Buyouts at the bell

An empirical study on the public market reception of primary and secondary leveraged buyouts

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Abstract

This paper examines the market reception of private equity-backed initial public offerings, conditional on whether companies have undergone one or multiple rounds of private equity ownership. Using a sample of 376 PE-backed IPOs in the US from 1990 to 2021, we empirically examine cross-sectional differences in underpricing and long-term abnormal performance between primary and secondary leveraged buyouts going public. Our findings show no statistically significant differences in underpricing, suggesting that public market investors do not perceive varying levels of ex ante uncertainty about the value of an issue between the two groups. Similarly, the lack of significant inter-group variation in abnormal performance indicates that investor sentiment does not reflect distinct firm characteristics across the groups that would imply different required returns. These findings suggest that equity markets do not meaningfully differentiate between primary and secondary leveraged buyouts.

Keywords: initial public offerings, private equity, secondary buyouts, underpricing, abnormal performance

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1 Introduction

The topic of private equity (PE) and its role in the financial ecosystem has been debated for several decades since it first emerged in the 1980s. Understanding the role of PE in the economy can be addressed by studying how long companies stay in PE ownership. Strömberg (2008) summarises the longevity of PE ownership in two disparate views. One extreme, proposed by Jensen (1989), states that the PE model is a long-term superior governance structure, imposing close investor monitoring and strong managerial discipline through a combination of ownership concentration and significant leverage. Thanks to these benefits, Jensen predicted that the PE model would eventually become a dominant organisational form, insinuating that PE ownership is a long-term optimal structure. The other extreme, represented by Rappaport (1990), considers PE ownership as a short-term "shock therapy", allowing inefficient, badly performing firms with weak corporate governance to enter a quick but intense period of corporate and governance restructuring, to eventually go public in a few years. Strömberg continues by stating that the common view evolved into the idea that PE is a temporary ownership model particularly suitable for public companies with dispersed ownership structures suffering from an excess of free cash flow relative to investment opportunities. Today, however, the motivation behind PE investments is no longer primarily about solving governance problems in publicly traded conglomerates. Rather, PE transactions occur in a variety of industries and target private and public companies. According to Kaplan and Strömberg (2009), there is also an increase in secondary buyouts (SBOs), in which both the buyer and the seller of a transaction are PE firms. This is opposed to primary buyouts (PBOs), when a PE firm acquires a company from a non-PE owner, implying a more persistent role of the PE model in the economy.

This rise in PE activity in general, and SBO transactions in particular, intensifies the importance of scrutinising the success of leveraged buyouts (LBOs), as PE investments often are called. There is an extensive field of research on value creation in SBOs, studying whether they constitute worthwhile investment opportunities despite the targets having reaped the benefits of the PE model in its precedent buyout. Researchers and practitioners have, however, not reached a consensus on this matter. While some find that SBOs very well generate comparable levels of operational value creation and equity returns to PBOs, others observe inferior performance in the subsequent LBO. Critics argue that the value creation potential might not represent the decisive investment motive behind SBOs, but rather that they serve as an effective vehicle to maximise fee-generating capital or provide a risk-balancing safe bet in the wider portfolio. To the best of our knowledge, however, no one has studied the difference between SBOs and PBOs through the lens of the public market reception. Comparing underpricing and after-market performance between the groups may yield additional insights into the effects of subsequent buyouts beyond operational value creation and equity returns. In doing so, it con-

tributes greater nuance to the understanding of whether SBOs provide justifiable investment opportunities. We aim to bridge this gap in the intersection between the comparison of SBOs and PBOs on the one hand, and the performance of PE-backed initial public offerings (IPOs) on the other hand, thereby enhancing the understanding of the effects of multiple rounds of PE ownership. The fundamental question we pose is: do public market investors differentiate between SBOs and PBOs?

We perform two sets of tests in order to study the difference in public market reception through IPO underpricing and after-market performance between SBO- and PBO-backed IPOs. First, we run regression models of an SBO dummy variable on the IPO underpricing, while controlling for appropriate variables. Second, we perform Fama and French (1993) three-factor models for the two groups of IPOs, testing the difference between their respective coefficients with emphasis on their abnormal performance measured as alpha. The tests are applied to a sample of 376 PE-backed IPOs in the US from 1990 until 2021. The US serves as the most suitable geographical region for studying these phenomena because it is, historically and presently, the country with the most PE activity and has the most developed equity markets.

The results show no significant difference in the degree of IPO underpricing between SBO- and PBO-backed IPOs, suggesting that there is no meaningful difference in the ex ante uncertainty of the value of the company going public. Put differently, public market investors do not find it more difficult to value one group compared to the other. Similarly, we do not observe significant differences in the abnormal performance between SBO- and PBO-backed IPOs, indicating that there are no material variations in unobserved risk characteristics leading to one group requiring a higher return than the other. The lack of impactful differences is further supported by our extended empirical analysis where we perform several tests yielding insignificant inter-group variations. However, we find evidence proposing that a portfolio of SBO-backed IPOs has a higher exposure towards value stocks than the corresponding portfolio of PBO-backed IPOs. This impact seems to, primarily, be driven by smaller stocks in the portfolio. All in all, our findings suggest that SBO- and PBO-backed IPOs receive undifferentiated treatment by public market investors. On the one hand, this indicates that one additional round of PE ownership does not increase the IPO readiness of a company in general. On the other hand, it suggests that equity markets do not translate the emerging critique on SBOs into distinct receptions.

