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Private Equity as Strategic Buyers

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Private Equity as Strategic Buyers*

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Abstract

We provide evidence of changes in the private equity (PE) business model from the traditional PE engineering toward focus on growth using the buy-and-build strategies as a setting. In these strategies, a PE firm buys a company and builds on that "platform" through serial "add-on" acquisitions. Our novel decomposition methodology compares the combined entities instead of individual firms, and uses artificial replicating strategies as controls. While the traditional engineering practices remain important for growth and efficiency, we demonstrate a new channel of operational improvements, based on synergies between companies.

Key Words: Private Equity, Leveraged Buyouts, Buy-and-Build, Operating Performance, Synergies

JEL Codes: G23, G34, L25

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1 Introduction

Since its early days in the 1980s, the business model of private equity (PE) in leveraged buy-outs (LBOs) included using a large amount of debt to take over inefficient targets, such as conglomerates, introduce drastic restructuring and divestment of unrelated divisions and real estate, and sell a more efficient company once exit opportunities become sufficiently appealing (Kaplan and Strömberg, 2009; Phalippou, 2017; Ivashina and Lerner, 2019). A recent report by Bain and Company (2021) explicitly recognizes that PE firms now search for new ways to differentiate themselves in the competitive environment where the buyout industry matures. While the way the classic buyouts create value is extensively documented, there is a growing evidence anecdotal evidence on the ways the business model of private equity is changing, supported by several recent industry studies.[1] A survey of fund managers by Gompers et al. (2016) emphasizes longer holding periods of investments and shift from cost cutting to growth as a key value driver.[2] One example of growth strategies is serial buy-and-build strategies that account now up to a half of all global PE deals, according to Bain and Company (2018). Using these increasingly popular strategies as a setting, we provide systematic evidence on previously undocumented operating value driver in modern buyouts through synergies between portfolio companies.

In buy-and-builds, the PE firm arranges the equity financing from institutional investors and debt from banks and specialized funds in order to *buy* a "platform" company, *build* its scale and scope through purchases of the "follow-on" acquisitions and organic growth, and

[1] Examples of this emerging research are Bernstein and Sheen (2016) who document operational changes in restaurant chain buyouts and Eaton et al. (2019) who show that takeovers of independent privately owned schools by PE lead to better financial performance but worse student outcomes.

[2] The financial press started to notice that now buyout groups hold assets for way more than a decade, preparing their clients to a bit lower but stable and less risky returns (Espinoza, 2018). Bain and Company (2021, Figure 17, p.18) reports, based on Preqin data, that the share of buyouts with the median holding period of more than five years increased from 35 percent in 2004 to close to 60 percent in 2013–14, and settled at around one-half in 2019–20. In general, the financial engineering of conventional LBOs has become a commodity (Sensoy et al., 2014; Braun et al., 2017; Brown et al., 2020) and capital providers have become more discerning with new strategies to create value (Lerner et al., 2007; Da Rin and Phalippou, 2017).

eventually exit the investment into the combined entity.[3] Essentially, they are a hybrid between serial acquisitions by strategic buyers, who integrate targets into their own business, and LBOs. Conceptually, there are three potential sources of growth in buy-and-builds: i) the traditional financial, governance, and operational engineering by PE (we call it the "PE effect") and two additional sources, not present in individual buyouts, being ii) the inorganic growth from combining companies, and iii) operational synergies due to interactions between the acquired companies. We hypothesize two forms of operational synergies in PE context: "restructuring synergies," resulting from cutting capacity and shifting assets between companies, or "growth synergies," resulting from learning, economies of scope, and other effects seen in successful strategic M&As. Both types of synergies should promote efficiency and profitability of the combined entity, but would have the opposite effect on its growth. Our key contribution is to distinguish and find evidence of these three sources of operating improvements by using the strategy-level (as opposed to deal-level) analysis.

First, we find that to a large extent the growth in these strategies is inorganic (acquisitive). Second, once we remove the acquisitive part, we still observe organic improvements in profitability at strategy-level. Buy-and-builds also show higher organic asset growth and sales margins then the single-company LBOs. Third, we uncover new sources of operational improvements compared to the traditional LBOs with our novel decomposition methodology. While the traditional engineering benefits of PE ownership are still important for most outcomes we find the additional synergetic effects on average and in a number of special settings where the synergies are theoretically expected. This supports operating synergy interpretation of our findings. Fourth, the type of synergies (restructuring, growth) is not

[3]We refer to any business, acquired by a PE investor, as a "target" or "portfolio company," and use the terms "PE fund," "PE firm," or "general partner" (GP) interchangeably to mean the entity that sponsors the buyout by arranging financing, finding the target company, closing the deal, controlling the company operations, etc. Furthermore we refer to a platform and all follow-ons assembled by a PE firm with above-specified goals as "combined entity" or "strategy;" we make it explicit when we use the the latter term to mean this specific type of buyouts by PE. We discuss our data collection in Section 3.1

the same in all settings but depends on strategy configurations.

Our data is collected from Zephyr and Orbis databases by Bureau van Dijk that have some attractive unique features for our study. We focus on seven advanced economies in Europe (Denmark, Finland, France, Norway, Spain, Sweden, and the UK) that represent the most active PE markets outside of the U.S. and, in contrast to North America, have more stringent data reporting requirements for private firms. Still, no database fully identifies these strategies as a combination of a platform and follow-on deals, aiming to exploit some form of synergetic relationship. We forensically search through the ownership structure of the relevant firms and identify 684 strategies from 2,085 deals over the 1997–2017.

An example from our sample clarifies what we regard a buy-and-build strategy. On 11 February 2011, a French PE firm Activa Capital acquired a majority stake in a provider of photographic services Primavista. In 2012, Primavista bought a manufacturer of invitations to marriage and birth celebrations Secret de Polichinelle and an online service provider for family planning and parenting Cadeaux Naissance. We consider these three transactions a single buy-and-build strategy because from deal descriptions we learned that by building a combined entity from these three firms Activa hoped to achieve better operating results than what each of them would obtain individually. The focus of our study is this combined entity, consisting of Primavista (considered the platform) and two other (follow-on) firms.

Using our data we establish several new facts about buy-and-builds. First, an average holding period of the strategies in our sample exceeds five years, a longer time horizon than in a typical LBO, and has large variation from one to more than ten years to exit. Second, there is a visible clustering of deals in services and manufacturing. Third, less than a half of the deals in our dataset are in the same narrow industry, against the common perception that buy-and-build mostly consolidate industries by horizontal deals (see Bain and Company, 2018, pp. 31–36). A sizable part of the deals combine firms from upstream

(supplier) or downstream (customer) industries, or even from seemingly unrelated industries.

Consistent with the view that these strategies promote growth of the acquired firms, we find that the strategy assets grow by 30 percentage points and sales grow by 14 percentage points over five years (or to exit if earlier), compared to growth of the matched non-acquired peers of the platforms. This "total" growth might look impressive but, as our Primavista example demonstrates, these strategies may grow inorganically by simply adding companies.

Our methodological innovation is to introduce a decomposition to shed the light on the sources of strategy-level growth. There are two differences in our analysis from the LBO or M&A studies that usually compare an individual target performance with a control group of similar non-acquired firms before and after the deal, using a single treatment variable. First, we tease out inorganic growth by constructing observationally similar artificial "placebo strategies" from the peers of our platforms and follow-ons. Specifically, we match each of these targets with comparable firms from the universe of non-acquired firms in Orbis on propensity scores, construct the control strategies by adding-up financials of these matched peers, and compare the evolution of actual and artificial strategies by diff-in-diff regressions.[4] Second, we introduce two treatments in the diff-in-diff regressions, exploiting the fact that there are two distinct phases in this strategy: from origination of the strategy with platform acquisition to exit and from the time when the first and subsequent follow-ons are acquired to exit. We interpret the effect of the latter "follow-on treatment" as operating synergies, because they can only develop if and when the strategies acquire follow-ons. Once we account for the effect of follow-ons, the other "buy-and-build treatment" measures the effect of PE ownership of the strategy, which we call the PE effect.

[4]Matching at the individual firm level follows the conceptual definition of synergy, because synergies are commonly understood as the relative performance of merged companies compared to non-acquired firms. We acknowledge that we cannot unambiguously conclude that private equity firms cause the combined entities to increase revenues and profitability, since selection into buy-and-builds is not random. We follow the literature and use matching methods in an attempt to alleviate these concerns, although we do not rely on a clear source of exogenous variation for identification.

The decomposition shows a complex combination of sources of operating improvements in buy-and-builds. There is a substantial acquisitive growth, ranging from 13 percentage points (p.p.) for assets, to 20 p.p. for sales, and 15 p.p. for employment. The positive effects of PE ownership for assets, margins and profitability are accompanied by restructuring synergies, which counterbalance acquisitive growth and deliver additional productivity gains on the top of the PE effect. All these effects materialize as a 23 percent organic improvement in operating margin and 11 percent improvement in labor profitability at strategy-level.[5]

Using heterogeneity of our strategies, we show a number of settings where combining a platform and follow-ons fosters profitability and efficiency, either by restructuring synergies or growth synergies. Compared to other configurations, we document restructuring synergies in strategies with a larger platform and relatively small follow-ons and strategies in capital-intensive industries, and find growth synergies in horizontal strategies (especially in somewhat consolidated industries) and strategies where follow-ons are in upstream or downstream industries relative to the platform. Our results are robust to observing the strategies over a fixed time window (with post-exit years for shorter strategies), controlling for the timing of follow-on acquisitions, staggered diff-in-diff estimation, and using an alternative definition of buy-and-builds.

This paper contributes to several bodies of literature. We show one of the ways the traditional business model of private equity has been changing in the last decade. The literature on corporate M&As has long named synergy as their key driver (see surveys by Andrade et al., 2001; Betton et al., 2008; and evidence in Hoberg and Phillips, 2010; Bena and Li, 2014), but this has not been documented in the PE context. We find that an increas-

[5]As explained earlier, the organic strategy performance is defined as difference in outcomes of strategy and placebos over time; it excludes the inorganic acquisitive growth. In our largest sample the operating margin, or return on sales (ROS), in strategies improves by 1.3 percentage points and labor profitability (EBITDA over the wage bill) increases by 6.5 percentage points, relative to these ratios in placebos. The pre-treatment mean (standard deviation) of ROS is 0.056 (0.086) and of labor profitability is 0.570 (0.555). These estimates imply 23 percent improvement in ROS and 11 percent improvement in labor profitability, compared to pre-deal mean.

ingly popular serial buy-and-build acquisition strategy blends the traditional value drivers of leveraged buyouts with ability to realize synergies, typically associated with strategic buyers (Gorbenko and Malenko, 2014; Baziki et al., 2017).

Following Kaplan (1989), Smith (1990), and Lichtenberg and Siegel (1990), a number of papers looking at the operational consequences of LBOs in the U.S. and Europe generally found mildly positive operational outcomes. There is still an active debate in this literature on how PE changes firms.[6] Boucly et al. (2011) and Gompers et al. (2016) emphasize a shift in the focus by buyout industry on operating improvements and growth. Acharya et al. (2013) explicitly recognize the serial nature of some buyouts and consequences of this distinction for portfolio company performance.[7] Smit (2001) describes the inorganic buy-and-build strategies implemented by PE and Hammer et al. (2017) study factors behind the probably of add-on acquisitions. We extend all this work by documenting three sources of operating value creation in private equity (inorganic growth, PE engineering, and undocumented operating synergies) by a novel decomposition methodology.

The rest of paper is organized as follows. In Section 2, we develop our hypotheses. In section 3 we discuss the data collection, some new facts about buy-and-builds, and the empirical methodology. Sections 4 and 5 present the main analysis and robustness checks. Section 6 concludes.

[6]Kaplan and Strömberg (2009) and Cohn et al. (2014) provide general evidence on operating results of portfolio firms.

[7]Acharya et al. (2013) relate portfolio company performance to PE firm and partner characteristics. They focus on the match between the PE partner background (financial or operating) and the nature of the deal in Western Europe (the deals with the M&A events during the private phase and "organic" deals without M&A event). Valkama et al. (2013) demonstrate that the inorganic transactions positively relate to the internal rate of return in LBOs in the UK.

2 Hypotheses development

A large body of work established a variety of ways professional private equity firms change their targets.[8] While the literature on individual LBOs provide a number of insights for our study, few studies describe the theoretical sources of operating value in buy-and-builds. Due to the nature of this strategy, we may expect qualitatively different sources of operating value than what is known from prior literature on the operational results of general PE acquisitions. In this strategy, the "follow-on" assets are *bought* and then added to "platform" companies in order to *build* (consolidate) a larger entity, which is eventually exited. As in Smit (2001), we define a platform as an entity whose core competencies or efficiencies can be transferred onto follow-on acquisitions and change the strategic position of the combined company. Platforms can be built from multiple small companies or acquired as an existing company. We define follow-ons (also known as "add-ons" or "bolt-ons") as other companies that can be merged with the platform to increase the overall value of the combined company.[9] Our goal is to investigate whether the buy-in-build strategy enhances operating results of consolidated entities built by a series of follow-on acquisitions.

Analytically, buy-and-build deals can improve growth and efficiency in these combined entities through three effects: the acquisitive growth, the private equity effect, and synergies. First, the strategy will *grow inorganically* when the assets of several acquired entities are added together and these parts continue to grow due to their prior fundamentals (as it would

[8]Changes introduced by PE include higher overall employee turnover and lower earnings for more vulnerable employees (Antoni et al., 2019; Garcia Gomez et al., 2022); facilitating entry/exit of establishments and labor reallocation within the portfolio (Bharath et al., 2014; Davis et al., 2014; Davis et al., 2019); outsourcing of intermediate goods and materials (Harris et al., 2005); alleviating credit constraints (Boucly et al., 2011); promote investments in innovation (Lerner et al., 2011); and improved governance (Nikoskelainen and Wright, 2007; Guo et al., 2011; Cornelli et al., 2013) or human resource management (Bloom et al., 2015).

[9]Our broad definition of this strategy encompasses a number of existing variations (Smit, 2001): quick roll-ups aiming to turn investments around in a shorter-term or sequential strategies with a longer planning horizon; horizontal buy-and-builds to consolidate industries or vertical buy-and-builds aiming at integration along the value chain. We follow these conceptual definitions to collect the data for buy-in-builds (see Section 3.1 and Appendix OA1 for more details).

be the case under the unobserved counterfactual of them remaining stand-alone entities), simply because they are serial acquisition strategies:

Hypothesis 1 (H1): *The buy-and-builds achieve inorganic growth at the level of strategy.*

Second, we expect that the new PE owners would restructure their targets and employ financial, governance, and operational engineering techniques (see Kaplan and Strömberg, 2009).[10] We refer to all these changes, documented in the large body of literature, by the overarching term the *"private equity effect"* with the following hypothesis regarding the operating performance.

Hypothesis 2 (H2): *The buy-and-builds achieve growth and improvement of operating efficiency at strategy-level, associated with the traditional benefits of private equity ownership (the PE effect).*

On the top of that, the operating results of the entire strategy can change due to interactions between platforms and follow-ons, which we interpret as *operating synergies*. The existing literature does not explicitly study the operational value created by PE when it integrates companies because the literature treats each buyout—even the buy-and-build deals within the large LBO samples—as an isolated investment. We argue that focusing an analysis only on changes of individual companies could potentially miss additional effects from their interactions within the strategy. We formulate two hypothesis about how synergies in buy-an-builds may materialize. In both cases we may expect improvements in margins and other performance ratios but possibly opposite effects on strategy growth.

[10] By operational engineering the literature typically understands the transfer of industry and operating expertise from the PE firms to their portfolio companies (ibid., Acharya et al., 2013). Financial engineering incentivizes the management of companies by the equity participation (Kaplan, 1989) (the "skin in the game") and pressure not to waste money through high leverage (Jensen, 1986; Axelson et al., 2009). Governance engineering means active governance via control of the boards (Nikoskelainen and Wright, 2007; Acharya et al., 2013; Bloom et al., 2015).

On one hand, the synergies may take the form of "top-line" revenue growth achieved by learning (Smit, 2001; Humphery-Jenner, 2013)[11], development of new products (Tsai, 2001), geographic expansion (Kogut, 1984; Humphery-Jenner et al., 2017), or both (Fracassi et al., 2022). The economies of scope, giving a combined company a cost advantage when it makes a complementary range of products with the same cost base, and (so called, pecuniary or purchasing) economies of scale, when a company grows in size relative to its competitors and negotiates better terms with suppliers, financiers, or advertisers (Fee and Thomas, 2004; Bhattacharyya and Nain, 2011)[12], fall under such "growth synergies:"

Hypothesis 3 (H3): *The buy-and-builds achieve growth and improvement of operating efficiency at strategy-level by promoting interactions between the companies within the strategy (growth synergies).*

On the other hand, synergies may be achieved by cutting inefficient capacity, much like during the early LBOs and takeovers in the 1980s (see Holmstrom and Kaplan, 2001), and reallocating assets or labor to the most productive use (Davis et al., 2014; Davis et al., 2019, and case studies cited by them). Davis et al. found evidence of productivity-enhancing reallocation between the individual plants *within* the PE-acquired firms. Tate and Yang (2015) establish the benefits of reallocation within the internal labor markets of diversified firms in the U.S. in general. Similar "restructuring synergies" may plausiblly happen *between* the

[11]Smit (2001) argues that a good platform in buy-and-builds would be a company with a scalable competitive advantage and known reputation for a particular service or product; this competency can be leveraged onto the add-ons. Humphery-Jenner (2013) shows that industry and geographic diversification can increase PE fund returns and attributes this to knowledge sharing and learning within a PE fund. The broader literature on "knowledge spillovers" provides some relevant insights for such synergies. Javorcik (2004) found evidence of productivity spillovers from multinationals to domestic firms through customer-supplier relationships between domestic firms and their multinational downstream customers or upstream suppliers, while Anjos and Fracassi (2015) provide evidence that vertically-integrated firms overcome informational frictions and combine cross-industry knowledge better than specialized companies. Finally, Bloom et al. (2013) and Acemoglu et al. (2016) argue that firms learn from the technological innovation of firms that are close in technology space.

[12]The concept of economies of scale can be traced to Graham (1923). See (Koutsoyiannis, 1979) for the textbook treatment of the cost theory and detailed classification and examples of various economies firms may enjoy.

PE-acquired firms within a strategy. In addition, reducing operating costs, streamlining selling, general, and administrative expenses, and combining R&D and marketing expenditures is an additional type of economies of scale that we classify as restructuring synergies.

Hypothesis 4 (H4): *The buy-and-builds implement downsizing and improve operating efficiency at strategy-level by promoting interactions between the companies within the strategy (restucturing synergies).*

We make an effort to uncover which of these mechanisms characterize buy-and-build strategies. Finding a compelling evidence of synergies between acquired firms would be consistent with the argument that the business model in private equity is experiencing important transformation.

3 Data and empirical methodology

3.1 Data collection and characteristics of buy-and-build strategies

The fact that no commercial database identifies the entire strategy (a platform plus all related follow-ons) is a major challenge for studying buy-and-builds.[13] This is perhaps because—as we see in most cases in our sample—the platforms and follow-ons remain independent legal entities that report financials separately and are "consolidated" only in the sense of common controlling ownership by PE. Therefore, we have to construct strategies from individual buyouts, making sure we select only relevant deals.

We collect our data from Zephyr and Orbis databases by Bureau van Dijk (BvD) because of the detailed data on the ownership, financials, and company characteristics for millions

[13]To our knowledge, three other databases used by researchers of alternative investments—Capital IQ, Pitchbook, and Preqin—have recently introduced flags broadly consistent with follow-on deals. Capital IQ has "consolidation/roll up," Pitchbook has "add-on" and "platform creation" but they do not seem to be for PE specifically. Preqin has investments by PE in a portfolio company, and by reading the details of the deal one can find "add-on investments" by the company in which the PE firm invested.

of listed and private firms of all sizes across the globe.[14] Orbis covers firm financial and productive activities in a standardized and internationally comparable format and detailed ownership structure. Zephyr focuses on ownership change and contains information on, in particular, private equity deals, from the minority acquisitions to the majority takeovers. Zephyr and Orbis share a common firm identifier. Due to internal organization of the BvD databases we identify buy-and-build strategies and assign their financials in several steps, as detailed in Appendix OA1. In short, we start by selecting the follow-on deals from Zephyr, use detailed company ownership information from Orbis Ownership to find the platforms, and then define strategies as a platform and all the relevant follow-ons. After this, we collect the financials of all these individual companies from Orbis, as recommended in Kalemli-Ozcan et al. (2015) in order to reduce the survivorship bias. In total, we identify 684 strategies with unique platforms located in these seven European countries with a total of 1,401 follow-on acquisitions.

