	59	5.7
2000	67	5.8	11	8.6	56	5.5
2001	64	5.5	5	3.9	59	5.7
2002	57	4.9	7	5.5	50	4.9
2003	98	8.5	7	5.5	91	8.9
2004	108	9.4	15	11.7	93	9.1
2005	69	6.0	9	7.0	60	5.8
2006	152	13.2	23	18.0	129	12.6
2007	180	15.6	16	12.5	164	16.0
2008	108	9.4	7	5.5	101	9.8
2009	61	5.3	6	4.7	55	5.4
2010	72	6.2	10	7.8	62	6.0
Total	1155	100.0	128	100.0	1027	100.0

Table 1: Sample distribution - *continued*

Panel B: Distribution by country

	Total sample		B&B [IR+TR]		Non-B&B [IR+TR]	
Country	N	%	N	%	N	%
Austria	9	0.8	1	0.8	8	0.8
Australia	5	0.4	0	0.0	5	0.5
Belgium	23	2.0	2	1.6	21	2.0
Bulgaria	4	0.3	1	0.8	3	0.3
Canada	8	0.7	0	0.0	8	0.8
China	2	0.2	0	0.0	2	0.2
Czech Republic	10	0.9	1	0.8	9	0.9
Germany	50	4.3	6	4.7	44	4.3
Denmark	2	0.2	0	0.0	2	0.2
Estonia	2	0.2	1	0.8	1	0.1
Egypt	3	0.3	0	0.0	3	0.3
Spain	55	4.8	7	5.5	48	4.7
Finland	8	0.7	1	0.8	7	0.7
France	172	14.9	18	14.1	154	15.0
United Kingdom	562	48.7	70	54.7	492	47.9
Israel	5	0.4	0	0.0	5	0.5
India	4	0.3	0	0.0	4	0.4
Italy	53	4.6	5	3.9	48	4.7
Japan	7	0.6	0	0.0	7	0.7
Korea, Republic Of	3	0.3	0	0.0	3	0.3
Lithuania	6	0.5	0	0.0	6	0.6
Luxembourg	2	0.2	0	0.0	2	0.2
Malaysia	3	0.3	0	0.0	3	0.3
Netherlands	24	2.1	3	2.3	21	2.0
Norway	12	1.0	1	0.8	11	1.1
Poland	8	0.7	0	0.0	8	0.8
Portugal	5	0.4	0	0.0	5	0.5
Romania	9	0.8	0	0.0	9	0.9
Sweden	41	3.5	6	4.7	35	3.4
Thailand	2	0.2	0	0.0	2	0.2
United States	47	4.1	5	3.9	42	4.1
Rest of world	9	0.8	0	0.0	9	0.9
Total	1155	100.0	128	100.0	1027	100.0

Table 1: Sample distribution – *continued*

Panel C: Distribution by industry

	Total sample		B&B [IR+TR]		Non-B&B [IR+TR]	
Industry	N	%	N	%	N	%
Food Products	41	3.5	8	6.3	33	3.2
Beer & Liquor	8	0.7	1	0.8	7	0.7
Recreation	41	3.5	13	10.2	28	2.7
Printing and Publishing	39	3.4	3	2.3	36	3.5
Consumer Goods	34	2.9	1	0.8	33	3.2
Apparel	11	1.0	0	0.0	11	1.1
Healthcare, Medical Equipment, Pharmaceutical Prod.	48	4.2	4	3.1	44	4.3
Chemicals	22	1.9	4	3.1	18	1.8
Textiles	10	0.9	0	0.0	10	1.0
Construction and Construction Materials	89	7.7	5	3.9	84	8.2
Steel Works Etc	14	1.2	1	0.8	13	1.3
Fabricated Products and Machinery	38	3.3	1	0.8	37	3.6
Electrical Equipment	20	1.7	1	0.8	19	1.9
Automobiles and Trucks	18	1.6	0	0.0	18	1.8
Aircraft, ships, and railroad equipment	8	0.7	1	0.8	7	0.7
Mining, Oil & Gas Extraction, Nonmetallic Minerals	8	0.7	1	0.8	7	0.7
Utilities	16	1.4	1	0.8	15	1.5
Communication	52	4.5	8	6.3	44	4.3
Business Equipment	46	4.0	3	2.3	43	4.2
Business Supplies and Shipping Containers	25	2.2	1	0.8	24	2.3
Transportation	52	4.5	10	7.8	42	4.1
Wholesale	67	5.8	7	5.5	60	5.8
Retail	99	8.6	2	1.6	97	9.4
Restaurants, Hotels, Motels	36	3.1	10	7.8	26	2.5
Banking, Insurance, Real Estate, Trading	37	3.2	6	4.7	31	3.0
Personal Services	50	4.3	9	7.0	41	4.0
Business Services	136	11.8	18	14.1	118	11.5
Computer Software	60	5.2	6	4.7	54	5.3
Everything Else	30	2.6	3	2.3	27	2.6
Total	1155	100.0	128	100.0	1027	100.0