This paper proceeds as follows. Section 2 and 3 define key concepts and explore the theoretical and empirical background from the literature. Section 4 describes our data collection and sample construction. Section 5 presents our models examining underpricing and abnormal performance. Comparative statistics are displayed in section 6 and results are discussed in Section 7. Finally, Section 8 concludes.

2 Background

2.1 Private equity in short

According to Kaplan and Strömberg (2009), a PE firm is a "specialised investment company" and raises capital through a PE fund, legally organised as a limited partnership. Within the limited partnership, the PE firm acts as general partners (GPs) and manages the fund, whereas limited partners (LPs) provide the majority of the capital. LPs typically consist of institutional investors such as pension funds, endowments, insurance companies and wealthy individuals. As long as the GPs follow the fund agreement, the LPs have little to say in how the GPs deploy the investment funds after committing their capital. Typically, the fund has a finite life of ten years, sometimes with the optionality of extending it for up to three additional years. The GPs normally have five years to deploy the committed capital into companies, followed by an additional five to eight years to return the capital to the LPs. The GPs are compensated in two main ways. First, GPs charge an annual management fee initially based on the committed capital during the investment phase, later based on the deployed capital as investments are realised. Second, GPs earn a share of realised profits from the investments, referred to as carried interest, nearly exclusively equalling 20%. Furthermore, some GPs charge deal and monitoring fees to their portfolio companies. A typical PE transaction is financed with 60-90% debt, accordingly referred to as a leveraged buyout. This includes senior, secured debt arranged by banks or investment banks, as well as junior, unsecured debt financed by high-yield bonds or mezzanine debt. The remainder is financed with equity committed by the LPs, and a small fraction committed by the management team of the acquired company.

Caselli and Negri (2021) disentangle the term PE and the different types of firms and deals that it includes, with an emphasis on the lifecycle of the target firm. According to the traditional European definition, venture capital (VC) and PE firms belong to different clusters. A typical VC firm invests early in the target's life cycle and the probability of success is difficult to estimate before the transaction. As a result, far from every investment pays off. In addition, VC firms often take minority rather than majority positions. This is in sharp contrast to PE firms generally acquiring majority positions in mature firms. Consequently, VC firms and PE firms have different performance profiles. Harris et al. (2014) find that PE performance, net of fees and carried interest, consistently has exceeded that of public markets. However, VC funds outperformed public equities in the 1990s but underperformed in the 2000s, suggesting that VC funds show a higher variability in performance over time. Furthermore, public and private investment companies show distinct differences from PE firms. Most importantly, they often have an indefinite, or at least a significantly longer, time horizon with their investments compared to PE firms. Naturally, this creates another attitude towards maximising value in

the short- to medium-term. We perform this study by excluding VC firms and investment companies from the definition of PE, aligning with the traditional European definition of PE firms, as well as previous research such as Kaplan and Strömberg (2009).

2.2 Value creation in private equity

Kaplan and Strömberg (2009) discuss whether PE constitutes a superior organisational form and examine the sources of value creation within such transactions. They refer to proponents of PE, like Jensen (1989), who argue that these firms apply financial, governance and operational engineering to their portfolio companies, improving operations and creating economic value. In contrast, critics argue that PE firms take advantage of tax breaks, superior information and market timing between debt and equity markets, rather than create operational value. Nevertheless, this categorisation is helpful in understanding the PE firms' activity with the companies in which they invest. First, financial and governance engineering is about aligning incentives between the owners and the management team. This is achieved by giving the management team a large equity upside through stock and options. PE firms also require management to co-invest in the company, to not only ensure significant upside, but also significant downside. Because the companies are private and the equity is illiquid, management's incentive to manipulate short-term performance is mitigated. Second, by using leverage, i.e., the borrowing that is done in association with the transaction, the PE firm puts pressure on managers to avoid wasting money as this becomes more of a scarce resource because of the required interest and principal payments. This decreases the risk of free cash flow problems in which management teams in mature industries with weak corporate governance misuse cash flows rather than return them to the investors. Additionally, in most countries leverage increases firm value through the tax deductibility of interest. Yet, excessive leverage creates financial inflexibility, in contrast to the flexibility of payments to equity investors, increasing the chance of financial distress. Third, governance engineering is expressed through the way PE firms control the boards of portfolio companies and their active involvement in governance compared to public company boards. Boards of PE-owned companies are smaller and meet more frequently than comparable public company boards. Further, PE investors do not hesitate to replace poorly performing management teams. Practices referred to as financial and governance engineering have been established since the late 1980s. Today, PE firms also make use of industry and operating expertise to identify attractive investment opportunities, and to develop and implement value creation plans. These value adding initiatives, referred to as operational engineering, could take the form of cost-cutting opportunities and productivity improvements, strategic changes or repositioning, acquisition opportunities as well as management changes and upgrades.