Table 1 presents descriptive statistics of our sample. In panel A, we report the number of acquisitions by year. The number of platforms and strategies is the same because each strategy has a single platform. The number of completed buy-and-build acquisitions was relatively small up to 2004 but strongly increased in the second half of the 2000s, prior to the Global Financial Crisis in 2007-08. After a short set-back, the number of acquisitions returned to their pre-crisis levels in 2010, and the low numbers in the last years are due to delays with the inclusion of later deals into the databases at the time of collection.

In panel B, we report the number of follow-on acquisitions per strategy. Most strategies have acquired either one or two follow-ons, with an average of 2.[15] But the variation of

[14]The databases are validated against the official sources and described in Kalemli-Ozcan et al. (2015).

[15]Our average number of follow-ons is comparable to what is reported by others. A study by the Boston Consulting Group with HHL Leipzig Graduate School of Management reports that the average number of add-on acquisitions per deal grew from 1.3 in 2000 to 2.7 in 2012 in the sample of 800+ deals designated by them as buy-and-build from the U.S., Western Europe, and the U.K. (Brigl et al., 2016).

Table 1: Characteristics of buy-and-build strategies in our sample.

Panel A: Buy-and-build acquisitions by year

Deal year	1997-98	1999	2000	2001	2002	2003	2004	2005	2006	2007
Strategies (Platforms)	10	25	18	16	8	22	27	48	71	76
Follow-ons	3	12	7	3	9	9	23	31	49	102
Total	13	37	25	19	17	31	50	79	120	178

Deal year	2008	2009	2010	2011	2012	2013	2014	2015	2016-17	**Total**
Strategies (Platforms)	61	37	69	73	56	36	27	2	2	684
Follow-ons	109	69	136	125	157	186	188	104	79	1,401
Total	170	106	205	198	213	222	215	106	81	2,085

Panel B: Composition of buy-and-build strategies

Follow-ons per strategy	Strategies	Percent	Cum.
0	184	26.9	26.9
1	255	37.3	64.2
2	99	14.5	78.7
3	44	6.4	85.1
4	31	4.5	89.6
5	16	2.3	92.0
6+	55	8.1	100
Total number of strategies	684		
Average number of follow-ons	2.2		
Maximum number of follow-ons	35		

Panel C: Status and length of buy-and-build strategies

Number of completed (exited) strategies	461
Number of strategies still active	195
Strategies without clear exit	28
Average strategy length (days)	2,171
Average strategy length exited only (days)	1,937
Minimum length (days)	44
Maximum length (days)	5,369

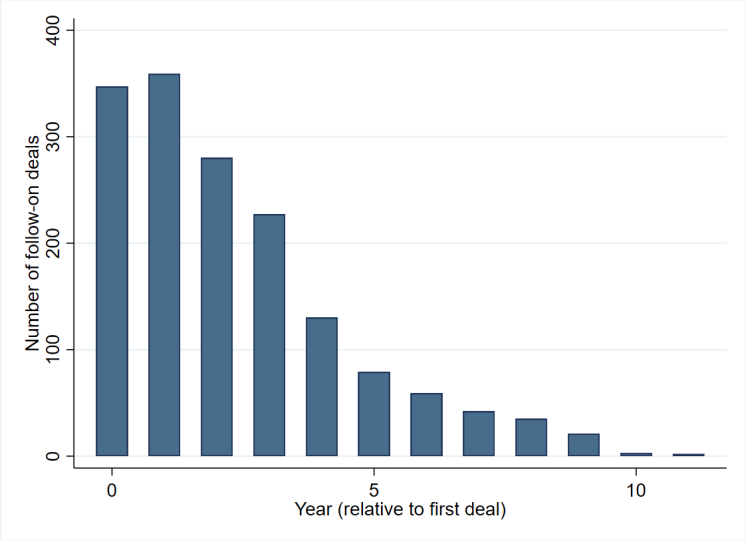
Panel D: Exit types of buy-and-build strategies

Exit type	Strategies	Percent	Cum.
Initial public offering	47	10.2	10.2
Secondary (or higher) buyout	194	42.1	52.3
Strategic buyer	220	47.7	100
Total	461		

the number of follow-on acquisitions per strategy is large. Noteworthy, some strategies explicitly designated themselves as buy-and-builds in deal descriptions but have not acquired any follow-ons. Buy-and-build strategies with five or more acquisitions are less common, although one strategy in our sample consists of an impressive 35 follow-ons. Our unit of

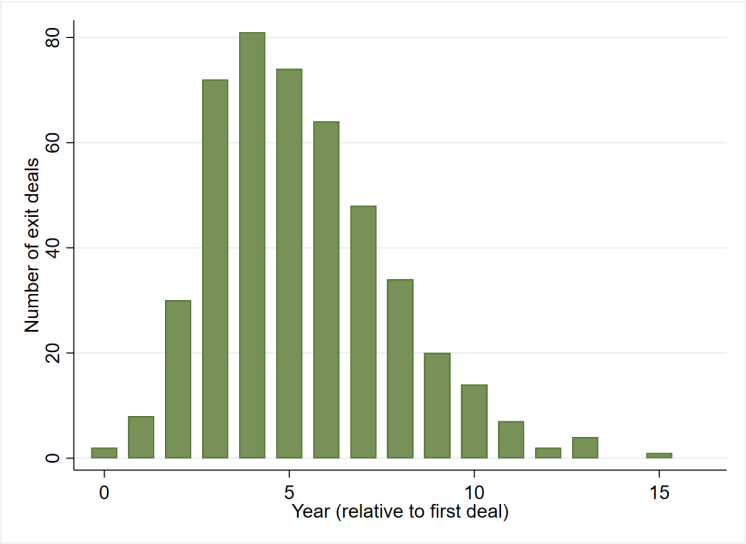
observation is a firm (a legal entity) and by examining our follow-ons we found that some included a large number of establishments, which might partially explain why our average number of follow-ons is lower than commonly thought about buy-and-builds. We conduct a robustness analysis with an alternative definition of serial buyouts by PE, and confirm the general conclusions from our preferred approach (see Section 5.3 for details). Figure 1 shows the timing of the follow-on acquisitions, where the year zero is when the platforms are acquired. As seen, most of follow-ons are added in the first three years following the platform acquisition. Given that identifying targets and completing deals takes time, this might mean that PE firms have a fairly good plan on what companies to add to the platform.

Figure 1: Timing of follow-on acquisitions relative to first (platform) acquisition. This figure presents the timing of follow-on acquisitions relative to the first acquisition. The numbers on the horizontal axis present the years after the first deal, with 0 representing the year of platform acquisition.



Panel C shows that out of our 684 strategies, 195 were still active (no exit) and 28 had an unclear status as of August 2017. Of note, if our source explicitly mentions that the companies went bankrupt we consider it an exited strategy. Figure 2 demonstrates that our sample includes some "quick-flips" in which the strategy took less than a year to complete. On the other side of the spectrum are strategies that took more than 10 years from the platform acquisition to exit. The average length of the exited buy-and-build strategies in

Figure 2: Timing of exits relative to first (platform) acquisition. This figure presents the timing of exit deals relative to the first acquisition. The numbers on the horizontal axis present the years after the first deal, with 0 representing the year of platform acquisition.



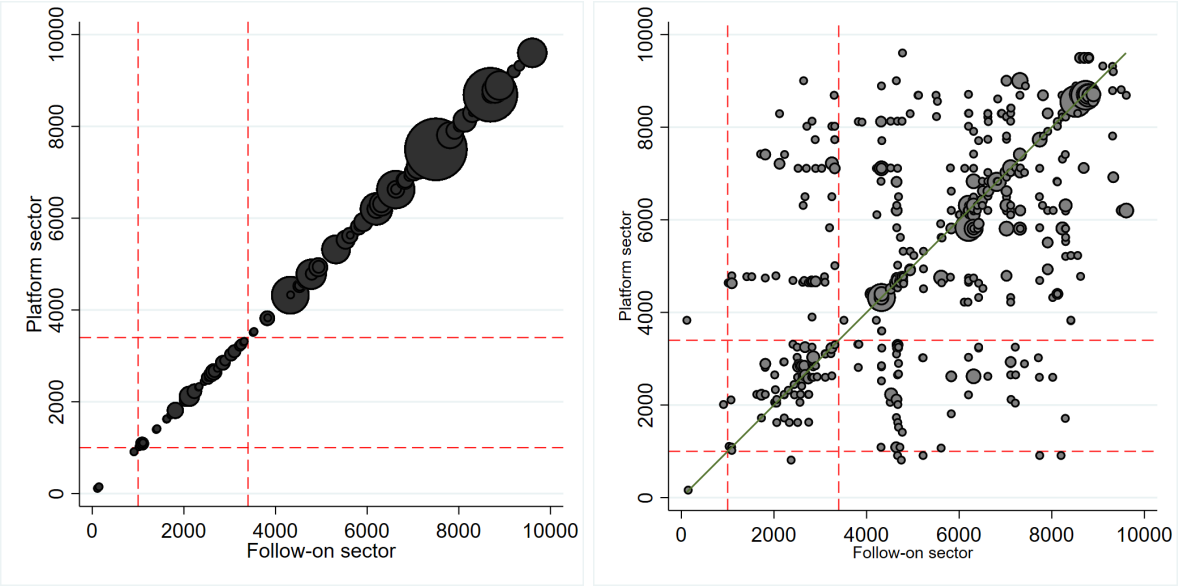
our sample is more than 5 years, confirming our expectation that buy-and-builds are indeed longer-term strategies. This is different from a typical LBO transaction that takes around 3-4 years to exit, hence, we will analyze the portfolio performance over a longer time window than is typically done in private equity research.

3.2 Sectoral Patterns

Industry reports and existing theoretical literature mentions industry consolidation in the local markets as the primary goal of buy-and-build strategy by PE (see Smit, 2001; Bain and Company, 2018). If true, we would see that most follow-on acquisitions are within the same industry as platforms.

In Figure 3 we present the volume of acquisitions by the industry combination of the platform and their follow-ons, using the European four-digit NACE classification (Statistical Classification of Economic Activities in the European Community). The sector codes of main activity of the platform are plotted on the vertical axis, the codes of its follow-ons on the horizontal axis, and the size of the circles represents the number of follow-ons in this

Figure 3: Horizontal and other industry combinations.
This figure presents the deal activity by industry combinations. The codes of four-digit NACE revision 2 sectors of the platforms are on the vertical axis, and the codes of the follow-on's sectors are on the horizontal axis. Combinations on the 45-degree line imply that the platform and follow-on belong to the same industry. The size of the ball is proportional to the deal count for that combination. In panel A, platform and follow-ons belong to the same four-digit NACE sector; in panel B they belong to a different four-digit sectors. Red lines mark Manufacturing sectors 10–33.



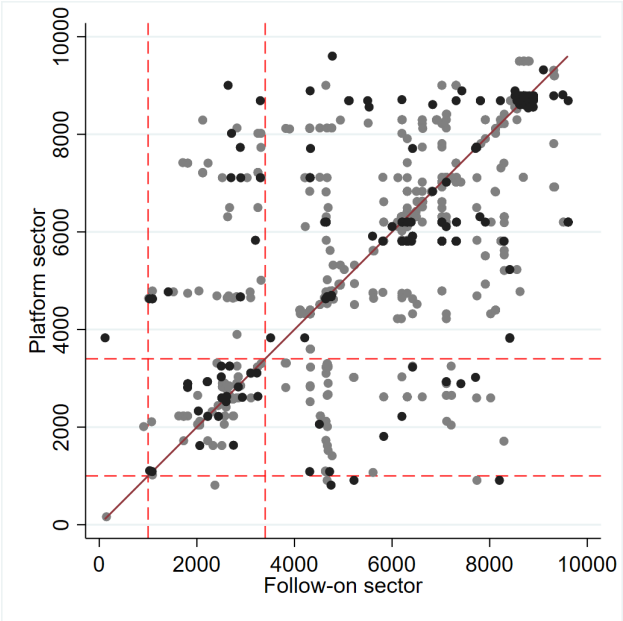
Panel A: Horizontal strategies

Panel B: Non-horizontal strategies

industry combination. In panel A, we plot the deals where platform and follow-ons belong to the same four-digit sector (or horizontally related) and in panel B the deals *outside* the same four-digit sector. The graph shows clustering of deal activity in certain industries. The horizontal acquisitions in panel A are especially visible in services industry (the industry numbers 6xxx and up). Panel B demonstrates that there are numerous strategies in which the follow-ons are active in a different industry than the platform, even a different one-digit industry (see also Figure OA3.1 at one-digit level in the Online Appendix). Here, the deals cluster in services and manufacturing (between the red dashed lines). Otherwise, the graph demonstrates that PE not only seeks to consolidate the industries, as is commonly believed, but also exploits other goals. Still, the majority of the deals in panel B are clustered around the 45-degree line, where close but not the same narrow sector combinations line-up.

What could be the reason for non-horizontal deals depicted in panel B? The industrial

Figure 4: Input-output relations of industry combinations in different sectors. This figure presents supplier-customer relations according to the input-output table between the industry combinations that do not belong to the same four-digit NACE sector. Light-gray circles indicate that the platform and follow-on share a supplier-customer relation. Dark-grey circles indicate that the platform and follow-on do not share a customer-supplier relation. On the vertical axis and horizontal axis the four-digit NACE code of respectively the platform and follow-on is presented. The green 45-degree line indicates combinations in which the platform and follow-on belong to the same industry.



organization literature has a long tradition investigating the so called "vertical linkages," where the companies might be related along the production value chain through the supplier-user linkages. Acquiring own suppliers could give the company more control on the speed of the production process and on the quality and reliability of the inputs (Porter, 1980),[16] or promote learning from upstream or downstream firms within the strategies as discussed under Hypothesis 3. The intensity of the supplier-customer linkages is typically measured by the coefficients from the input-output (I-O) tables that show the fraction of each sector output supplied to or sourced from all other sectors in an economy, either intermediate inputs or final products (see early work by Lemelin, 1982; Caves and Bradburd, 1988; and in finance literature by Fan and Lang, 2000). We construct the I-O coefficients at the four-

[16]Barrot and Sauvagnat (2016) show that firm-level supplier shocks from natural disasters propagate in production networks and impose substantial output losses leading to lower market share on their customers, especially when they produce specific inputs.

digit industry level using the most detailed to date input-output table for the U.S. from 2007, compiled by the Bureau of Economic Analysis.[17] In Figure 4 the light-gray dots indicate the deals where the platform is a direct supplier to or consumer of the follow-on; the black circles indicate that there is no direct I-O relation. The figure shows that the majority of the deals do indeed have a direct I-O (product market) relation, however, there are numerous combinations in which the nature of relation between the platform and follow-on is unclear. As we discussed in Section 2, one potential source of value in the absence of the I-O links is learning through technological linkages (Bloom et al., 2013; Acemoglu et al., 2016). Either type of non-horizontal acquisitions can potentially be motivated by the economies of scope. We exploit the relatedness of the companies in product space in the empirical analysis.

3.3 Empirical issues

To establish a causal effect of buy-and-builds on operating results of the combined entities we have to confront a dual problem of i) non-random selection into this strategy and ii) lack of the comparison unit (the counterfactual). To alleviate these concerns we borrow the empirical methodology from the literature (see Roberts and Whited, 2013, for review) but adapt it for our strategy-level analysis.

Matching. The first issue is well-known in empirical research and, in our case, stems from the fact that "buy-in-build treatment" is not randomly assigned, either because the companies self-select into the acquisitions or because PE firms are professional investors who carefully select their targets. To mitigate (but not solve) this concern, we follow the literature

[17] Statistics prepared at the 389-industry level of aggregation was available until very recently only for estimate year 2007, which is a mid-year of our sample. The table "Use Tables/After Redefinitions/Producer Value" is available at https://www.bea.gov/industry/input-output-accounts-data (accessed 21/3/2017). Recently the 2012 estimates were released. Using the U.S.-based measures assumes that the patterns of input flows in the advanced European countries of our sample are close to those of the United States. If the U.S. production and input structures are imperfect for European countries, we are introducing random error in the measurement of our regressors and, therefore, reducing the probability of finding statistically significant results. The alternative is the World Input-Output Database (WIOD) that provides time-series of I-O tables for forty countries but at the less detailed 2-digit industry level.

and match each acquired platform and follow-on company to similar non-acquired companies on pre-acquisition company-level observables. We use the entire population of non-acquired companies in Orbis from our sample countries as potential controls. There are at least three reasons why we choose our control group from non-acquired companies, rather than, for instance, acquisitions of strategic buyers or individual LBOs. First, conceptually, we research whether the buy-and-build strategies create operating synergies, and not whether these strategies are doing better or worse than other acquisitions, which is an interesting but different research question. Second, Wang (2018) theoretically argues that the market cannot perfectly observe the probability of a firm merging with or acquiring another firm; the market learns more about the target fundamentals and re-evaluates its stand-alone value only after the M&A announcement. A priori, any stand-alone company can, therefore, be selected into buy-and-build. And third, from the practical viewpoint, to achieve good match we have to draw from a large pool of controls (the potential targets). Other controls, such as serial acquisitions by strategic buyers, are relatively rare to achieve good matching.

We match by estimating the probability (the "propensity score") of being acquired into a buy-and-build strategy and selecting a subset of acquired and non-acquired firms with similar probabilities. Based on the general advice of Roberts and Whited (2013), our probability model includes a number of pre-acquisition explanatory variables, to ensure the observational equivalence of the matched companies, and lagged values of the dependent variable, in order to hedge against the regressions spuriously picking up pre-existing trends with the acquisition variables. We match the firms based on this propensity score within the same country, two-digit industry, and year to account for the omitted third (macro) factors, such as country-level changes in economic policies or the business climate or PE targeting some sectors across different markets. We match each acquired company one-to-many, keeping

five closest non-acquired neighbors.[18]

Placebo strategies. The second issue with the lack of the comparison unit is crucial. We use the companies that we matched to our platforms and follow-ons and construct portfolios that resemble our actual strategies based on the financial variables that we use to match. We randomly select one of the five matched peers of the companies within an observed strategy and combine the financials of these peers similarly to how we assign financials within the observed strategies (see details in Appendix OA1). We refer to these artificial counterfactual strategies as "placebo strategies."[19] We repeat the process and construct five placebo strategies for each observed strategy.

Outcomes of interest and empirical specifications. Our performance measures include the natural logarithm of sales and total assets, to verify whether the strategies grow faster; EBITDA over total assets (return on assets, ROA), EBITDA over operating revenue (return on sales, ROS), and EBITDA over the wage bill or over the number of employees (labor profitability), to see whether the strategies show better profitability. Using EBIT instead of EBITDA delivered similar results. Finally, we test whether these strategies are associated with efficiency improvements, measured by revenue over the wage bill or over the number of employees (labor productivity).

Using the sample of observed strategies (treated) and placebo strategies (controls), we

[18] Appendix OA2 provides more details on the implementation of matching and its quality, in particular, the usual diagnostics of the covariates balancing and the parallel trends assumption.