Table 2: Variable definitions

This table describes the dependent (panel A) and independent variables (panel B) used in this paper.

Category	Variable	Description
Entry pricing	EV/sales	Disclosed deal enterprise value divided by sales in the year of the buyout. Source: BvD Zephyr; BvD Orbis
B&B	B&B [IR+TR]	Indicator variable that equals one if the portfolio firm performs all add-on acquisitions within the same FFown industry and the first add-on acquisition within two years after the initial buyout and zero otherwise. Source: BvD Zephyr
	B&B [IR]	Indicator variable that equals one if the portfolio firm performs all add-on acquisitions within the same FFown industry and zero otherwise. Source: BvD Zephyr
	B&B [TR]	Indicator variable that equals one if the portfolio firm performs the first add-on acquisition within two years after the initial buyout and zero otherwise. Source: BvD Zephyr
	B&B	Indicator variable that equals one if the portfolio firm performs at least one add-on acquisition and zero otherwise. Source: BvD Zephyr
PE firm characteristics	LN(fund size)	Natural logarithm of the fund volume (USD million) of the sponsoring PE firm. Variable is averaged in case of a syndicate. Source: Thomson One
	Novice	Indicator variable that equals one if the PE firm age is less than six years at the time of the buyout and zero otherwise. Source: Bloomberg, Reuters, PE firm websites
	Dry powder	Indicator variable that equals one if, at buyout entry, a PE fund completed less than 75% of the number of deals that PE funds of similar size and vintage year (based on three size clusters) have completed since fund inception and zero otherwise. Source: BvD Zephyr, Thomson One
	Affiliated	Indicator variable that equals one if the PE firm is affiliated to a bank, insurance company, pension fund, family office, governmental institution or any other financial or non-financial corporation and zero otherwise. Source: Bloomberg, Reuters
Portfolio firm and buyout characteristics	LN(prev. net acq. exp.)	Natural logarithm of one plus the number of acquisitions made by the portfolio firm prior to the entry. For financial buyouts, this variable is net of the add-on acquisitions from the previous buyout. Source: BvD Zephyr
	Management participation	Indicator variable that equals one if the buyout is labelled as "management buyout", "management buy-in" or "buy-in management buyout" in Zephyr. Note: Deals with management participation are only included if a PE investor is involved, i.e., pure management buyouts without PE involvement are excluded. Source: BvD Zephyr
	Public-to-private	Indicator variable that equals one if the portfolio firm's vendor at entry is a publicly listed entity and zero otherwise. Source: BvD Zephyr
	Divisional	Indicator variable that equals one if the portfolio firm has been a corporate division or subsidiary before the buyout event and zero otherwise. Source: BvD Zephyr
	Financial organic	Indicator variable that equals one if the portfolio firm's vendor at entry is another PE firm and if the portfolio company did not record add-on acquisitions in the previous buyout and zero otherwise. Source: BvD Zephyr