On the value lever of governance engineering, being at the core of the PE model, Zong (2005)

contributes valuable insights. PE firms provide corporate governance using a less bureaucratic and more hands-on approach than public companies. This is expressed through proactive management ownership, close monitoring of value creation at board level, reliance on financial indicators, performance-based incentives, high levels of shareholder activism, emphasis on transparency in disclosure as well as balancing risk-taking and deliberate governance. The GPs of the PE firm participate in the board of the portfolio company, scrutinising, criticising and reviewing strategic and financial planning, investment discipline and identify opportunities for partnerships, mergers and acquisitions. In summary, strong corporate governance is prevalent in PE-backed companies, reflected in greater transparency, more credibility and higher accountability. These are all key success factors for PE firms in creating value in their portfolio companies. Wright et al. (2009) continue the discussion on the governance model inherent in PE ownership. The authors explicitly state that SBOs provide a means to continue the buyout organisational form, although with a different set of investors, which may facilitate enhanced performance through executing on growth opportunities.

2.3 Performance measurements

Kaplan and Schoar (2005) evaluate the performance of buyout and venture capital funds and present several widely established performance measures. The authors employ three metrics: the public market equivalent (PME), internal rate of return (IRR) and total value to paid-in capital (TVPI). Each metric captures a distinct aspect of fund performance. PME measures performance relative to public equity markets by discounting cash flows at market returns. IRR reflects the timing and magnitude of cash flows to investors. TVPI indicates the total distributions relative to capital invested. IRR and TVPI are standard metrics for evaluating and benchmarking the value created for PE fund investors relative to alternative investment opportunities. In contrast, PME provides a comparative performance measurement for assessing PE fund returns achieved in private markets relative to public market returns specifically. However, the authors highlight its failure to account for the systematic risk, or beta, of PE investments. If the beta of PE returns exceeds one, PME will overstate risk-adjusted performance. Conversely, if the beta is below one, PME will understate it. In contrast to fund-level performance and private transactions, our study focuses on how public equity markets, and hence public market investors, perceive and value companies backed by PE sponsors when they become publicly traded. Accordingly, we adopt a market-based definition of performance, relying on Fama and French (1993) three-factor model regressions and buy-and-hold abnormal returns (BHARs), in line with the methodologies of Cao and Lerner (2009) and Levis (2011). A more detailed discussion of these performance measures is provided in Section 5.

3 Literature review

3.1 The phenomenon of secondary buyouts

The increasing trend of SBOs has been met with scepticism from practitioners and researchers with three main arguments summarised by Achleitner and Figge (2014), together making up the "conventional wisdom" on value creation in SBOs. First, because the first PE owner already will have realised all the "low-hanging fruit", i.e., the easily realised value creation measures with the largest impact, the operational value creation potential in SBOs is thought to be limited. Critics argue that all PE investors essentially rely on the same tools, and that it is consequently questionable whether an SBO is a worthwhile investment opportunity. Second, the increase in SBO activity has historically coincided with greater liquidity in the credit markets. This could suggest that favourable credit market conditions allow the second PE owner to amplify the amount of leverage used in the transaction to compensate for lower operational value creation potential. Third, critics argue that SBOs are overpriced because the selling PE firm, to a greater extent than a non-financial sponsor, will exercise market timing and negotiation skills to maximise value at the time of exit. In summary, the conventional wisdom criticises SBOs for being more expensive while offering less room for operational value creation potential than deals sourced elsewhere. In turn, this should lead to lower returns unless the leverage successfully inflates returns.

There are two counterarguments to why PE firms could find material operational value creation potential in an SBO setting, making them a worthwhile investment opportunity regardless of the state of credit markets, according to Achleitner and Figge (2014). First, the initial PE firm may be forced to sell the investment early. This could be due to the fund approaching the end of its lifetime, the PE firm seeking a tangible track record to promote fundraising activities for a new fund or the PE firm striving for a stable cash flow profile. Second, differing skill sets among PE firms favour complementary value creation strategies, offering room for additional value creation potential. According to Degeorge et al. (2016), complementary skill sets classified as finance-oriented vs. operations-oriented, MBA-dominated vs. non-MBA-dominated, regional vs. global and margin-grower vs. sales-grower, seem to be significant value-enhancing aspects of SBOs.

Other scholars highlight fund-level considerations and market conditions as important drivers of SBO activity. Wang (2012) finds that SBO activity is positively related to cold equity markets, defined as low industry IPO volume, as well as to favourable credit markets, measured by the size of the high-yield market. Similarly, Jenkinson and Sousa (2015) suggest that capital market conditions are the most important determinant of the exit route. Moreover, Wang states that

the likelihood of choosing to exit through an SBO increases if the PE firm raises a new fund in the two years following the exit. This is supported by Jenkinson and Sousa who observe that SBOs can serve as an effective marketing tool for the subsequent fund. The probability also increases the longer the portfolio company has been held. This proposes the role of SBOs as an effective exit route when PE firms have relatively high demand for liquidity. Further, Bonini (2015) suggests that PE investors may view SBOs as a shortcut to generate returns and maximise follow-up fundraising. As the target companies have a proven track record of generating solid cash flows and coping with strict requirements of PE owners, an investment in such a company can be a rational portfolio diversification strategy. Despite limited room for incremental growth, such investments provide balance to the portfolio by decreasing the overall risk. In fact, Jenkinson and Sousa argue that companies, characterised by a high debt capacity given stable cash flows and low capital expenditure needs, are particularly suited for continued PE ownership. In other words, SBOs may not exclusively occur as a result of the first buyer's liquidity needs, but just as well as a consequence of the second buyer's investing preferences.