[19] Hochberg and Fehder (2019) use an alternative quasi-experimental design based on the synthetic control method (see Abadie et al., 2010) to study the spillover effects of seed accelerator programs for technology entrepreneurship activity in the U.S. metro areas. Unlike in matching, where the goal is to find a close peer from observed companies, a (synthetic) control unit is a convex combination of observed companies. The method attempts to improve the match to the treated company and potentially account for the time-varying treatment effects at different time horizons. However, the method is difficult to apply for our purposes because we conduct the analysis at the level of strategies while the method computes the average lead-specific treatment effect and does not specify the existing non-acquired companies from which we can build the comparable strategies.

estimate the following specification:

$$Y_{s,t} = \alpha + \beta_1 Post_{s,t} + \beta_2 BB_s \times Post_{s,t} + \eta_s + \eta_t + \epsilon_{s,t}, \tag{1}$$

where $Y_{s,t}$ are outcomes for a treated or control strategy s in the year t. For both strategies and placebos, the indicator $Post_{s,t}$ is equal to one for the years after the platform of s was acquired and coefficient β_1 estimates the average growth in actual and placebo strategies. The BB_s is our treatment indicator, equal to one for the observed buy-and-build strategies. The β_2 is the coefficient of interest, identified from the post-buyout performance of actual strategies compared to performance of the observationally equivalent "artificial counterfactual" strategies, constructed by us. We control for unobserved time-invariant differences between actual or placebo strategies by strategy fixed effects η_s, and for year-specific shocks that correlate with PE activity across countries by year fixed effects η_t. In this specification the β_2 represents all changes to operating results of the strategy in excess to the acquisitive growth, which we refer to as the "organic strategy growth." Our unit of observation is the consolidated entity, and we use the terms "organic growth" and "strategy" inseparably to contrast from the notion of "organic growth" of an individual company.

We discussed in Section 2 that conceptually the coefficient β_2 in Eq. (1) is a mixture of the PE effect and operating (growth or restructuring) synergies. In order to estimate these two effects separately and test our hypotheses we introduce a second treatment variable to our model in Eq. (1), as:

$$\begin{aligned} Y_{s,t} = \alpha' + \beta'_1 Post_{s,t} + \beta'_2 BB_s \times Post_{s,t} + \\ \beta'_3 Follow\text{-}Ons_{s,t} + \beta'_4 BB_s \times Follow\text{-}Ons_{s,t} + \\ \eta'_s + \eta'_t + \epsilon'_{s,t} \end{aligned} \tag{2}$$

where the variable *Follow-Ons* is the indicator variable that takes the value of one for the year when a given strategy or the control placebo strategy obtains the first follow-on and the years thereafter.[20] The coefficient β_3' measures the acquisitive growth from combining multiple companies. Then the coefficient β_4' estimates the changes in strategy outcomes (relative to placebos) from the moment the strategy acquires follow-ons, and—with other controls—can plausibly be interpreted as the synergetic effects. The coefficient of the main treatment β_2', now captures the remaining difference between the buy-and-build strategies and the placebo control strategies attributable to the general effects of private equity ownership.[21]

4 Results

4.1 Decomposition of growth within buy-and-build strategies

We begin from visual illustration of our decomposition of the changes in buy-and-build performance. Figure 5 presents the unconditional cumulative total strategy growth (dashed line) using total assets in Panel A and operating revenue in Panel B. The strategy growth is computed relative to growth of the matched peers of platforms, and relative to the strategy-specific year of platform acquisition, t=0. The cumulative total growth is positive for both outcomes. The figure also presents the decomposition of total growth into the "organic strategy growth" (light solid line with diamonds) and the leftover "acquisitive strategy growth" (dark solid line with dots). Following our methodology, we obtain the organic strategy growth as the growth of the observed strategy minus growth of placebo strategy; it

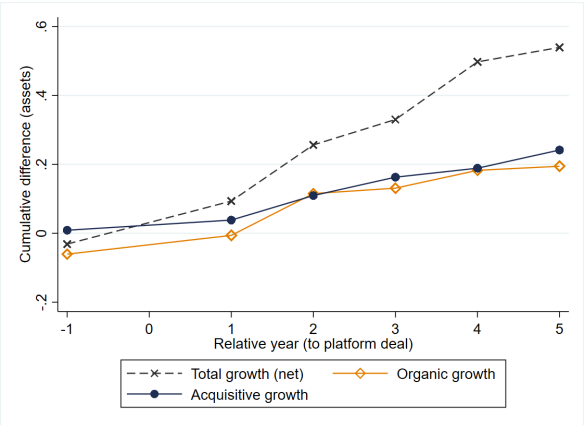
[20] The introduction of the second treatment moment may be susceptible to distortions from heterogeneous treatment timing effects (Sun and Abraham, 2021). We consider this problem in section 5.1.2 and show that an alternative specification leads to quantitatively similar results. We prefer to present the results from the simplified model to improve the readability of our tables.

[21] The assumption behind our decomposition in Eq (2) is that PE effect in buy-and-build strategies does not change from before and after adding follow-ons to the strategy. We defend this assumption with two arguments: i) we have a variation of timing of add-on acquisitions relative to platform estimate average PE effect; ii) we consider any deviation from pre-follow-on trends in outcomes due to PE effect in the follow-on stage as a part of synergies, measured by β_4'.

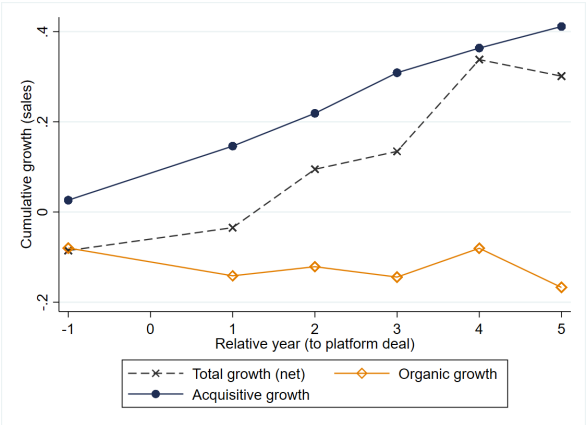
is a mixture of the PE effect and synergies. The residual difference between the total strategy growth and the organic strategy growth represents the inorganic acquisitive growth. In our sample, total assets grow both acquisitively and organically in equal proportions, whereas the operating revenue grows strongly through acquisitions but the organic change in revenue is negative. The decomposition shows that it might be misleading from the policy viewpoint to focus on total strategy growth without separating it into organic and acquisitive components.

The trends in Figure 5 do not account for time-invariant heterogeneity between strategies, common time trends, and industry effects. In Table 2, we report the estimates of the model in Eq. (1) in the sample of our buy-and-build strategies and the matched peers of *just* the platform, and we cluster the standard errors two-ways, over the strategy and industry-year. The after-event indicator *Post* measures the growth of strategies and controls over a five-

Figure 5: Decomposition of growth in buy-and-build strategies over time.
This figure presents the unconditional average cumulative growth of buy-and-build strategies and its decomposition into acquisitive growth and organic growth. We present the growth of total assets in panel A and operating revenue in panel B. For each year relative to the year of platform acquisition (t=0) we compute the cross-sectional mean of the strategy outcomes (the natural logarithm of assets, revenue) less the mean outcome of the chosen comparison group, and then compute one-period growth as the first difference of the result over time (we exclude the year of the platform acquisition, so the difference at t=1 is versus t=-1). The cumulative growth is the summation of these differences over the periods. Specifically, $Cum.\ Growth_t = \sum_{t=-1,\neq 0}^{5}(\overline{X}_{s,t} - \overline{X}_{c,t}) - (\overline{X}_{s,t-1} - \overline{X}_{c,t-1})$, where the X is a chosen outcome (log-level), s refers to the buy-and-build strategy and c—to the "controls," the platform peers for total growth and the placebo strategies for the organic growth. In each graph, the total growth (dashed line) uses the matched peers of the platform as controls, the organic growth (light solid line with diamonds) uses the placebo strategies as controls, and the acquisitive growth (dark solid line with dots) is calculated as the difference between the total growth and the organic growth. For each strategy we include up to 5 years (or exit, whichever is earlier) after the acquisition year of the platform.



Panel A: Growth in assets



Panel B: Growth in sales

Table 2: Performance of buy-and-build strategies relative to peers of platform.
This table shows the performance of buy-and-build strategies compared to matched peers of the platform over the first five years following the platform acquisition. The sample includes strategies with known exit and non-exited strategies. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+5 (or exit, whichever is earlier), where t indicates the year of acquisition of the strategy's platform. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *BB* is an indicator for the treated sample. All specifications include strategy and year fixed effects. Standard errors are clustered two-ways over the strategy and industry-year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1)	(2)	(3)
	ln Assets	ln Sales	ln Empl.
BB× Post	0.302***	0.140*	0.109
	(5.52)	(1.79)	(1.57)
Post	0.020	0.041	0.044
	(0.73)	(1.35)	(1.29)
Observations	5,961	5,928	4,859
Adj. R^2	0.948	0.933	0.956
Year FE	✓	✓	✓
Strategy FE	✓	✓	✓

year time horizon or up to the exit, whichever is earlier[22]. The coefficient of the interaction $Post \times BB$ shows the difference in the outcome between the observed strategies and the platform peers during the years after the acquisition. Conceptually, it is the conditional average value of the dashed line in Figure 5.

The results show that over five years these strategies are associated with significantly higher growth in assets and sales (columns 1-2), while changes in employment (column 3) are not significantly different from that of the platform peers. The total growth of assets is also much larger over the same time period than the growth of sales, similarly to what we see comparing the dashed lines in two panels of Figure 5. This difference in growth may imply that it is easier to boost the scale in assets by simply adding follow-ons to the platform than achieve proportional increase of sales. However, this is only a conjecture. The model in Table 2 is silent about the relative contribution of acquisitions per se versus the operating value creation of private equity and the synergies between the platform and

[22]The *Post* takes the value of zero at t-1 and one for the period t+1 up to t+5 where t is the company acquisition year.If a strategy exits before the first five years the *Post* is equal to one up to and including its exit year.

follow-ons. Figuring out which factors contribute to this total growth would help shed the light on whether, as stated in our paper's title, PE developed a skill to realize some form of operating synergies, akin to strategic buyers.

4.2 Organic operating improvements in buy-and-builds

The first step in our decomposition is to remove the contribution of acquisitive growth by estimating the model in Eq. (1) in the sample of buy-and-build strategies and placebo control strategies over our preferred time horizon of five years or up to the exit, if earlier. The remainder is what we call the "organic strategy growth." The results in panel A of Table 3 show that without the acquisitive part strategy assets grow at about 8 percent but this estimate is significant only at a 12 percent level.[23] The coefficients to sales and employment are not significantly different from zero at conventional levels. These results are consistent with the visual representation of organic strategy growth (solid line with hollow diamonds) in Figure 5. To large extent, the total growth in assets and sales in buy-and-builds seen in Table 2 is acquisitive, providing preliminary evidence for Hypothesis 1.

Profitability of assets follows the overall negative trend (the coefficient to *Post* in column 4) and labor productivity (column 7) is flat. In contrast, the strategy operating margin (ROS, column 5) improves by 1.3 percentage points, and labor profitability (EBITDA over the wage bill, column 6) by 2.7 percentage points above the overall negative trend (this difference is statistically significant). These estimates imply 23 percent improvement in ROS and 15 percent improvement in labor profitability, compared to pre-deal mean,[24] but do not tell by what channels these efficiency gains are achieved.

We explore this next with our main decomposition in Eq (2), where we attempt to sep-

[23] Throughout our analysis the level of profits measured by EBIT or EBITDA follows the pattern of total assets; we do not report these results to save space focusing instead on profitability ratios.

[24] The pre-treatment mean (standard deviation) of ROS is 0.056 (0.086) and of labor profitability is 0.570 (0.555).

Table 3: Performance of the strategies relative to the placebo strategies

This table shows the performance of buy-and-build strategies compared to placebo strategies. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+5 (or exit, whichever is earlier), where t indicates the year of acquisition of the strategy's platform. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *BB* is an indicator for the treated sample. *Follow-ons* is an indicator equal to one for the year following the first follow-on acquisition in a given strategy (placebo), onward. The indicator *No Deals BB* (*No Deals*) identifies the buy-and-build strategies (and their placebos) that did not acquire follow-ons. All specifications include strategy and year fixed effects. "Lab.Prof." stands for labor profitability, EBITDA over the wage bill; "Lab.Prod." is labor productivity computed as operating revenue over the wage bill. Standard errors are clustered two-ways over the strategy and industry-year dimension. *, **, and *** stand for a 15%, 10%, 5%, and 1% significance level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	"Size" outcomes			Operating ratios			
	ln Assets	ln Sales	ln Empl.	ROA	ROS	Lab.Prof.	Lab.Prod.
Panel A: Strategy performance excluding acquisitive growth (Organic strategy growth)							
BB×Post	0.081	-0.047	-0.125	0.003	0.013**	0.065**	-0.061
	(1.52)	(-0.52)	(-1.45)	(0.45)	(2.01)	(2.02)	(-0.42)
Post	-0.027	0.045	-0.013	-0.009**	-0.005	-0.038*	0.154
	(-0.74)	(0.88)	(-0.24)	(-2.43)	(-1.29)	(-1.74)	(1.31)
Observations	6,061	6,042	5,074	5,976	5,966	5,647	5,688
Adj. R^2	0.932	0.892	0.880	0.661	0.695	0.718	0.853
Panel B: Decomposition of organic strategy growth							
Follow-ons	0.131***	0.200***	0.159***	0.005	0.003	0.014	-0.034
	(3.13)	(4.05)	(3.04)	(1.61)	(0.76)	(0.69)	(-0.31)
BB×Follow-ons	-0.148**	-0.153	-0.181**	-0.019***	-0.001	0.007	0.375**
	(-2.04)	(-1.38)	(-2.56)	(-2.64)	(-0.07)	(0.14)	(2.12)
BB×Post	0.150**	0.004	-0.004	0.025***	0.023***	0.102**	-0.231
	(2.16)	(0.02)	(-0.04)	(3.35)	(2.75)	(2.35)	(-1.38)
Post	-0.019	-0.005	0.063	-0.009**	-0.003	-0.024	0.238*
	(-0.37)	(-0.07)	(0.96)	(-2.09)	(-0.54)	(-0.91)	(1.66)
No Deals	0.005	0.267	0.206	0.021*	0.013	0.094*	0.996**
	(0.05)	(1.03)	(0.94)	(1.90)	(1.49)	(1.69)	(2.10)
No Deals×Post	-0.143**	-0.219***	-0.171**	-0.007	-0.009	-0.046	-0.154
	(-2.47)	(-2.83)	(-2.23)	(-1.15)	(-1.35)	(-1.34)	(-0.86)
No Deals BB×Post	0.014	0.069	-0.066	-0.033**	-0.026**	-0.110	-0.071
	(0.12)	(0.41)	(-0.52)	(-2.51)	(-2.04)	(-1.51)	(-0.25)
Leverage	0.158	-0.011	0.216	-0.067***	-0.067***	-0.346***	-0.371
	(1.24)	(-0.07)	(1.27)	(-5.73)	(-5.23)	(-4.51)	(-0.94)
Observations	6,061	6,042	5,074	5,976	5,966	5,647	5,688
Adj. R^2	0.933	0.894	0.882	0.667	0.700	0.722	0.854
Year FE	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓

arate the PE effect and the operating synergies between platforms and follow-ons—the two components of the organic strategy growth. To help the reader with interpretation of results in panel B, we remind that the *Follow-ons* is a common trend in strategies and placebos over the period from the first follow-on acquisition, onward, and explicitly tests Hypothesis 1 about the acquisitive growth from combining multiple companies. The interaction, *BB*×*Follow-ons* shows whether the growth of actual strategies differs from this trend and whether, in our interpretation, there are synergies between firms within the strategy, testing Hypotheses 3 and 4. The *BB*×*Post* now captures the difference between the buy-and-build strategies and the placebo control strategies, attributable to the PE effect, and helps testing Hypotheses 2. We include a measure of the operating leverage to control for the fact that the PE-backed firms tend to have higher leverage and risk a higher probability of default than comparable companies, borrowing in leveraged loan markets (Hotchkiss et al., 2021).[25] And we explicitly control for the trends in "degenerate" strategies that did not acquire any follow-ons (see Panel B in Table 1) with the time-invariant indicator *No Deals* taking the value of one for the strategies or placebos without follow-ons.

The positive coefficients to *Follow-ons* in columns 1-3 imply the acquisitive growth in all three size variables. This trend is reversed for assets and employment in actual strategies since the interaction *BB*×*Follow-ons* is significant and negative for these outcomes. And the positive significant coefficient to *BB*×*Post* in column 1 shows that PE ownership is associated with higher assets growth in these strategies. Profitability of buy-and-builds (columns 4 to 6) shows a significant and strong positive PE effect, although it is weakened for ROA in the acquisition phase. And the results in column 7 suggest large benefits of

[25]By levering up their investments and putting too much debt on the firms they acquire, PE owners can pay large dividends, pursue acquisition programs (ibid., p.700), or increase fund manager's compensation in form of carried interest (Phalippou et al., 2018) at a cost of liquidity drain and higher risk of default of PE-owned firms. The results in Panel A are robust to inclusion of this variable and also qualitatively similar in somewhat larger sample where we do not require to have information on strategy operating leverage.

integration through close to 40 percentage points increase in labor productivity after the first follow-on is completed, even above the positive industry trend, captured by the *Post*.

The rest of the coefficients in panel B suggests that PE firms tend to select profitable and productive companies to serve as platforms (the coefficient to the *No Deals* in columns 4,6,7). But they shrink in size over time (the coefficient to the *No Deals*×*Post* in columns 1-3) and the profitability in actual strategy platforms falls (the second to last line in columns 4-5) if they do not proceed with add-ons. These findings are in line with the notion that strategies without follow-ons are under-performing, although the causality may run both ways. Finally, the higher operating leverage is harmful for profitability, probably reflecting the higher riskiness of more levered strategies.

In sum, in an average buy-and-build strategy we find evidence of Hypothesis 1 that buy-and-builds are growth-oriented strategies with significant acquisitive growth in assets, sales, and employment. The fact that the strategies are implemented by the PE investors further contributes to growth of assets and boosts profitability of the combined entity, as expected according to Hypothesis 2. Finally, we document evidence that buy-and-builds experience reduction of assets and employment accompanied by large increases in labor productivity once follow-ons are being acquired, consistent with restructuring synergies Hypothesis 4, rather than with growth synergies story under Hypothesis 3.

We conduct a number of robustness checks to confirm these findings. Throughout the paper, we analyze buy-and-build strategies up to five years or exit, whichever is earlier. However, two concerns may be present. First, private equity firms may have more information about the prospects of their investment and therefore time their exit. In Table OA3.1, we show the results over a fixed time window of five years regardless of the exit and find that this is not driving the results. Second, some strategies may develop synergies in the very long-run, beyond our estimation period of five years. In Table OA3.2, we analyze the

performance up to the exit or longest time-series possible for unexited deals and find similar performance in the very long-run. These robustness analyses are also in line with previous research on the longer-term structural benefits of private equity ownership.[26]

4.3 Buy-and-builds compared to individual buyouts

Table 3 provides first evidence that buy-and-builds deliver operating changes not only by the standard PE levers, documented extensively from at least Kaplan (1989), but also by combining companies. We interpret this additional effect as operating synergies. In single-target (stand-alone) buyouts the synergies we describe are not present. Given what the PE industry claims about buy-and-builds, we may expect these strategies to be more focused on growth, even when we remove the acquisitive part. For other outcomes the effect is more ambiguous since going after synergies may reinforce the (positive) effect of PE ownership, or create a trade-off between them, as some of the results in Table 3, panel B demonstrate. Finally, the PE effect may differ in stand-alone LBOs and buy-and-builds, perhaps, because different PE firms specialize in different buyouts. Do these conceptual differences appear as material differences in operating performance between buy-and-builds and stand-alone LBOs?

For our standalone LBO sample we gather all PE-executed or financed deals in Zephyr, not identified by us as a part of some buy-and-build strategy, and match these targets one-to-many to non-acquired firms.[27] Then we compute the annual differences in outcomes of

[26] Our findings are further robust across different specifications: a) excluding buy-and-build strategies that completed follow-ons in the same year as the platform deal; b) removing controls if treated stop reporting financials; c) simplifying to a single difference; d) including platform deals that were completed after 2012.

