Deployment Pressure and Overinvestment in Private Equity

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Abstract

The standard private equity fee contract rewards general partners for deploying capital before the investment window closes. Using 9,155 U.S. and European buyouts, I find that investments made in years 5-6 generate annualized revenue growth roughly 50 percent lower than earlier investments in the same fund. The decline is concentrated in funds with abnormally high dry powder, vanishes outside the investment window, and persists in within-GP overlapping-fund comparisons. Excess dry powder accumulates not in absolutely large funds but in funds whose size exceeds the GP's demonstrated deployment capacity, activated by hot fundraising markets. The resulting late deployment damages fund returns.

Keywords: Private Equity; Capital Deployment; Dry Powder; GP Incentives
JEL Classification: G11, G23, G24, and D86

1 Introduction

Private equity funds are structured as long-lived partnerships in which limited partners commit capital for up to a decade while delegating investment decisions to general partners. Because investors cannot easily withdraw capital and performance is realized only gradually, the compensation contract plays a central role in shaping incentives. Yet despite the rapid growth of the industry and the sophistication of its investors, the basic fee structure has remained largely unchanged. This paper asks a simple but underexplored question: Does the structure of private equity compensation distort investment decisions within a fund's life?

The institutional setting creates a potentially important incentive near the end of the investment period. Management fees are typically charged on committed capital during the investment window, while remaining uninvested capital generates no future fee income once the window closes. As a result, funds that still hold substantial dry powder late in the investment period face pressure to deploy capital. Whether this pressure affects investment quality is an empirical question.

Using a sample of 9,155 U.S. & European buyouts matched to accounting data, I compare operating performance of investments made early and late within the same fund. The results show that investments made in years 5-6 of the investment period generate significantly lower annualized revenue growth than earlier investments.

Across specifications that include fund fixed effects and progressively richer controls—vintage–industry and vintage–industry–country fixed effects—late-period deals show 0.8 percentage point lower annualized revenue growth, roughly a 50% reduction relative to the sample mean of 1.6. The effect is substantially stronger when a fund holds unusually high dry powder in year 3 and is largely concentrated among these funds. When funds retain a greater share of unspent capital relative to their peers, late-period investments experience a 1.6 percentage point decline in annualized revenue growth—almost as much as the average growth rate of a deal—whereas in low-dry-powder environments the estimate is small and

statistically indistinguishable from zero, suggesting that the mechanism is due to pressure to deploy capital. Year-by-year specifications further reveal a monotonic deterioration in performance as the investment period progresses, with the decline becoming most pronounced in year 6, when annual revenue growth approaches zero. Because these estimates are identified within fund and control for detailed vintage–industry–country conditions, they are unlikely to reflect cross-fund heterogeneity or time-varying industry or geographic shocks.

To assess whether the documented deal-level decline in top-line growth translates into lower fund-level returns, I examine the relationship between fund performance and the share of capital deployed during the late investment period. The fund-level results reinforce the return implications of the deal-level evidence. Specifically, a one–standard-deviation increase in the proportion of capital allocated to late-period investments is associated with an approximately 3.6% decline in fund performance relative to the sample mean, after controlling for GP fixed effects and vintage-year effects. This implies that late-period deals earn a TVPI of approximately 1.05, compared to a sample mean of 1.75—a return that nominally preserves capital but destroys value once opportunity costs and fees are accounted for.

Of course, deploying capital into value-destroying deals also carries offsetting costs for the GP: lower carried interest from the current fund and, through worse interim performance, a smaller follow-on fund and reduced future fees. To show whether the management-fee gain outweighs these costs, I formalize this trade-off in a stylized model (Appendix C), calibrated to standard industry fee terms and the follow-on fundraising sensitivity from Chung et al. (2012). As long as the deal loses no more than roughly 12% of its invested cost basis, the additional management fees outweigh the GP's lost carry and reduced follow-on fund size. In other words, even deals that destroy value for LPs can still increase total GP compensation, consistent with the magnitude of late-period underperformance documented in the main results.

Two alternative explanations may account for the documented decline in late-period investment performance. First, investment opportunities may arrive in waves, such that

GPs select the most attractive deals first within a given opportunity set. In this case, weaker performance among late investments would simply reflect natural deal-flow dynamics rather than distortions arising from contractual incentives. Second, GPs may optimally allocate higher-growth firms earlier in the fund's life and lower-growth, more stable firms later, reflecting the shorter runway available for late investments and the finite life of the fund. Under this view, early deals are intentionally tilted toward high-growth opportunities, while later deals prioritize stability and shorter-duration returns.

The institutional features of PE contracts allow me to address both concerns. I test the deal-flow explanation by comparing investments made in the same year, industry, and GP but across funds at different life-cycle stages, and I test the optimal-allocation explanation by examining whether the performance decline persists outside the contractual investment window.

The first test holds constant the pool of deals a GP could plausibly have accessed. It is feasible because standard LPA terms explicitly preserve a current fund's right to make new platform investments throughout its Investment Period——the contractually defined window, typically four to six years, during which a fund deploys capital into new companies.[1] Critically, this right is preserved even after a follow-on fund has begun fundraising. Section 7.4 of Institutional Limited Partners Association (ILPA) (2020) places no restriction on new platform investments during the Investment Period itself, while Section 9.1 sets a 60% deployment threshold: a follow-on fund may only begin raising capital and charging management fees once the current fund has deployed at least 60% of its committed capital. The remaining 40% may continue to be deployed into new platform investments while the follow-on fund is simultaneously being raised and invested. The simultaneous existence of late-stage current fund deployment and early follow-on fund fundraising is therefore contractually permissible and well-documented—more than 30% of GPs in our sample have at least one overlapping fund pair.

[1]See the model LPA terms provided by the Institutional Limited Partners Association (ILPA) (2020)

Within this overlapping sample, late-fund investments still significantly underperform their early-fund counterparts by approximately 1.8–1.9 percentage points in annualized revenue growth against a sample mean of 1.4%. The effect is concentrated among funds with high remaining dry powder—where the underperformance grows to 3.8 percentage points—and disappears among funds with low remaining dry powder, suggesting that capital spending pressure, rather than deal flow or sequencing, drives GPs to overinvest in the late period. Importantly, late and early deals are statistically indistinguishable across revenue volatility, firm age, and the probability of being a startup, ruling out the possibility that GPs are systematically routing riskier or younger companies into maturing funds.

To assess whether the documented underperformance reflects an optimal tilt toward shorter duration, more stable firms in the late period, I exploit the contractual investment window of private equity funds, which generally lasts five to six years. During this window, GPs can deploy capital at their discretion, whereas investments made afterward require LP approval. I therefore examine whether the performance decline persists once the discretionary investment window has closed. At the deal-level, the top-line growth of placebo Late deals in year 7 is indistinguishable from earlier investments. At the fund level, the placebo late period capital deployment in year 7 bears no statistically significant association with fund performance, consistent with the deal-level placebo results. Because year 7 lies outside the contractual investment period yet features an even shorter runway to exit, the absence of a placebo effect at both the deal- and fund-level suggests that the documented decline is tied to the investment period incentive structure rather than to shorter holding horizons.

A natural question is why some funds accumulate more dry powder than others and thus face greater deployment pressure late in the fund's life. Absolute fund size is uninformative: across funds, log fund size has no detectable relationship with abnormal dry powder, consistent with recent evidence that larger PE funds tend to execute larger deals rather than fail to deploy committed capital (Braun et al., 2026). Within GP, however, the picture changes sharply. Funds raised at sizes exceeding the GP's own demonstrated scale accumulate sub-

stantially more dry powder by year 3: a one-standard-deviation overshoot relative to the manager's typical fund adds roughly 4 percentage points of abnormal dry powder and the friction is through oversized funds during hot markets. What produces dry powder is therefore not scale per se but the gap between fundraising momentum and a GP's demonstrated deployment capacity, activated when elevated valuations in hot vintages deter disciplined deployment.

This pressure matters most when it coincides with late-period deployment. Among funds raised at sizes exceeding their GP's norm, each percentage point of capital deployed late reduces TVPI by approximately 0.008, with an additional 0.008 penalty in hot vintages. A fund deploying 20 percentage points of capital late into a hot market suffers a TVPI drag of roughly 0.32—nearly 19 percent of average fund returns in this subsample. By contrast, among funds operating within their GP's demonstrated capacity, neither late deployment nor its interaction with market hotness has a detectable effect on returns. Taken together, these results are consistent with a broader story in which LP capital markets, by occasionally rewarding GPs in excess of demonstrated deployment capacity, inadvertently amplify the contractual incentives that produce late-period overinvestment.

I also conduct a range of robustness tests, several of which merit discussion here. First, I examine whether late-period underperformance reflects a mechanical shift toward riskier or younger firms. Late deals show no systematic tilt toward younger firms across any specification. On volatility, low-dry-powder funds exhibit meaningful de-risking in late deals (12 to 17 percent below the sample mean), while high-dry-powder funds show no such reduction despite weaker growth—a pattern inconsistent with deliberate portfolio optimization and consistent with funds under capital pressure relaxing investment standards rather than substituting toward safer targets.

Second, on the smaller subsample of deals for which realized returns are observable, I replicate the main specification—comparing late-period deals to earlier deals within fund and vintage-industry-country cells—and find consistent evidence. Late-period deals (years 5

or 6) earn returns 226.6 percentage points lower than earlier deals, or 132% below the sample mean deal return of 171.3%. Because reported deal returns are likely subject to selection bias—GPs systematically underreport poor outcomes—I further examine reporting behavior using a missing-return indicator. If poor deals are disproportionately concentrated in the late period and more likely to go unreported, I would expect late-period deals to be missing return data at higher rates. Indeed, late-period deals are disproportionately likely to be missing return data, reinforcing rather than undermining the interpretation.

Third, I address the concern that funds entering year 3 with unusually high dry powder may simply be lower-quality GPs, in which case the result would be capturing manager type rather than deployment pressure. I find no significant relationship between abnormal dry powder and fund-level performance, suggesting that high year-3 dry powder is not a proxy for GP skill.

This paper provides the cleanest evidence to date that GPs overinvest when under pressure to deploy capital. Using a deal-level, within-fund analysis, I pinpoint when in a fund's life GPs are most likely to engage in such behavior and identify the mechanism through which spending pressure distorts their investment decisions. It is also the first rigorous study to show how fund structure generates these distortive incentives. I build on an existing literature that examines how the fee structure of private equity funds shapes GP investment behavior. Gompers and Lerner (1999) document how incentive alignment varies across a GP's career, though the mechanisms are imperfect and open questions remain about where and when conflicts resurface. Axelson et al. (2009) show theoretically that even under the pure ex ante financing structure of a fund, GPs retain money-burning incentives. Metrick and Yasuda (2010) quantify the magnitude of GPs' fixed revenue, showing that GPs rely substantially on compensation unrelated to performance. Empirical work by Robinson and Sensoy (2013) provides suggestive evidence that GPs game distributions around contractual fee triggers and sometimes delay exits to sustain fixed fee income.[2]

[2]For additional work on GPs responding to fee and fundraising incentives in ways that distort investment behavior, see Barber and Yasuda (2017), Chakraborty and Ewens (2018), Brown et al. (2019), Jenkinson

The most closely related previous studies are Arcot et al. (2015) and Degeorge et al. (2016), which show that funds under pressure to spend disproportionately engage in late secondary buyouts that underperform and destroy value for investors. While those papers focus specifically on SBO underperformance in the latter half of the investment period and take spending pressure as given, I take a broader view by asking when GPs actually feel pressure to spend and when that pressure leads them to overinvest. Using a year-by-year, within-fund analysis, I find that the drop in fund performance is concentrated in the final two years of the investment period—years 5 and 6. Within funds, late PBOs significantly underperform earlier deals, while late SBOs do not, which contrasts with Degeorge et al. (2016), who compare SBOs made in the latter half of the investment period to other deals using time rather than fund controls. Finally, I find that this underperformance is concentrated in funds with unusual dry powder and in funds that have raised more capital than their past performance would predict.

I also contribute to the ongoing debate over whether private equity creates or destroys value for the broader economy. A substantial literature documents positive real effects of buyouts on portfolio companies, including productivity gains, operational improvements, and expanded growth opportunities (Davis et al. (2014), Bernstein and Sheen (2016), Howell et al. (2022)). A parallel literature, however, documents significant value destruction in settings where the interests of private equity owners diverge from those of other stakeholders, such as students, patients, and workers (Eaton et al. (2020), Gupta et al. (2024)). Our findings speak to this debate by identifying a channel through which value destruction can arise even in the absence of such stakeholder conflicts: the fund structure itself can generate incentives for GPs to deploy capital into deals that are ex ante unlikely to create value. In doing so, I show that the costs of private equity ownership need not stem solely from misalignment with portfolio-company stakeholders but can also originate within the GP–LP relationship.

et al. (2013), Phalippou et al. (2018), Hüther et al. (2020), Litvak (2009), Song (2023), and Lambert et al. (2022).

2 Institutional Background: Private Equity Fund Structure and Incentives

2.1 Private equity fund structure

PE funds are typically organized as closed-end limited partnerships in which institutional investors, such as pension funds, endowments, and sovereign wealth funds, commit capital to a fund managed by a GP (Gompers and Lerner, 1999; Kaplan and Strömberg, 2009). The GP is responsible for sourcing, executing, and monitoring investments, while LPs provide capital but exercise limited control over day-to-day investment decisions. Because LP commitments are locked in for the duration of the fund and cannot be withdrawn at will, contractual design plays a central role in shaping managerial incentives (Metrick and Yasuda, 2010; Robinson and Sensoy, 2013). The governing contract, the LPA, specifies the fund's investment mandate, compensation terms, governance provisions, and restrictions on investment activity.

A defining feature of PE funds is the separation between capital commitment and capital deployment. LPs commit capital at fund inception but transfer funds gradually through capital calls issued by the GP. Capital calls typically occur when the GP identifies investment opportunities or needs to cover management fees and fund expenses. This structure gives GPs substantial discretion over the timing of investment activity within the fund's lifecycle. While LPs may monitor performance and participate in advisory committees, they generally do not approve individual investments made within the contractual investment period (Kaplan and Strömberg, 2009).

The lifecycle of a PE fund typically spans ten to twelve years and can be divided into two phases: the investment period and the post-investment harvesting phase. The investment period, which usually lasts five to six years, is the interval during which the GP is authorized to make new platform investments. The standard LPA provided by ILPA defines the Commitment Period as "ending on the [fifth] anniversary of the Initial Closing Date,

provided that this period may be extended by one (1) year by the General Partner with the prior consent of the Advisory Committee or a Majority in Interest," or "earlier upon the first date on which [100]% of Commitments have been drawn down and used to fund the Acquisition Cost of Portfolio Investments, reserved for Follow-on Investments or used to create Reserves" (Institutional Limited Partners Association (ILPA), 2020).[3] After the contractual investment period, funds may continue to make follow-on investments in existing portfolio companies but are restricted from undertaking new platform investments. According to Section 7.4 of the ILPA model LPA, post-investment period drawdowns are limited to fund expenses, follow-on investments in existing portfolio companies, and deals for which the fund has already agreed to invest prior to the expiration of the investment period. Any deviation from these restrictions requires explicit LP approval, as the model LPA specifies that new platform investments beyond the investment period may only proceed with "the prior written consent of the Advisory Committee" (Institutional Limited Partners Association (ILPA), 2020). This contractual distinction is economically meaningful because it defines the window during which GPs have the greatest flexibility in capital deployment and, crucially, the strongest incentive to source and execute high-quality new investments.