Further, SBOs arguably serve as an effective vehicle for GPs to optimise compensation. Jenkinson and Sousa (2015) find evidence of PE firms' choosing quick and certain exit routes from a compensation perspective. GPs earn a carried interest conditional on beating the hurdle rate expressed as the fund's IRR. All things equal, a rapid exit boosts the IRR, leading to a trade-off between maximising value for LPs and immediacy and certainty when choosing an exit route. The authors also confirm that SBOs could be a quick way of deploying committed capital towards the end of the fund's investment period. Degeorge et al. (2016) argue that GPs have an incentive to take bad deals to increase the invested capital and consequently their management fees. SBOs are a convenient investment channel for such purposes given their lower search costs compared to other buyouts, and lower adverse selection problems as any portfolio company of another PE firm is a priori up for sale. However, the findings conclude that SBOs made late in the buying fund's investment period, when the fund is under pressure to spend capital, underperform other buyouts. This appears as a short-lived trick for GPs as investors penalise such behaviour through smaller follow-on-funds.

3.2 Primary buyouts vs. secondary buyouts

The evidence on value creation in SBOs versus PBOs is ambiguous. Using a proprietary, global sample of PE deals, Achleitner and Figge (2014) do not find that SBOs have lower equity returns or offer less operational performance improvements than PBOs. However, SBOs employ more leverage after controlling for credit market conditions at the time of transactions, which is attributed to reduced informational asymmetries in an SBO setting. They also find that SBOs, on average, are valued at higher multiples than PBOs, a premium driven by greater

accessibility to debt financing, in turn facilitated by lower informational asymmetry. Bonini (2015) provides evidence suggesting that SBOs do not exhibit incremental operating performance compared to their peer sample and underperform versus PBOs, which create significant efficiency gains. Contrary to Achleitner and Figge, this paper supports the conventional wisdom on value creation in SBOs. Further, the study illustrates that returns to PE investors are largely positive for PBOs and SBOs, although significantly lower for SBOs. However, Kick and Schwetzler (2024) criticise his methodology of purely basing the operating performance comparison on back-to-back deals instead of including all PBOs irrespective of exit channel to avoid selection bias. Additionally, one could argue that the time window employed from one year prior to the first buyout to two years after the second buyout cannot adequately assess the true realised performance over the second holding period.

Kick and Schwetzler (2024) suggest that the current perception on SBOs should be revised from "second hand" deals to "second generation" deals. The authors match SBOs and PBOs of similar size and holding period and do not find significant differences in returns. They conclude that similar buyouts yield similar investor returns independent of whether the investment was a PBO or an SBO. Similarly, there is no indication of significant differences in operating performance. However, the study indicates that SBOs outperform matched back-to-back PBOs if the SBO's first round deal was a small or medium-sized enterprise (SME). This suggests that the first-round owners provide a valuable foundation of a professionalised asset, supporting the SBO's performance. The authors propose that PE firms select high-performing first-round deals for an SBO, as they outperform first-round deals exited to a non-PE owner. In general, this paper concludes that PE ownership likely leads to significant changes in the characteristics of a company, transforming the company at PBO entry to another company at SBO entry. This observation resonates with Wang (2012) who provides evidence of SBOs showing better performance in producing operating cash flows compared to PBOs, but a worse performance in generating earnings. In the case of SBOs, increased profits seem to be achieved through expansion rather than efficiency gains.

3.3 IPO underpricing

Researchers suggest that IPOs must be priced below their fundamental value. Ljungqvist (2007) categorises the reasons into asymmetric information, institutional reasons, control considerations and behavioural approaches. The asymmetric information-based models are the most widely established. In his seminal paper, Rock (1986) introduced the "winners curse problem". Rock proposes that underpricing is necessary to attract uninformed investors, leading to underpricing becoming an equilibrium feature of public offerings. Building on this theory, Beatty and Ritter (1986) emphasise that there exists an equilibrium relationship between the

expected underpricing of an IPO and the ex ante uncertainty about its value. They argue that this underpricing equilibrium is enforced by the investment banking industry, being involved in many IPOs over time. The lower the degree of over-subscription in an IPO, the higher the probability for a representative investor to be allocated shares. Consequently, investors face a "winner's curse": if one is allocated the requested number of shares, one can expect that the initial return will be less than average. Hence, a representative investor will only submit purchase orders if, on average, IPOs are underpriced. The magnitude of the underpricing is conditional on the ex ante uncertainty about the value of an issue because the winner's curse problem intensifies as ex ante uncertainty increases. Although most companies only go public once and therefore lack incentive to "leave money on the table", the underwriting investment banks must balance relationships with the issuers and the investors, ensuring a functioning equilibrium mechanism. Ljungqvist describes institutional theories as focusing on litigation, banks' price stabilising activities and taxes. Control theories propose that underpricing helps in shaping a desirable shareholder base, thereby reducing intervention by outside investors. Lastly, behavioural theories assume the presence of irrational traders bidding up the price following an IPO beyond the fundamental value, or issuers putting insufficient pressure on the underwriting investment banks to reduce underpricing.