Table 2: Variable definitions (continued)

Panel B: Independent variables

Category	Variable	Description
	Financial inorganic	Indicator variable that equals one if the portfolio firm's vendor at entry is another PE firm and if the portfolio company recorded at least one add-on acquisition in the previous buyout and zero otherwise. Source: BvD Zephyr
	Small cap	Indicator variable that equals one if the disclosed deal enterprise value is less than 25 million USD and zero otherwise. Source: BvD Zephyr
	Mid cap	Indicator variable that equals one if the disclosed deal enterprise value is equal to or larger than 25 million USD and less than 600 million USD and zero otherwise. Source: BvD Zephyr
	Large cap	Indicator variable that equals one if the disclosed deal enterprise value is equal to or larger than 600 million USD and zero otherwise. Source: BvD Zephyr
Investment conditions	LIBOR	EURO 5 months LIBOR rate. Source: Datastream
	Competitive pressure	Indicator variable that equals one if the PE market share of the portfolio firm's industry in a respective country increased by more than 50% in the year before the buyout and zero otherwise. Source: BvD Zephyr
Additional controls for PSM	3yr Tobin's Q	3yr Tobin's Q (Asset Market Value/Asset Replacement Costs) for the respective portfolio firm industry. Source: Datastream
	Total market growth	Indicates the 1-year median sales growth over all industries in the buyout year. Based on FFown classification scheme. Basis is the S&P Global Broad Market Index. Source: Datastream
	High industry concentration	Indicator variable equal to one if the Herfindahl-Hirschman Index (HHI) of the portfolio firm's FFown industry is in the upper quartile in the year of the buyout, and zero otherwise. Basis for the calculation is the S&P Global Broad Market Index in each buyout year. Source: Datastream, S&P Global Broad Market Index.
	Moderate industry concentration	Indicator variable equal to one if the Herfindahl-Hirschman Index (HHI) of the portfolio firm's FFown industry is between the second and third quartile in the year of the buyout, and zero otherwise. Basis for the calculation is the S&P Global Broad Market Index in each buyout year. Source: Datastream, S&P Global Broad Market Index.
	Low industry concentration	Indicator variable equal to one if the Herfindahl-Hirschman Index (HHI) of the portfolio firm's FFown industry is below the second quartile in the year of the buyout, and zero otherwise. Basis for the calculation is the S&P Global Broad Market Index in each buyout year. Source: Datastream, S&P Global Broad Market Index.
	Relative buyout intensity	Indicator variable equal to one if the number of deals in the entry year in a specific local market (based on FFown industry and country) is at least twice as high as in the long-term average (1997 – 2010) and zero otherwise. Source: BvD Zephyr
	3yr average GDP growth	Previous 3 year's average world GDP growth at buyout entry. Source: OECD
	Crisis	Indicator variable equal to one if the buyout is conducted in a year, in which the MSCI World Index had a negative (annualized) return and zero otherwise. Source: Datastream.

Table 3: Summary statistics

This table shows summary statistics for the dependent (panel A) and independent variables (panel B).

	N	Mean	S.D.	Q1	Median	Q3
EV/Sales	1,155	1.96	2.46	0.57	1.11	2.34
B&B [IR+TR]	1,155	0.11	0.31	0.00	0.00	0.00
B&B [IR]	1,155	0.15	0.36	0.00	0.00	0.00
B&B [TR]	1,155	0.20	0.40	0.00	0.00	0.00
B&B	1,155	0.28	0.45	0.00	0.00	1.00
Fund size (USD million)	686	1550.47	3184.01	177.05	501.83	1484.74
Novice	1,005	0.16	0.37	0.00	0.00	0.00
Competitive pressure	1,155	0.08	0.28	0.00	0.00	0.00
Dry powder	1,155	0.03	0.18	0.00	0.00	0.00
Affiliated	1,084	0.28	0.45	0.00	0.00	1.00
Previous net acquisition experience (# of acq.)	1,155	2.20	7.88	1.00	1.00	1.00
Management participation	1,155	0.26	0.44	0.00	0.00	1.00
Public-to-private	1,155	0.14	0.34	0.00	0.00	0.00
Divisional	1,155	0.29	0.45	0.00	0.00	1.00
Financial organic	1,155	0.17	0.37	0.00	0.00	0.00
Financial inorganic	1,155	0.08	0.27	0.00	0.00	0.00
Small cap	1,155	0.25	0.44	0.00	0.00	1.00
Mid Cap	1,155	0.61	0.49	0.00	1.00	1.00
Large Cap	1,155	0.13	0.34	0.00	0.00	0.00
LIBOR (percent)	1,155	4.76	1.65	4.14	4.96	5.88