[27] We follow the same selection, cleaning, and matching steps as we did for the construction of the buy-and-build sample as described in Appendix OA1. In short, we retain LBO deals are completed from 1998 up to 2012, include exited and non-exited deals, and the "accidental" acquisitions by the PE-owned companies. We match them one-to-many to the companies in the same country, industry, and acquisition year clusters whose propensity scores, computed with the 1st and 2nd lags of several pre-acquisition outcomes, fall within 20 percent radius (the 0.2 caliper). We retain up to five matched peers and perform the usual diagnostics of the quality of the matching. The final matched sample includes 1,979 unique LBOs.

the buyouts and average outcomes of five matched peers to control for the selection into LBO targets and isolate part of the growth only attributable to what we refer to as the PE effect.

Table 4: Performance of the buy-and-builds relative to the stand-alone buyouts. This table compares changes in outcomes in buy-and-builds to the PE effect in individual LBOs, defined the growth of targets of individual LBOs relative to the growth of their matched stand-alone peers. In Panel A we compare the PE effect in LBOs to the organic strategy growth, that is, strategy growth relative to placebo strategies, as in Table 3(A). The sample includes the buy-and-build sample of Table 3 and the individual LBO companies. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+5 (or exit, whichever is earlier), where t indicates the year of acquisition of the strategy's platform. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *BB* is an indicator for the buy-and-build sample. All specifications include strategy and year fixed effects. Standard errors are clustered two-ways over the strategy and industry-year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Changes in buy-and-build outcomes are compared to the PE effect in stand-alone LBOs							
	"Size" outcomes			Operating ratios			
	ln Assets	ln Sales	ln Empl.	ROA	ROS	Lab.Prof.	Lab.Prod.
Panel A: Organic strategy growth relative to the PE effect in stand-alone LBOs							
BB×Post	0.127*	-0.098	-0.115	0.007	0.020***	0.054	-0.322
	(1.72)	(-1.09)	(-1.25)	(0.99)	(2.85)	(1.34)	(-1.49)
Post	0.026	-0.015	-0.005	0.006	-0.001	0.040*	0.130
	(0.84)	(-0.34)	(-0.16)	(1.24)	(-0.35)	(1.92)	(1.21)
Observations	6,782	6,456	5,347	6,204	6,143	5,830	5,868
Adj. R^2	0.900	0.875	0.871	0.594	0.625	0.654	0.812
Panel B: Decomposition of organic strategy growth relative to the PE effect in stand-alone LBOs							
BB×Post	0.204**	-0.043	-0.063	0.008	0.013*	0.024	-0.552***
	(2.29)	(-0.41)	(-0.64)	(1.00)	(1.68)	(0.54)	(-2.59)
BB×Follow-ons	-0.156*	-0.110	-0.110	-0.003	0.014	0.062	0.479*
	(-1.82)	(-1.02)	(-1.02)	(-0.33)	(1.56)	(1.17)	(1.94)
Post	0.020	-0.018	-0.009	0.005	-0.001	0.042**	0.148
	(0.67)	(-0.43)	(-0.27)	(1.21)	(-0.19)	(2.05)	(1.38)
Observations	6,782	6,456	5,347	6,204	6,143	5,830	5,868
Adj. R^2	0.901	0.875	0.871	0.593	0.625	0.655	0.812
Year FE	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓

In panel A of Table 4, we compare the PE effect in stand-alone LBOs to the organic strategy growth (the synergetic growth plus the PE effect), computed as the annual differences in strategy outcomes against their placebo strategies.[28]. The coefficient to $BB \times Post$

[28]To remind, in analysis in Table 3 and the rest of the paper we subtract average outcome of five cor-

is positive-significant in column 1, implying stronger effect on organic asset growth in buy-and-builds. This provides some support for the argument that overall these strategies are more growth-focused than what we know about stand-alone LBOs from the literature[29], even when ignoring the acquisitive growth, and that higher asset growth is likely to be synergetic. Our strategies have significantly higher operating margin than what is achieved in stand-alone LBOs (column 5) but are not distinguishable for the rest of the outcomes, including the common significant positive growth of profitability of labor seen in column 6.

In panel B we include the follow-on treatment which, conditional on it, would allow us to isolate and compare *only* the PE effect in buy-and-builds and stand-alone LBOs by focusing on the interaction $BB \times Post$. The latter is a conceptually similar part of value creation between these two buyout types. We establish that asset and margin growth seen in panel A are attributable to a stronger effect of PE ownership in buy-and-builds than in stand-alone LBOs and not to the synergetic growth.[30] Similarly to what we see in Table 3, buy-and-builds engage in restructuring in the follow-on stage, cutting assets and achieving higher labor productivity (column 7), again consistent with Hypothesis 4 but using a benchmark of standalone LBOs.

4.4 Strategy configurations and synergy interpretation

So far, we found consistent evidence of what we call the PE effect (financial, operational, and governance engineering deployed by PE in any buyout) in an average strategy, in line with Hypothesis 2. With acquisition of follow-ons, PE facilitates not yet documented in

responding placebo strategies in a given year, because for each actual strategy we construct five placebo strategies everywhere in our paper

[29]When we compare the total growth of strategies (relative to platform peers, as in Table 2) to the PE effect in stand alone LBOs the coefficient of growth of assets is significant-positive and doubles in size, being 0.263*** (3.47) furhter illustrating the point

[30]We conduct a robustness check of panel B where we control for differences in leverage between two buyout types and the separate the PE effect in strategies that do not acquire follow-ons. We also estimate the regressions as in panel A and B but in the sample with available leverage, as in Table 3. The results are similar.

the literature synergetic interactions between companies at a level of strategy. These synergies are of restructuring type (Hypothesis 4) rather than of growth type (Hypothesis 3). Either type of operating improvements coming from interaction between companies within a strategy would point to an important transformation of the business model in private equity. The lack of growth synergies in an *average* strategy does not mean that they are not present in certain circumstances. We exploit heterogeneity of our strategies and introduce a triple difference into Eq. (1) and Eq. (2) by interacting the BB_s term with several strategy characteristics that in theory should be conducive with, specifically, growth synergies. Finding a positive significant interaction term in those regressions would also reinforce our interpretation that these operating changes represent synergies.

4.4.1 Size and the configuration of buy-and-build portfolios

Our conceptual definition of a buy-and-build strategy may imply that growth synergies described in Hypothesis 3 are achieved when an established (and maybe large) business leverages its core competencies onto follow-on acquisitions and, among other things, the overall entity achieves economies of scale or scope. The configuration of a portfolio with respect the size of firms *within* and *of* the portfolio may then matter for realizing synergies.

We hypothesized in Section 2 that assembling a large total portfolio of companies may lead to growth synergies due to, for example, exercising market power toward suppliers or service providers or some form of knowledge spillovers within the portfolio. For a portfolio of a given size, we expect growth synergies to be more likely in the strategies consisting of a large platform with relatively small follow-ons ("stringing beads") than of firms with comparable size because of integration costs.[31] Conversely, it might be more challenging to

[31]Larger acquirers (here, platforms) often perform better because they have a more professional decision-making process and access to resources (Moeller et al., 2004; Laamanen and Keil, 2008). These benefits have larger spillover onto smaller targets (Lambrecht, 2004; Erel et al., 2015), in our case, follow-ons. Growth synergies among larger targets may require more skill and experience due to the higher integration costs

realize growth synergies in a given portfolio of smaller firms when PE firm's own human capital is limited while more targets should be found, acquired, monitored, and integrated.[32]

We test whether the size within strategies and of the strategies matter for the realized synergies and their type by putting all the strategies into the two-by-two grid of the *relatively* small follow-ons (denoted "SmFO") or the relatively large follow-ons ("LrgFO"), assembled into either the small portfolios ("SmPrtf") or the large portfolios ("LrgPrtf"). We split by the sample medians, computed over the first five years of strategies, or exit if earlier, of i) the average assets of follow-ons relative to assets of their platform and ii) the total assets of the strategy (platform and all follow-ons).[33] Then we replace the treatment indicator BB in the interaction $BB \times Follow\text{-}ons$ in specification (2) of Table 3 into four interactions constructed as the combination of these two dimensions. For example, the $BB^{[\text{SmFO,LrgPrtf}]} \times Follow\text{-}ons$ is equal to one for the strategies with relatively small follow-ons and large total strategy size over the period when such strategy acquires its first follow-on, onward, and zero otherwise.[34] The interpretation of all other variables is the same as in Table 3.

Table 5 reports the results, with the non-interacted dummies $BB^{[.]}$ and the common trends $BB^{[.]} \times Post$ and the other controls suppressed for brevity. The baseline category of strategies combining a large portfolio of relatively small follow-ons (row 2) show decrease in assets and employment but increase in profitability and productivity. We saw similar downsizing in Table 3 for all strategies with follow-ons, but here the downsizing coincides with both synergetic profitability and efficiency gains providing stronger evidence for Hy-

(see Aktas et al., 2013, and references therein).

[32] Mulherin and Boone (2000) and Fuller et al. (2002) argue that smaller firms are organized and operate less professionally and efficiently than larger firms. Lopez-de-Silanes et al. (2015) demonstrate that a large number of simultaneous investments lead to organizational diseconomies of scale in PE. Kaplan and Schoar (2005) show diseconomies of scale between fund size and IRR in the VC industry.

[33] In a robustness analysis, we measure the size of the acquired portfolio as the sum of the total assets of follow-ons only. Results are similar.

[34] In these interactions the time variation comes from the trend variable *Follow-ons*, representing the period when the actual or placebo strategies had follow-ons, while the strategy configuration dummies $BB^{[.]}$ control for cross-sectional differences. They are non-dynamic because the configuration is determined over the entire strategy duration.

Table 5: Strategy total size and composition by company size.
This table shows the performance of buy-and-build strategies, compared to placebo control strategies following the platform acquisition, depending on the size configuration of the companies within the strategy. We include strategies with at least one follow-on. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+5 (or exit, whichever is earlier), where t indicates the year of acquisition of the strategy's platform. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *BB* is an indicator for the treated sample. *Follow-ons* an indicator equal to one for the year following the first follow-on acquisition in a given strategy (placebo), onward. The second treatment indicator *BB*×*Follow-ons* is estimated for four strategy types, as the combination of two dimensions: 1) the *relatively* small follow-ons (denoted "SmFO") or relatively large follow-ons ("LrgFO"), using the sample median of the average assets of the follow-ons relatively to their platform, and 2) the small portfolio ("SmPrtf") or the large portfolio ("LrgPrtf"), using the sample median of the platform and follow-ons (total portfolio). All specifications include strategy and year fixed effects and other terms non-interacted with *BB* or *Post*. Standard errors are clustered two-ways over the strategy and industry-year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	"Size" outcomes			Operating ratios			
	ln Assets	ln Sales	ln Empl.	ROA	ROS	Lab.Prof.	Lab.Prod.
Follow-ons	0.056	0.041	0.086	0.005	0.006	0.011	-0.241
	(1.08)	(0.61)	(0.92)	(1.05)	(1.13)	(0.31)	(-0.99)
$BB^{[SmFO,LrgPrtf]}$×Follow-ons	-0.169**	0.140	-0.292**	-0.006	0.022*	0.203**	0.899**
	(-2.14)	(0.69)	(-2.35)	(-0.68)	(1.67)	(2.06)	(2.57)
$BB^{[SmFO,SmPrtf]}$×Follow-ons	0.195	-0.070	0.253	-0.028	-0.030	-0.319**	-0.835
	(1.05)	(-0.27)	(1.59)	(-1.25)	(-1.50)	(-2.44)	(-1.56)
$BB^{[LrgFO,SmPrtf]}$×Follow-ons	0.081	-0.459	0.323	-0.031*	-0.031	-0.314***	-1.380**
	(0.47)	(-1.55)	(1.16)	(-1.96)	(-1.50)	(-2.98)	(-2.47)
$BB^{[LrgFO,LrgPrtf]}$×Follow-ons	-0.380***	-0.857***	-0.307*	-0.000	-0.031	-0.198*	-0.099
	(-2.87)	(-3.15)	(-1.65)	(-0.01)	(-1.64)	(-1.73)	(-0.20)
BB×Post	0.187***	0.063	0.037	0.024***	0.024***	0.106**	-0.254
	(2.70)	(0.44)	(0.39)	(3.46)	(2.75)	(2.53)	(-1.41)
Post	-0.320*	-1.296*	-0.451	-0.027	-0.018	-0.015	0.247*
	(-1.85)	(-1.79)	(-0.81)	(-0.99)	(-0.75)	(-1.34)	(1.71)
Observations	5,990	5,971	5,005	5,905	5,895	5,580	5,617
Adj. R^2	0.936	0.898	0.886	0.669	0.705	0.726	0.854
Year FE	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓
Non-interacted terms	✓	✓	✓	✓	✓	✓	✓
No Deals strategy	✓	✓	✓	✓	✓	✓	✓
Leverage	✓	✓	✓	✓	✓	✓	✓

pothesis 4. The coefficients of the other three configurations are interpreted relative to this baseline category. Smaller strategies in which the follow-ons are also small (row 3) are similar to the baseline configuration in all outcomes, except for its labor profitability declines when follow-ons are acquired (column 6). The strategies including relatively large follow-ons (row 4 and 5) seem to perform worse in profitability or efficiency, again, relative to the baseline. When a relatively small strategy tries to accommodate large follow-ons (row 4) ROA, labor profitability, and labor productivity decline. And the large strategies with large follow-ons (row 5) show decline in assets, sales, and employment too. As in Table 3 and in line with Hypothesis 2, we continue to see the significant and positive PE effect $BB \times Post$ in assets and profitability.

Overall, we do not detect growth synergies as in Hypothesis 3 when strategies are formed in terms of firm or portfolio size. But strategies focusing on "stringing beads" improve profitability and productivity, consistent with restructuring synergies as in Hypothesis 4, likely due to efficient transformation of smaller targets. In contrast, strategies with large follow-ons on average do not achieve efficient integration in the sense of not generating any synergistic operating improvements.

4.4.2 Horizontal and vertical strategies

While we find that building a larger business out of a number of smaller firms generates the largest restructuring synergies of all other configurations, we did find any evidence of growth synergies solely focusing on the size of the firms and strategies. From Section 3.2, we know that our firms operate in large variety of sectors. We use the insights from the industrial organization literature to verify if strategy benefits from the relatedness of follow-ons and platforms along the product value chain, which is one of the mechanisms behind Hypothesis 3. We consider the strategies to have the *horizontal* focus if more than half of follow-ons

are in the same narrow four-digit NACE sector as the platform. And we consider strategies to have the *vertical* focus when more than half of follow-ons operate outside of the platform's four-digit sector but in upstream (supplier) or downstream (customer) sectors according to the input-output (I-O) tables.[35] The portfolio configurations are determined as of the end of our empirical time horizon. The interaction of the corresponding time-invariant indicators *Horizontal* and *Vertical* with the familiar variable *Follow-ons* measures the acquisitive growth of the final portfolio with, correspondingly, the horizontal or vertical configuration. The triple interaction of these variables with our treatment indicator *BB* shows the changes in performance of particular strategy configuration, attributable to synergies. This performance is measured relative to the (base) configurations that are neither horizontal nor vertical by our definition. As before, the variable $BB \times Post$ identifies the PE effect, the portfolios without follow-ons are assigned to a separate category, and the control placebo strategies are constructed from matched peers of the firms in actual strategies.

Table 6 reports the results.[36] The base category of strategies experiences decline in sales and ROA (see the interaction $BB \times Follow\text{-}ons$ in column 2,4) since the moment of the first follow-on. This means that strategies that do not have either vertical or horizontal focus do not realize any synergies and only grow asset and sales inorganically (shown by the *Follow-ons* in column 1 and 2). Compared to the strategies with unrelated firms, the configurations with horizontal focus have much lower acquisitive growth in assets and sales

[35] We do not have the data on whether firms in our strategies actually start to supply to or source from each other after acquisition and, as an approximation, use the detailed four-digit NACE codes. The most detailed I-O table to identify customer-supplier linkages on a four-digit industry level is available for the U.S. The input-output coefficients derived from the I-O table record the fraction of its own output that a given four-digit sector $s4$ supplies to or sources from each given sector $\tilde{s}4$. See section 3.2 for a discussion on using the U.S. input-output table from the Bureau of Economic Analysis (BEA).

[36] We focus discussion on the acquisitive and synergetic components of growth because the earlier results showing strong PE effect in buy-and-builds are not affected by the exercise in this section. In Table 6 we assume the PE effect is the same for all strategy configurations, but we did not find any significant differences when we interact the variable $BB \times Post$ with the *Horizontal* and *Vertical*. We admit that this may be the result of too demanding specification and not the true relationship but do not explore this issue further.

Table 6: Performance of the strategies relative to the placebo strategies: Horizontal and vertical strategies.

This table shows the performance of buy-and-build strategies compared to placebo control strategies, depending on product-market relatedness of companies. *BB* is an indicator for the treated sample. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+5 (or exit, whichever is earlier), where t indicates the year of acquisition of the strategy's platform. *Follow-ons* an indicator equal to one for the year following the first follow-on acquisition in a given strategy (placebo), onward. *Horizontal* is the indicator equal to one than more than half of follow-ons are in the same four-digit NACE sector as the platform at t+5 (or exit). The base category when strategies are neither horizontal nor vertical in our definitions. *Vertical* is the indicator equal to one than more than half of follow-ons are in the sector with the identified input-output relationship, outside of the four-digit NACE sector of the platform, at t+5 (or exit). For the control samples, the relatedness dummies are defined based on the treated companies to which the control is matched. All specifications include strategy and year fixed effects. Standard errors are clustered two-ways over the strategy and industry-year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	"Size" outcomes			Operating ratios			
	ln Assets	ln Sales	ln Empl.	ROA	ROS	Lab.Prof.	Lab.Prod.
Follow-ons	0.268***	0.356***	0.108	0.003	-0.001	0.033	0.288*
	(3.01)	(3.26)	(1.30)	(0.46)	(-0.18)	(0.93)	(1.69)
BB×Follow-ons	-0.179	-0.493***	-0.076	-0.027**	-0.013	-0.085	-0.304
	(-1.35)	(-2.83)	(-0.46)	(-2.29)	(-1.04)	(-1.19)	(-1.05)
Follow-ons×Horizontal	-0.217**	-0.268**	-0.057	0.006	0.004	-0.007	-0.247
	(-2.22)	(-2.12)	(-0.57)	(0.77)	(0.58)	(-0.14)	(-0.97)
BB×Follow-ons×Horizontal	0.003	0.426**	-0.078	-0.001	0.016	0.089	0.858**
	(0.01)	(2.15)	(-0.39)	(-0.07)	(0.81)	(0.87)	(2.11)
Follow-ons×Vertical	-0.152	-0.150	0.195	0.001	0.006	-0.054	-0.646**
	(-1.57)	(-1.10)	(1.46)	(0.11)	(0.84)	(-1.20)	(-2.33)
BB×Follow-ons×Vertical	0.081	0.524**	-0.180	0.024	0.021	0.185**	1.031*
	(0.62)	(2.08)	(-0.72)	(1.58)	(1.38)	(2.04)	(1.88)
BB×Post	0.153**	0.019	0.010	0.024***	0.023***	0.104**	-0.225
	(2.10)	(0.14)	(0.10)	(3.35)	(2.66)	(2.39)	(-1.31)
Post	-0.025	0.049	-0.016	-0.009**	-0.003	-0.027	0.245*
	(-0.49)	(0.78)	(-0.23)	(-2.20)	(-0.69)	(-1.03)	(1.68)
Observations	6,041	6,022	5,061	5,956	5,946	5,633	5,674
Adj. R-Squared	0.946	0.915	0.908	0.733	0.759	0.778	0.883
Year FE	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓
Non-interacted terms	✓	✓	✓	✓	✓	✓	✓
No Deals strategy	✓	✓	✓	✓	✓	✓	✓
Leverage	✓	✓	✓	✓	✓	✓	✓

and strong growth in sales and improvement in labor productivity (row 4, column 2 and 7). This finding is novel because the most frequent motivation for horizontal consolidation by PE industry is to eliminate the small firm discount and sell the combined larger company at a higher multiple (Bain and Company, 2018). We do not rule out such motivation but leave studying the exit multiples and returns in these strategies for future research. Similar improvements in sales and productivity, as well as labor profitability, are seen in strategies involving firms in sectors sharing the I-O relationships (row 6, column 2, 6-7). Overall, the results in this section provide evidence consistent with Hypothersis 3 that realizing growth synergies across the product value chain, as it is often done by the successful strategic buyers, may have become a part of the PE business model.