The degree of IPO underpricing is significantly impacted by the issuer and the underlying ownership prior to the floatation. Levis (2011) states that, although benefits of the PE model accrue during the period a company is under PE control, it is reasonable to expect that management and financial practices established at that time will be maintained for some time following the exit. When it comes to IPOs, this is strengthened by the fact that PE firms are responsible for the structure, terms and timing of the issuance. Similarly, lock-up agreements, performance incentives and liquidity considerations usually result in PE firms retaining significant, although reduced, stakes for a considerable time period following the IPO. This maintained involvement of the PE firm facilitates continued close monitoring and reduced information asymmetries, and potential conflicts of interests, with other stakeholders. Therefore, the author argues that studying PE-backed IPOs provides an opportunity to enrich the research on the impact of the PE model in general, offering a wider perspective of its contribution through the full length of the involvement.

According to Bergström et al. (2006) PE-backed companies may be classified as high-quality companies given the extensive resources in terms of capital, industry experience and the active, professional management put in place. PE firms should be reluctant to float companies of low quality. Given the higher degree of publicity surrounding an IPO compared to other exit routes, the reputation, which will impact future fundraising and exit opportunities, is at greater risk. In this respect, PE firms can be viewed as a certification effect concerning

the quality of the company going public, decreasing the cost of investors' research activities. Returning to the argument put forward by Beatty and Ritter (1986), PE-backing is expected to reduce the ex ante uncertainty since the information is likely to be more homogeneously spread amongst investors. This is because such IPOs offer greater publicity and transparency, further contributed to by fund LPs' scrutiny of PE owned companies during their investment period. Greater information dispersion should decrease the asymmetry between investors and consequently the ex ante uncertainty of the fundamental value of the issuing firm. This leads to fewer investors engaging in costly information acquiring activities, alleviating the adverse selection problem. Further, the authors state the fact that underwriting investment banks may be less incentivised to underprice PE-backed IPOs as they stand to gain from repeated business with the PE firms.

There is an agreement among researchers that PE-backing is associated with lower IPO underpricing. Levis (2011) find that PE-backed IPOs in the UK experience lower underpricing than other IPOs, attributed to the relatively lower risks of such issues. Revisiting the categorisation by Ljungqvist (2007), this evidence argues that asymmetric information decreases under PE-backed IPOs. Further, Levis finds that PE-backed IPOs, on average, are larger in terms of market capitalisation, total assets and sales, are more profitable and maintain higher levels of debt. Likewise, Bergström et al. (2006) confirm lower underpricing among PE-backed IPOs in the UK and France, as well as PE-backed IPOs being larger than non-PE-backed IPOs. Larger firms, and hence larger issues, are associated with greater availability of information and larger fractions of institutional ownership. However, the study finds that the timing of the IPO and the size of the issue seem to have larger effects on underpricing than the presence of a PE owner. Lastly, Cao and Lerner (2009) observe lower underpricing among PE-backed IPOs compared to other offerings in the US.

3.4 After-market performance

For a more comprehensive examination of public market reception, it is also insightful to study the after-market performance. In their paper, Loughran and Ritter (1995) establish that IPOs severely underperform relative to non-issuing firms five years after the offering date. This is while the traditional measure of risk, beta, is slightly higher for issuing firms than non-issuing firms, implying that IPOs in fact possess a higher expected return. Further, the results cannot be sufficiently explained by long-term return reversals, size or book-to-market effects. The authors put forward multiple potential explanations for the low returns. First, it could be the case that there are yet unidentified risk factors driving this outcome. Second, it could be caused by investors' ignorance in valuing companies when they go public. Investors seem to systematically misestimate the probability of finding a big winner. Third, issuing firms have

typically had recent improvement in operating performance. The market seems to overweight such recent improvement and underweight long-term, mean-reverting tendencies in operating performance measures.

Discussing ownership structure and investor composition, Bergström et al. (2006), provide insights on post-IPO price dynamics of PE-backed offerings. PE firms tend to retain a large fraction of shares in the IPO before reducing their ownership stake gradually, creating a possible pattern where PE-backed IPOs experience a price appreciation over a shorter period of time before deteriorating in the long run. PE-backed IPOs are associated with larger allocations of shares to institutional investors eager to be allocated shares in forthcoming PE-backed IPOs, motivating them to support the price for a longer period compared to non-PE-backed IPOs. Underwriting investment banks may also stimulate the price of PE-backed IPOs during lock-up periods to strengthen their position to win lucrative business in the future. According to the divergence of opinion theory, those investors with the highest expectations of the future performance of the issuing firm are those investors buying into the IPO, pushing the price upwards. As an increasing amount of information becomes available post floatation, investors become more homogenous in their expectations and concentrate them around the true fundamental value of the company. The divergence of opinion should be narrower in a PE-backed IPO because of the greater amount of information available prior to the IPO, leading to more modest price adjustments in the post-IPO period. Further, as overoptimistic investors reassess their expectations in the after-market, they provoke downwards pressure on the stock price. Given the expectation that irrational investors hold a relatively larger share of smaller firms, such behaviour may be particularly prevalent in these firms, as they appear riskier and are harder to value due to limited public information.