Compensation in PE funds generally consists of management fees and carried interest. Management fees are typically around 2% per year and are commonly calculated on committed capital during the investment period, before shifting to invested capital or declining thereafter (Metrick and Yasuda, 2010).[4] This feature implies that uninvested capital reduces the future fee base and may create incentives for GPs to accelerate capital deployment as the investment window approaches its close. Carried interest, typically set at 20% of fund profits above a preferred return threshold (often 8%), provides performance-based compensation but is realized only after investments are exited. Because carried interest is determined at the fund level rather than on a deal-by-deal basis and is typically realized only after capital

[3]Since individual LPAs are proprietary, ILPA provides a model LPA that replicates the tone and standard clauses typically embedded in PE fund agreements.

[4]See, e.g., StepStone Group (2021), Alter Domus (2025), and industry summaries of private equity fee structures.

has been returned to investors, GP compensation depends primarily on overall fund performance rather than the outcomes of individual investments (Robinson and Sensoy, 2013). As a result, marginal investment decisions late in the fund's lifecycle may have limited impact on expected compensation when interim performance is already strong.

Fundraising dynamics further shape incentives within the private equity lifecycle. LPAs commonly restrict GPs from raising a Follow-on Fund until a substantial portion of capital in the existing fund has been invested or committed. In practice, these restrictions are often relaxed once a substantial share of commitments has been deployed, which typically occurs near the end of the investment period. Standard LPAs codify this threshold explicitly, prohibiting the GP from accruing management fees on a Follow-on Fund until "the date when [60]% of Commitments have been funded for investments" (Institutional Limited Partners Association (ILPA), 2020).[5] Because GP compensation and reputation depend on continued access to capital, managers may face pressure to demonstrate capital deployment progress prior to raising follow-on funds. At the same time, prior research shows that fundraising success is strongly related to past fund performance and interim signals about managerial ability (Kaplan and Schoar, 2005; Jenkinson et al., 2013). This interaction between performance persistence and fundraising incentives may contribute to the accumulation of capital within certain funds, increasing incentives to deploy capital late in the investment period when uninvested capital remains.

Another institutional feature relevant to investment incentives is the management of overlapping funds. Established PE firms frequently raise successor vehicles while continuing to invest and manage existing funds. After the follow-on fund is raised, the current fund retains the contractual authority to invest in new platform investments for as long as its Commitment Period remains active.[6] The coexistence of overlapping funds can create intertemporal

[5]See also standard fund-formation guidance and legal analyses of private equity partnership terms (Til Law, 2024; Reed Smith LLP, 2025; Goodwin Procter LLP, 2023).

[6]As noted above, the standard LPA defines the Commitment Period as ending on the fifth anniversary of the Initial Closing Date, subject to a one-year extension, or earlier upon full deployment of committed capital (Institutional Limited Partners Association (ILPA), 2020).

trade-offs, as GPs must allocate attention, deal flow, and capital across vehicles with different vintages and contractual horizons. Although LPAs typically include provisions intended to mitigate cross-fund conflicts—for instance, Section 9.4 of the ILPA model LPA requires that all investment opportunities "will first be allocated to the Fund," provided that they fall within the fund's investment objectives, sufficient capital remains, and participation is in the best interest of the fund (Institutional Limited Partners Association (ILPA), 2020)—such provisions are difficult for LPs to enforce in practice, as they have no contemporaneous visibility into how GPs classify and allocate individual opportunities across vehicles. The presence of multiple active funds may therefore intensify incentive conflicts related to the timing and quality of investments deployed in the later stages of an existing fund's life.

Consistent with this institutional feature, Table 1 shows that approximately 13% of firm-level deals occur during periods in which a GP operates overlapping funds, with about 10% corresponding to late-period investments in the earlier fund and 3% to early-period investments in the follow-on fund. These patterns indicate that a nontrivial share of investment activity takes place when multiple funds are active simultaneously within the same PE firm. Whether such overlap gives rise to conflicts of interest that affect investment timing and outcomes has received limited empirical attention.

Most PE funds establish a Limited Partner Advisory Committee (LPAC), typically composed of the fund's largest investors, to review conflicts of interest, valuation practices, and certain strategic decisions such as extensions of the investment period (Kaplan and Strömberg, 2009). However, LPACs generally do not exercise ex-ante control over individual investment decisions made within the contractual investment window, leaving the GP with substantial discretion over the timing and selection of deals. The allocation of bargaining power between GPs and LPs further constrains the scope for direct intervention, particularly in the case of highly reputed managers. Theoretical and empirical evidence suggests that successful GPs are selective in choosing their investors and often restrict access to oversubscribed funds, producing asymmetric bargaining positions in which LPs accept less

protective terms in exchange for allocation (Maurin et al., 2020; Døskeland and Strömberg, 2018). Under such conditions, weaker investor bargaining power can attenuate the effectiveness of contractual monitoring mechanisms, as emphasized in legal-economic analyses of private equity contracting (Clayton, 2020).

Taken together, these institutional features create a setting in which the timing of capital deployment is shaped not only by the underlying investment opportunity set but also by contractual incentives and fundraising considerations. The combination of a declining fee base after the investment period, performance-sensitive fundraising dynamics, and limited LP intervention generates potential incentives for GPs to adjust investment timing in ways that need not align with LP interests.

2.2 GPs' incentives

The institutional features described above generate time-varying incentives for capital deployment over the fund's lifecycle. During the investment period, management fees are typically calculated as a fixed percentage of committed capital, but once this period ends the fee base often transitions to invested capital or net asset value. Uninvested capital therefore reduces the future stream of fee income, increasing the incentive for GPs to deploy capital before the investment window closes (Metrick and Yasuda, 2010). Compounding this effect, the ability to call new capital for a new platform investment is generally restricted after the end of the investment period, further increasing the urgency to complete investments within the contractual horizon.

These features imply that GPs face declining option value from waiting as the fund matures. Early in the fund's life, managers can afford to be selective and allocate capital to the most promising opportunities. However, as the investment period approaches its end, the marginal benefit of maintaining investment discipline declines relative to the cost of leaving capital uninvested. Consequently, GPs may rationally relax their screening thresholds and undertake marginal investments that would not have been optimal earlier in the fund

lifecycle. This dynamic distortion is particularly pronounced when investment opportunities are scarce, as the incentive to preserve fee income and demonstrate capital deployment can outweigh the expected value of waiting for better opportunities.

A second incentive that may appear aligned with LP preferences, but can generate distortions in equilibrium, arises from LPs' desire to see committed capital deployed. In practice, investors often interpret timely capital deployment as a signal of managerial effectiveness and access to investment opportunities.[7] At first glance, this preference appears aligned with GPs' incentives to invest. However, it implicitly assumes that investment discipline and screening intensity remain constant throughout the fund lifecycle. When this assumption does not hold, the desire for full capital deployment can create a dynamic agency conflict. In particular, GPs may overraise funds following strong performance and subsequently face pressure to deploy the increased capital base, leading to overinvestment in marginal opportunities late in the investment period even when such investments are suboptimal from the perspective of long-run fund performance. Thus, behavior that satisfies investors' short-run expectations regarding capital utilization may be inconsistent with their ultimate objective of maximizing returns.

While the discussion above describes the gross benefit from late deployment, GPs also bear offsetting costs: lower carried interest from the current fund and, through worse interim performance, a smaller follow-on fund. Appendix C formalizes this trade-off. Calibrated to industry-standard fee terms (2% management fee, 20% carried interest, 8% hurdle) and a follow-on fundraising sensitivity drawn from Chung et al. (2012), the model implies that the management-fee gain dominates the carry and follow-on penalties for any deal losing less than roughly 12% of its invested cost basis. The basic compensation structure therefore rationalizes overinvestment in marginally negative deals even before invoking any non-pecuniary deployment-record motive.

Consistent with this mechanism, Figure 1 illustrates capital deployment dynamics across

[7]This perception is consistent with practitioner discussions, including conversations with institutional investors in Korean investment organizations.

funds operating in different market environments, defined by the level of aggregate dry powder. Panel A shows that funds in more congested environments—where investment opportunities are relatively scarce—initially deploy capital more slowly than funds operating in high-opportunity environments. However, deployment trajectories converge near the end of the investment period, around quarter 20, suggesting that funds ultimately reach similar levels of invested capital regardless of early-stage deployment conditions. Panel B further indicates that this convergence is achieved through a back-loaded deployment pattern: funds facing more constrained opportunity sets increase their investment intensity during the latter half of the investment period. Together, these patterns are consistent with declining option value of waiting and increasing incentives to deploy capital as the contractual investment window approaches its end.

3 Data and Descriptive Statistics

This section describes our data sources and summary statistics.

3.1 Data sources

The deal-level information comes from *PitchBook*, a comprehensive database covering private firm mergers and acquisitions. However, deal-level price or return information is available for fewer than 7% of all transactions. To evaluate investment performance at the deal-level, I instead rely on post-investment operating performance of portfolio companies. To obtain accounting information, I restrict the sample to leveraged buyout transactions undertaken by funds based in the US or Europe.[8]

I match the deal-level data from *PitchBook* to firm-level financial information in *Orbis* using company name, address, and website identifiers. A match is considered successful when

[8]Venture-backed firms are typically younger and less likely to report standardized financial statements. In contrast, many European private firms are required to file financial accounts. Financial information is also available for a subset of US private firms through *PitchBook*, which allows their inclusion in the sample.

these criteria uniquely identify a single firm. In cases where multiple firms share the same name and lack additional distinguishing characteristics, I implement a manual verification procedure. For example, when multiple entities correspond to different branches of a single corporate group, I use financial data for the headquarters entity. In other instances, I conduct targeted searches using external sources such as LexisNexis or public web records to verify firm identity before linking observations to *Orbis*.

With the matched sample from *PitchBook* and *Orbis*, I exclude transactions that lack revenue information or do not have financial data available either in the year prior to the deal or within the first four years following the investment. For companies without a recorded exit, the observation window is capped at five years after the deal date to maximize sample coverage. I further exclude fund countries with fewer than ten deals and restrict the sample to funds based in the US or Europe. In addition, I remove transactions without identifiable investor fund information. The final sample consists of 9,155 deals matched to their corresponding fund characteristics.

Appendix Tables A.1 and A.2 report additional details on the composition of the sample, including the largest funds and transactions as well as the distribution of deals across countries. The five largest funds in the sample each exceed $18 billion in committed capital and are all headquartered in the US. Among the largest transactions, three are US-based and two are located in Spain. Overall, approximately 80% of funds in the sample are based in the United States, while 74% of the underlying deals are associated with non-U.S. countries.

3.1.1 Summary statistics

Table 1 reports summary statistics for the sample of buyout transactions and corresponding investor funds. Panel A presents deal-level characteristics for 9,155 leveraged buyout investments matched to accounting data from *Orbis*, while Panel B reports fund-level characteristics constructed from *PitchBook*.

The deal-level sample consists of portfolio companies acquired by buyout funds head-

quartered in the US and Europe between 1996 and 2023. Target firms exhibit substantial heterogeneity in scale and performance. Average annual revenue at the time of investment is approximately $300 million, while annualized revenue growth averages around 2% per year. The interquartile range spans from −1% to 4%, indicating meaningful variation in post-investment operating outcomes. The average holding period is 15.8 quarters, or roughly four years, consistent with the typical horizon over which buyout funds implement value-creation strategies (Kaplan and Strömberg, 2009).

Consistent with the focus of the paper on investment timing, 19% of transactions are classified as late-period investments occurring in years 5 and 6 of the investment window, while 6% of deals take place outside the contractual investment period (year 7) and serve as placebo observations. Early-period investments are larger on average, with mean revenues of approximately $344 million compared to $168 million for late-period deals. The difference in median revenue is considerably smaller, however, suggesting that the timing patterns documented in the paper are not driven by a small number of unusually large early deals. The average target firm is 30.7 years old, and 5% of targets are startups five years old or younger.

For the subsample of deals with observable realized returns—approximately 7% of the total observations—the average deal return is 153.6% and the median is 118.75%. Because GPs are not obligated to report returns on individual deals, these figures are likely subject to selection bias, as managers tend to disclose favorable outcomes and withhold information on underperforming investments.[9] The reported average is notably higher than industry-wide deal return benchmarks documented in Braun et al. (2017), reinforcing the concern that the observable return sample is non-representative.

A nontrivial share of investment activity occurs while multiple funds are simultaneously active within the same private equity firm. Approximately 13% of firm-level deals take place during periods of fund overlap, with about 10% corresponding to late-period investments in

[9]See Barber and Yasuda (2017) and Brown et al. (2019) for evidence on selective reporting by private equity managers.

the earlier fund and 3% to early-period investments in the follow-on fund. More than 30% of GPs in the sample have at least one overlapping fund pair, indicating that the within-firm, across-fund comparisons employed later in the paper are drawn from a substantial and contractually permissible subset of the data (Institutional Limited Partners Association (ILPA), 2020).

At the fund level, the sample spans vintage years from 1999 to 2022 and includes funds with an average size of approximately $1.65 billion. On average, funds deploy about 11.5% of committed capital during the late investment period (years 5 and 6), though the distribution is highly dispersed, indicating significant heterogeneity in investment timing behavior. Funds in the sample are raised by GPs with an average fund sequence number of 13, reflecting the concentration of the sample among established managers.

Dry powder is measured as the share of committed capital that remains undeployed, demeaned within vintage-country-fund type-size quintile cells. On average, a fund has 2 percentage points more uninvested capital in year 3 than its peers. Average fund performance, measured by TVPI, is 1.73, broadly consistent with the industry benchmarks reported by Harris et al. (2014) and Kaplan and Schoar (2005).

Fundraising outcomes also display meaningful variation. On average, follow-on funds are about twice the size of their predecessors (mean growth rate of 1.01). To decompose the component of fund size into a GP-norm fund size component and excess fund size compared to the GP Norm, I demean fund size within the same fund family. The residual captures fund size overshoot compared to the GP norm.

4 Empirical Results

This section examines whether and when the compensation structure of private equity funds distorts investment timing and leads general partners to overinvest late in the fund's life. Section 4.1 presents the empirical strategy and deal-level results. Section 4.2 relates the deal-

level evidence to fund-level performance. Section 4.3 addresses key alternative explanations.

4.1 Within-Fund Investment Timing and Deal Performance

I first examine whether the deals in the later period of the investment phase have lower operational performance compared to the ones made earlier. Since the point in time when there is a conflict of interest between GPs and LPs is likely to be toward the end of the investment phase, I test whether the deals made in year 5 or 6 of the investment period perform poorly compared to the earlier period.

4.1.1 Empirical strategy for the deal-level analysis

The use of operating performance rather than realized deal returns avoids the upward bias introduced by selective disclosure, given the limited availability of transaction-level pricing and exit information. But Nevertheless, revenue growth provides a consistent and robust measure of deal performance: unlike EBITDA, it remains unaffected by the heavy reinvestment and cost expansion that typically accompany high-growth phases, during which EBITDA may be temporarily suppressed—making it a noisy proxy for deal performance.[10] In particular, private equity value-creation strategies often involve front-loaded investments in growth initiatives or operational restructuring, which may temporarily depress margins while still reflecting improvements in long-run firm performance. As a result, revenue growth offers a more stable and comparable measure of performance across firms and over the investment lifecycle.