Table 4: Univariate difference tests

This table presents univariate comparisons of means and medians of the EV/Sales Multiple for different B&B definitions. In panel A, we base our B&B definition on a time (first add-on within two years) and industry restriction (all add-ons within same extended FF30 industry code). In panel B, we only keep the industry restriction and in panel C we only keep the time restriction. In panel D we relax both restrictions. The symbols ***, **, * denote significance at 1%, 5% and 10%, respectively.

Panel A: Time and industry restriction			
	B&B [IR+TR]	Non-B&B [IR+TR]	Diff.
Mean	2.53	1.88	0.65***
Median	1.48	1.07	0.41**
N	128	1027	1155
Panel B: Industry restriction			
	B&B [IR]	Non-B&B [IR]	Diff.
Mean	2.36	1.88	0.48***
Median	1.38	1.07	0.31**
N	179	976	1,155
Panel C: Time restriction			
	B&B [TR]	Non-B&B [TR]	Diff.
Mean	2.27	1.88	0.39**
Median	1.35	1.06	0.29***
N	229	926	1155
Panel D: No restriction			
	B&B	Non-B&B	Diff.
Mean	2.15	1.88	0.26*
Median	1.27	1.06	0.21**
N	327	828	1155

Table 5: Multivariate baseline results

This table presents OLS regression models where the dependent variable is the entry EV/Sales multiple. All variables are defined in table 2. Omitted categories are private-to-private for the entry channels and small cap for the portfolio firm size measures. Standard errors are clustered by world regions (Asia, Australia, Central Europe, Eastern Europe, Scandinavia, U.K., U.S., Canada and Rest of World) and reported in parentheses. The symbols ***, **, * denote significance at 1%, 5% and 10%, respectively.

	Dependent variable: EV/Sales							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
B&B [IR+TR]	0.280***	0.356***						
	(0.02)	(0.09)						
B&B [IR]			0.208	0.214**				
			(0.11)	(0.08)				
B&B [TR]					0.168**	0.125		
					(0.06)	(0.14)		
B&B							0.108**	-0.048
							(0.04)	(0.18)
LN(fund size)		0.102***		0.104***		0.102**		0.102**
		(0.03)		(0.03)		(0.03)		(0.03)
Novice		0.516**		0.519**		0.525**		0.535**
		(0.16)		(0.16)		(0.16)		(0.17)
Competitive pressure		0.497*		0.479*		0.480*		0.473*
		(0.25)		(0.25)		(0.25)		(0.25)
Dry powder		0.540*		0.544*		0.541*		0.518**
		(0.26)		(0.24)		(0.25)		(0.20)
Affiliated		0.281		0.293		0.296		0.302
		(0.23)		(0.22)		(0.22)		(0.22)
LN(prev. net acq. exp.)		0.587		0.590		0.587		0.594
		(0.47)		(0.47)		(0.47)		(0.48)
Management participation		-0.283**		-0.283**		-0.283**		-0.289**
		(0.11)		(0.11)		(0.11)		(0.12)
Public-to-private		-0.444*		-0.444		-0.453*		-0.458*
		(0.23)		(0.24)		(0.23)		(0.25)
Financial organic		0.187		0.186		0.179		0.157
		(0.19)		(0.19)		(0.18)		(0.23)
Financial inorganic		0.218**		0.228**		0.246**		0.315***
		(0.08)		(0.07)		(0.08)		(0.09)
Divisional		0.018		0.020		0.015		0.019
		(0.14)		(0.14)		(0.15)		(0.15)
Mid cap		0.898***		0.898***		0.915***		0.927***
		(0.15)		(0.17)		(0.17)		(0.19)
Large cap		1.394***		1.393***		1.426***		1.435***
		(0.30)		(0.29)		(0.28)		(0.27)
LIBOR		-19.97**		-21.10**		-22.10**		-22.62**
		(8.06)		(8.86)		(8.41)		(8.68)
Sponsor FE	Yes	No	Yes	No	Yes	No	Yes	No
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Entry year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	1,155	635	1,155	635	1,155	635	1,155	635