Previous papers argue that PE-backed IPOs outperform other offerings in the after-market. Cao and Lerner (2009) study the long-run performance of PE-backed IPOs in the US and find that PE-backed IPOs consistently outperform their non-PE-backed counterparts based on BHARs. The authors construct calendar-time portfolios comprising all PE-backed IPOs issued within the preceding 36 months and estimate Fama and French (1993) regressions to evaluate risk-adjusted returns. By accounting for the portfolio's loading on systematic risk factors, they assess the presence of abnormal performance. The results indicate no statistically significant outperformance for either equally-weighted or value-weighted portfolios, suggesting that the superior performance in BHARs may be attributed to risk factor exposure. Similarly, Levis (2011) studies the after-market performance of PE-backed IPOs in the UK, measured as BHARs, providing evidence of PE-backed IPOs outperforming non-PE-backed IPOs. Conversely, Levis rejects the outperformance stemming from market risk, size or book-to-market effects due to the significant positive intercepts in the Fama and French (1993) regressions. Bergström et al.

(2006) confirm the after-market outperformance of PE-backed IPOs, measured as cumulative abnormal returns, in the UK and France.

Researchers are trying to identify the underlying reasons behind the after-market outperformance of PE-backed IPOs. Levis (2011) argues that PE-backed IPOs are more profitable and efficient compared to other IPOs, potentially indicating that investors are surprised by the marked reduction of debt and strong operating performance in the three years following the IPO. Further, the study finds a positive relationship between the relative superior long-term performance of PE-backed IPOs and the proportion of equity maintained by the PE firm as well as the amount of leverage immediately after floatation. Furthermore, the paper elaborates on how characteristics like firm age, underwriter reputation, initial price multiples, firm size and book-to-market ratios are related to long-term after-market performance according to previous literature. PE ownership appears to enhance a number of such value-creating features. Cao and Lerner (2009) identify a declining trend in the performance of PE-backed IPOs over time, with the exception of those brought to market by larger PE firms showing relatively better performance in recent years. They also address the historical criticism that PE firms often bring highly leveraged firms to market, which subsequently experience significant price declines. Indeed, the study finds that PE-backed IPOs tend to be substantially more leveraged than other IPOs. Nevertheless, the analysis reveals no significant differences in post-IPO performance based on the level of leverage among PE-backed IPOs.

3.5 Hypotheses development

The integral role of governance engineering in the PE model to drive operational value creation and realise financial returns is highlighted by Kaplan and Strömberg (2009), Zong (2005) and Wright et al. (2009). By ensuring management's incentive through co-ownership, mitigating free cash flow problems, quickly replacing non-performing management teams and by active monitoring and involvement, PE-backed companies exhibit particularly strong governance. This results in transparency, credibility and accountability, aspects valued by public investors.

Examining the cross-sectional variation in characteristics between SBOs and PBOs, Achleitner and Figge (2014) attribute the higher valuation multiples and leverage observed in SBOs to reduced informational asymmetry. This implies that PE ownership enhances transparency, disclosure standards and company reputation. Bonini (2015) argues that SBOs exhibit a lower risk profile due to their demonstrated capacity to generate stable cash flows and operate under the strict requirements of PE owners, including high levels of transparency and disclosure. As such, an additional round of PE ownership should extend this credible track record. Kick and Schwetzler (2024) propose that initial PE owners can contribute by professionalising portfolio

companies, thereby establishing a robust foundation for subsequent PE owners. Collectively, these insights support the view that an additional round of PE ownership should reduce ex ante uncertainty and perceived risk from the perspective of public market investors.

As concluded by Beatty and Ritter (1986), IPO underpricing is conditional on the ex ante uncertainty about the value of an issue. As recognised, SBOs seem to be perceived as having lower ex ante uncertainty than PBOs. This leads to the formulation of our first hypothesis: SBO-backed IPOs exhibit lower underpricing than PBO-backed IPOs.

The risk-diminishing characteristics associated with SBOs should yield a lower risk premium, resulting in an inferior long-term abnormal performance compared to PBOs, all else equal. We argue that this risk premium is not absorbed by conventional systematic risk factors. Hence, we formulate our second hypothesis accordingly: SBO-backed IPOs exhibit lower long-term abnormal performance than PBO-backed IPOs.

4 Data

4.1 Data collection and sample construction

This study is based on IPOs from 1990 until 2021 on the US stock market. The lower boundary of 1990 is set for two reasons. First, the underlying data and availability of companies and transactions prior to 1990 are of lower quality. Strömberg (2008) states that Capital IQ may under-report PE transactions before the mid-1990s, and smaller transactions in particular. Second, including IPOs made in the early 1990s captures PE transactions made in the late 1980s. According to Kaplan and Strömberg (2009), transaction values peaked in 1988. Hence, setting a lower boundary at a later point in time would risk excluding transactions of significance, thereby justifying the inclusion of the early 1990s even if this period might not be fully exhaustive. The upper boundary of 2021 is set to guarantee the availability of 36 months of stock price data for all IPOs. From a geographical perspective, studying PE-backed IPOs being listed in the US serves as an optimal opportunity to study short- and long-term price behaviour. American transactions make up approximately 50% of global PE transactions according to data from Capital IQ. Further, the data quality and availability is generally higher in the US, leading to a more robust sample. Moreover, the definition of underpricing rests on the assumption that the price equals the true fundamental value of the company after one day of trading. This assumption requires highly liquid markets which is the case in the US, however not globally.