For the analysis, I use the following equation to measure the annualized revenue growth:

$$\text{Annualized Revenue Growth}_i = \left(\frac{Revenue_{iT}}{Revenue_{i1}} \right)^{\frac{1}{\text{Years held}}} - 1 \tag{1}$$

[10]Both EBITDA growth and revenue growth are widely used in studies examining the real effects of private equity ownership on portfolio company performance: Davis et al. (2014), Guo et al. (2011), Cohn et al. (2014), Howell et al. (2022)

where Annualized Revenue Growth$_i$ represents the per-year growth rate of revenue over the holding period of deal i. Specifically, it is computed as the ratio of revenue at the end of the holding period (denoted as T) to revenue at the beginning of the holding period (denoted as 1), raised to the power of one over the number of years the deal was held (denoted as Years held). The measure would capture the annualized change in the revenue growth for a given deal, taking into account the holding period. We winsorize the variable at the 2% level in both tails.

To test whether late-period investments underperform, I estimate the following specification:

$$y_{ifd} = \beta \cdot \mathbf{1}(\text{Late})_{ifd} + \gamma X_{ifd} + \alpha_f + \alpha_{v \times s \times c} + \varepsilon_{ifd} \tag{2}$$

where y_{ifd} is the annualized revenue growth of portfolio company i held by fund f and made in deal year d. $1(Late)_{ifd}$ is an indicator equal to one for investments made in years 5-6 of the contractual investment period. X_{ifd} is a vector of deal-level controls. α_f denotes fund fixed effects and $\alpha_{v \times s \times c}$ denotes vintage-industry-country fixed effects.

The identifying variation in β comes from comparing deals made late versus early *within the same fund*, after absorbing fund-level differences in strategy, geography, and manager skill through α_f. A natural concern is that late investments may systematically coincide with different macroeconomic or industry-specific conditions than early investments—for example, if a fund raised in a particular vintage year happens to reach its late period during an industry downturn. The vintage-industry fixed effects $\alpha_{v \times s}$ address this by absorbing any common performance shocks experienced by all funds of the same vintage year investing in the same industry, thereby ensuring that the comparison is not confounded by cohort-specific industry trends. To further address the possibility that conditions vary not just by industry but also by country—for instance, due to country-level regulatory changes or macroeconomic cycles that affect portfolio companies differentially—I replace the vintage-industry fixed effects with vintage-industry-country fixed effects, which additionally absorb time-varying shocks at the industry-country level for each fund cohort. Together, these fixed

effect structures form a progressively demanding set of controls, and the stability of $\hat{\beta}$ across them supports a causal interpretation of late-investment effect.

4.1.2 Deal-level results

Panel A in Table 2 presents estimates of the baseline specification in equation 2.

Across the full sample (columns 1 and 2), late-stage investments are associated with annualized revenue growth that is approximately 0.8-0.7 percentage points lower than earlier investments in the same fund.[11] Relative to the sample mean revenue growth of around 1.6-1.7%, this represents a reduction of roughly 42-50%. The remaining columns split the sample by the level of abnormal dry powder (DP)—the amount of uncalled capital remaining in the fund, demeaned relative to funds of the same vintage, country, and size quintile—to test whether capital deployment pressure drives this underperformance. Because abnormal DP is constructed by demeaning within vintage-country-size cells, the High-DP and Low-DP groups reflect cross-sectional variation across funds within the same cohort rather than absolute levels of dry powder. The comparison is therefore not driven by aggregate time-series shifts in industry-wide capital deployment or by a concentration of high-DP funds in particular vintage years. Among funds facing *high* dry powder pressure (columns 3 and 5), the underperformance of late-stage deals is significantly larger: annualized revenue growth is 1.3-1.6 percentage points lower, representing a 72-100% reduction relative to the group mean. This suggests that when GPs are under pressure to deploy remaining capital quickly, the quality of late-stage investments deteriorates substantially. By contrast, among funds with *low* dry powder (columns 4 and 6), the coefficient on 1(Late) is small and statistically insignificant, indicating that late-period investments do not meaningfully underperform when GPs face less pressure to invest. The specifications include vintage-industry or vintage-industry-country fixed effects, which absorb any variation in revenue growth attributable to broader market conditions, industry trends, or cross-country differences within a given fund

[11] Panel A column 1 reports 6,698 observations, column 2 reports 5,776. The drop is from adding the vintage-industry-country fixed effects.

cohort, ensuring that the estimated effect of 1(Late) reflects within-group differences across deals rather than systematic differences across time periods, industries, or geographies. The results are not driven by the largest funds or transactions: dropping the top 5 funds by committed capital (Table A.11 Panel A) or the top 20 deals by transaction value (Panel B) leaves the late-period coefficient effectively unchanged. Also the pattern survives the removal of fund fixed effects (Table A.12), confirming the result is not mechanically driven by within-fund demeaning and reproducing the same monotone year-by-year decline.

Panel B in Table 2 now breaks down investment timing year-by-year, replacing the single 1(Late) indicator with separate dummies for each investment year relative to year 1(the omitted category). This dynamic specification allows us to trace whether underperformance accumulates gradually or concentrates sharply in the final years of the investment period.

Across the full sample (columns 1 and 2), investments in years 2 through 4 show no statistically significant deviation from year 1, suggesting that early to mid-period deals perform comparably to the earliest investments within the same fund. The underperformance becomes apparent only in the final years: year 5 investments exhibit a marginally significant decline of 0.7 percentage points, while year 6 investments show the sharpest drop of 1.3 percentage points—a reduction of roughly 44-81% relative to the sample mean.

The pattern is considerably more pronounced among funds facing high abnormal dry powder (columns 3 and 5). Year 5 and year 6 coefficients are 1.6-2.2 percentage points below year 1, representing reductions of 89-129% relative to the group mean. By contrast, funds with low dry powder pressure (columns 4 and 6) show no statistically significant underperformance in any year, with all coefficients small and precisely estimated near zero.

Figure 2 visualizes this pattern directly, plotting the year-by-year coefficients relative to fund year 1 and making the flat early-year profile followed by the sharp late-year drop immediately apparent. The figure also splits the sample by abnormal dry powder in Panels B and C, showing that the deterioration is concentrated among High DP funds, foreshadowing the heterogeneity results.

Together, these dynamic estimates reinforce the Panel A findings: while investment quality appears to erode gradually throughout the fund lifecycle, the deterioration becomes both economically large and statistically detectable primarily in the final two years, and is concentrated among funds under capital deployment pressure—pointing to capital deployment pressure as the primary mechanism behind late-stage underperformance. If the performance decline were purely a consequence of the shorter time available for value creation in late deals, it should be present regardless of how much dry powder a fund retains.

Table A.8 corroborates this interpretation. Panel A reports balance tests on revenue volatility. In the full sample, late-period deals exhibit modestly lower volatility (columns 1 and 2), but this average masks a sharp asymmetry across funds. The reduction is concentrated in funds with low dry powder (columns 4 and 6), where late deals show significantly lower volatility—approximately 12 to 17 percent of the sample mean—while funds under deployment pressure show no significant change in volatility (columns 3 and 5). High-dry-powder funds exhibit no de-risking in late deals, despite being meaningfully lower-growth. The combination of weaker growth without a corresponding reduction in risk is difficult to reconcile with deliberate portfolio optimization and instead suggests that funds under capital pressure relax investment standards rather than substituting toward safer targets.

Panel B reports an analogous test using an indicator for whether the target is a young firm (age ≤ 5 years at investment). The coefficients on 1(Late) are statistically indistinguishable from zero across all specifications and subsamples, indicating that late-period deals are not systematically targeting younger or earlier-stage firms. Together, the two panels suggest that the late-period underperformance documented earlier does not reflect a mechanical shift toward riskier or less mature firms. Instead, the asymmetric volatility pattern in Panel A reinforces the interpretation that high-dry-powder funds overinvest in lower-quality firms when the cost of leaving capital undeployed is highest, while low-pressure funds engage in the kind of selective late-stage de-risking that optimal portfolio management would predict.

Finally, Table A.10 decomposes the late indicator into PBOs and SBOs. The late-period

underperformance is driven by PBOs: the PBO-late coefficient is negative and statistically significant across all specifications, while the SBO-late coefficient is statistically indistinguishable from zero. This contrasts with Degeorge et al. (2016), who document underperformance in late-period SBOs using time controls rather than within-fund variation, and suggests that once within-fund comparisons are imposed, the deal-type composition of late-period underperformance shifts toward PBOs.

4.2 Late-Period Capital Deployment and Fund Performance

The deal-level evidence in the previous section establishes that late-period investments generate significantly lower revenue growth than early investments within the same fund. Here, I examine whether this deal-level underperformance translates into lower returns at the fund level. In particular, I test whether % of deployment during the late period affects the overall fund return.

4.2.1 Empirical strategy for the fund-level analysis

To examine whether funds that deploy more capital late in their investment period generate lower returns, I estimate the following specification at the fund level:

$$y_f = \beta \cdot \%\text{Late Deployed}_f + \delta \cdot \text{PrevTVPI}_f + \gamma X_f + \alpha_v + \alpha_{gp} + \varepsilon_f \tag{3}$$

where y_f is the TVPI (total value to paid-in capital) of fund f. $\%\text{Late Deployed}_f$ is the share of committed capital that fund f invests during years 5-6 of its contractual investment period. PrevTVPI_f is the realized TVPI of the GP's immediately preceding fund, included to control for persistence in GP skill. X_f is a vector of fund-level controls. α_v denotes vintage fixed effects and α_{gp} denotes GP fixed effects. Standard errors are clustered at the GP level.

The regression specification offers several advantages. First, the inclusion of GP fixed effects (α_{gp}) absorbs time-invariant GP quality, so that β is identified within-GP variation

across funds; the coefficient is not contaminated by the possibility that certain GPs are systematically worse performers and happen to deploy late, as the comparison is between a GP's high-late-deployment funds and that same GP's low-late-deployment funds. Second, vintage fixed effects (α_v) absorb market-wide conditions at fund inception—interest rates, valuation levels, competition for deals, and exit conditions—mitigating the concern that late deployment spuriously correlates with unfavorable vintages, such as funds raised at market peaks that deploy into overvalued markets. Third, controlling for the prior fund's realized TVPI captures time-varying GP skill: even within a GP, a declining skill might both underperform and deploy late, and PrevTVPI_f proxies for the GP's current skill level at the time of fundraising, net of the fixed GP effect.

Table 3 columns 1-3 report baseline estimates on the full sample. Columns 4-5 and 6-7 re-estimate the specification on the subsamples of funds with above- and below-median abnormal dry powder in year 3, respectively, to test whether the late-deployment penalty is concentrated in funds facing greater deployment pressure.

4.2.2 Fund-level results

Table 3 shows that funds allocating a larger share of capital to the late investment period generate lower overall returns. This pattern holds after absorbing differences across vintage years (column 1) and after further controlling for time-invariant differences in manager skill, strategy, and investment style across GPs (column 2). The within-GP result is particularly informative because it rules out the possibility that the fund-level relationship is driven by systematic differences in GP quality—less skilled managers may both deploy capital later and generate lower returns for unrelated reasons. The fact that the effect persists within the same GP indicates that it is the timing of capital deployment, rather than manager ability, that drives the performance penalty. Table A.9 reports this directly: the coefficient on year-3 abnormal dry powder is small and statistically indistinguishable from zero in TVPI and PME specifications, with and without controls for prior fund TVPI. To put the

magnitude in perspective, a one-standard-deviation increase in the share of late-deployed capital is associated with a decline in TVPI of approximately 0.063—roughly 3.6% of the sample mean of 1.75, or about 9% of the average fund's value created above invested capital. This effect is economically meaningful: a gap of this size is large enough to shift a fund noticeably down within its peer distribution.

Column 3 adds the GP's prior fund TVPI as a direct control for manager quality, and the coefficient on late deployment remains negative and significant, confirming that the result is robust to controlling for past performance. Columns 4 and 5 split funds by their year-3 abnormal dry powder—their dry powder position relative to peers in the same vintage-country-size cohort—and reveal that the late-deployment underperformance is concentrated among funds with above-median abnormal dry powder: the effect is roughly twice as strong in this subsample as in the pooled specification, while the coefficient for below-median funds attenuates and loses statistical significance. This asymmetry mirrors the deal-level heterogeneity documented in Table 2 and reinforces the interpretation that late-period capital deployment harms fund returns specifically when it is driven by capital deployment pressure rather than by the arrival of attractive investment opportunities. Table A.5 replicates these results using the Public Market Equivalent (PME) as the dependent variable, and the findings are unchanged. Taken together, the fund-level results confirm that the weaker performance of late-period deals is not confined to operating metrics but translates into lower realized returns for LPs.

To tie the deal-level results more directly to realized returns, I conduct a subsample analysis restricted to deals with reported deal-level returns. Table A.3 replicates the main deal-level specification using Deal Return (%) as the dependent variable. Consistent with the top-line growth results, late-period deals earn approximately 204% lower returns than earlier deals in the full sample, with the effect again concentrated in funds holding abnormally high dry powder. Among funds with abnormally low dry powder, by contrast, late-period deals appear to earn substantially higher returns—an estimate that reverses the sign of

the average effect. This subsample is considerably smaller than the main specification and is likely subject to selection bias, as GPs disproportionately report returns for successful investments.

If a reported deal return signals a successful deal, then a missing return may reflect an unsuccessful deal—or at least a high probability of one. Building on this logic, I re-estimate the specification using an indicator for whether the deal return is unreported. Results in Table A.4 show that late-period deals are significantly more likely to have missing return data, and this pattern is once again concentrated among high-dry-powder funds. The three sets of results are mutually reinforcing: conditional on reporting, late-period deals in high-pressure funds underperform; and unconditionally, late-period deals in high-pressure funds are more likely to go unreported in the first place. Both patterns are consistent with GPs deploying capital late under pressure into investments that ex post perform poorly.

4.3 Ruling Out Alternative Explanations

The baseline results establish that late-period investments generate significantly lower annualized revenue growth than early investments within the same fund. Before attributing this pattern to contractual incentives, I consider two alternative explanations.

The first is a deal-flow story: investment opportunities arrive in waves, and GPs invest in the best deals first, so late investments underperform simply because the strongest opportunities are exhausted earlier. If this is correct, late deals should not underperform concurrent deals made by follow-on funds investing in the same market at the same time.

The second is a rational allocation story: GPs optimally tilt early capital toward high-growth firms—which have more time to compound—and reserve later capital for more mature, lower-risk targets. If this is correct, the performance decline should persist with the same strength even outside the contractual investment window, since the underlying logic does not depend on whether the GP is within or beyond the discretionary investment period.

4.3.1 Evidence from overlapping funds

Table 4 tests the deal-flow alternative using the overlapping fund design. Panel A describes the structure of the sample. All 143 GPs in the sample manage at least two funds, and 45 of them (31.5%) have at least one overlapping fund pair—a period in which two of their funds are investing simultaneously in the same market. At the deal-level, this yields 223 unique overlapping fund pairs, comprising 1,619 deals across both funds during the overlap window: 463 late overlapping deals made in years 5-6 (28.6%) and 1,156 early overlapping deals made in years 0-4 (71.4%). Consistent with the LPA clauses described in Section 2.1, overlapping deployment periods across sibling funds are not uncommon in practice.