Table 6: Matching diagnostics and estimators

This table presents probit regressions on the 2YR B&B FFown indicator on the unmatched and matched sample (panel A) as well as the average treatment effect on the treated (ATET) for PSM estimators (panel B) with varying numbers of nearest neighbours. The dependent variable is the 2YR B&B FFown indicator in panel A and the EV/Sales multiple in panel B. Robust standard errors are reported in parentheses and the symbols ***, **, * denote significance at 1%, 5% and 10%, respectively.

Panel A: Matching diagnostics

	Dependent variable: B&B [IR+TR]	
	Before matching	After matching
LN(fund size)	0.013	0.017
	(0.06)	(0.07)
Novice	0.352*	0.105
	(0.18)	(0.21)
Competitive pressure	-0.307	-0.031
	(0.28)	(0.36)
Dry powder	-0.022	0.037
	(0.35)	(0.44)
Affiliated	0.304*	0.020
	(0.17)	(0.19)
LN(prev. net acq. exp.)	0.153	0.022
	(0.13)	(0.15)
Management participation	-0.019	0.095
	(0.18)	(0.21)
Public-to-private	-0.307	0.050
	(0.29)	(0.37)
Financial organic	-0.329	0.066
	(0.24)	(0.32)
Financial inorganic	0.816***	0.283
	(0.23)	(0.25)
Divisional	0.059	0.013
	(0.19)	(0.23)
Mid cap	0.201	-0.023
	(0.23)	(0.28)
Large cap	0.184	-0.100
	(0.37)	(0.41)
LIBOR	9.567	5.235
	(7.52)	(8.33)
3yr Tobin's q	-0.115	-0.048
	(0.11)	(0.15)
Total market growth	-0.234	-0.266
	(0.80)	(1.05)
High industry concentration	0.379*	0.043
	(0.21)	(0.24)
Moderate industry concentration	0.234	0.085
	(0.18)	(0.22)
Relative buyout intensity	-0.028	-0.012
	(0.17)	(0.22)
3yr average GDP growth	-8.920	-5.678
	(12.80)	(15.56)
Crisis	-0.298	0.029
	(0.19)	(0.24)
N	635	635

Panel B: Treatment effects	
	Dependent Variable: EV/Sales
ATET with NN=1	0.879***
	(0.33)
ATET with NN=3	0.971***
	(0.32)
ATET with NN=5	0.800***
	(0.31)
ATET with NN=10	0.692**
	(0.32)
ATET with NN=50	0.528*
	(0.30)

Table 7: Maximum likelihood endogenous treatment-regression

This table presents estimates of a linear regression with endogenous treatment. In this first stage, we run a probit regression, with the dependent variable being the potentially endogenous regressor 2YR B&B FFown, where we include local market B&B share as an additional explanatory variable. The second stage is a linear OLS regression on the EV/Sales multiple. Omitted categories are private-to-private for the entry channels and small cap for the portfolio firm size measures. Standard errors are clustered by world regions (Asia, Australia, Central Europe, Eastern Europe, Scandinavia, U.K., U.S., Canada and Rest of World) and reported in parentheses. The symbols ***, **, * denote significance at 1%, 5% and 10%, respectively.