4.4.3 Capital-intensive strategies

Recall from Figure 3 that most of our buy-and-build targets are clustered in manufacturing and services. Firms in these industries differ in capital intensity, which might have implications for the synergies in buy-and-builds through at least three channels.

First, firms in capital-intensive industries generally have greater need for external funds. Then the gains on the operating side may result from PE firms relaxing their capital constraints, as in Ivashina and Kovner (2011), Boucly et al. (2011), and Fracassi et al. (2022), materializing as significant positive PE effect (in our decomposition) on growth, profitability, and efficiency. A better access to financing of the strategy as the whole may, additionally, enable the constituent firms to realize growth synergies discussed in Hypothesis 3.[37]

Second, economies of scale is one of the claimed sources of synergies in M&As. Scale economies may be achieved by lowering the costs and reorganizing the use of equipment and personnel within the company, and PE is traditionally effective in these practices.

[37]In addition, access to the internal capital markets within a conglomerate is well-established benefit of corporate diversification (Hubbard and Palia, 1999; Khanna and Tice, 2001).

Consistent with this, we established in Section 4.4.1 that a large portfolio of relatively small follow-ons realizes restructuring synergies. Larger firms may also achieve operating efficiency by pooling resources together or become more competitive by capturing a larger market share, generating growth synergies. Returns to scale in the production process influences how PE chooses between these two practices to realise economies of scale. If buy-and-builds mostly happen in sectors with increasing returns to scale we can expect economies of scale materialize as larger growth effects in capital-intensive strategies. If, instead, our sample is dominated by the sectors with decreasing returns to scale for very capital-intensive companies, the PE firm may try to make a combined company more profitable by cutting redundant capacity. Existing estimates show increasing returns to scale for capital-intensive manufacturing industries and many services,[38] although the literature, starting from Basu and Fernald (1997), has documented significant heterogeneity in the economies of scale across industries. It is then an empirical question how capital intensity interacts with the variation in returns to scale in buy-and-builds.

Third, tangible assets in capital-intensive industries are often more redeployable to other uses (Williamson, 1988). Shleifer and Vishny (1992) argue that strategic buyers are better positioned to put very specific assets to their best use, while PE prefer more generic and redeployable assets that are easier to manage or dispose of.[39] Fidrmuc et al. (2012) find evidence of their theory by showing that in the U.S. over 1997-2006, the strategic buyers

[38] Basu et al. (2006) estimate returns to scale for 29 industries (roughly at the two-digit level) for the U.S. over 1949–96. For durable manufacturing (11 industries), they report the median returns-to-scale of 1.07; for nondurable manufacturing (10), 0.89; for nonmanufacturing (8), 1.10, and for all 29 industries, 1.00. These aggregates show a large variation from 0.65 for FIRE to 1.30 in communications or business services, and from 0.70/0.82 in Apparel/Food to 1.16/1.82 in Fabricated metals/Chemicals. We expect similar features of production processes in our sample of advanced European economies.

[39] The theory of Shleifer and Vishny (1992) is also consistent with the transaction-cost theory in Williamson (1988), who argues that assets (or projects) with higher redeployability can be financed at better terms and with more debt, which makes them the attractive LBO targets. He also suggests that asset tangibility is not the same as redeployability but there is a positive correlation between the two. Gorbenko and Malenko (2014) show that strategic buyer tend to value research and development expenses and intangible assets such as growth options.

would typically buy listed targets with higher market-to-book ratios and more specific assets (high R&D or intangible assets) while the PE target firms with lower market-to-book ratios. These mechanisms are consistent with restructuring synergies as in Hypothesis 4, if any.

Table 7: Performance of the strategies relative to the placebo strategies: Capital-intensive strategies.
This table shows the performance of buy-and-build strategies compared to placebo control strategies, depending on the capital intensity of the platform's industry. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+5 (or exit, whichever is earlier), where t indicates the year of acquisition of the strategy's platform. For the control samples, *Post* takes on the respective values of the treated company to which the control is matched. *BB* is an indicator for the treated sample. *Follow-ons* an indicator equal to one for the year following the first follow-on acquisition in a given strategy (placebo), onward. *K-Intensity* is an indicator variable equal to one for strategies of which the platform had an asset to revenue ratio that was higher than the sample median in the pre-deal year. All specifications include strategy and year fixed effects. Standard errors are clustered two-ways over the strategy and industry-year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	"Size" outcomes			Operating ratios			
	ln Assets	ln Sales	ln Empl.	ROA	ROS	Lab.Prof.	Lab.Prod.
Follow-ons	0.200**	0.191**	0.034	0.004	0.002	0.048	0.117
	(2.45)	(2.23)	(0.53)	(0.73)	(0.34)	(1.51)	(0.76)
BB×Follow-ons	-0.110	-0.230**	0.040	-0.040***	-0.011	-0.130**	-0.137
	(-1.00)	(-2.24)	(0.42)	(-3.64)	(-1.25)	(-2.21)	(-0.55)
BB×Follow-ons×K-intensity	-0.046	0.151	-0.373***	0.036**	0.019	0.256**	0.957***
	(-0.33)	(0.65)	(-2.63)	(2.53)	(1.26)	(2.40)	(3.12)
BB×Post	0.362***	0.019	-0.027	0.020	0.023***	0.153**	-0.054
	(3.09)	(0.18)	(-0.18)	(1.57)	(2.68)	(2.37)	(-0.18)
BB×Post×K-intensity	-0.366***	-0.011	0.073	0.009	-0.000	-0.098	-0.398
	(-2.77)	(-0.03)	(0.41)	(0.53)	(-0.03)	(-0.83)	(-0.88)
Post	-0.051	0.034	0.036	-0.010*	-0.007	-0.066**	0.195
	(-0.60)	(0.41)	(0.38)	(-1.67)	(-1.06)	(-2.06)	(1.02)
Post×K-intensity	0.051	0.036	-0.080	0.001	0.005	0.067	0.099
	(0.54)	(0.34)	(-0.78)	(0.13)	(0.67)	(1.54)	(0.39)
Observations	5,984	5,965	5,005	5,899	5,889	5,576	5,617
Adj. R-Squared	0.934	0.894	0.883	0.670	0.704	0.725	0.854
Year FE	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓
Non-interacted terms	✓	✓	✓	✓	✓	✓	✓
No Deals strategy	✓	✓	✓	✓	✓	✓	✓
Leverage	✓	✓	✓	✓	✓	✓	✓

We define a binary variable *K Intensity* equal to one for the strategies in which the platform had a fixed assets to revenue ratio higher than the sample median in the pre-deal year.[40] Then we interact this indicator with both *Post* and *Follow-ons* since the capital intensity

[40] We experimented with the definition of capital intensity based on the split by the median sales to assets or fixed assets to number of employees and obtained qualitatively similar results.

may affect strategy performance through either PE effect or synergies, as we discussed above. The results are reported in Table 7, where we suppress the non-interacted terms. Comparing the coefficients to the *BB*×*Follow-ons*, we observe that acquiring follow-ons is associated with lower sales growth, ROA, and labor profitability in an average strategy (row 2, columns 2, 4, 6), plus a cut in the workforce in capital-intensive industries (row 3, column 3). This downsizing is not accompanied by a decline in ROA; rather, capital-intensive strategies achieve higher profitability and labor productivity compared to the other strategies. On the contrary, comparing the coefficients to the *BB*×*Post* in column 1 we see the standard PE practice of downsizing only in capital-intensive strategies. All these findings are consistent with the assets redeployability hypothesis advanced by Shleifer and Vishny (1992) or prevalence of the capital-intensive firms with decreasing returns to scale. Compared to the existing insights of the LBO literature about the capacity reduction by PE, we show that the improvements of profitability and labor productivity in capital-intensive industries is driven by what we interpret as restructuring synergies, as in Hypothesis 4.

5 Robustness checks

In this section we present the results of several robustness checks of our findings in order to reinforce the case that the strategy-level analysis (of buy-and-build strategies) brings additional insights to what we know from the PE literature.

5.1 Timing of follow-on acquisitions

5.1.1 "Speedy" buy-and-builds

In Section 4.4 we established that the larger synergetic operating improvements are realized in relatively complicated strategies. It is then plausible that PE firms need time to identify

Table 8: Performance of the strategies relative to the placebo strategies. Timing of follow-ons.

This table shows the performance of buy-and-build strategies compared to placebo control strategies, depending on timing of follow-on companies relative to the acquisition of the strategy's platform. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+5 (or exit, whichever is earlier), where t indicates the year of acquisition of the strategy's platform. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *Follow-ons* an indicator equal to one for the year following the first follow-on acquisition in a given strategy (placebo), onward. In Panel A, the specification is similar to that in Table 3 panel B but excluding "speedy" strategies and placebos that acquired follow-ons in the year of acquisition of the strategy's platform. *BB* is an indicator for the treated sample. In Panel B we report overall organic strategy growth by timing of follow-ons in full sample. The indicator *Speedy BB* (*Speedy*) identifies the "speedy" strategies (their placebos); the indicator *Wait BB* (*Wait*) identifies the strategies (their placebos) that acquired follow-ons in the years following the the year of acquisition of the strategy's platform. All specifications include strategy and year fixed effects. "Lab.Prof." stands for labor profitability, EBITDA over the wage bill; "Lab.Prod." is labor productivity computed as operating revenue over the wage bill. We suppress the coefficients for operating leverage and other controls. Standard errors are clustered two-ways over the strategy and industry-year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	"Size" outcomes			Operating ratios			
	ln Assets	ln Sales	ln Empl.	ROA	ROS	Lab.Prof.	Lab.Prod.
Panel A: Decomposition of the sources of organic growth in sample without "speedy" strategies							
Follow-ons	0.144***	0.223***	0.192***	0.005	0.005	0.016	-0.003
	(3.10)	(3.78)	(3.00)	(1.33)	(1.10)	(0.70)	(-0.02)
BB×Follow-ons	-0.148*	-0.123	-0.190**	-0.017**	0.004	0.029	0.417**
	(-1.80)	(-1.07)	(-2.39)	(-1.97)	(0.46)	(0.50)	(2.21)
BB×Post	0.165*	0.048	-0.020	0.032***	0.034***	0.152***	-0.155
	(1.68)	(0.32)	(-0.17)	(3.91)	(2.87)	(2.99)	(-0.79)
Post	-0.054	-0.017	0.058	-0.007	0.002	-0.012	0.284*
	(-0.96)	(-0.25)	(0.80)	(-1.33)	(0.42)	(-0.42)	(1.71)
Observations	3,986	3,969	3,256	3,935	3,926	3,680	3,703
Adj. R^2	0.938	0.906	0.912	0.668	0.719	0.733	0.874
Other controls	✓	✓	✓	✓	✓	✓	✓
Panel B: Organic strategy growth by timing of follow-ons							
No Deals×Post	-0.188***	-0.207***	-0.203***	-0.017***	-0.012**	-0.075**	0.073
	(-4.34)	(-3.13)	(-3.20)	(-2.97)	(-2.14)	(-2.47)	(0.47)
No Deals BB×Post	0.161**	0.070	-0.070	-0.009	-0.003	-0.009	-0.305
	(2.03)	(0.79)	(-0.65)	(-0.71)	(-0.25)	(-0.16)	(-1.36)
Speedy×Post	0.358***	0.427***	0.499***	0.010	0.009	0.060	0.023
	(5.39)	(4.70)	(5.40)	(1.39)	(1.28)	(1.46)	(0.09)
Speedy BB×Post	-0.175	-0.275	-0.096	0.007	0.014	0.063	0.362
	(-1.31)	(-1.42)	(-0.55)	(0.52)	(1.03)	(0.78)	(0.86)
Wait×Post	0.127**	0.158**	0.248***	0.013*	0.014**	0.059*	0.240
	(2.30)	(2.05)	(3.02)	(1.93)	(2.04)	(1.65)	(1.20)
Wait BB×Post	-0.087	-0.099	-0.078	0.030*	0.039**	0.178**	0.412
	(-0.68)	(-0.65)	(-0.52)	(1.93)	(2.48)	(2.23)	(1.26)
Observations	6,051	6,032	5,070	5,966	5,956	5,643	5,684
Adj. R-Squared	0.933	0.894	0.882	0.666	0.700	0.722	0.853
Other controls	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓

companies related along a value chain, as shown in Section 4.4.2, or to assemble relatively large portfolio of smaller add-ons, as in Section 4.4.1. On the other hand, if the PE company has a concrete initial plan regarding the companies it wants to select for a specific strategy it might purchase follow-ons earlier and fully focus on realizing synergies and other changes thereafter. We define the "speedy" strategies that only acquire follow-ons in the same year with the platform and presumably and all other strategies, that acquire follow-ons in the years following the platform acquisitions and verify whether such "speedy" strategies drive our results by two tests. The results are in Table 8.

First, in panel A of Table 8 we estimate our main specification from Table 3(B), excluding strategies that acquired follow-ons in the same year as the platform acquisition. The results without such "speedy" strategies are very similar, which means that the strategies where PE waits and purchases the add-ons in the years following the platform acquisitions are *not systematically worse* than the speedy strategies.

Second, in Panel B we investigate the overall organic strategy growth in the full sample, as in Table 3(A), but separately for three categories of strategies, define by whether and when they acquire follow-ons. As before, the strategies with no follow-ons (identified with the familiar time-invariant *No Deals* indicator) underperform relative to other configurations across the board (row 1 and 2). The configurations with immediate acquisitions of follow-ons (the *Speedy* indicator) show strong growth of size variables (row 3, columns 1-3) but not operating ratios (columns 4-5). This growth is likely to be acquisitive because actual strategies are indistinguishable from these common trends (row 4). The configurations where follow-ons come somewhat later (the *Wait* indicator) lie in between these two extremes with moderate growth (row 5, columns 1-3) but do better than the other two categories in terms of operational ratios (columns 4-5). Finally, only the actual strategies deliver additional statistically significant improvements in profitability and efficiency (the

last row). The results in this table indicate that the buy-and-build strategies that do not "front load" acquisitions of follow-ons achieve both moderate organic growth and growth synergies postulated in Hypothesis 3, while speedy strategies, at best, grow inorganically.[41]

5.1.2 Effects of heterogeneity in timing of follow-ons

In our setting the follow-on acquisitions essentially represent staggered treatment because strategies acquire follow-ons at different moments in time. This moment can be driven by unobserved factors and the effect of follow-ons on strategy performance can depend on this timing. There may be a concern that the standard diff-in-diff estimates are biased with staggered treatment when treatment effects are heterogeneous across time, especially when there are relatively few controls that are never treated (Baker et al., 2022).[42] The problem with staggered diff-in-diff estimates has received much attention recently, and several solutions have been proposed (Callaway and Sant'Anna, 2021; Sun and Abraham, 2021). In this section we discuss whether our setting warrants correction for such biases and test whether addressing these concerns changes the conclusions about synergetic effects in buy-and-builds. We follow Sun and Abraham (2021) to control for this concern, adjusting their specification to our setting.

We classify strategies into cohorts based on when they first receive the follow-on treatment, which could be in years t+1 to +4, and re-define two stages of the strategies to be i) the holding period before the first follow-on (the "pre-FO phase") and ii) the period after

[41] All these indicators are time-invariant and defined from the information we observe about our strategies (and their placebos) over the period of study, from t+1 to t+5 (or exit, whichever is earlier), t being the year platform acquisition. It is possible that we miss-classify some of the non-exited strategies which only acquire add-ons in the year six or later after the platform acquisition. This classification, however, does not invalidate our estimated synergetic effect because for them we cannot expect any synergies up to t+5. It is also unlikely that our results would materially change even if the PE effect in platforms for such very delayed strategies is systematically different from those that never acquire add-ons because the former are very rare in our sample.

[42] Our sample includes a relatively large number of strategies that never receive the follow-on treatment, hence, reducing the potential bias from the strategies experiencing staggered treatment.

the first follow-on (the "follow-on (FO) phase"). Time length of these stages in a strategy depends on when the strategy acquires the first follow-on and, unlike in main analysis, the indicators defining these phases are not overlapping. Strategies that receive the follow-on treatment in the same year as the platform (=t) are considered always treated; we exclude them from the regression as suggested by Sun and Abraham (2021), since we cannot separate the PE effect and follow-on effect when the deals coincide in time. We estimate the average effects in the latter two phases for both the buy-and-build strategies and placebo strategies relative to the benchmark of strategies that never receive the follow-on treatment.[43] The results, estimated by the routine developed by Sun (2021), are presented in Table 9 Panel A. In Panel B, the PE treatment effect is calculated as the difference between the outcomes of buy-and-build strategies and placebo strategies during the pre-FO phase. The follow-on treatment effect is the difference between outcomes of strategies and placebos in the FO phase, minus the PE treatment effect.

Overall, the results from this analysis are in line with our main findings. The private equity effect is still positively related to profitability, although the positive asset growth statistical lost significance.[44] At the same time, completing follow-ons is related to a decrease in return on assets and in the size of the labor force and increase in labor productivity. It is reassuring that the key conclusions do not change once we control for heterogeneity of treatment timing effects.

[43]Strategies that complete a follow-on in year t+5 are considered as strategies without follow-ons since in our analysis we retain a five-year window after the platform deal.

[44]The statistically weaker relations compared to the earlier tables may be expected due to a correction for the heterogeneous treatment timing effects and because of added interaction terms.

Table 9: Performance of the strategies relative to the placebo strategies: Controlling for treatment timing and treatment effects heterogeneity.
This table uses an alternative specification to estimate the PE effect and the follow-on effect on operational synergies following Sun and Abraham (2021). Due to limitation of methodology the sample excludes "speedy" strategies and placebos that acquired follow-ons in the year of acquisition of the strategy's platform (=t) as in Table 8(A). All specifications include strategy and year fixed effects. Standard errors are clustered two-ways over the strategy and industry-year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	"Size" outcomes			Operating ratios			
	ln Assets	ln Sales	ln Empl.	ROA	ROS	Lab.Prof.	Lab.Prod.
Panel A: *Estimates of the outcomes in buy-and-builds and placebos by phase*							
Strategy Pre-FO phase	0.055	0.088	-0.012	0.034***	0.035***	0.157***	0.288
	(0.65)	(0.51)	(-0.13)	(4.79)	(3.33)	(3.35)	(1.62)
Strategy FO phase	0.137	0.027	0.003	0.029	0.061***	0.148	-0.290
	(0.94)	(0.15)	(0.02)	(1.39)	(3.04)	(1.36)	(-0.35)
Placebo Pre-FO phase	-0.050	0.035	-0.014	0.000	0.005	0.013	0.339**
	(-1.07)	(0.58)	(-0.22)	(0.02)	(0.97)	(0.49)	(2.18)
Placebo FO phase	0.139	0.081	0.192**	0.015	0.027*	-0.021	-0.668
	(1.32)	(0.49)	(2.11)	(0.72)	(1.86)	(-0.22)	(-0.81)
Observations	4,016	3,999	3,285	3,965	3,956	3,702	3,725
Adj. R-squared	0.938	0.913	0.907	0.669	0.719	0.733	0.873
Panel B: *Treatment estimates in buy-and-builds relative to placebos*							
Follow-on treatment	-0.054	-0.053	-0.095*	-0.010*	0.002	0.013	0.215*
	(-1.10)	(-0.68)	(-1.66)	(-1.90)	(0.36)	(0.38)	(1.85)
PE treatment	0.105	0.052	0.002	0.034***	0.030***	0.143***	-0.051
	(1.17)	(0.30)	(0.02)	(4.38)	(2.71)	(2.92)	(-0.26)
Leverage	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓

5.2 Horizontal strategies and industry fragmentation

In Table 6 we saw that most of the synergies in horizontal strategies are seen in sales growth and labor productivity improvements. Perhaps horizontal strategies may improve the other operating outcomes in industries with certain characteristics. Often, the private equity tries to gain market power by consolidating fragmented industries, while in concentrated markets the antitrust authorities may prevent further consolidations. At the same time, changing platform's market power in highly competitive fragmented markets may be complicated when potential follow-ons are too small. To test this conjectures, we use the EU guidelines on what is considered a competitive market and define the industries as "fragmented" when the initial (at t-1) value of the Herfindahl-Hirschman Index (HHI) is below 1,000.[45]

In Table 10 we interact the indicator variable *Fragmented* for the initially most fragmented industries with the indicator of the strategy's horizontal focus *Horizontal*. The coefficients to this interaction show that horizontal strategies in highly-fragmented markets have lower sales margin and labor efficiency. We conclude that horizontal buy-and-build strategies realize the growth synergies only in somewhat consolidated markets (provided, these deals are not stopped by the regulators).[46] The rest of results from Table 6 remain virtually the same and we do not report them to save the space.