Data are gathered from Capital IQ's database. We use the "Companies" screening tool and perform two data pulls. First, we obtain a complete list of IPOs with the "Leveraged Buy Out (LBO)" feature which is assigned when a sponsor, management, individual or strategic buyer acquires a mature business through a combination of equity and debt. It is only applicable to transactions where majority stakes (i.e., 50% or more) are being acquired. Second, we retrieve a similar list of IPOs with the "Secondary LBO" feature, assigned when the target is a strategic company and the buyer and the seller are sponsors, management or individuals. Further, the buyer is acquiring the target through a leveraged buyout, meaning that the LBO feature is applied indirectly. Lastly, the seller has previously acquired the target through a leveraged buyout, leading to two consecutive LBOs.

As a next step, we perform a thorough manual procedure to consolidate the data and remove non-desirable data points. As the PBO sample also contains the IPOs from the SBO sample, we have to account for overlap prior to consolidating the data sets by removing duplicates from the PBO sample. Further, as we aim to analyse the public market perception of IPOs conditional on previous ownership, all IPOs occurring before the LBOs are removed. Moreover, we solely study companies going public for the first time as including companies having been listed

previously would risk distorting our analysis by adding noise to our model through increased asset awareness among public market investors, independent of the rounds of PE ownership. Additionally, our study exclusively focuses on PE-backed IPOs. As such, all LBOs done by another type of sponsor (e.g. a VC firm or investment company), management, an individual or a strategic buyer are removed. However, distinguishing between previous PE- or VC ownership is not always straightforward to do in practice. As Levis (2011) notes, this is due to the overlapping nature of the sponsors' involvement in PE and VC transactions, making the distinction ambiguous. As a consequence, to ensure highest possible precision in our data, we manually research each IPO carefully to verify PE involvement on a case-to-case basis. This is done by considering the sponsor's characteristics, the stage of investment and the presence of syndicates. VC firms generally invest in early-stage companies, spread investments across multiple rounds and engage in syndicates with other investors. This manual review also allows us to identify some additional SBOs which are not part of the initial SBO sample from Capital IQ, further enhancing the accuracy of our sample. Private markets are opaque by nature, which is effectively what poses the main challenge when studying such transactions. In other words, this is an obstacle shared by all researchers in the field. However, by combining the screening tools with case-by-case analysis, it is managed to the largest extent possible and should not bias our results.

Our underpricing variable is calculated as the difference between the first-day closing price adjusted for stock splits and the IPO price, divided by the IPO price. All values are sourced from Capital IQ. In some cases, either the adjusted closing price or the IPO price is missing from our initial data pull. To address this, we collect complementary data from alternative sources, such as news articles and filing reports. Some observations are simply missing because the IPO has been withdrawn and are excluded from the sample. When the IPO price is missing, it is usually retrievable from public sources. Missing first-day closing prices typically results from inconsistencies between the reported IPO date and the actual first day of trading. In such instances, we manually identify the correct listing date and replace the missing first-day closing price provided that it occurred shortly after the reported IPO date. Observations are excluded if the discrepancy is substantial. After constructing a complete dataset, we verify that the majority of outliers reflect genuine underpricing patterns. This is confirmed by cross-checking the top and bottom 10% underpricing observations with news reports and alternative calculations, such as comparing opening and closing prices on the first day of trading. Erroneous observations are mostly due to incorrect or missing adjustments for stock splits and are corrected accordingly. As a final robustness measure, we winsorise the underpricing variable at the 1% level to mitigate the influence of extreme outliers.

Finally, we account for firms that have been delisted during the observation period. Consistent

with the methodology of Bergström et al. (2006), we retain all delisted firms in the sample regardless of the reason for delisting in order to avoid survivorship bias. Delisting events may result from companies being acquired or filing for bankruptcy. Consequently, the average holding period across the sample falls short of the predefined horizon used in the BHAR analysis. Nevertheless, the resulting returns remain representative of what a rational investor would realise in practice, under the assumption that any proceeds received at the time of delisting are reinvested in the market, thereby yielding a neutral abnormal return from that point onward. In addition, the use of equally-weighted portfolios assumes a proportional reinvestment of proceeds across all remaining stocks, while value-weighted portfolios simulate reinvestment based on the relative market capitalisation of each residual stock. Delistings constitute approximately 15% of the full sample, with an equal distribution across the subgroups. This suggests that the analysis is not affected by imbalances in delistings between the two groups.