	Dependent variable 1st stage: B&B [IR+TR]	Dependent variable 2nd stage EV/Sales
Local market B&B share	9.289***	
	(0.74)	
B&B [IR+TR]		0.256**
		(0.13)
LN(fund size)	-0.026	0.102***
	(0.13)	(0.03)
Novice	0.333	0.520***
	(0.27)	(0.14)
Competitive pressure	-1.637***	0.491**
	(0.31)	(0.24)
Dry powder	-1.027***	0.536**
	(0.35)	(0.24)
Affiliated	0.117	0.287
	(0.29)	(0.21)
LN(prev. net acq. exp.)	-0.357	0.588
	(0.29)	(0.44)
Management participation	-0.070	-0.284***
	(0.17)	(0.10)
Public-to-private	0.432	-0.447**
	(0.65)	(0.21)
Financial organic	0.123	0.181
	(0.39)	(0.17)
Financial inorganic	1.361***	0.239***
	(0.21)	(0.08)
Divisional	-0.136***	0.018
	(0.09)	(0.14)
Mid cap	0.853***	0.905***
	(0.15)	(0.14)
Large cap	1.268***	1.404***
	(0.16)	(0.29)
LIBOR	-89.540**	-20.675***
	(41.73)	(7.41)
Rho		0.055
		(0.06)
Country FE	Yes	Yes
Industry FE	Yes	Yes
Entry year FE	Yes	Yes
N	635	635

Table 8: Sub-sample regressions

This table presents sub-sample regressions where we exclude "over-valued buyouts". Specifically, we define local markets (based on FFown industry and entry year clusters) and exclude the highest valued 30% of buyouts in each local market. Regression models are as in table 5. Standard errors are clustered by world regions (Asia, Australia, Central Europe, Eastern Europe, Scandinavia, U.K., U.S., Canada and Rest of World) and reported in parentheses. The symbols ***, **, * denote significance at 1%, 5% and 10%, respectively.

	Dependent variable: EV/Sales							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
B&B [IR+TR]	0.259***	0.297***						
	(0.06)	(0.04)						
B&B [IR]			0.136	0.227***				
			(0.11)	(0.05)				
B&B [TR]					0.127**	0.179***		
					(0.05)	(0.04)		
B&B							0.030	0.062
							(0.07)	(0.06)
Controls included	No	Yes	No	Yes	No	Yes	No	Yes
Sponsor FE	Yes	No	Yes	No	Yes	No	Yes	No
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Entry year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	775	414	775	414	775	414	775	414

Table 9: Interaction effects

This table presents regression results of the relation between EV/Sales Multiples and different B&B definitions, including interaction terms. We investigate the influence of the following variables on the B&B effect: Dry powder, LN(previous net acquisition experience), Novice and Competitive pressure. We include the same controls as in the baseline model. Omitted categories are private-to-private for the entry channels and small cap for the portfolio firm size measures. All variables are defined in table 2. Standard errors are reported in parentheses and the symbols ***, **, * denote significance at 1%, 5% and 10%, respectively. Standard errors are clustered by world regions (Asia, Australia, Central Europe, Eastern Europe, Scandinavia, U.K., U.S., Canada and Rest of World).

	Dependent variable: EV/Sales			
	(1)	(2)	(3)	(4)
B&B [IR+TR]	0.320**	0.143**	0.249**	0.320**
	(0.12)	(0.05)	(0.08)	(0.10)
x Dry powder	0.872**			
	(0.28)			
x Net acquisition experience		0.571***		
		(0.13)		
x Novice			0.480	
			(0.28)	
x Competitive pressure				0.614*
				(0.27)
Interacted variable stand-alone	Yes	Yes	Yes	Yes
Other controls	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Entry year FE	Yes	Yes	Yes	Yes
N	635	635	635	635