[45] According to Article 2 of EU Council Regulation No 139/2004 of 20 January 2004 on the control of concentrations between undertakings, the EU considers "unlikely to identify horizontal competition concerns in a market with a post-merger HHI below 1,000" (The European Union, 2004). We set the upper threshold of the HHI prior to the strategy initiation.

[46] We conduct a number of robustness checks of this finding. We define fragmented markets by either the HHI below 2,000 (also in EU guidelines), or the lowest quartile of HHI, with similar results, adding negative coefficient to ROA, significant at 11-15 percent. Conversely we find that strategies in most *concentrated* markets (top quartile in the HHI) have higher organic sales margin and labor profitability than average horizontal strategies. The results are robust and confirm our interpretation.

Table 10: Performance of the strategies relative to the placebo strategies: Horizontal strategies in fragmented markets.

This table shows the performance of buy-and-build strategies compared to placebo control strategies, depending on product-market relatedness of companies, as in Table 6. The variables are defined in Table 6. The indicator *Horizontal* is interacted by the indicator *Fragmented*, taking value of one if the strategy takes place in the industries classified by the EU as having unlikely horizontal competition concerns, with the Herfindahl-Hirschman Index below 1,000. For the control samples, the relatedness dummies are defined based on the treated companies to which the control is matched. The coefficient estimates to other variables are similar and are suppressed for space considerations. All specifications include strategy and year fixed effects. Standard errors are clustered two-ways over the strategy and industry-year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	"Size" outcomes			Operating ratios			
	ln Assets	ln Sales	ln Empl.	ROA	ROS	Lab.Prof.	Lab.Prod.
Follow-ons×Horizontal	-0.223**	-0.280**	-0.074	0.005	0.004	-0.012	-0.281
	(-2.26)	(-2.20)	(-0.74)	(0.61)	(0.51)	(-0.24)	(-1.14)
BB×Follow-ons×Horizontal	-0.006	0.480**	-0.052	0.007	0.028	0.156	1.208***
	(-0.03)	(2.35)	(-0.24)	(0.39)	(1.25)	(1.42)	(2.96)
BB×Follow-ons×Horiz.×Fragmented	0.082	-0.157	-0.011	-0.028	-0.054**	-0.267***	-1.326***
	(0.34)	(-1.06)	(-0.06)	(-1.56)	(-2.32)	(-3.23)	(-2.87)
Vertical strategy	✓	✓	✓	✓	✓	✓	✓
Unrelated strategy	✓	✓	✓	✓	✓	✓	✓
PE effect	✓	✓	✓	✓	✓	✓	✓
Observations	5,961	5,942	4,982	5,876	5,866	5,553	5,594
Adj. R-Squared	0.947	0.916	0.909	0.735	0.764	0.781	0.884
Year FE	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓
Non-interacted terms	✓	✓	✓	✓	✓	✓	✓
No Deals strategy	✓	✓	✓	✓	✓	✓	✓
Leverage	✓	✓	✓	✓	✓	✓	✓

5.3 Alternative definition of strategies

Recall, that we construct the buy-and-build sample first, by collecting the follow-ons using the corresponding ("build-up") deal tag from Zephyr and, second, by using the ownership structure and deal description to find the platform associated this particular follow-on or find any additional follow-ons (see Appendix OA1). The build-up tag is assigned to deals that matches the conceptual definition of buy-and-build, and we further scrutinize the textual information from deal description to make sure we collect all the companies that belong to a strategy with a common goal. There could be a concern that our strategy identification might miss some follow-ons because the average number of follow-ons in our strategies is two. We verified and confirmed that such perception might be misguided because a given follow-on deal often consists of more than one firm or establishment. In this case, an acquisition of several operations from the news or the deal prospectus would be featured in Zephyr database as the acquisition of a single *legal* entity. For example, Zephyr reports a "build-up" deal where in March 2006 three PE companies, the Dutch Ackermans & van Haaren (AvH) NV, and the Belgian Tikehau Capital Partners and Compagnie Nationale a Portefeuille (SNP) SA, used their subsidiary GIB Group SA to acquire the Financiere Flo and the Groupe Flo SA, a Paris-based restaurant chain. The GIB Group was bought by AvH and CNP in 2002 and used as the platform in the 2006 deal. In our data, the strategy consists of a platform and two follow-ons, but from the company websites we learned that the Groupe Flo is an leader in themed catering in France with 171 restaurants Hippopotamus, Grandes Brasseries, and Flo Concessions. So, in fact, the deal involved a highly publicised acquisition of a large number of establishments.[47]

[47]Likewise, we find in Zephyr that on October 14, 2010 the Bridgepoint and Apax Partners acquired Histoire d'Or and Marc Orian, two French jewelry retailers, "that will be merged together to form a single entity led by Histoire d'Or's management team." In our data, the strategy consists of one platform and one follow-on (we did not find any other platform deal and judge that one of these companies was used as platform). It turns out that at the time of the deal Marc Orian had 105 jewelers throughout France and Histoire d'Or had 207 outlets, including 22 in Italy and 15 in Belgium.

Table 11: Performance of the strategies relative to the placebo strategies: Alternative definition of buy-and-build strategies.

This table replicates Panel B of Table 3 using an alternative definition of buy-and-build strategies, as detailed in Section 5.3. The sample includes all PE-owned portfolio companies that make an acquisition within five years after becoming PE-owned. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to t+5 (or exit, whichever is earlier), where t indicates the year of acquisition of the strategy's platform. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *BB* is an indicator for the treated sample. *Follow-ons* an indicator equal to one for the year following the first follow-on acquisition in a given strategy (placebo), onward. All specifications include strategy and year fixed effects. Standard errors are clustered two-ways over the strategy and industry-year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	"Size" outcomes			Operating ratios			
	ln Assets	ln Sales	ln Empl.	ROA	ROS	Lab.Prof.	Lab.Prod.
Follow-ons	0.126***	0.180***	0.157***	0.004	0.002	0.009	-0.125
	(3.15)	(3.90)	(3.10)	(1.26)	(0.50)	(0.47)	(-1.18)
BB×Follow-ons	-0.145**	-0.158	-0.183***	-0.022***	-0.005	-0.007	0.445***
	(-2.09)	(-1.50)	(-2.65)	(-2.93)	(-0.63)	(-0.14)	(2.84)
BB×Post	0.201***	0.091	0.075	0.027***	0.020***	0.091**	-0.182
	(2.85)	(0.66)	(0.87)	(3.55)	(2.78)	(2.24)	(-1.14)
Post	-0.048	-0.068	0.007	-0.011***	-0.004	-0.031	0.254*
	(-1.07)	(-0.96)	(0.12)	(-2.94)	(-0.90)	(-1.31)	(1.83)
No Deals	-0.030	0.178	0.144	0.016	0.007	0.072	0.713*
	(-0.42)	(0.86)	(0.83)	(1.57)	(0.97)	(1.62)	(1.83)
No Deals×Post	-0.104**	-0.177**	-0.074	-0.007	-0.008	-0.045	-0.229
	(-2.00)	(-2.58)	(-1.08)	(-1.12)	(-1.30)	(-1.36)	(-1.38)
BB×No Deals×Post	-0.032	-0.012	-0.144	-0.037***	-0.021*	-0.093	-0.119
	(-0.29)	(-0.07)	(-1.22)	(-2.65)	(-1.80)	(-1.33)	(-0.43)
Leverage	0.178*	-0.097	0.097	-0.073***	-0.062***	-0.344***	-0.318
	(1.65)	(-0.74)	(0.68)	(-7.33)	(-5.97)	(-5.36)	(-0.88)
Observations	8,015	7,990	6,784	7,898	7,885	7,512	7,571
Adj. R-Squared	0.938	0.902	0.887	0.665	0.708	0.725	0.856
Year FE	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓

We recognize that the definition of what constitutes a buy-and-build strategy has not been established clearly in the literature, and check if our results are robust to an alternative definition. We follow the approach of Hammer et al. (2017) and include all acquisitions by all PE-held companies during their private stage. Since, unlike in our main analysis, this definition ignores the deal rationale, the resulting sample is likely to be a mixture of more traditional private equity investments and buy-and-build strategies. Comparing the results in Table 11 to those in Table 3(B) we see that our key conclusions about the operating results of serial acquisition strategies by private equity are invariant to a different way to construct the investment portfolios. As before, the second row demonstrates the restructuring synergies as in Hypothesis 4 with reduction of assets and employment and improvement in labor productivity. What we interpret as the PE effect in row three has positive effect on asset growth and profitability, regardless of the measure. We prefer our main strategy to identify buy-and-builds because in those deals we can directly verify whether the claimed purpose of these strategies fits the data, but encouraged by the robustness of the main takeaways from the alternative definition.

6 Conclusion

We analyze the operating performance of buy-and-build strategies by private equity, a type of serial acquisition strategy with declared long-term focus on growth, which is typically associated with strategic buyers. We find that sources of operating improvements in these strategies include both the traditional value drivers in buyouts and an additional undocumented effect, which we interpret as operational synergies. We support this interpretation by exploiting the heterogeneity within this strategy along several dimensions and by numerous robustness checks. The findings of this paper point to a new PE business model,

emphasizing operating synergies.

The scope of this study points to the directions for future research. First, we found statistically significant differences in the PE-effect in buy-and-builds and single-company buyouts but did not explore the reason for these differences. This can be due to differences in targets or in PE-firms specializing in each type of buyouts, among other things. Second, we focus on operating improvements in these strategies. Our evidence suggests that operating synergies is one of the valid "selling points" of buy-and-build strategy. Further research would need to look at whether these operating improvements deliver positive returns to investors, net of fees, and what other factors contribute to investment returns and their persistence (for example, pure multiple arbitrage, elimination of small firm discount, characteristics of the PE firm, corporate governance issues, and so on).[48] Third, in interpreting our results, we adopt a broad view of operating synergies, defining them as *any* statistically significant difference in operating results of strategies, over time, relative to artificial strategies. To the extent it is possible with our data we identify several channels of how these improvements are achieved. A fruitful direction of further inquiry would use disaggregated product-level data, survey data or industry studies on changes implemented by PE within these strategies.[49] Advancing in these directions should further improve our understanding on how modern-day private equity firms change their portfolio companies.

[48]There are a number of potential agency problems, summarized in Morris and Phalippou (2020), due to a nature of PE partnership arrangement that can have implications for returns to PE investments. The examples are overinvestment when money is cheap (Axelson et al., 2009), "window-dressing" for fundraising (Phalippou, 2009; Barber and Yasuda, 2017), pressure to establish track record (Ljungqvist et al., 2020), manipulating accounting valuations (Brown et al., 2019), and charging sizeable and cryptic fees (Phalippou and Gottschalg, 2009; Robinson and Sensoy, 2013; Phalippou et al., 2018).

[49]See Bernstein et al. (2016) and Eaton et al. (2019), cited above, for an example of this emerging research in LBO literature. More generally, Eliason et al. (2019) show that independent dialysis facilities acquired by large chains increase their revenue or decrease their operating costs but reduce quality of care. Fracassi et al. (2022) focus on a competitive consumer goods industry in the U.S., using price and sales data, and show that the manufacturers of consumer goods acquired by PE firms increase sales 50 percent more than matched control firms by launching new products and geographic expansion, but prices on existing products increase by mere 1 percent.

References

Abadie, A., Diamond, A., and Hainmueller, J. (2010) Synthetic control methods for comparative case studies: Estimating the effect of California's tobacco control program, *Journal of the American Statistical Association* **105**, 493–505.

Acemoglu, D., Akcigit, U., and Kerr, W. R. (2016) Innovation network, *Proceedings of the National Academy of Sciences* **113**, 11483–11488.

Acharya, V. V., Gottschalg, O. F., Hahn, M., and Kehoe, C. (2013) Corporate governance and value creation: Evidence from private equity, *The Review of Financial Studies* **26**, 368–402.

Aktas, N., De Bodt, E., and Roll, R. (2013) Learning from repetitive acquisitions: Evidence from the time between deals, *Journal of Financial Economics* **108**, 99–117.

Andrade, G., Mitchell, M., and Stafford, E. (June 2001) New evidence and perspectives on mergers, *Journal of Economic Perspectives* **15**, 103–120.

Anjos, F. and Fracassi, C. (2015) Shopping for information? diversification and the network of industries, *Management Science* **61**, 161–183.

Antoni, M., Maug, E., and Obernberger, S. (2019) Private equity and human capital risk, *Journal of Financial Economics* **133**, 634–657.

Axelson, U., Strömberg, P., and Weisbach, M. S. (2009) Why are buyouts levered? The financial structure of private equity funds, *The Journal of Finance* **64**, 1549–1582.

Bain and Company (2018) *Global private equity report 2018*. Available at https://www.bain.com/insights/global-private-equity-report-2018/. Accessed: 2018-09-15.

Bain and Company (2021) *Global private equity report 2012*. Available at https://www.bain.com/globalassets/noindex/2021/bain_report_2021-global-private-equity-report.pdf/. Accessed: 2022-02-20.

Baker, A. C., Larcker, D. F., and Wang, C. C. (2022) How much should we trust staggered difference-in-differences estimates?, *Journal of Financial Economics* **144**, 370–395.

Barber, B. M. and Yasuda, A. (2017) Interim fund performance and fundraising in private equity, *Journal of Financial Economics* **124**, 172–194.

Barrot, J.-N. and Sauvagnat, J. (2016) Input specificity and the propagation of idiosyncratic shocks in production networks, *The Quarterly Journal of Economics* **131**, 1543–1592.

Basu, S. and Fernald, J. G. (1997) Returns to scale in u.s. production: estimates and implications, *Journal of Political Economy* **105**, 249–283.

Basu, S., Fernald, J. G., and Kimball, M. S. (2006) Are technology improvements contractionary?, *The American Economic Review* **96**, 1418–1448.

Baziki, S. B., Norbäck, P.-J., Persson, L., and Tåg, J. (2017) Cross-border acquisitions and restructuring: Multinational enterprises and private equity-firms, *European Economic Review* **94**, 166–184.

Bena, J. and Li, K. (2014) Corporate innovations and mergers and acquisitions, *The Journal of Finance* **69**, 1923–1960.

Bernstein, S., Lerner, J., Sørensen, M., and Strömberg, P. (2016) Private equity and industry performance, *Management Science* **63**, 1198–1213.

Bernstein, S. and Sheen, A. (Sept. 2016) The operational consequences of private equity buyouts: Evidence from the restaurant industry, *The Review of Financial Studies* **29**, 2387–2418.

Betton, S., Eckbo, B. E., and Thorburn, K. S. (2008) Chapter 15 - Corporate Takeovers. In: *Handbook of empirical corporate finance*. Ed. by B. E. Eckbo. Handbooks in Finance. San Diego: Elsevier, 291–429.

Bharath, S., Dittmar, A., and Sivadasan, J. (2014) Do going-private transactions affect plant efficiency and investment?, *The Review of Financial Studies* **27**, 1929–1976.

Bhattacharyya, S. and Nain, A. (2011) Horizontal acquisitions and buying power: A product market analysis, *Journal of Financial Economics* **99**, 97–115.

Bloom, N., Sadun, R., and Van Reenen, J. (May 2015) Do private equity owned firms have better management practices?, *American Economic Review* **105**, 442–46.

Bloom, N., Schankerman, M., and Van Reenen, J. (July 2013) Identifying technology spillovers and product market rivalry, *Econometrica* **81**, 1347–1393.

Boucly, Q., Sraer, D., and Thesmar, D. (2011) Growth LBOs, *Journal of Financial Economics* **102**, 432–453.

Braun, R., Jenkinson, T., and Stoff, I. (2017) How persistent is private equity performance? Evidence from deal-level data, *Journal of Financial Economics* **123**, 273–291.

Brigl, M., Jansen, A., Schwetzler, B., Hammer, B., and Hinrichs, H. (2016) *The power of buy and build. How private equity firms fuel next-level value creation.* Available at https://www.bcg.com/publications/2016/private-equity-power-of-buy-build.aspx. Accessed: 2017-02-02.

Brown, G. W., Gredil, O. R., and Kaplan, S. N. (2019) Do private equity funds manipulate reported returns?, *Journal of Financial Economics* **132**, 267–297.

Brown, G. W., Harris, R. S., Kaplan, S. N., Jenkinson, T., and Robinson, D. T. (2020) Private equity: Accomplishments and challenges, *Journal of Applied Corporate Finance* **32**, 8–20.

Callaway, B. and Sant'Anna, P. H. (2021) Difference-in-differences with multiple time periods, *Journal of Econometrics* **225**, 200–230.

Caves, R. E. and Bradburd, R. M. (1988) The empirical determinants of vertical integration, *Journal of Economic Behavior & Organization* **9**, 265–279.

Cohn, J. B., Mills, L. F., and Towery, E. M. (2014) The evolution of capital structure and operating performance after leveraged buyouts: Evidence from U.S. corporate tax returns, *Journal of Financial Economics* **111**, 469–494.

Cornelli, F., Kominek, Z., and Ljungqvist, A. (2013) Monitoring managers: Does it matter?, *The Journal of Finance* **68**, 431–481.

Da Rin, M. and Phalippou, L. (2017) The importance of size in private equity: evidence from a survey of limited partners, *Journal of Financial Intermediation* **31**, 64–76.

Davis, S. J., Haltiwanger, J. C., Handley, K., Lerner, J., and Miranda, J. (2014) Private equity, jobs, and productivity, *The American Economic Review* **104**, 3956–3990.

Davis, S. J., Haltiwanger, J. C., Handley, K., Lipsius, B., Lerner, J., and Miranda, J. (Oct. 2019) *The (heterogenous) economic effects of private equity buyouts.* Working Paper 26371. National Bureau of Economic Research.

Eaton, C., Howell, S. T., and Yannelis, C. (Oct. 2019) When investor incentives and consumer interests diverge: Private equity in higher education, *The Review of Financial Studies.*

Eliason, P. J., Heebsh, B., McDevitt, R. C., and Roberts, J. W. (Nov. 2019) How acquisitions affect firm behavior and performance: Evidence from the dialysis industry, *The Quarterly Journal of Economics* **135**, 221–267.

Erel, I., Jang, Y., and Weisbach, M. S. (2015) Do acquisitions relieve target firms' financial constraints?, *The Journal of Finance* **70**, 289–328.

Espinoza, J. (Sept. 2018) Private equity aims lower and longer, *Financial Times.* (2018-09-20) Available at https://www.ft.com/content/95539ab8-7b81-11e8-bc55-50daf11b720d, Accessed: 2018-11-05.

Fan, J. P. H. and Lang, L. H. P. (2000) The measurement of relatedness: An application to corporate diversification, *The Journal of Business* **73**, 629–660.

Fee, C. and Thomas, S. (2004) Sources of gains in horizontal mergers: Evidence from customer, supplier, and rival firms, *Journal of Financial Economics* **74**, 423–460.

Fidrmuc, J. P., Roosenboom, P., Paap, R., and Teunissen, T. (2012) One size does not fit all: Selling firms to private equity versus strategic acquirers, *Journal of Corporate Finance* **18**, 828–848.