Panel B of Table 4 presents the regression estimates. The key indicator 1(Overlap Late) flags late-stage deals made while the GP's follow-on fund is simultaneously active; the omitted category is the early deal in the same overlapping pair. By comparing these late-fund deals to concurrent early-fund deals by the *same GP-fund series pair* operating in the *same market* at the *same time*, the design directly absorbs any timing variation in deal flow.

Across the full sample (columns 1 and 2), late overlap deals underperform concurrent early-stage deals by roughly 1.8-1.9 percentage points in annualized revenue growth, representing a reduction of approximately 129-136% relative to the sample mean of 1.4%. Even when the same GP has access to the same investment opportunities through a simultaneously active follow-on fund, late-period investments in the older fund significantly underperform. The effect is again concentrated among high dry powder funds (column 3), while funds with low dry powder (column 4) show a small and statistically insignificant effect—a heterogeneity that mirrors the baseline results and is inconsistent with a deal-flow story, under which capital pressure would be irrelevant.

Columns 5 through 7 also speak to the rational allocation alternative by examining whether late overlap deals differ systematically in their ex-ante characteristics. Although LPAs nominally require opportunities to be allocated to the fund first——a provision I discuss in Section 2.1——compliance is not directly observable to LPs. I therefore test for

deliberate selection through observable deal characteristics: if GPs were steering safer or more mature targets toward late-stage deployment, late deals should exhibit lower revenue volatility, involve older portfolio companies, or be less likely to involve startups. The evidence is inconsistent with this view: the coefficient on revenue volatility (column 5) is statistically indistinguishable from zero; portfolio company age at investment (column 6) shows no significant difference across investment years and, if anything, firms are younger; and the probability of investing in a startup (column 7) is similarly unchanged. These null results suggest the performance gap reflects a deterioration in deal quality driven by relaxed investment standards rather than reallocation of capital toward safer targets.

4.3.2 Evidence from placebo tests

Table 5 provides a more direct test of the rational allocation story. The key implication of that explanation is that its logic should apply beyond the contractual investment period: if GPs systematically tilt later capital toward safer, more mature targets, the performance decline should persist even for investments made in year 7, which lies outside the discretionary investment window and requires explicit LP approval.

Panel A replaces the late indicator in Table 2 Panel A with 1(Placebo Late), which equals one for investments made in year 7. By construction, these deals fall outside the contractual investment period and cannot be driven by end-of-fund deployment pressure. Across the full sample (columns 1 and 2), the coefficient on 1(Placebo Late) is statistically indistinguishable from zero, and this null result holds after splitting the sample by dry powder level (columns 3 to 5). No coefficient is significant at any conventional level.

Table A.6 replaces the placebo indicator with investment year dummies for years 2, 3, 4, and 7, comparing each directly against year 1 (the omitted category). Years 5 and 6 are excluded so that year 7 can be evaluated against the same early-period baseline used in the main results. Across the full sample, high dry powder, and low dry powder subsamples, the coefficient on year 7 is statistically indistinguishable from zero in all specifications.

Panel B of Table 5 replicates Table 3 using % Late Deployed (Placebo)—the share of capital deployed during year 7—in place of the original measure. Across all columns, an increase in the percentage of capital deployed outside the contractual period has no effect on fund performance. Table A.7 confirms the same null result using PME.

These placebo results are informative in two respects. First, the absence of any year 7 underperformance—even among high dry powder funds—contradicts the rational allocation explanation: if GPs were systematically reserving later investments for safer targets, the pattern should appear regardless of the contractual window. Second, the sharp contrast between the large, significant coefficients on % Late Deployed in Table 3 and the near-zero (and occasionally positive) coefficients in Table 5 Panel B is precisely what the contractual incentive mechanism predicts: deployment pressure peaks in the final years of the discretionary period and dissipates once that window closes. If anything, the explicit LP approval required for year 7 investments adds a layer of scrutiny that screens out lower-quality deals, further explaining why the underperformance does not extend beyond the contractual window.

5 Which Funds Face the Greatest Deployment Pressure?

The results show that late-period deployment under high dry powder damages fund returns, but they leave open the question of why some funds end up with excess undeployed capital in the first place. A substantial literature on diseconomies of scale in private equity offers a natural prediction. Lopez-de Silanes et al. (2015) document declining returns as fund size grows and attribute the pattern to organizational frictions in firms running many simultaneous investments; Kaplan and Lerner (2010) describe fund size as "the enemy of persistence." Each of these papers implies a direct prediction: larger funds should hold more abnormal dry powder, because their committed capital outruns the supply of acceptable deals. Table 6 examines this prediction in two parts. Panel A asks whether fund size predicts abnormal

dry powder in year 3; Panel B asks whether the late-deployment penalty on fund returns is concentrated in the funds whose size produces this excess dry powder. In Panel A, the dependent variable is the dry-powder share demeaned at the population level, so coefficients read directly as percentage-point deviations from the mean dry-powder ratio.

Column 1 of Panel A reports the fixed-effects baseline using vintage, country, and GP fixed effects with no fund-size measure. The fixed effects alone account for nearly half of the variation in abnormal dry powder ($R^2 = 0.479$), driven primarily by the GP fixed effect. By contrast, column 2 drops GP fixed effects and adds log fund size, and the explanatory power collapses to $R^2 = 0.145$; the coefficient on log fund size, is statistically indistinguishable from zero. Two facts emerge from this comparison. First, GPs have idiosyncratic styles of capital deployment that are not captured by fund size. Second, absolute fund size is uninformative about which funds end up with excess undeployed capital. The latter is consistent with Braun et al. (2026), who argue that larger PE funds typically execute larger deals rather than fail to deploy committed capital.

The picture changes once I examine variation *within* GPs. Column 3 reintroduces GP fixed effects alongside log fund size, and the coefficient jumps to 2.720. A one-standard-deviation upward deviation from a GP's typical scale is associated with approximately 4.0 percentage points of additional abnormal dry powder. Column 4 makes this within-GP margin explicit through fund size decomposition. The GP norm component is statistically null; only the within-GP excess component is positively significant with the abnormal dry powder in year 3. A one-standard-deviation overshoot relative to the GP's recent trajectory implies roughly 1.0 percentage points of additional abnormal dry powder. The friction is present within GP rather than across GPs, consistent with the view in Lerner et al. (2012) that better GPs get larger, which is accompanied by increases returns for a while. But at a fund size of roughly $500 million, performance clearly begins to decline.

Where does the within-GP overshoot come from? Column 5 provides a direct answer by interacting excess size with market hotness, defined as the standardized level of aggregate

PE dry powder at the time of fundraising. The unconditional excess-size effect collapses to -0.178, while Excess Fund Size $\times$ Hotness loads at 3.289. The interaction absorbs the entire positive loading on excess size from column 4, indicating that the friction is through oversized funds raised during hot markets. Translated into magnitudes: in a one-standard-deviation hot vintage, a one-standard-deviation overshoot adds approximately 1.2 percentage point of abnormal dry powder; in a one-standard-deviation cold vintage, the same overshoot *reduces* dry powder by roughly 1.3 percentage point. Excess size is therefore not a static handicap but a state-contingent one. The pattern is consistent with a story in which deployment frictions emerge when fundraising momentum meets a saturated capital environment: elevated valuations in hot vintages deter disciplined deployment by oversized funds, whereas in cold markets the same fund clears its commitments roughly on schedule because acceptable deals are relatively abundant.

The kind of fundraising that produces dry powder accumulation has a specific character: GPs raising in hot markets accept commitments that exceed what their organizations have previously demonstrated they can absorb, not because their skill has expanded, but because the LP capital market is, at that moment, enthusiastic in a way that is not anchored to the GP's track record. Such GPs are over-burdened by their own fundraising success.

Panel B traces these dynamics through to fund-level performance. The dependent variable is TVPI. Column 1 reports the full-sample regression with the focal interaction Excess Fund Size $\times$ % Late Deployed. The unconditional effect of % Late Deployed is small and statistically null, but the interaction loads significantly negative: late deployment is value-decreasing conditional on the fund being oversized. For a fund one standard deviation above its GP's size norm, each percentage point of late deployment reduces TVPI by approximately 0.008, combining the small main effect with the interaction term. A fund deploying 20 percentage points of capital late while sitting one standard deviation above its GP's size norm would suffer a TVPI drag of approximately 0.22 once the standalone penalty for being oversized is included, against a sample mean of 1.76—a hit of roughly 13% of average returns.

Column 2 substitutes Hotness $\times$ % Late Deployed for the excess-size interaction. Each percentage point of late deployment reduces TVPI by approximately 0.006, with an additional 0.008 drag in a one-standard-deviation hot vintage. A fund deploying 20 percentage points of capital late into a one-standard-deviation hot vintage would suffer a TVPI drag of approximately 0.28, against a sample mean of 1.76—a hit of nearly 16% of average returns.

Columns 3 and 4 split the sample on the sign of excess fund size and confirm the asymmetry. Among oversized funds (Excess > 0), each percentage point of late deployment reduces TVPI by 0.008, with an additional 0.008 in hot vintages. A fund deploying 20 percentage point of capital late into a one-standard-deviation hot market would suffer a TVPI drag of approximately 0.32, against a subsample mean of 1.69—a hit of nearly 19% of average returns. Among undersized funds (Excess < 0), neither the main effect nor the hotness interaction (-0.009) is statistically distinguishable from zero, despite a comparable subsample mean of 1.94. Late deployment is benign in funds operating within their GP's demonstrated capacity and damaging in funds that have outgrown it—particularly when the overshoot occurred in a hot fundraising environment.

Taken together, the two panels yield a unified picture. GPs have idiosyncratic capital-deployment styles, and absolute fund size is uninformative about which funds accumulate dry powder. The friction is a within-GP phenomenon: it emerges when fundraising outpaces a manager's demonstrated deployment capacity, and occurs especially in hot fundraising markets. The capital that accumulates through this channel is then forced out under the contractual fee deadline, and the resulting losses are concentrated in the funds whose size was not anchored to the GP's track record. Scale itself is not the enemy of persistence; scale that outruns a manager's deployment capacity—particularly when raised into a saturated market—is.

6 Conclusion

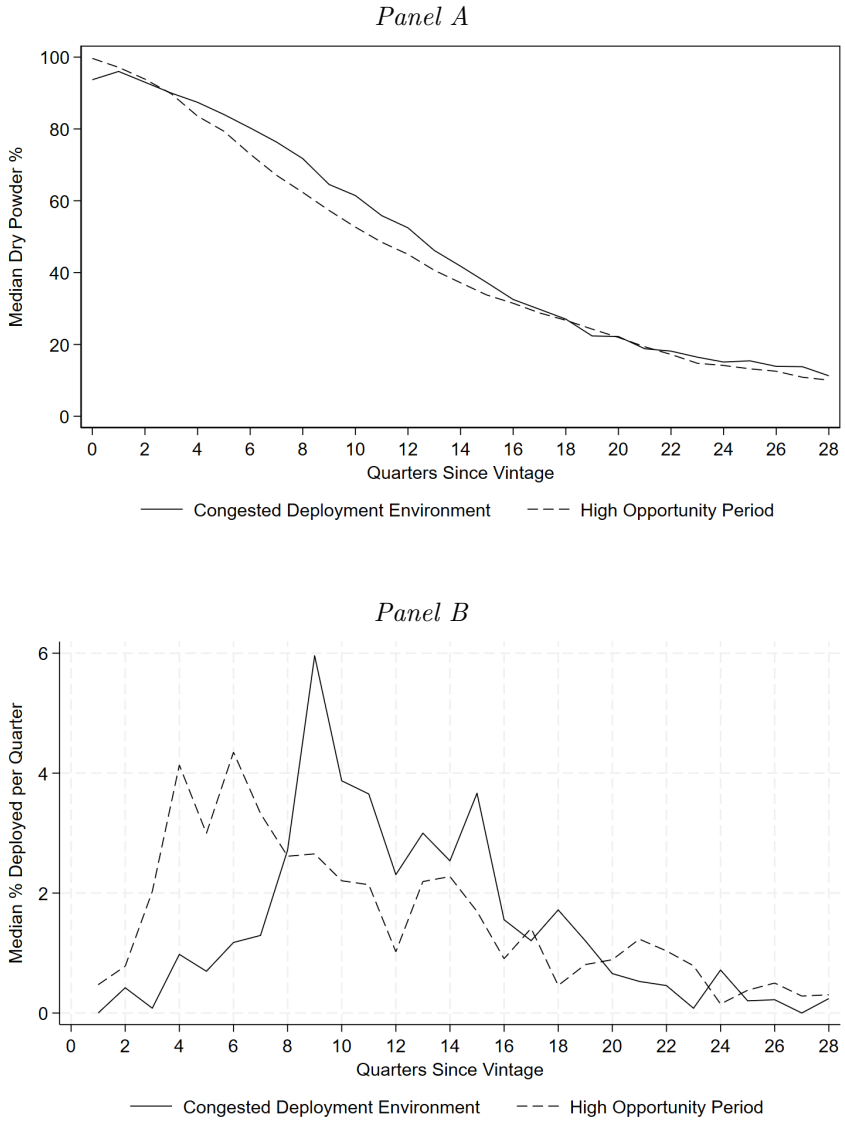
This paper shows that the standard private equity fee contract creates a dated and measurable distortion in investment behavior. Within fund, deals made in years 5-6 of the contractual investment period generate substantially weaker top-line growth and lower realized returns than deals made earlier—but only in funds that enter the late period with abnormally high undeployed capital. The pattern survives within-GP comparisons across overlapping funds and disappears outside the contractual window, ruling out shorter-horizon and deal-flow explanations. Excess dry powder accumulates not in absolutely large funds but in funds whose size exceeds the GP's demonstrated deployment capacity, particularly when raised into hot fundraising markets.

The findings have two main implications. For limited partners, the chain running from hot-market fundraising to oversized commitments to accumulated dry powder to deteriorating late-period deals offers an observable early signal of poor investment quality. A fund whose size outpaces the GP's demonstrated capacity, raised in a hot vintage, and still holding abnormally high dry powder by year 3 is precisely the kind of fund where late-period deal quality is most likely to deteriorate. Absolute fund size, by contrast, is uninformative about deployment pressure. For fund governance, the results point to two pressure points: a fee base charged on committed capital that converts a benign GP preference into a binding deadline, and a fundraising market that occasionally rewards GPs in excess of their demonstrated deployment capacity. Linking the fee base more directly to invested capital, or extending LPAC visibility into the pace and composition of late-period deal activity, would reduce the deadline's bite.

More broadly, the results offer a new perspective for the long-standing observation that scale and persistence are negatively related in private equity. The relevant friction is not absolute fund size—consistent with recent evidence that larger funds simply execute larger deals—but size in excess of a GP's demonstrated deployment capacity, activated by saturated capital environments. The agency problem identified here is therefore not principally one of

manager selection—LPs picking the wrong GPs—but of capital flowing to GPs in volumes that exceed their demonstrated capacity to deploy it. The relevant friction is not which managers receive capital but how much. This refines the long-standing view that fund size is the enemy of persistence (Kaplan and Lerner, 2010): scale itself is not the problem. Scale that outpaces a GP's demonstrated deployment capacity, particularly when raised into a hot fundraising market, is.

Figure 1: Capital Deployment Dynamics: Congested vs. High-Opportunity Market Regimes

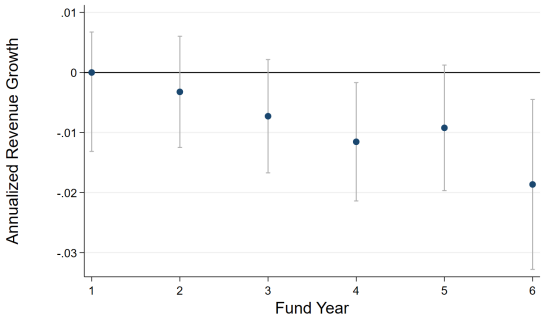


Note: This figure illustrates capital deployment dynamics across two distinct market environments. Panel A plots the median percentage of remaining dry powder over the fund's life, representing the rate of capital exhaustion. Panel B plots the median percentage of capital deployed per quarter, illustrating the intertemporal trend of investment activity throughout the fund's life. The solid line denotes funds operating in a "Congested" environment (aggregate dry powder in the top quintile), while the dashed line denotes funds in a "High-Opportunity" environment (aggregate dry powder in the bottom quintile).

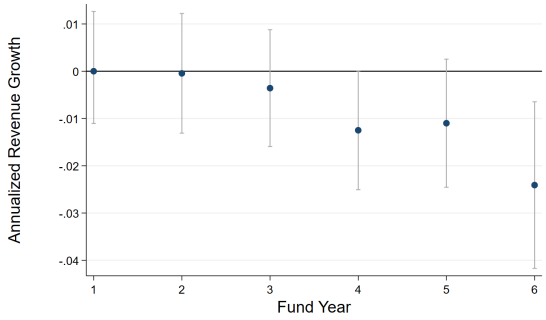
Alt-text: Two-panel line chart across quarters since vintage. Panel A shows median dry powder declining from 100% to about 10%, with congested-environment funds (solid) retaining more dry powder than high-opportunity funds (dashed) through quarter 18 before converging. Panel B shows median quarterly deployment, with high-opportunity funds peaking early (quarters 4-7) and congested funds peaking later (quarters 9-16), indicating back-loaded deployment under congestion.

Figure 2: Revenue Growth Deterioration Across Fund Years

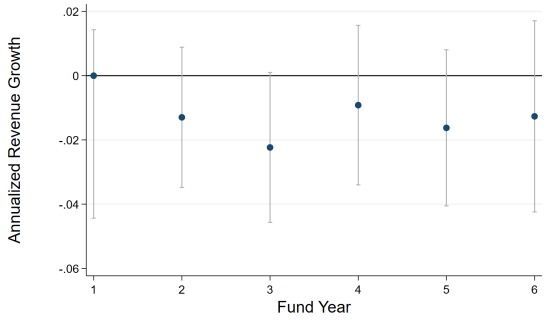
Panel A: Full Sample



Panel B: Above Median Abnormal Dry Powder in Year 3



Panel C: Below Median Abnormal Dry Powder in Year 3



Note: These figures plot the annualized revenue growth of portfolio companies by fund year, estimated relative to fund year 1 (the omitted baseline). Each dot represents the point estimate and the bars represent 95% confidence intervals. The full sample is shown in Panel A, while Panels B and C split the sample by abnormal dry powder, defined as a fund's dry powder in year 3 minus the average dry powder in year 3 among funds of the same vintage year, fund type, size quintile, and country. High DP (Panel B) refers to funds with above-median abnormal dry powder and Low DP (Panel C) refers to funds with below-median abnormal dry powder. Standard errors are clustered at the vintage year level.

Alt-text: Three-panel coefficient plot of annualized revenue growth by fund year (1-6), relative to year 1, with 95% confidence intervals. Panel A (full sample) and Panel B (above-median abnormal dry powder) show progressively negative coefficients reaching about -0.02 to -0.025 by year 6 with intervals excluding zero in late years; Panel C (below-median abnormal dry powder) shows no statistically significant deterioration.

Table 1: Summary Statistics

This table shows the summary statistics of the target companies and the funds. The target companies are investment targets of 9,155 US & European funds provided by *Pitchbook*. The corresponding fund's information is also from *Pitchbook*. Panel A presents the summary statistics of the buyout firms matched with *Orbis*. The accounting data of targets are from *Orbis*. Panel B presents summary statistics for the corresponding buyout firms and the investor funds from *Pitchbook*.

Panel A. Buyout Backed Firm Characteristics								
	N	Mean	Min	p25	Median	p75	Max	SD
Deal Characteristics								
Annualized Revenue Growth	9,155	0.02	-0.29	-0.01	0.01	0.04	0.30	0.07
Deal Return(%)	640	153.60	-33.22	47.23	118.75	209.29	581.68	142.67
1(Missing Deal Return)	6,118	0.91	0.00	1.00	1.00	1.00	1.00	0.28
1(Late)	9,155	0.19	0.00	0.00	0.00	0.00	1.00	0.39
1(Placebo Late)	9,155	0.06	0.00	0.00	0.00	0.00	1.00	0.23
1(Overlapping Late Deals)	9,155	0.10	0.00	0.00	0.00	0.00	1.00	0.30
1(Overlapping early Deals)	9,155	0.03	0.00	0.00	0.00	0.00	1.00	0.17
Revenue (M)	9,155	299.89	0.00	7.90	26.38	100.79	82,385.00	2,028.27
Early Deal's Revenue (M)	6,008	344.33	0.00	9.51	31.64	122.89	82,385.00	2,288.56
Late Deal's Revenue (M)	1,701	168.14	0.00	7.08	21.82	77.65	8,875.13	629.60
Revenue volatility (M)	9,155	0.34	0.00	0.13	0.24	0.44	2.78	0.33
Year Established	9,155	1,983.56	1,800.00	1,976.00	1,993.00	2,002.00	2,023.00	30.63
Holding Period (Quarter)	9,155	15.83	3.00	8.00	16.00	20.00	72.00	7.85
Vintage Year	9,149	2,010.59	1,986.00	2,006.00	2,012.00	2,016.00	2,024.00	6.57
Deal Year	9,155	2,014.25	1,996.00	2,009.00	2,015.00	2,020.00	2,023.00	6.28
Firm's Age	9,155	30.69	0.00	12.00	21.00	37.00	217.00	29.76
1(Startup)	9,155	0.05	0.00	0.00	0.00	0.00	1.00	0.21
Investment Yr 2	9,155	0.17	0.00	0.00	0.00	0.00	1.00	0.38
Investment Yr 3	9,155	0.17	0.00	0.00	0.00	0.00	1.00	0.38
Investment Yr 4	9,155	0.14	0.00	0.00	0.00	0.00	1.00	0.35
Investment Yr 5	9,155	0.11	0.00	0.00	0.00	0.00	1.00	0.31
Investment Yr 6	9,155	0.08	0.00	0.00	0.00	0.00	1.00	0.27

Panel B. Fund Characteristics								
	N	Mean	Min	p25	Median	p75	Max	SD
Investor Fund Characteristics								
Vintage Year	1,336	2,012.48	1,999.00	2,008.00	2,013.00	2,017.00	2,022.00	5.08
% Late Deployed	1,336	11.47	0.00	4.70	10.24	16.27	66.88	8.45
Fund Sequence Number	1,326	12.90	1.00	3.00	5.00	13.00	109.00	18.68
Fund Size	1,334	1,653.06	20.00	280.64	650.00	1,600.00	25,919.22	2,934.78
Abnormal Dry Powder in Year 3	1,218	2.09	-61.24	-6.10	0.00	13.09	51.92	17.05
Fund TVPI	1,336	1.73	0.00	1.33	1.63	2.00	14.24	0.75
Prev Fund TVPI	772	1.89	0.14	1.46	1.78	2.20	7.20	0.73
Abnormal Prev Fund TVPI	772	0.01	-3.19	-0.34	0.00	0.23	4.45	0.65
Follow-on Fund Size Growth	811	1.01	-0.96	0.07	0.48	0.94	152.60	5.80
Excess Fund Size (vs. GP Norm)	1,302	0.03	-1.22	-0.13	0.00	0.23	1.07	0.37
GP Norm Fund Size	1,335	6.50	2.74	5.64	6.49	7.26	9.93	1.23
Total Market Dry Powder in Year 3	1,336	276.50	0.37	157.41	298.85	340.89	580.27	104.98

Table 2: Within-Fund Investment Timing and Deal Performance

This table examines the relationship between investment timing within a fund's life cycle and subsequent annualized revenue growth at the deal-level. The dependent variable is the annualized revenue growth of portfolio companies during the private equity holding period. Panel A tests whether late-stage investments — defined by the indicator 1(Late), which equals one for investments made in years 5–6 of the contractual investment period — underperform early investments. Panel B replaces the single late-stage indicator with year-by-year indicators, 1(Year 2) through 1(Year 6), to trace the dynamic evolution of deal performance across a fund's investment horizon; year 1 serves as the omitted baseline category. Columns 1, 3, and 4 include fund fixed effects and vintage industry fixed effects, comparing investments within the same fund while controlling for cohort-specific industry conditions. Columns 2, 5, and 6 replace vintage industry fixed effects with vintage industry–country fixed effects, absorbing time-varying industry conditions at the country level. For both panels, I estimate the same specifications separately for high and low dry powder environments. To mitigate concerns that time trends drive the results, dry powder is measured at the fund level and demeaned relative to the average dry powder in year 3 among funds of the same vintage, size group, fund type, and country. This residualized measure isolates cross-sectional variation in capital pressure rather than aggregate time effects. All regressions include standard deal-level controls. Standard errors are clustered at the fund level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Late-Stage Deals and Revenue Growth

Dep Var:	Annualized Revenue Growth					
	Full Sample		High DP	Low DP	High DP	Low DP
	(1)	(2)	(3)	(4)	(5)	(6)
1(Late)	-0.008***	-0.007**	-0.013**	-0.004	-0.016**	-0.005
	(0.002)	(0.003)	(0.005)	(0.005)	(0.008)	(0.007)
Observations	6698	5776	1584	1718	1067	1257
Vintage-Industry FE	Yes	No	Yes	Yes	No	No
Vintage-Industry-Country FE	No	Yes	No	No	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Y-Mean	0.016	0.017	0.018	0.016	0.016	0.017

Panel B: Dynamic Effects by Investment Year

Dep Var:	Annualized Revenue Growth					
	Full Sample		High DP	Low DP	High DP	Low DP
	(1)	(2)	(3)	(4)	(5)	(6)
1(Year 2)	0.003	0.001	0.007	-0.002	0.005	-0.006
	(0.003)	(0.004)	(0.008)	(0.008)	(0.009)	(0.009)
1(Year 3)	-0.003	-0.004	-0.011	-0.005	-0.010	-0.011
	(0.003)	(0.004)	(0.008)	(0.007)	(0.010)	(0.009)
1(Year 4)	-0.004	-0.006	-0.007	-0.005	-0.009	-0.010
	(0.003)	(0.004)	(0.008)	(0.008)	(0.009)	(0.009)
1(Year 5)	-0.007**	-0.007	-0.018**	-0.002	-0.018*	-0.007
	(0.004)	(0.005)	(0.009)	(0.008)	(0.010)	(0.009)
1(Year 6)	-0.013***	-0.013***	-0.016**	-0.014	-0.022**	-0.016
	(0.004)	(0.005)	(0.008)	(0.009)	(0.009)	(0.010)
Observations	6698	5776	1584	1718	1381	1513
Vintage-Industry FE	Yes	No	Yes	Yes	No	No
Vintage-Industry-Country FE	No	Yes	No	No	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Y-Mean	0.016	0.017	0.018	0.016	0.017	0.017

Table 3: Late-Period Capital Deployment and Fund Performance

This table reports OLS regressions examining the relationship between late-period capital deployment and fund performance. The dependent variable across all columns is TVPI (Total Value to Paid-In capital). % Late Deployed measures the share of capital deployed in years 5 to 6 of a fund's life. Columns 4 through 7 split the sample by abnormal dry powder, where High DP and Low DP refer to funds with above- and below-median abnormal dry powder, respectively. Abnormal dry powder is defined as a fund's dry powder in year 3 minus the average dry powder in year 3 among funds of the same vintage year, fund type, size quintile, and country. Prev Fund's TVPI captures the GP's prior fund performance and is included in columns 3, 5, and 7 to control for GP quality. Columns 1, 3, 5, and 7 include vintage year fixed effects, while columns 2, 4, and 6 include both vintage and GP fixed effects, which absorb time-invariant differences across GPs. The Y-Mean reflects the unconditional sample mean of the dependent variable. Standard errors are reported in parentheses and are clustered at the vintage year level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dep Var:	TVPI						
	Baseline			High DP		Low DP	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
% Late Deployed	-0.007**	-0.007***	-0.009**	-0.009*	-0.015***	-0.007	-0.009
	(0.003)	(0.003)	(0.004)	(0.005)	(0.004)	(0.008)	(0.008)
Prev Fund's TVPI			0.224***		0.085		0.320***
			(0.061)		(0.059)		(0.099)
Observations	1390	1089	649	356	225	323	208
Vintage FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GP FE	No	Yes	No	Yes	No	Yes	No
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Y-Mean	1.751	1.808	1.800	1.811	1.860	1.824	1.848

Table 4: Testing the Agency Channel: Overlapping Funds

This table provides evidence on whether the late-investment effect can be attributed to contractual incentives, as opposed to deal flow considerations. The dependent variable in all specifications is annualized revenue growth of portfolio companies during the private equity holding period. Panel A documents overlap patterns among GPs in the sample, reporting the share of GPs managing at least two funds and the share with at least one overlapping fund pair, alongside the deal-level composition of the overlapping-fund sample across late-stage (years 5–6) and early-stage (years 0–4) investments. Panel B tests whether the performance penalty for late-period investments persists in a within-GP overlap pair, across-fund design. The indicator 1(Overlap Late) equals one for late-period investments in the current fund, while early investments in the overlapping follow-on fund serve as the comparison group, thereby holding GP ability and strategy constant. Columns 1 and 2 estimate the baseline overlapping-fund specification with overlap Pair fixed effects; Column 1 includes deal-year fixed effects, while Column 2 replaces these with industry–deal-year fixed effects, absorbing time-varying opportunity conditions within industries. Columns 3 and 4 replicate Columns 1 and 2 separately for high and low dry powder environments. Columns 5 through 7 extend the analysis to alternative outcomes — revenue volatility, firm age, and an indicator for startup investments, respectively — using the full overlapping-fund sample with overlap pair and industry–deal-year fixed effects. Dry powder is measured at the fund level as remaining committed capital at the end of year 3 and is demeaned relative to funds of the same vintage, size group, fund type, and country, thereby isolating cross-sectional variation in capital pressure rather than aggregate market conditions. All regressions include standard deal-level controls where applicable. Standard errors are clustered at the overlap deal pair level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Overlap Patterns Among GPs in the Sample

GP-Level Overlapping Fund Activity

	N	Share (%)
Total GPs in sample	143	100.0
GPs with at least two funds	143	100.0
GPs with at least one overlapping fund pair	45	31.5

Deal-Level Sample Composition

	N	Share (%)
Unique deal pairs	223	100.0
Late-stage overlap deals (Years 5–6)	463	28.6
Early-stage deals (Years 0–4)	1156	71.4
N observations	1619	

Panel B: Subsample and Alternative Outcomes

Dep Var:	Annualized Revenue Growth				Revenue Volatility	Firm Age	1(Startup)
	Full	Full	High DP	Low DP			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1(Overlap Late)	-0.018***	-0.019***	-0.038**	-0.016	-0.012	-3.141	0.006
	(0.003)	(0.007)	(0.015)	(0.014)	(0.035)	(2.406)	(0.019)
Observations	1616	996	207	241	1035	1004	1035
Overlap Pair FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Deal Year FE	Yes	No	No	No	No	No	No
Industry-Deal Year FE	No	Yes	Yes	Yes	Yes	Yes	Yes
Y-Mean	0.014	0.014	0.018	0.010	0.338	29.112	0.037