Fracassi, C., Previtero, A., and Sheen, A. W. (2022) Barbarians at the store? Private equity, products, and consumers, *The Journal of Finance* **77**, 1439–1488.

Fuller, K., Netter, J., and Stegemoller, M. (2002) What do returns to acquiring firms tell us? Evidence from firms that make many acquisitions, *The Journal of Finance* **57**, 1763–1793.

Garcia Gomez, P., Maug, E. G., and Obernberger, S. (2022) *Private equity buyouts and employee health.* Available at SSRN https://ssrn.com/abstract=3601813.

Gompers, P., Kaplan, S. N., and Mukharlyamov, V. (2016) What do private equity firms say they do?, *Journal of Financial Economics* **121**, 449–476.

Gorbenko, A. S. and Malenko, A. (2014) Strategic and financial bidders in takeover auctions, *The Journal of Finance* **69**, 2513–2555.

Graham, F. D. (Feb. 1923) Some Aspects of Protection Further Considered, *The Quarterly Journal of Economics* **37**, 199–227.

Guo, S., Hotchkiss, E. S., and Song, W. (2011) Do buyouts (still) create value?, *The Journal of Finance* **66**, 479–517.

Hammer, B., Knauer, A., Pflucke, M., and Schwetzler, B. (2017) Inorganic growth strategies and the evolution of the private equity business model, *Journal of Corporate Finance* **45**, 31–63.

Harris, R., Siegel, D. S., and Wright, M. (2005) Assessing the impact of management buyouts on economic efficiency: Plant-level evidence from the united kingdom, *The Review of Economics and Statistics* **87**, 148–153.

Hoberg, G. and Phillips, G. (Aug. 2010) Product Market Synergies and Competition in Mergers and Acquisitions: A Text-Based Analysis, *The Review of Financial Studies* **23**, 3773–3811.

Hochberg, Y. and Fehder, D. (2019) *Spillover effects of startup accelerator programs: Evidence from venture-backed startup activity.* Available at http://yael-hochberg.com/assets/portfolio/FH.pdf. Unpublished manuscript. Accessed: 2020-03-15.

Holmstrom, B. and Kaplan, S. N. (June 2001) Corporate governance and merger activity in the united states: making sense of the 1980s and 1990s, *Journal of Economic Perspectives* **15**, 121–144.

Hotchkiss, E. S., Smith, D. C., and Strömberg, P. (Sept. 2021) Private Equity and the Resolution of Financial Distress, *The Review of Corporate Finance Studies* **10**, 694–747.

Hubbard, R. G. and Palia, D. (1999) A reexamination of the conglomerate merger wave in the 1960s: an internal capital markets view, *The Journal of Finance* **54**, 1131–1152.

Humphery-Jenner, M. (2013) Diversification in private equity funds: on knowledge sharing, risk aversion, and limited attention, *The Journal of Financial and Quantitative Analysis* **48**, 1545–1572.

Humphery-Jenner, M., Sautner, Z., and Suchard, J.-A. (2017) Cross-border mergers and acquisitions: the role of private equity firms, *Strategic Management Journal* **38**, 1688–1700.

Ivashina, V. and Lerner, J. (2019) *Patient capital: The challenges and promises of long-term investing.* Princeton University Press.

Ivashina, V. and Kovner, A. (2011) The private equity advantage: leveraged buyout firms and relationship banking, *The Review of Financial Studies* **24**, 2462–2498.

Javorcik, B. S. (2004) Does foreign direct investment increase the productivity of domestic firms? In search of spillovers through backward linkages, *The American Economic Review* **94**, 605–627.

Jensen, M. C. (1986) Agency costs of free cash flows, corporate finance and takeovers, *The American Economic Review* **76**, 323–339.

Kalemli-Ozcan, S., Sorensen, B., Villegas-Sanchez, C., Volosovych, V., and Yesiltas, S. (Sept. 2015) *How to construct nationally representative firm level data from the orbis global database: New facts on SMEs and aggregate implications for industry concentration.* NBER Working Papers 21558. National Bureau of Economic Research, Inc.

Kaplan, S. N. (1989) The effects of management buyouts on operating performance and value, *Journal of Financial Economics* **24**, 217–254.

Kaplan, S. N. and Schoar, A. (2005) Private equity performance: Returns, persistence, and capital flows, *The Journal of Finance* **44**, 611–632.

Kaplan, S. N. and Strömberg, P. (2009) Leveraged buyouts and private equity, *The Journal of Economic Perspectives* **23**, 121–146.

Khanna, N. and Tice, S. (2001) The bright side of internal capital markets, *The Journal of Finance* **56**, 1489–1528.

Kogut, B. (1984) Normative Observations on the International Value-Added Chain and Strategic Groups, *Journal of International Business Studies* **15**, 151–167.

Koutsoyiannis, A. (1979) Theory of costs. In: *Modern microeconomics*. London: Macmillan Education UK, 105–150.

Laamanen, T. and Keil (2008) Performance of serial acquirers: Toward an acquisition program perspective, *Strategic Management Journal* **29**, 663–672.

Lambrecht, B. M. (2004) The timing and terms of mergers motivated by economies of scale, *Journal of Financial Economics* **72**, 41–62.

Lemelin, A. (1982) Relatedness in the patterns of interindustry diversification, *The Review of Economics and Statistics* **64**, 646–657.

Lerner, J., Schoar, A., and Wongsunwai, W. (2007) Smart institutions, foolish choices: The limited partner performance puzzle, *The Journal of Finance* **62**, 731–764.

Lerner, J., Sørensen, M., and Strömberg, P. (2011) Private equity and long-run investment: The case of innovation, *The Journal of Finance* **66**, 445–477.

Lichtenberg, F. R. and Siegel, D. (1990) The effects of leveraged buyouts on productivity and related aspects of firm behavior, *Journal of Financial Economics* **27**, 165–194.

Ljungqvist, A., Richardson, M., and Wolfenzon, D. (2020) The investment behavior of buyout funds: Theory and evidence, *Financial Management* **49**, 3–32.

Lopez-de-Silanes, F., Phalippou, L., and Gottschalg, O. (2015) Giants at the gate: Investment returns and diseconomies of scale in private equity, *Journal of Financial and Quantitative Analysis* **50**, 377–411.

Moeller, S. B., Schlingemann, F. P., and Stulz, R. M. (2004) Firm size and the gains from acquisitions, *The Journal of Financial Economics* **73**, 201–228.

Morris, P. and Phalippou, L. (2020) Thirty years after Jensen's prediction: Is private equity a superior form of ownership?, *Oxford Review of Economic Policy* **36**, 291–313.

Mulherin, J. H. and Boone, A. L. (2000) Comparing acquisitions and divestitures, *Journal of Corporate Finance* **6**, 117–139.

Nikoskelainen, E. and Wright, M. (2007) The impact of corporate governance mechanisms on value increase in leveraged buyouts, *Journal of Corporate Finance* **13**, 537.

Phalippou, L. (2017) *Private equity laid bare*. Createspace Independent Publishing Platform.

Phalippou, L. (2009) Beware of venturing into private equity, *Journal of Economic Perspectives* **23**, 147–66.

Phalippou, L. and Gottschalg, O. (2009) The performance of private equity funds, *The Review of Financial Studies* **22**, 1747–1776.

Phalippou, L., Rauch, C., and Umber, M. (2018) Private equity portfolio company fees, *Journal of Financial Economics* **129**, 559–585.

Porter, M. E. (1980) *Competitive strategy: Techniques for analyzing industries and competitors*. New York: Free Press.

Roberts, M. R. and Whited, T. M. (2013) Endogeneity in empirical corporate finance. In: ed. by G. M. Constantinides, M. Harris, and R. M. Stulz. Vol. 2. Handbook of the Economics of Finance. Elsevier, 493–572.

Robinson, D. T. and Sensoy, B. A. (2013) Do private equity fund managers earn their fees? compensation, ownership, and cash flow performance, *The Review of Financial Studies* **26**, 2760–2797.

Sensoy, B. A., Wang, Y., and Weisbach, M. S. (2014) Limited partner performance and the maturing of the private equity industry, *Journal of Financial Economics* **112**, 320–343.

Shleifer, A. and Vishny, R. W. (1992) Liquidation values and debt capacity: A market equilibrium approach, *The Journal of Finance* **47**, 1343–1366.

Smit, H. T. J. (2001) Acquisition strategies as option games, *Journal of Applied Corporate Finance* **14**, 79–89.

Smith, A. J. (1990) Corporate ownership structure and performance: The case of management buyouts, *Journal of Financial Economics* **27**, 143–164.

Sun, L. (2021) Eventstudyinteract: stata module to implement the interaction weighted estimator for an event study.

Sun, L. and Abraham, S. (2021) Estimating dynamic treatment effects in event studies with heterogeneous treatment effects, *Journal of Econometrics* **225**, 175–199.

Tate, G. and Yang, L. (2015) The bright side of corporate diversification: evidence from internal labor markets, *The Review of Financial Studies* **28**, 2203–2249.

The European Union (Feb. 2004) *Guidelines on the assessment of horizontal mergers under the council regulation on the control of concentrations between undertakings*. the Official Journal of the European Union C 31/5. Available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52004XC0205(02)&from=EN. The European Union.

Tsai, W. (2001) Knowledge transfer in intraorganizational networks: effects of network position and absorptive capacity on business unit innovation and performance, *Academy of Management Journal* **44**, 996–1004.

Valkama, P., Maula, M., Nikoskelainen, E., and Wright, M. (2013) Drivers of holding period firm-level returns in private equity-backed buyouts, *Journal of Banking & Finance* **37**, 2378–2391.

Wang, W. (2018) Bid anticipation, information revelation, and merger gains, *Journal of Financial Economics* **128**, 320–343.

Williamson, O. (1988) Corporate finance and corporate governance, *The Journal of Finance* **43**, 567–591.

Private Equity as Strategic Buyers

Online Appendix. Not for Publication

OA1 Identification of strategies and computing strategy-level financials

This appendix provides the details on how we identify buy-and-build strategies and assign their financials using Zephyr and Orbis databases by the Bureau Van Dijk and other sources.

Identification of strategies

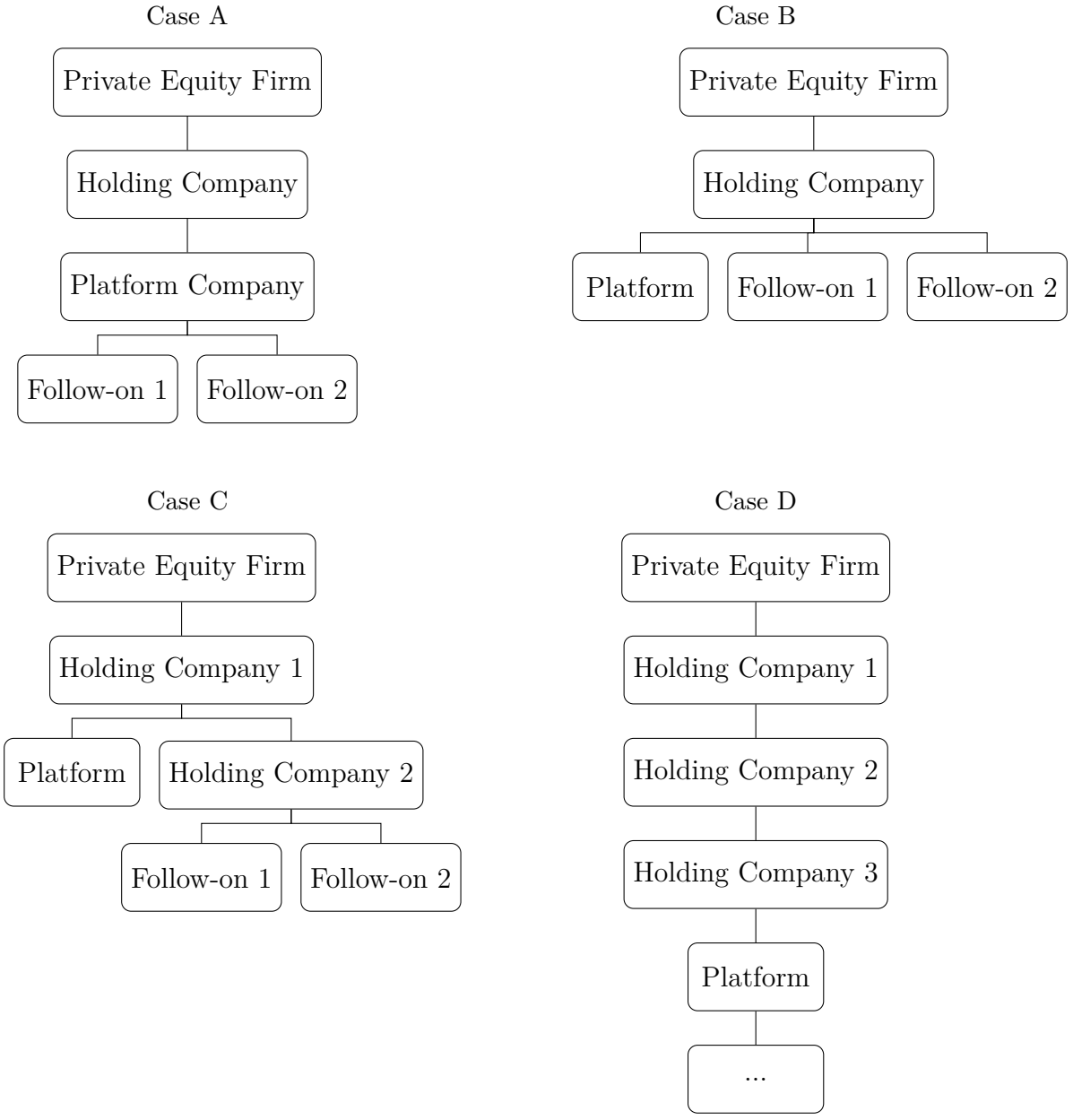
We identify buy-and-build strategies from our data sources by first, looking for follow-on companies and second, finding the earlier acquisition of the company under the common ownership structure (considered as the platform), making sure that all these companies are purchased to exploit some form of synergetic relationship according to deal descriptions. This procedure allows us to create a unique dataset of buy-and-build strategies consisting of the platform and related follow-ons. We also identify the strategy exits. We follow two main steps.

Step 1: Collecting follow-ons. There is no direct identifier for buy-and-build strategies or the platform deals in Zephyr—only the follow-on deals are flagged and defined as the deal "when a Private Equity company builds up the company it owns by acquiring other companies to amalgamate into the larger firm, thus increasing the total value of its investments *through synergies between the acquired*" (our italics). This definition fits nicely the conceptual definition of buy-and-builds with a clear pre-determined goal. Zephyr uses the sub-deal type "build-up" to refer to the follow-on deals. Therefore, we begin by collecting all follow-on deals from Zephyr, requiring that the deal is a majority stake acquisition, from less than 50% of the target's equity before the deal to more than 50% after. The average acquired stake in our sample is 97% which is common in the PE market. The time period for the deals is between 1999 (when Zephyr has a relatively good coverage) and 2014. Even though we had a more recent deals (up to 2016 at the time we began the data collection) we stop in 2014 in order to observe the operating performance of the acquired companies for several years after the deal.

Step 2: Identifying individual strategies. Having a sample of follow-ons, we use rich information in the historic vintages of Orbis Ownership database, deal description in Zephyr, and various external sources, such as the websites of PE firms, in order to find the portfolio companies and combine them with relevant follow-ons into unique strategies. This is not trivial because the ownership structure associated with buy-and-build strategy is complex. Several frequently found ownership structures are presented schematically in Figure OA1.1. The "acquirer" of many follow-on deals mentioned by Zephyr is not necessarily the platform company or the private equity firm, but can be a different entity that lies somewhere between the follow-on company and private equity firm in the ownership structure. Conversely, the PE firm may be mentioned as the acquirer by Zephyr but the deal is structured such that a separate entity (or multiple entities) is established to allocate the controlling stake in the target but is itself controlled by the PE firm. We refer to these intermediate companies as the "holding companies."[50]

[50]In PE industry, these entities are called "bidco," "midco," or "topco" reflecting their place in ownership structure between the target and the PE acquirer. Holding companies offer several advantages. First, holding companies can be used as acquisition vehicles to allocate the debt raised for acquisitions. Second, holding companies can be used to create structures with tax benefits. Third, by creating layers of ownership the ultimate owner (the private equity firm) can alter the relation between the control (voting) rights and cash flow rights in its favor. Fourth, keeping the companies as a separate legal entities the PE firm ensures that a possible distress of individual companies does not directly influence the other portfolio companies as

Figure OA1.1: Ownership structures.
This figure provides an overview of generalized examples of ownership structures in buy-and-build strategies in our sample. Case A shows a simple ownership structure in which it is easy to identify the platform from the follow-ons. Cases B–D show more complex structures. The "holding companies" are additional entities which may be created by PE companies as acquisition vehicles for platforms, follow-ons or both.



Using the Orbis Ownership database, we trace the controlling shareholder of every follow-on found in Zephyr and, sequentially, every other entity in the ownership structure that lies between the follow-on and the private equity firm that initiates the deal. These entities are potential platforms or holding companies.

Then we use the names and identifiers of these potential platforms and search *all* the Zephyr deals in the previous years that are *not* identified as "build-up" but in which the

would be the case were the companies integrated. Furthermore, the exit is streamlined because the sale can be discussed at a single holding company level with less parties involved.

target is (similar to) the potential platform found in the previous step. We use the time window of 4–5 years for searching these earlier transactions because it matches the average time to exit of these strategies in our sample. To ensure that we have a unique and relevant platform, we verify whether these earlier transactions were executed by the same PE firm and whether the ownership structure of the potential platforms can be traced to the same PE firm or holding company of the follow-on deal in question. When we are not able to identify platforms or exits solely on the ownership structure, we use additional information from deal comments in Zephyr, news sources, and company websites (of the PE firm and of the potential platform) to identify the platform deal in Zephyr.

Step 3: Supplement sample with more follow-ons. The alternative definition of buy-and-build strategies, supplements the sample from our main analysis with additional acquisitions by the entities from the ownership structure of follow-ons shown schematically in Figure OA1.1. Specifically, in our main sample of the platform and follow-on deals we check whether *any* company from their ownership structure—up to, but excluding, the private equity fund—is identified by Zephyr as an acquirer. Most of these intermediate companies are acquisition vehicles or the platform company itself. As the result, we include the deals related to our buy-and-build sample via the ownership structure, but the descriptions of these acquisitions do not explicitly specify the operating synergies, growth, or other motivations characteristic of buy-and-builds. If they would, they would make to our main sample. We reconstruct the placebo strategies for these new portfolios.

Assigning strategy financials from the individual company data

Timing of financials in strategies. Figure OA1.2 demonstrates how we assign financials to time periods using a hypothetical strategy with a single platform and a single follow-on. The platform was acquired in 2006 (t=0 in our notation everywhere) and the follow-on in 2007. The "pre-deal" financials, denoted in red italic font, are taken as of two years before the entity was acquired. We use the financials from the year following the acquisition year as the post-deal outcomes because the deals are spread out throughout the acquisiton year and we want to analyze the full years of economic activity; these values are denoted by black regular font. The numbers from the acquisition years (marked with "X") are, thus, excluded from the analysis. The financials of strategies pre-deal and in all years up to and including the year when the follow-on was acquired (here, 2007) coincide with the financials of platforms. In the years following the acquisition of a follow-on the strategy financials include the financials of the platform and the follow-on (115+45=160 in 2008, and so on, in the example). We add the financials of any subsequent follow-ons similarly.

Choice of the companies and company financial statements. We need to make judgement on what entities in the structures created for a given buy-and-build strategy should contribute to the strategy-level financials. In addition, the individual companies in Orbis may report unconsolidated and consolidated financial statements (the latter include operations of subsidiaries). We need to decide what type of statements to choose in order to correctly reflect the changes in outcomes of strategies and avoid double-counting.