Table 5: Testing the Agency Channel: Placebo Tests

This table tests whether the late-investment effect can be attributed to contractual incentives rather than investment-horizon considerations by examining whether the timing effect persists beyond the discretionary investment period. For Panel A, the sample is restricted to funds with at least one investment after year 5 or 6, and investments made in years 5 and 6 are excluded so that the placebo indicator estimates the same early-vs.-late comparison as in the main specification. The placebo indicator equals one for investments made in year 7, which lies outside the contractual investment window and requires LP approval. Panel A reports deal-level results, where the dependent variable is the annualized revenue growth of portfolio companies during the private equity holding period. Columns 1 and 2 estimate the placebo specification on the full sample, progressively adding fund, vintage-industry, and vintage-industry-country fixed effects. Columns 3 and 4 replicate column 1, and columns 5 and 6 replicate column 2, separately for funds with high and low dry powder. Panel B reports fund-level results, where the dependent variable is fund TVPI and the placebo variable is the share of committed capital deployed in year 7. Column 1 includes vintage fixed effects, column 2 adds GP fixed effects, and columns 3 to 5 report subsample estimates by dry powder, controlling for the GP's prior-fund TVPI. Dry powder is measured as remaining committed capital at the end of year 3, demeaned relative to funds of the same vintage, size group, fund type, and country to isolate cross-sectional variation in capital pressure. All regressions include standard controls where applicable. Standard errors are clustered at the fund level in Panel A and at the GP level in Panel B. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Deal-level result

Dep Var:	Annualized Revenue Growth					
	Full Sample		High DP	Low DP	High DP	Low DP
	(1)	(2)	(3)	(4)	(5)	(6)
1(Placebo Late)	0.001	0.004	-0.012	0.013	-0.014	0.004
	(0.009)	(0.012)	(0.021)	(0.016)	(0.024)	(0.019)
Observations	786	615	200	203	171	170
Vintage-Industry FE	Yes	No	Yes	Yes	No	No
Vintage-Industry-Country FE	No	Yes	No	No	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Y-Mean	0.012	0.011	0.010	0.015	0.008	0.015

Panel B: Fund-level result

Dep Var:	TVPI				
				High DP	Low DP
	(1)	(2)	(3)	(4)	(5)
% Late Deployed (Placebo)	-0.001	0.007**	-0.000	0.002	-0.002
	(0.003)	(0.003)	(0.003)	(0.005)	(0.004)
Prev Fund's TVPI			0.307***	0.228***	0.279***
			(0.048)	(0.060)	(0.092)
Observations	1266	978	715	309	242
Vintage FE	Yes	Yes	Yes	Yes	Yes
GP FE	No	Yes	No	No	No
Y-Mean	1.776	1.823	1.834	1.847	1.856

Table 6: Excess Fund Size, Dry Powder, and Fund Performance

This table examines how oversized fundraising drives the accumulation of undeployed dry powder, and whether that dry powder translates into worse fund performance through the channel of late capital deployment. Panel A reports regressions of Dry Powder Year 3—remaining committed capital at the end of year 3, demeaned relative to funds of the same vintage, size group, fund type, and country—on fund size. Column 1 reports the FE-only baseline using vintage, country, and GP fixed effects. Column 2 uses log fund size with vintage and country fixed effects and controls. Column 3 adds GP fixed effects and controls. Column 4 implements a Mundlak decomposition: log fund size is split into the GP-specific mean (GP Norm Fund Size) and the within-GP deviation (Excess Fund Size), so the latter isolates fund-by-fund overshooting relative to the GP's typical scale rather than between-GP variation. Column 5 interacts Excess Fund Size with Hotness, a standardized measure of aggregate PE/VC market dry powder at fundraising, testing whether deployment frictions are amplified when GPs raise outsized funds into saturated capital environments. Panel B tests whether the dry powder documented in Panel A translates into worse performance. The dependent variable is TVPI. % Late Deployed is the share of total committed capital deployed in years 5 and 6 of fund life. Columns 1 and 2 estimate the full sample: column 1 interacts Excess Fund Size with % Late Deployed (testing whether the cost of late deployment is amplified for oversized funds), and column 2 replaces Excess Fund Size with Hotness in the interaction (testing whether late deployment is especially costly in hot markets). Columns 3 and 4 re-estimate the column 2 specification on subsamples of oversized (Excess > 0) and undersized (Excess < 0) funds, isolating whether the Hotness $\times$ Late Deployed penalty concentrates among funds that raised more than their GP's typical base. All regressions are restricted to Buyout funds, include vintage and country fixed effects, and control for dry powder year 3, log prior fund size, GP norm fund size, and fund sequence where applicable. Standard errors are clustered at the GP level. *, **, *** denote significance at the 10%, 5%, and 1% levels.

Panel A: Excess Fund Size and Dry Powder Accumulation

Dep Var:	Dry Powder Year 3				
	(1)	(2)	(3)	(4)	(5)
Log(Fund Size)		0.271	2.720***		
		(0.469)	(0.636)		
Excess Fund Size (vs. GP Norm)				2.759**	-0.178
				(1.332)	(1.582)
GP Norm Fund Size				0.100	3.093***
				(0.506)	(0.783)
Excess Fund Size × Hotness					3.289**
					(1.610)
Observations	1418	1710	1411	1642	1339
R-squared	0.479	0.145	0.490	0.144	0.505
Vintage FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
GP FE	Yes	No	Yes	No	Yes
Controls	Yes	Yes	Yes	Yes	Yes
Y-Mean	-0.474	-0.388	-0.542	-0.283	-0.494

Table 6: Excess Fund Size, Dry Powder, and Fund Performance (continued)

Panel B: Performance Consequences of Late Deployment

Dep Var:	TVPI			
	Full Sample		Excess > 0	Excess < 0
	(1)	(2)	(3)	(4)
% Late Deployed	-0.003	-0.006**	-0.008**	-0.001
	(0.003)	(0.003)	(0.003)	(0.007)
Excess Fund Size (vs. GP Norm)	-0.161*			
	(0.093)			
GP Norm Fund Size	0.058	0.127***	0.127**	0.069
	(0.048)	(0.047)	(0.052)	(0.078)
Excess Fund Size × % Late Deployed	-0.014**			
	(0.006)			
Hotness × % Late Deployed		-0.008**	-0.008*	-0.009
		(0.004)	(0.005)	(0.009)
Observations	867	901	538	301
R-squared	0.208	0.184	0.224	0.175
Vintage FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
GP FE	No	No	No	No
Controls	Yes	Yes	Yes	Yes
Y-Mean	1.757	1.759	1.691	1.936

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(Internet Appendix)

Table A.1: Top Funds and Deals in the Sample

This table reports summary information on the largest funds and portfolio company investments in the estimation sample. Panel A lists the five largest buyout funds ranked by committed capital, together with their country of domicile, vintage year, and fund size. Panel B reports the five largest portfolio company investments ranked by deal-level revenue at entry, along with the portfolio company's country, investment year, and the sponsoring fund. The sample is restricted to buyout funds included in the main regression analysis. Fund size is measured in billions of U.S. dollars based on committed capital, while revenue size corresponds to portfolio company revenue (in billions of U.S. dollars) at or near the time of investment. Each fund and deal is counted once. Country refers to the fund's legal domicile in Panel A and to the portfolio company's headquarters location in Panel B.

Panel A: Top 5 Largest Funds

Rank	Fund Name	Country	Vintage Year	Fund Size (B)
1	Apollo Investment Fund IX	United States	2018	24.73
2	Blackstone Capital Partners V	United States	2005	21.70
3	GS Capital Partners VI	United States	2007	20.33
4	TPG Partners VI	United States	2008	18.87
5	Blackstone Capital Partners VII	United States	2016	18.87

Panel B: Top 5 Largest Deals

Rank	Deal Name	Country	Vintage Year	Fund Name	Revenue Size (B)
1	Bank of America	United States	2013	D.E. Shaw Private Equity Fund	82.39
2	Advantage Solutions (BPO/Outsource Services)	United States	2014	Green Equity Investors V	65.00
3	Ingram Micro	United States	2021	Platinum Equity Capital Partners V	49.12
4	Repsol	Spain	2018	CVC Capital Partners VII	44.52
5	Naturgy Energy Group	Spain	2018	CVC Capital Partners VII	24.73

Table A.2: Country Distribution of Funds and Deals

This table reports the geographic distribution of buyout funds and portfolio company investments in the estimation sample. Panel A presents the distribution of funds by country of legal domicile, while Panel B reports the distribution of portfolio company investments by the headquarters location of the acquired firm. The sample is restricted to buyout funds included in the main regression analysis. Percentages are calculated relative to the total number of funds and deals in the estimation sample, respectively.

Panel A: Country Distribution of Funds

Country	# Funds	% Funds
United States	872	79.34
United Kingdom	153	13.92
Switzerland	19	1.73
Sweden	13	1.18
France	9	0.82
Luxembourg	8	0.73
Germany	6	0.55
Netherlands	4	0.36
Spain	3	0.27
South Africa	3	0.27
Chile	3	0.27
Italy	2	0.18
New Zealand	1	0.09
Denmark	1	0.09
Norway	1	0.09
Finland	1	0.09

Table A.2: Country Distribution of Funds and Deals (continued)

Panel B: Country Distribution of Deals

Country	# Deals	% Deals
United States	1681	25.97
United Kingdom	1464	22.61
France	584	9.02
Sweden	571	8.82
Italy	396	6.12
Spain	277	4.28
Norway	237	3.66
Finland	225	3.48
Germany	221	3.41
Belgium	120	1.85
Denmark	117	1.81
Netherlands	83	1.28
Ireland	60	0.93
Poland	59	0.91
India	53	0.82
Czech Republic	32	0.49
Romania	29	0.45
Portugal	28	0.43
Switzerland	27	0.42
Canada	23	0.36
Estonia	15	0.23
Austria	13	0.20
Luxembourg	10	0.15
Russia	9	0.14
Hungary	8	0.12
Hong Kong	8	0.12
Greece	8	0.12
Slovenia	8	0.12
Japan	8	0.12
Bermuda	7	0.11
Latvia	7	0.11
Brazil	7	0.11
Australia	7	0.11
Israel	6	0.09
China	6	0.09
Croatia	6	0.09
Thailand	6	0.09
Singapore	5	0.08
Slovakia	4	0.06
South Korea	4	0.06
Turkey	4	0.06
South Africa	3	0.05
Ukraine	3	0.05
Lithuania	3	0.05
Vietnam	3	0.05
Colombia	3	0.05
Malta	2	0.03
Bulgaria	2	0.03
Serbia	2	0.03
United Arab Emirates	1	0.02
Malaysia	1	0.02
Indonesia	1	0.02
Taiwan	1	0.02
Monaco	1	0.02
Saudi Arabia	1	0.02
Chile	1	0.02
Iceland	1	0.02
Moldova	1	0.02
New Zealand	1	0.02

Table A.3: Late-Period Investment Performance: Using Deal Return

This table examines whether investments made later in the fund's investment period generate lower realized returns than earlier investments, and whether any such differences vary with the fund's deployment pressure. The dependent variable is the realized deal return (%), defined as the gross return on a portfolio company investment as reported by the GP. The variable 1(Late) equals one for investments undertaken in years 5 and 6 of the fund's investment period and zero otherwise. High DP and Low DP indicate funds with above- and below-median abnormal dry powder, respectively. Abnormal dry powder is defined as a fund's dry powder in year 3 minus the average dry powder in year 3 among funds of the same vintage year, fund type, size quintile, and country. Columns 1 and 2 report results for the full sample. Columns 3 and 5 restrict the sample to High DP funds; columns 4 and 6 restrict to Low DP funds. Columns 1, 3, and 5 include vintage-industry fixed effects, while columns 2, 4, and 6 include vintage-industry-country fixed effects. All specifications include fund fixed effects and a common set of deal-level controls. Because deal returns are reported only for a subset of investments, the sample is substantially smaller than in the main specifications and is likely subject to selection bias, as GPs disproportionately disclose returns for successful investments. Standard errors are clustered at the fund level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Dep Var:	Deal Return (%)					
	Full Sample		High DP	Low DP	High DP	Low DP
	(1)	(2)	(3)	(4)	(5)	(6)
1(Late)	-226.561**	-183.007**	-123.063**	428.141*	-123.063**	428.141*
	(106.854)	(77.051)	(52.394)	(225.944)	(52.091)	(225.944)
Observations	330	324	166	107	164	107
Vintage-Industry FE	Yes	No	Yes	Yes	No	No
Vintage-Industry-Country FE	No	Yes	No	No	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Y-Mean	171.347	172.667	149.590	173.383	149.115	175.456

Table A.4: Late-Period Investment Performance: Using Missing Deal Return Indicator

This table examines whether investments made later in the fund's investment period are more likely to have unreported deal returns, and whether any such pattern varies with the fund's deployment pressure. The dependent variable, 1(Missing Deal Return), is an indicator that equals one if the realized deal return on a portfolio company investment is not reported. Because GPs disproportionately disclose returns for successful investments, missing returns are more likely to correspond to underperforming deals; this specification therefore tests whether late-period deals are disproportionately concentrated among unreported, and likely poorly-performing, outcomes. The variable 1(Late) equals one for investments undertaken in years 5 and 6 of the fund's investment period and zero otherwise. High DP and Low DP denote funds with above- and below-median abnormal dry powder, respectively, where abnormal dry powder is defined as a fund's dry powder in year 3 minus the average dry powder in year 3 among funds of the same vintage year, fund type, size quintile, and country. Columns 1 and 2 report results for the full sample. Columns 3 and 5 restrict the sample to High DP funds; columns 4 and 6 restrict to Low DP funds. Columns 1, 3, and 5 include vintage-industry fixed effects, while columns 2, 4, and 6 include vintage-industry-country fixed effects. All specifications include fund fixed effects and a common set of deal-level controls. Standard errors are clustered at the fund level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Dep Var:	1(Missing Deal Return)					
	Full Sample		High DP	Low DP	High DP	Low DP
	(1)	(2)	(3)	(4)	(5)	(6)
1(Late)	0.030***	0.041***	0.044*	0.011	0.057***	0.024
	(0.009)	(0.015)	(0.026)	(0.023)	(0.021)	(0.023)
Observations	6065	3415	1327	1451	1258	1447
Vintage-Industry FE	Yes	No	Yes	Yes	No	No
Vintage-Industry-Country FE	No	Yes	No	No	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Y-Mean	0.938	0.936	0.922	0.934	0.926	0.933

Table A.5: Fund Performance and Late Capital Deployment–using PME

This table reports OLS regressions examining the relationship between late-period capital deployment and fund performance. The dependent variable across all columns is PME (Public Market Equivalent). % Late Deployed measures the share of capital deployed in years 5 to 6 of a fund's life. Columns 4 through 7 split the sample by abnormal dry powder, where High DP and Low DP refer to funds with above- and below-median abnormal dry powder, respectively. Abnormal dry powder is defined as a fund's dry powder in year 3 minus the average dry powder in year 3 among funds of the same vintage year, fund type, size quintile, and country. Prev Fund's TVPI captures the GP's prior fund performance and is included in columns 3, 5, and 7 to control for GP quality. Columns 1, 3, 5, and 7 include vintage year fixed effects, while columns 2, 4, and 6 include both vintage and GP fixed effects, which absorb time-invariant differences across GPs. The Y-Mean reflects the unconditional sample mean of the dependent variable. Standard errors are reported in parentheses and are clustered at the vintage year level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Dep Var:	PME						
	Baseline			High DP		Low DP	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
% Late Deployed	-0.005***	-0.005***	-0.006**	-0.005*	-0.014***	-0.003	-0.006
	(0.002)	(0.002)	(0.002)	(0.003)	(0.005)	(0.004)	(0.006)
Prev Fund's TVPI			0.126***		0.058		0.138**
			(0.039)		(0.048)		(0.050)
Observations	1426	1139	662	366	221	364	221
Vintage FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GP FE	No	Yes	No	Yes	No	Yes	No
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Y-Mean	1.156	1.176	1.180	1.170	1.216	1.171	1.193

Table A.6: Dynamic Year-by-Year Deal Performance Beyond the Contractual Investment Period

This table provides a placebo test of the investment-year dynamics documented in Panel B of Table 2 by replacing the late-stage indicators for years 5 and 6 with investment-year indicators for years 2 through 4 and year 7, where year 1 serves as the omitted baseline category. The sample is restricted to funds with at least one investment after year 5 or 6, and investments made in years 5 and 6 are excluded so that the placebo indicator estimates the same early-vs.-late comparison as in the main specification. Year 7 falls outside the contractual investment window and requires LP approval, and therefore should not exhibit the same performance penalty driven by capital pressure as years 5 and 6 if the agency channel is the operative mechanism. The dependent variable is annualized revenue growth of portfolio companies during the private equity holding period. Columns 1, 3, and 4 include fund fixed effects and vintage industry fixed effects, comparing investments within the same fund while controlling for cohort-specific industry conditions. Columns 2, 5, and 6 replace vintage industry fixed effects with vintage industry–country fixed effects, absorbing time-varying industry conditions at the country level. For both panels, I estimate the same specifications separately for high and low dry powder environments. To mitigate concerns that time trends drive the results, dry powder is measured at the fund level and demeaned relative to the average dry powder in year 3 among funds of the same vintage, size group, fund type, and country. This residualized measure isolates cross-sectional variation in capital pressure rather than aggregate time effects. All regressions include standard deal-level controls. Standard errors are clustered at the fund level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Dep Var:	Annualized Revenue Growth					
	Full Sample		High DP	Low DP	High DP	Low DP
	(1)	(2)	(3)	(4)	(5)	(6)
1(Year 2)	-0.005	-0.003	-0.019	-0.032	-0.016	-0.024
	(0.011)	(0.014)	(0.036)	(0.023)	(0.043)	(0.021)
1(Year 3)	-0.007	-0.010	-0.027	-0.019	-0.028	-0.028
	(0.010)	(0.012)	(0.025)	(0.020)	(0.032)	(0.021)
1(Year 4)	-0.007	-0.010	-0.005	-0.009	-0.007	-0.012
	(0.010)	(0.013)	(0.030)	(0.021)	(0.039)	(0.019)
1(Year 7)	-0.004	-0.003	-0.027	-0.003	-0.028	-0.014
	(0.011)	(0.015)	(0.035)	(0.024)	(0.043)	(0.026)
Observations	786	615	200	203	171	170
Vintage-Industry FE	Yes	No	Yes	Yes	No	No
Vintage-Industry-Country FE	No	Yes	No	No	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Y-Mean	0.012	0.011	0.010	0.015	0.008	0.015

Table A.7: Fund Performance and Placebo Late Capital Deployment-Using PME

This table reports OLS regressions examining the relationship between placebo late-period capital deployment and fund performance. The dependent variable in all specifications is PME (Public Market Equivalent). % Late Deployed (Placebo) measures the share of capital deployed in years 7 and 8 of a fund's life, which fall outside the contractual investment period. Columns 4 and 5 split the sample based on abnormal dry powder, where High DP and Low DP indicate funds with above- and below-median abnormal dry powder, respectively. Abnormal dry powder is defined as a fund's dry powder in year 3 minus the average dry powder in year 3 among funds of the same vintage year, fund type, size quintile, and country. Prev Fund TVPI captures the general partner's prior fund performance and is included in columns 3 through 5 to control for GP quality. Columns 1 and 3 through 5 include vintage year fixed effects, while column 2 instead includes GP fixed effects, absorbing time-invariant differences across general partners. The Y-Mean reports the unconditional sample mean of the dependent variable. Standard errors are reported in parentheses and are clustered at the vintage year level. ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

Dep Var:	PME				
				High DP	Low DP
	(1)	(2)	(3)	(4)	(5)
% Late Deployed (Placebo)	-0.002	0.002	-0.002	-0.002	-0.003
	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)
Prev Fund's TVPI			0.183***	0.130***	0.164***
			(0.033)	(0.037)	(0.054)
Observations	1302	1031	726	314	245
Vintage FE	Yes	Yes	Yes	Yes	Yes
GP FE	No	Yes	No	No	No
Y-Mean	1.160	1.173	1.193	1.199	1.181

Table A.8: Risk Characteristics over the Fund Life Cycle

This table examines whether investments made later in the fund's investment period differ in their risk characteristics from earlier investments, and whether any such differences vary with the fund's deployment pressure. Panel A uses revenue volatility as a proxy for operating risk. Panel B uses an indicator equal to one if the portfolio company is five years old or younger at the time of investment. The variable 1(Late) equals one for investments undertaken in years 5 and 6 of the fund's investment period and zero otherwise. High DP and Low DP indicate funds with above- and below-median abnormal dry powder, respectively. Abnormal dry powder is defined as a fund's dry powder in year 3 minus the average dry powder in year 3 among funds of the same vintage year, fund type, size quintile, and country. Columns 1 and 2 report results for the full sample. Columns 3 and 5 restrict the sample to High DP funds; columns 4 and 6 restrict to Low DP funds. Columns 1, 3, and 5 include vintage-industry fixed effects, while columns 2, 4, and 6 include vintage-industry-country fixed effects. All specifications include fund fixed effects and a common set of deal-level controls. Standard errors are clustered at the fund level. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Balance on Firm Risk

Dep Var:	Revenue Volatility					
	Full Sample		High DP	Low DP	High DP	Low DP
	(1)	(2)	(3)	(4)	(5)	(6)
1(Late)	-0.016*	-0.018	-0.011	-0.041*	-0.023	-0.061**
	(0.010)	(0.012)	(0.026)	(0.024)	(0.030)	(0.027)
Observations	6620	5702	1667	1871	1450	1623
Vintage-Industry FE	Yes	No	Yes	Yes	No	No
Vintage-Industry-Country FE	No	Yes	No	No	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Y-Mean	0.321	0.321	0.359	0.347	0.364	0.350

Panel B: Balance on Firm Maturity

Dep Var:	1(Startup)					
	Full Sample		High DP	Low DP	High DP	Low DP
	(1)	(2)	(3)	(4)	(5)	(6)
1(Late)	-0.009	-0.009	-0.017	-0.013	-0.028	-0.020
	(0.010)	(0.011)	(0.022)	(0.019)	(0.027)	(0.022)
Observations	6698	5776	1766	1967	1540	1717
Vintage-Industry FE	Yes	No	Yes	Yes	No	No
Vintage-Industry-Country FE	No	Yes	No	No	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Y-Mean	0.066	0.067	0.078	0.072	0.077	0.073

Table A.9: Abnormal Dry Powder and GP Skill

This table examines whether abnormal dry powder in year 3 of a fund's life is associated with fund-level performance, testing whether high year-3 dry powder reflects lower GP skill rather than deployment pressure. The dependent variables are TVPI (columns 1–3) and PME (columns 4-6). Dry Powder Year 3 is the fund's abnormal undeployed capital in year 3, defined as the fund's dry powder minus the average dry powder in year 3 among funds of the same vintage year, fund type, size quintile, and country. % Late Deployed is the share of committed capital deployed in years 5 or 6 of the fund's investment period. Prev Fund's TVPI is the realized TVPI of the GP's immediately preceding fund. Columns 1 and 4 include only Dry Powder Year 3; columns 2 and 5 add % Late Deployed; columns 3 and 6 additionally control for Prev Fund's TVPI. All specifications include vintage fixed effects and a common set of fund-level controls. Standard errors, clustered at the GP level, are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Dep Var:	TVPI			PME		
	(1)	(2)	(3)	(4)	(5)	(6)
Dry Powder Year 3	-0.002	0.000	0.000	-0.000	0.001	0.001
	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
% Late Deployed		-0.005*	-0.009***		-0.004**	-0.006***
		(0.003)	(0.003)		(0.002)	(0.002)
Prev Fund's TVPI			0.215***			0.122***
			(0.047)			(0.030)
Observations	1995	1425	814	1962	1423	812
Vintage FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Y-Mean	1.616	1.719	1.782	1.117	1.138	1.176

Table A.10: Late-Period Investment Performance: SBO versus PBO Deals

This table examines whether the underperformance of late-period investments documented in Table 2 differs by deal type. The dependent variable is annualized revenue growth of portfolio companies during the private equity holding period. 1(SBO Late) and 1(PBO Late) are indicators equal to one for secondary and primary buyout investments, respectively, made in years 5–6 of the contractual investment period. Columns 1 and 2 report estimates for the full sample. Columns 3 and 4 restrict the sample to funds with above- and below-median abnormal dry powder, respectively, with vintage-industry fixed effects. Columns 5 and 6 replicate this split using vintage-industry-country fixed effects. Abnormal dry powder is defined as a fund's dry powder in year 3 minus the average dry powder in year 3 among funds of the same vintage year, fund type, size quintile, and country. All specifications include fund fixed effects and standard deal-level controls. Standard errors clustered at the fund level are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Dep Var:	Annualized Revenue Growth					
	Full Sample		High DP	Low DP	High DP	Low DP
	(1)	(2)	(3)	(4)	(5)	(6)
1(SBO Late)	-0.007	-0.002	-0.000	0.001	-0.007	0.001
	(0.005)	(0.007)	(0.012)	(0.009)	(0.012)	(0.011)
1(PBO Late)	-0.008***	-0.007**	-0.015***	-0.004	-0.016**	-0.003
	(0.003)	(0.003)	(0.005)	(0.005)	(0.006)	(0.006)
Observations	6523	5578	1534	1688	1328	1483
Vintage-Industry FE	Yes	No	Yes	Yes	No	No
Vintage-Industry-Country FE	No	Yes	No	No	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Y-Mean	0.016	0.016	0.018	0.016	0.017	0.016

Table A.11: Late-Period Investment Performance: Excluding Top Funds and Deals

This table examines whether the underperformance of late-period investments documented in Table **??** is robust to excluding the largest funds (Panel A) and the largest deals (Panel B), addressing the concern that outliers may drive the main result. The dependent variable is annualized revenue growth of portfolio companies during the private equity holding period. 1(Late) is an indicator equal to one for investments made in years 5 or 6 of the contractual investment period. Panel A excludes the top 5 funds by committed capital; Panel B excludes the top 20 deals by transaction value. Columns 1 and 2 report estimates for the full (post-exclusion) sample. Columns 3 and 4 restrict the sample to funds with above- and below-median abnormal dry powder, respectively, with vintage-industry fixed effects. Columns 5 and 6 replicate this split using vintage-industry-country fixed effects. Abnormal dry powder is defined as a fund's dry powder in year 3 minus the average dry powder in year 3 among funds of the same vintage year, fund type, size quintile, and country. All specifications include fund fixed effects and standard deal-level controls. Standard errors, clustered at the fund level, are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Excluding Top 5 Funds

Dep Var:	Annualized Revenue Growth					
	Full Sample		High DP	Low DP	High DP	Low DP
	(1)	(2)	(3)	(4)	(5)	(6)
1(Late)	-0.008***	-0.006**	-0.014**	-0.004	-0.016**	-0.002
	(0.002)	(0.003)	(0.006)	(0.005)	(0.006)	(0.006)
Observations	6490	5546	1516	1686	1313	1481
Vintage-Industry FE	Yes	No	Yes	Yes	No	No
Vintage-Industry-Country FE	No	Yes	No	No	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Y-Mean	0.016	0.016	0.018	0.016	0.017	0.016

Panel B: Excluding Top 20 Deals

Dep Var:	Annualized Revenue Growth					
	Full Sample		High DP	Low DP	High DP	Low DP
	(1)	(2)	(3)	(4)	(5)	(6)
1(Late)	-0.008***	-0.007**	-0.014**	-0.004	-0.016**	-0.003
	(0.002)	(0.003)	(0.006)	(0.005)	(0.006)	(0.006)
Observations	6506	5565	1529	1683	1321	1478
Vintage-Industry FE	Yes	No	Yes	Yes	No	No
Vintage-Industry-Country FE	No	Yes	No	No	Yes	Yes
Fund FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Y-Mean	0.016	0.016	0.018	0.016	0.017	0.017

Table A.12: Late-Period Investment Performance: Without Fund FE

This table replicates the main results of Table **??** without fund fixed effects, addressing the concern that the documented late-period underperformance might be sensitive to the inclusion of fund-level controls. The dependent variable is annualized revenue growth of portfolio companies during the private equity holding period. Panel A reports estimates using a single indicator 1(Late), equal to one for investments made in years 5 or 6 of the contractual investment period. Panel B reports year-by-year specifications, where 1(Year t) indicates investments made in year t of the investment period (year 1 is the omitted category). Columns 1 and 2 report estimates for the full sample, with vintage-industry fixed effects in column 1 and vintage-industry-country fixed effects in column 2. Columns 3 and 4 restrict the sample to funds with above- and below-median abnormal dry powder, respectively, with vintage-industry fixed effects. Columns 5 and 6 replicate this split using vintage-industry-country fixed effects. Abnormal dry powder is defined as a fund's dry powder in year 3 minus the average dry powder in year 3 among funds of the same vintage year, fund type, size quintile, and country. All specifications include standard deal-level controls but exclude fund fixed effects. Standard errors, clustered at the fund level, are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Late-Stage Deals and Revenue Growth

Dep Var:	Annualized Revenue Growth					
	Full Sample		High DP	Low DP	High DP	Low DP
	(1)	(2)	(3)	(4)	(5)	(6)
1(Late)	-0.008***	-0.006**	-0.009*	-0.003	-0.016***	-0.000
	(0.002)	(0.002)	(0.005)	(0.004)	(0.006)	(0.006)
Observations	7530	6556	1919	2096	1301	1552
Vintage-Industry FE	Yes	No	Yes	Yes	No	No
Vintage-Industry-Country FE	No	Yes	No	No	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Y-Mean	0.018	0.018	0.021	0.017	0.019	0.017