For individual companies, we rely on the numbers from unconsolidated statements, unless consolidated statements are available. If acquired follow-on companies become the subsidiaries of a platform one could identify financials of the strategy using the consolidated accounts of the platform in the years following the follow-on acquisition. Platform and follow-on companies are often the same level subsidiaries of a separate holding company (Case B in Figure OA1.1) or a separate holding company is used to acquire follow-ons (Case

Figure OA1.2: Assigning of company financials for strategy-level analysis.
This figure presents a hypothetical strategy with one platform and one follow-on. The entries represent the unconsolidated financial data of the platform and follow-on over time. The values in red italics represent pre-deal financials. The consolidated data at strategy level is reported in the third row. Pre-deal, the consolidated financials of the strategy consist of only the financials the platform; the financials of the follow-on are added to the strategy post follow-on acquisition. Under "Placebo Str." we report the financials of the hypothetical placebo strategies, constructed from the matched peers of the platform and follow-on in actual strategy. The acquisition year (the observations marked by "X") is excluded in the analysis.

Platform	*90*	*100*	105^X	110	115	120	130	140
Follow-on		*35*	*38*^{X}	40^X	45	45	50	60
Strategy	*90*	*100*	105^X	110	160	165	180	200
Placebo Str.	*90*	*100*	104^X	111	158	165	182	201
Year	2004	2005	2006	2007	2008	2009	2010	2011
t=	−2	−1	0	1	2	3	4	5

PL Acq. *FO Acq.*

C). In such cases, using the consolidated data of the platform will overlook the financials of the follow-ons because the real activity of the strategy would be reflected in the financials of the holding company. Our ownership data allows differentiating these various ownership structures. By tracing the ownership relationships from each acquisition target to the ultimate acquirer (the PE company) we collect the correct financials and aggregate them in the way avoiding double-counting but accounting the activity of the relevant platforms and follow-ons. With this forensic bottom-up approach we are able to measure the real and financial performance of these strategies more comprehensively than when the data comes from the PE side. The latter data is typically limited to the reported portfolio performance and scant company information.

OA2 Matching Procedure

One-to-many matching at company level. We match the individual companies that are part of the strategy with non-acquired companies in the same country, industry, and acquisition year to control for the common trends in fundamentals. Our controls are non-acquired firms, as motivated in the main text. We require the relevant financials of control companies to be available in Orbis in the two pre-treatment years, where the treatment year refers to the year when the treated company was acquired. We also require that the controls have financial data at least three or five years after the treatment year depending on the exit of the corresponding strategy.

The nature of the traditional LBOs by PE and the postulated difference between LBOs and buy-and-builds guides our choice of the matching variables. While PE companies traditionally look at firm profitability when selecting the targets, recent claims from the industry suggest that buy-and-build strategy is primarily aimed at sales growth over the long-run. In addition, Roberts and Whited (2013) recommend to include lagged growth rates of outcome of interest to ensure similarity of pre-treatment trends and consistency of the diff-in-diff

estimator. Consequently, we match on the return on assets, the return on sales, log of total assets, log of total sales, the squares of both, the growth of sales and of assets, and the changes in return on assets and return on sales, using the *pre-treatment* values to reduce the possibility that the matching variables are affected by the treatment. We use two lags of level and one lag of growth of outcomes, relative to the acquisition year. We winsorize our variables before the matching: assets and sales at 1% and 99% and the profitability measures at 10% and 90% levels. The data coverage in pre-deal years is limited, and matching on the earlier lags of pre-deal growth would seriously decrease the sample size, which is prohibitive to the quality of match.

We use the Stata's psmatch2 command written by E. Leuven and B. Sianesi. We match with replacement and make sure that the probability of selection into a strategy of the matched peer differs by at most twenty percentage points (a 0.2 caliper of the propensity score) and drop acquired firms for which the propensity score is higher than the maximum or less than the minimum propensity score of the non-acquired firms (the common support condition). For each treated company we keep the five closest matched controls to balance the accuracy of matching with the precision of the resulting estimates. We match with replacement to have a better match but at the expense of worse power, which is a lesser concern in our large sample. The matched control sample for follow-ons is formed by a similar procedure, using the year when the follow-on was acquired as the deal year but using a less stringent caliper of 0.5. This is because we have many more follow-ons than platforms finding matches for each of them is more difficult.

Matching quality evaluation. In Table OA2.1 we present the means of financial variables from the matched treated and control group for the pre-deal year, together with the results of the test of difference of means, for platforms (panel A) and follow-ons (panel B). The company size (log Total Assets) is somewhat larger for acquired platforms while the asset turnover is lower, but only at 10% significance level. These differences in level variables, if persistent, would be absorbed in the regression analysis by firm fixed effects. In addition, the magnitude of the difference in log-assets is about 1.5 percent which is economically small. The difference in means of the other matching variables are insignificant at conventional levels. In our case, the parallel trends assumption means that without acquisition the average change in company performance would have been the same for both treated and control firms. As seen, the changes in outcomes are not significantly different between treated and matched controls. Figure OA2.1 demonstrates that in our largest matched sample of panel A of Table OA2.1, the "parallel trends" condition is satisfied: in the pre-treatment year, there is no significant differences in growth of key outcomes between treated (acquired into buy-and-build strategy) and control (non-acquired) platform companies. Levels and trends for follow-ons reported in panel B are not significantly different for between treated and matched controls. As a robustness check, we match on just the pre-treatment log of total assets, total sales, the squares of both, return on assets and return on sales. This requires only one year of pre-buyout data and expands the sample by about 12 percent. This modest increase in sample size does not, in our view, justify the risk of affecting our results due to divergent pre-treatment trends.

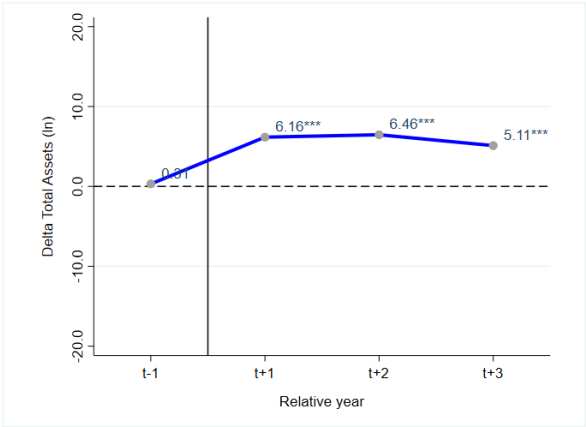
OA3 Additional tables and figures

This Appendix contains additional figures and tables referred to but not included in the main text.

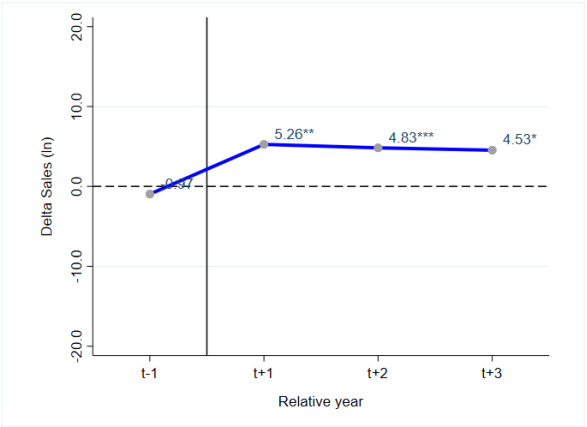
Table OA2.1: Strategy statistics in pre-deal year in matched sample.
This table presents the means of the outcome variables in the pre-strategy year and their difference between the treated and matched controls. The matching is performed on the pre-deal log of total assets, log of total sales, the squares of both, growth of sales, growth of assets, the return on assets, return on sales and changes in return on assets and the return on sales. (ln) indicates the logarithmic transformation. *** stands for a 1% significance level.

Treated	Controls	Difference	(T-stat)
17.081	16.804	0.277***	(2.51)
16.673	16.709	-0.036	(-0.30)
0.092	0.091	0.001	(0.11)
0.062	0.066	-0.004	(-0.68)
0.071	0.068	0.003	(0.26)
0.074	0.091	-0.018	(-1.52)
0.003	0.001	0.002	(1.09)
0.001	0.001	0.000	(0.14)
4.656	4.382	0.275***	(2.25)
4.886	5.740	-0.854***	(-3.12)
0.517	0.565	-0.047	(-1.29)

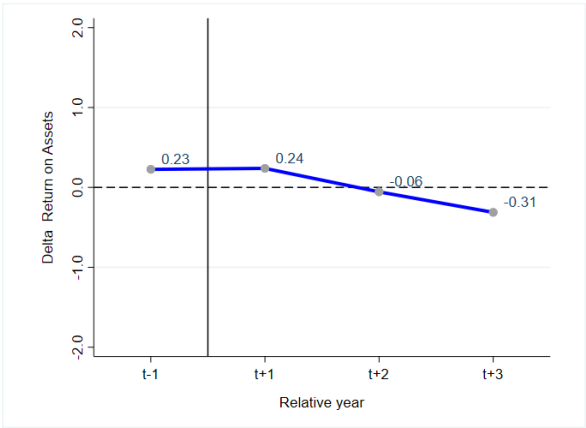
Figure OA2.1: Growth of selected outcomes in matched sample of acquired platforms in buy-and-build strategies vs. non-acquired companies.
This figure reports differences of growth rates of selected outcomes between acquired platforms in buy-and-build strategies and matched non-acquired companies, corresponding to the sample in Panel A, Table OA2.1. We match on the return on assets, the return on sales, log of total assets, log of total sales, the squares of both, the growth of sales and of assets, and the changes in return on assets and return on sales, using the pre-treatment values of outcomes (two lags for levels, one lag for growth rates). We use a caliper matching procedure with replacement, retaining five closest matched controls (see Appendix OA2 for details). The figure displays the estimated β_t–coefficients from the regression $\Delta Y_{i,t} = \alpha + \sum_{t=-1,\neq 0}^{3} \beta_t (Acq_{i,t} \times BB_i) + \eta_t + \epsilon_{i,t}$, where $\Delta Y_{i,t}$ are changes in outcomes for a company i in the year t and t=0 represents the year when the platform was acquired, the $\text{Acq}_{i,t}$ are dummy variables equal to one for the observations (treated or controls) in year t and zero otherwise, the BB_i is our treatment indicator, equal to one for targets in buy-and-build strategies, and η_t are year fixed effects. The β_t significantly different from zero at a 10%, 5% and 1% significance level are marked by *, **, and ***, respectively.



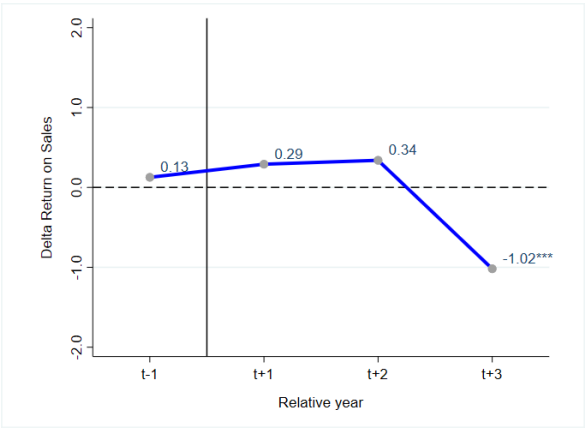
Panel A: Growth in Total assets



Panel B: Growth in Sales



Panel C: Changes in Return on assets



Panel D: Changes in Return on sales

Table OA3.1: Performance of the strategies relative to the placebo strategies. Fixed five-year time window.

This table shows the performance of buy-and-build strategies compared to placebo control strategies for a fixed five-year time window. *Post* is an indicator equal to zero for t-1 and one for the *fixed* period t+1 up to t+5 , where t indicates the year of acquisition of the strategy's platform. Some strategies may exit earlier than at t+5, in which case we use the observations after the exit. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *BB* is an indicator for the treated sample. *Follow-ons* an indicator equal to one for the year following the first follow-on acquisition in a given strategy (placebo), onward. The indicator *No Deals BB* (*No Deals*) identifies the strategies (their placebos) that did not acquire follow-ons . All specifications include strategy and year fixed effects. "Lab.Prof." stands for labor profitability, EBITDA over the wage bill; "Lab.Prod." is labor productivity computed as operating revenue over the wage bill. Standard errors are clustered two-ways over the strategy and industry-year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

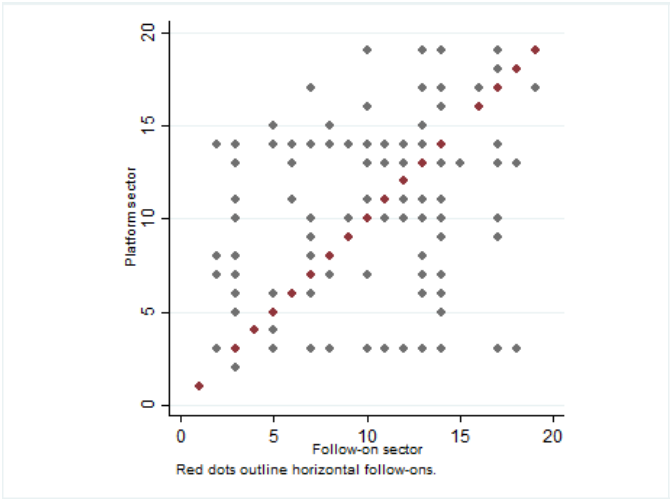
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	"Size" outcomes			Operating ratios			
	ln Assets	ln Sales	ln Empl.	ROA	ROS	Lab.Prof.	Lab.Prod.
Follow-ons	0.129***	0.220***	0.173***	0.006*	0.003	0.014	-0.073
	(2.84)	(4.24)	(3.29)	(1.86)	(0.64)	(0.70)	(-0.64)
BB×Follow-ons	-0.145*	-0.177	-0.214***	-0.020***	-0.001	0.011	0.386**
	(-1.91)	(-1.59)	(-3.03)	(-2.73)	(-0.11)	(0.21)	(2.18)
BB×Post	0.155**	0.018	0.010	0.024***	0.023***	0.102**	-0.213
	(2.16)	(0.12)	(0.10)	(3.30)	(2.68)	(2.27)	(-1.29)
Post	-0.021	-0.009	0.041	-0.010**	-0.002	-0.020	0.216
	(-0.40)	(-0.13)	(0.62)	(-2.37)	(-0.47)	(-0.77)	(1.47)
No Deals	0.007	0.307	0.284	0.019**	0.008	0.055	0.797*
	(0.08)	(1.27)	(1.47)	(2.04)	(1.01)	(1.13)	(1.86)
No Deals×Post	-0.152**	-0.203***	-0.177**	-0.006	-0.008	-0.037	-0.135
	(-2.46)	(-2.62)	(-2.28)	(-1.00)	(-1.19)	(-1.07)	(-0.74)
No Deals BB×Post	0.019	0.065	-0.063	-0.033**	-0.028**	-0.124*	-0.054
	(0.15)	(0.39)	(-0.48)	(-2.53)	(-2.31)	(-1.68)	(-0.20)
Leverage	0.209	0.067	0.187	-0.065***	-0.061***	-0.290***	-0.233
	(1.52)	(0.42)	(1.14)	(-5.89)	(-4.90)	(-3.86)	(-0.56)
Observations	6,590	6,566	5,549	6,497	6,485	6,144	6,188
Adj. R^2	0.924	0.890	0.876	0.656	0.690	0.714	0.851
Year FE	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓

Table OA3.2: Performance of the strategies relative to the placebo strategies. Up to the exit.

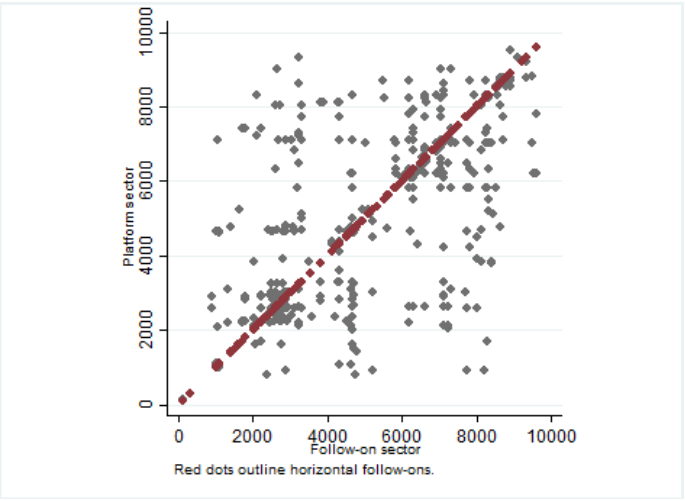
This table shows the performance of buy-and-build strategies compared to placebo control strategies, where we estimate the performance up to the PE exit or using the longest available time window. *Post* is an indicator equal to zero for t-1 and one for the period t+1 up to the exit, where t indicates the year of acquisition of the strategy's platform. Some strategies may not have exited and for those we use the longest available window. For the control sample, *Post* takes on the respective values of the treated company to which the control is matched. *BB* is an indicator for the treated sample. *Follow-ons* an indicator equal to one for the year following the first follow-on acquisition in a given strategy (placebo), onward. The indicator *No Deals BB* (*No Deals*) identifies the strategies (their placebos) that did not acquire follow-ons . All specifications include strategy and year fixed effects. "Lab.Prof." stands for labor profitability, EBITDA over the wage bill; "Lab.Prod." is labor productivity computed as operating revenue over the wage bill. Standard errors are clustered two-ways over the strategy and industry-year dimension. *, **, and *** stand for a 10%, 5%, and 1% significance level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	"Size" outcomes			Operating ratios			
	ln Assets	ln Sales	ln Empl.	ROA	ROS	Lab.Prof.	Lab.Prod.
Follow-ons	0.156***	0.267***	0.197***	0.004	-0.001	-0.005	-0.123
	(3.05)	(4.49)	(3.07)	(1.16)	(-0.33)	(-0.19)	(-0.82)
BB×Follow-ons	-0.121	-0.118	-0.149*	-0.023**	-0.003	-0.020	0.170
	(-1.13)	(-0.89)	(-1.88)	(-2.45)	(-0.32)	(-0.38)	(0.69)
BB×Post	0.132	-0.016	-0.055	0.025***	0.025**	0.141***	0.031
	(1.65)	(-0.11)	(-0.48)	(3.00)	(2.54)	(2.93)	(0.15)
Post	0.074	0.118	0.130*	-0.014***	-0.007	-0.043	0.065
	(1.24)	(1.49)	(1.77)	(-3.11)	(-1.47)	(-1.55)	(0.38)
No Deals	0.038	0.278	0.234	0.015*	0.006	0.044	1.197**
	(0.35)	(1.29)	(1.10)	(1.75)	(1.01)	(1.07)	(2.10)
No Deals×Post	-0.149**	-0.209**	-0.192**	-0.010	-0.012*	-0.059	-0.226
	(-2.11)	(-2.34)	(-2.12)	(-1.46)	(-1.77)	(-1.57)	(-1.11)
No Deals BB×Posts	0.074	0.168	0.049	-0.033**	-0.031**	-0.154**	-0.236
	(0.59)	(1.03)	(0.37)	(-2.48)	(-2.34)	(-1.98)	(-0.78)
Leverage	0.135	0.000	0.032	-0.070***	-0.049***	-0.265***	-0.302
	(0.78)	(0.00)	(0.23)	(-6.91)	(-4.37)	(-4.11)	(-0.82)
Observations	9,230	9,189	7,831	9,093	9,078	8,561	8,622
Adj. R^2	0.906	0.875	0.860	0.615	0.658	0.669	0.816
Year FE	✓	✓	✓	✓	✓	✓	✓
Strategy FE	✓	✓	✓	✓	✓	✓	✓

Figure OA3.1: Industry combinations within strategies.
This figure plots the sector of main activity of the platform on the vertical axis against the sector of its follow-ons on the horizontal axis, using three levels of sector classification: a large one-digit sectors in panel A and four-digit NACE rev. 2 sectors in panel B. The dots on the 45 degree line indicate follow-on targets that are in the same sector as the platform (or horizontally related); the other dots indicate vertically related (suppliers or users) or unrelated acquisitions.



Panel A: Main Sectors



Panel B: NACE 4 digit Sectors