Panel B: Dynamic Effects by Investment Year

Dep Var:	Annualized Revenue Growth					
	Full Sample		High DP	Low DP	High DP	Low DP
	(1)	(2)	(3)	(4)	(5)	(6)
1(Year 2)	0.000	-0.002	-0.005	-0.006	-0.004	-0.006
	(0.003)	(0.003)	(0.006)	(0.005)	(0.007)	(0.006)
1(Year 3)	-0.007**	-0.007**	-0.013**	-0.010*	-0.011	-0.014*
	(0.003)	(0.003)	(0.006)	(0.006)	(0.007)	(0.007)
1(Year 4)	-0.006**	-0.009***	-0.011*	-0.007	-0.010	-0.011
	(0.003)	(0.003)	(0.006)	(0.006)	(0.007)	(0.007)
1(Year 5)	-0.010***	-0.009**	-0.015**	-0.006	-0.016*	-0.008
	(0.003)	(0.004)	(0.007)	(0.006)	(0.008)	(0.007)
1(Year 6)	-0.014***	-0.013***	-0.021***	-0.011	-0.022***	-0.008
	(0.004)	(0.004)	(0.007)	(0.006)	(0.008)	(0.007)
Observations	7530	6556	1919	2096	1687	1864
Vintage-Industry FE	Yes	No	Yes	Yes	No	No
Vintage-Industry-Country FE	No	Yes	No	No	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Y-Mean	0.018	0.018	0.021	0.017	0.020	0.017

Appendix B: Variable Definitions and Data Coverage

Variable	Definition	Coverage	Source
A. Deal-Level Variable			
Annualized Revenue Growth	Compound annual growth rate of portfolio company revenue over the PE holding period: $\left(\text{Revenue}_{iT}/\text{Revenue}_{i1}\right)^{1/\text{Years held}} - 1$, where T is exit year and 1 is the year prior to the deal.	$N = 9{,}155$	Orbis
1(Late)	Indicator equal to one for investments made in years 5–6 of the fund's contractual investment period; zero otherwise. Captures the end-of-window capital deployment pressure window.	$N = 9{,}155$	PitchBook
1(Late (Placebo))	Indicator equal to one for investments made in year 7 of the fund's life, which falls outside the contractual investment window and requires explicit LP approval. Used as a placebo test.	$N = 9{,}155$	PitchBook
1(Overlapping Late Deals)	Indicator equal to one for late-period investments (years 5–6) in the current fund made while the GP's follow-on fund is simultaneously active.	$N = 9{,}155$	PitchBook
1(Overlapping Early Deals)	Indicator equal to one for early-period investments (years 0–4) in the follow-on fund made while the predecessor fund is still within its investment period.	$N = 9{,}155$	PitchBook
Investment Year Dummies (Yr 2–6)	Indicators for each investment year relative to the fund vintage, replacing 1(Late) in dynamic specifications (Panel B of Table 2 and Table A.6).	Yr2: 17%; Yr3: 17%; Yr4: 14%; Yr5: 11%; Yr6: 8%	PitchBook
Revenue (M)	Portfolio company revenue (USD millions) in the year prior to the investment, reflecting firm size at entry.	$N = 9{,}155$	Orbis
Revenue Volatility	Standard deviation of annual revenue growth computed over available pre-deal years for each portfolio company. Used as a proxy for operating risk.	$N = 9{,}155$	Orbis
Year Established	Calendar year in which the portfolio company was founded.	$N = 9{,}155$; Mean = 1984	Orbis / PitchBook
Holding Period (Quarters)	Number of quarters between the deal entry date and the exit date (or end of the 5-year observation window if no exit is recorded).	$N = 9{,}155$	PitchBook
Vintage Year	Calendar year of the fund's first closing.	$N = 9{,}155$	PitchBook
Deal Year	Calendar year in which the investment was executed.	$N = 9{,}155$	PitchBook
Abnormal Dry Powder in Year 3	Percentage of committed capital remaining uninvested at the end of fund year 3, demeaned within cells defined by vintage year × fund type × size quintile × country. Positive values indicate more undeployed capital than peer funds at the same stage.	$N = 4{,}199$	PitchBook
High DP / Low DP	Sample-split indicators based on whether a fund's Abnormal Dry Powder in Year 3 is above or below the cross-sectional median. High DP funds retain more undeployed capital than comparable peers and face greater late-period deployment pressure.	$N = 4{,}199$	PitchBook
B. Fund-Level Variables			
% Late Deployed	Share of total committed capital deployed in years 5–6 of the fund's investment period, expressed as a percentage.	$N = 1{,}314$	PitchBook

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Appendix B (continued)

Variable	Definition	Coverage	Source
% Late Deployed (Placebo)	Share of committed capital deployed in year 7 of a fund's life, outside the contractual investment window.	$N = 1{,}308$	PitchBook
Unspent Capital (Pre-Raise)	Percentage of committed capital remaining at the time the GP begins raising its follow-on fund, demeaned within vintage × country × fund type × size quintile cells.	$N = 1{,}314$ (fund-level)	PitchBook
Fund TVPI	Total Value to Paid-In capital: (cumulative distributions + residual NAV) / paid-in capital.	$N = 1{,}336$	PitchBook
Interim TVPI (Pre-Raise)	TVPI measured at the time the GP begins raising its follow-on fund. Captures the interim performance signal available to prospective LPs during fundraising.	$N = 1{,}156$	PitchBook
Prev Fund TVPI	TVPI of the GP's immediately preceding fund.	$N = 820$	PitchBook
Fund Size	Total committed capital raised by the fund (USD millions).	$N = 1{,}310$	PitchBook
Fund Sequence Number	Ordinal number of the fund within the GP's fund series (e.g., Fund III = 3). Proxies for GP experience and reputation.	$N = 1{,}314$	PitchBook
Follow-on Fund Size Growth	Proportional change in fund size from the current to the follow-on fund: (Follow-on Size − Current Size) / Current Size.	$N = 1{,}170$	PitchBook
1(Drop in Follow-on Fund Size)	Indicator equal to one if the follow-on fund is smaller than the current fund.	$N = 1{,}314$	PitchBook

Appendix C. A Simple Model of GP Incentives to Deploy Late-Period Capital

This appendix presents a stylized model that shows GPs have monetary incentives to deploy late-period capital into deals with negative expected returns. The model has three compensation channels: current-fund management fees, current-fund carried interest, and a follow-on fund channel through which the next fund's size depends on current-fund performance. At the average fund in my sample, the GP is strictly better off deploying late-period capital into a deal even when that deal is expected to lose up to roughly 12% of its invested value.

C.1 Setup

Consider a fund of committed capital V_1 at the end of its investment period. The GP has deployed fraction κ of the fund into "good" deals earning return $r_g > 0$, leaving $(1-\kappa)V_1$ as dry powder. The GP now chooses a binary action $\theta \in \{0, 1\}$:

- $\theta = 0$: Return the dry powder uncalled. Fund return is $R(0) = \kappa r_g$.
- $\theta = 1$: Deploy the dry powder into a "bad" deal earning return $r_b < 0$. Fund return is $R(1) = \kappa r_g + (1-\kappa) r_b$.

The GP's total compensation has three components.

Current-fund management fee. During the harvesting period (length T_{post}), the GP earns rate σ per year on the cost basis of invested capital remaining in the fund.[12] As portfolio companies exit, the fee base declines. I assume linear exits over the harvesting period, so the cost basis of invested capital at time $\tau \in [0, T_{\text{post}}]$ is $D(\tau) = D \cdot (1 - \tau/T_{\text{post}})$,

[12] This is the modal practice: after the investment period, management fees "step down" to be calculated on net invested capital (cost basis), not committed capital and not NAV. NAV-based fee structures exist but are uncommon in traditional buyout funds. See, e.g., Metrick and Yasuda (2010) for institutional details. Using cost basis is conservative for the model: it gives the bad deal full fee credit at deployment, rather than docking the fee for poor mark-to-market performance.

where $D = (1-\kappa)V_1$ is the dry powder deployed at $\tau = 0$. Time-averaged fees on the newly deployed capital are then:

$$\Delta\text{MF}_{\text{curr}} \;=\; \sigma \int_0^{T_{\text{post}}} D(\tau)\, d\tau \;=\; \tfrac{1}{2}\, T_{\text{post}}\, \sigma\, (1-\kappa)\, V_1. \tag{4}$$

Current-fund carried interest. The GP earns fraction β of the fund's profits above hurdle h, where profits are computed at the fund level:

$$\text{Carry}(\theta) \;=\; \beta\, V_1\, \max\big(R(\theta) - h,\; 0\big). \tag{5}$$

Here V_1 is the cost basis of capital and $R(\theta)$ is the fund's net-of-cost return: \$1 invested returning \$1.20 corresponds to $R = 20\%$ and generates \$0.04 of carry per dollar of cost (above an 8% hurdle). Assuming both $R(0)$ and $R(1)$ exceed the hurdle, which holds throughout the empirically relevant range for my sample,[13]

$$\Delta\text{Carry}_{\text{curr}} \;=\; \beta\, V_1\, (1-\kappa)\, r_b \;<\; 0. \tag{6}$$

Follow-on fund channel. The size of the next fund, V_2, increases in the current fund's realized return R. I take a local-linear approximation around the sample mean and adopt the sensitivity estimated by Chung et al. (2012):

$$\frac{\partial V_2}{\partial R} \;\equiv\; b_R\, V_1, \qquad b_R > 0. \tag{7}$$

Let ϕ denote the present value of GP compensation per dollar of next-fund commitments. The follow-on channel is then:

$$\Delta\Pi_{\text{FoF}} \;=\; \phi\, b_R\, (1-\kappa)\, V_1\, r_b \;<\; 0. \tag{8}$$

[13]The average sample fund has $R(0) = \kappa r_g = 0.885 \times 20\% = 17.7\%$, well above the standard $h = 8\%$ hurdle. The deployment decision shifts the fund return down by $(1-\kappa)|r_b| \approx 11.5\% \times |r_b|$, which keeps the fund above the hurdle for any $r_b > -85\%$.

Deploying bad deals lowers current-fund returns, which shrinks the expected next fund and reduces future GP compensation.[14]

C.2 The Deployment Condition

The GP deploys whenever $\Delta\pi \equiv \Delta\text{MF}_{\text{curr}} + \Delta\text{Carry}_{\text{curr}} + \Delta\Pi_{\text{FoF}} > 0$. Substituting (4), (6), and (8):

$$\Delta\pi \;=\; (1-\kappa)\, V_1 \Big[\underbrace{\tfrac{1}{2}\, T_{\text{post}}\, \sigma}_{(+)} \;+\; \underbrace{\beta\, r_b}_{(-)} \;+\; \underbrace{\phi\, b_R\, r_b}_{(-)} \Big]. \tag{9}$$

Setting $\Delta\pi = 0$ yields a closed-form threshold:

$$r_b^* \;=\; -\,\frac{\tfrac{1}{2}\, T_{\text{post}}\, \sigma}{\beta \;+\; \phi\, b_R}. \tag{10}$$

The threshold depends only on contract parameters $(\sigma, \beta, T_{\text{post}})$ and the follow-on-fund parameters (b_R, ϕ): it is independent of fund size V_1, dry powder $(1-\kappa)$, and good-deal returns r_g. The GP deploys bad deals whenever $r_b > r_b^*$.

C.3 Calibration to the Sample Average

I calibrate to the average fund in my sample: $V_1 = \$1.6\text{B}$, $\kappa = 0.885$, $r_g = 20\%$. Contract terms are standard: $\sigma = 2\%$, $\beta = 20\%$, $h = 8\%$, $T_{\text{post}} = 5$ years. For the follow-on fund, I calibrate b_R using Chung et al. (2012), who estimate a log-fund-growth coefficient of 0.524 on IRR for buyout funds. Combined with their reported average first-time and follow-on fund sizes (\$417.5M and \$685.7M, respectively), this implies $b_R = 0.524 \times (417.5 + 685.7)/417.5 = 1.39$.[15] I set $\phi = 0.16$, which equals committed-capital fees during the

[14] One could also model a positive "deployment-record" channel: LPs may penalize GPs who fail to deploy committed capital, because undeployed capital signals weak deal-sourcing capacity. Including such a channel would widen the deployment region of the parameter space. I omit it here for parsimony and to keep the model's predictions conservative.

[15] The mapping is $b_R = \beta_{\text{CSSW}} \times (f(\theta_{i-1}) + f(\theta_i))/V_1$, derived from differentiating Chung et al. (2012)'s $\ln(f(\theta_i)/f(\theta_{i-1}) + 1)$ specification. This treats my model's b_R as a local approximation to their nonlinear $f'(\theta)\cdot s/(\tau+s)$ at the sample-average fund size. Using the vintage-fixed-effects coefficient (0.466) gives $b_R = 1.23$, with qualitatively identical results.

investment period ($T_{\text{inv}}\sigma = 0.10$) plus declining-base fees during the harvesting period ($\frac{1}{2}T_{\text{post}}\sigma = 0.05$) plus expected carry ($\beta(\bar{R}_2 - h)$ at $\bar{R}_2 = 15\%$). Table A.14 reports the decomposition for the average sample fund across three bad-deal return scenarios.

Table A.14: Decomposition of $\Delta\pi$ for the Average Sample Fund

This table reports the decomposition of the GP's profit gain from deploying late-period dry powder, computed from equations (4), (6), and (8). Values are based on the average fund in the sample: $V_1 = \$1.6\text{B}$ and $\kappa = 0.885$, with standard contract terms ($\sigma = 2\%$, $\beta = 20\%$, $T_{\text{post}} = 5$, $h = 8\%$, $r_g = 20\%$) and follow-on parameters $b_R = 1.39$ (calibrated to Chung, Sensoy, Stern, and Weisbach 2012, Table 3, Panel C) and $\phi = 0.16$. Management fees are paid on the cost basis of invested capital, which declines linearly as portfolio companies exit over the harvesting period. "Performance" captures the loss in expected next-fund compensation from lower current-fund returns. Positive $\Delta\pi$ indicates the GP is strictly better off deploying the dry powder than returning it uncalled.

	Current Fund		Follow-on Fund	
r_b	ΔMF ($M)	ΔCarry ($M)	Performance ($M)	$\Delta\pi$ ($M)
+5%	+9.18	+1.84	+2.08	+13.09
0%	+9.18	+0.00	+0.00	+9.18
−5%	+9.18	−1.84	−2.08	+5.26
−10%	+9.18	−3.67	−4.17	+1.34

The average sample fund has a strict incentive to deploy bad deals up to a threshold of $r_b^* \approx -12\%$. The table illustrates this by stepping through deal returns from +5% to −10%: all four scenarios lie on the "deploy" side of the line, with $\Delta\pi$ ranging from +$13.1M (when the deal earns a positive but sub-fund return of +5%) to +$1.3M (when the deal loses 10% of its cost basis). The current-fund management fee, $9.2M, anchors the GP's payoff: it is collected regardless of deal performance and is paid in addition to whatever carry and follow-on-fund value the deal generates.

C.4 Discussion

The three channels in equation (9) capture the basic tension in GP compensation. The positive force—new management fees on invested capital—scales with $(1 - \kappa)$, the dry powder available for deployment. The two negative forces—lost current-fund carry and

weaker next-fund performance—scale with $(1-\kappa) \times r_b$, so they shrink (in absolute terms) as r_b approaches zero. This asymmetry generates the result: for any sufficiently bad deal, the management-fee gain dominates and the GP overinvests.

The threshold $r_b^* \approx -12\%$ implies that the model predicts overinvestment in deals with negative expected returns. The result highlights how the management fee distorts incentives: a portion of the dry powder still generates fees for the GP regardless of underlying performance, and the carry and follow-on penalties dominate only when the deal is deeply negative.

The model is deliberately simple. It abstracts from heterogeneity in deal quality, sequential deployment, and LP renegotiation. The point is to show that even under a minimal contract specification with standard parameters, the basic compensation structure rationalizes the overinvestment patterns documented in the main text.