4.2 Final sample

The final sample consists of 376 PE-backed IPOs, comprising 58 SBO-backed and 318 PBO-backed offerings. This is notably smaller than the 526 PE-backed IPOs examined by Cao and Lerner (2009). We attribute this deviation to four factors. First, our analysis relies solely on Capital IQ as the data source, whereas Cao and Lerner integrate four different sources, including Capital IQ. They acknowledge that Capital IQ's coverage declines for earlier periods, which poses a potential limitation to the consistency of our sample construction. However, this concern is mitigated by starting the sample period in 1990, compared to their sample period starting in year 1981. Second, we exclusively include companies going public for the first time to isolate our analysis to the impact from previous PE ownership. Thus, we exclude noise from the degree of asset familiarity among public investors sourcing from previous public trading. Meanwhile, Cao and Lerner include all PE-backed IPOs irrespective of historical ownership structure. Third, we apply a more stringent criterion, requiring that the LBO preceding the IPO involves a majority stake. Although Cao and Lerner deliberately exclude VC-backed IPOs, their methodology does not ensure full control by the PE firm, which we consider essential to the focus of our study. Fourth, we exclude observations with non-exhaustive data to prioritise data accuracy and consistency, sometimes at the expense of sample size. In contrast, Cao and Lerner apply varying sample sizes across different analyses. For instance, their return analysis includes only firms listed in CRSP, thereby reducing their effective sample to 437 PE-backed IPOs. All in all, we do not consider the discrepancy in sample size to compromise the validity or representativeness of our dataset.

5 Methodology

5.1 Underpricing methodology

Bergström et al. (2006) state that underwriting investment banks could be less incentivised to underprice PE-backed IPOs while Cao and Lerner (2009) find that PE-backed IPOs use more reputable underwriters. In other words, previous studies are affected by the intermediaries' underlying motivations and reputation. Our study, however, compares two groups of PE-backed IPOs expected to have similar preferences and be treated equally by the underwriting investment banks. According to the categorisation by Ljungqvist (2007), institutional theories are consequently neutralised in our model. This constitutes a considerable strength of our analysis and rests on the assumption that there is no systematic difference in the type of PE firms performing SBO- and PBO-backed IPOs. Additionally, we anticipate no material difference in the construction of the new shareholder base following the IPO across the two groups, cancelling out the effect from control theories and behavioural theories. Consequently, we isolate the analysis purely on investor perception and information asymmetry. We follow the conventional procedure in academic literature to analyse initial returns of IPOs, adopted by e.g. Levis (2011), defined as the difference between the closing price of a stock on the first day of trading and its respective offering price as a percentage of the offering price.

$$Underpricing_i = \frac{P_{c,i} - P_{o,i}}{P_{o,i}},$$

where $P_{c,i}$ and $P_{o,i}$ denote the closing price and the offering price of IPO i.

More specifically, we collect the IPO price, which is compared to the closing price on the first day of trading adjusted for any stock splits, ensuring consistency in price units when calculating the underpricing. Further, we collect control variables to capture potential cross-sectional differences between SBO- and PBO-backed IPOs. Replicating Bergström et al. (2006), we use a regression model to examine the effect on IPO underpricing stemming from a particular group affiliation, in our case an SBO- or PBO-backed IPO. Heteroscedasticity-robust standard errors are applied to address potential non-constant variance across residuals, ensuring valid inferences. Standard errors clustered by industry or year are dismissed due to the low number of groups posing a risk of downward-biased standard errors, and the appearance of groups with few observations weakening the reliability of the variance estimation within each cluster. To study the difference in IPO underpricing between SBO- and PBO-backed IPOs, we run the following regression.

$$Underpricing_i = \alpha_i + \beta_1 SBO_i + \beta_2 Grossproceeds_i + \beta_3 HotIPOmarket_i + \gamma_j + \epsilon_i$$

1. *Underpricing.* Our dependent variable is the IPO underpricing. It is winsorised at the 1st and 99th percentiles to mitigate the influence of outliers and improve the robustness of the regression estimates.

2. *SBO.* We use a dummy variable equalling 1 if the IPO is SBO-backed and 0 if it is PBO-backed. This variable serves as the key independent variable in testing whether underpricing differs systematically between the two groups of PE-backed IPOs.

3. *Gross proceeds.* The offering size is defined as the issuer's gross proceeds from the IPO, i.e., the proceeds from primary and secondary shares sold before IPO-related expenses. Bergström et al. (2006) state that greater issuance size decreases ex ante uncertainty and consequently expected underpricing. To prevent skewness from influencing the results, we apply a natural logarithmic transformation of the variable.

4. *Hot IPO market.* We account for the IPO cycle on an industry level in line with Wang (2012) using a dummy variable. The industry IPO market is considered as hot if the number of IPOs in the industry is above the median number of IPOs per year in the industry for the sample period and regarded as cold otherwise. The IPO volume is based on all IPOs across the US stock markets and not limited to PE-backed listings to capture the overall IPO cycle rather than PE specific trends.

5. *Industry, γ.* To control for industry-specific characteristics, the Global Industry Classification Standard (GICS) is considered which defines 11 distinct industries. However, due to the absence of PE-backed IPOs in the utilities sector and inexistence of a comprehensive historical real estate industry index forcing us to drop such observations, our sample contains nine GICS industries.

Next, we estimate a second model to test whether underpricing differs between SBO- and PBO-backed IPOs using an alternative way to treat time-varying characteristics in the IPO market. The model is specified similarly to the first regression and includes our SBO variable, gross proceeds and industry-specific effects. However, instead of treating IPO timing as a binary dummy for hot and cold markets, we account for time-specific variation by introducing year-fixed effects. We do this to account for year-specific variation in IPO activity, offering size and other year-specific factors that might influence the outcome of our regression. Moreover, it reveals years in which the underpricing phenomenon was particularly prevalent. However, leveraging year-fixed effects comes with the downside of potentially overfitting the model and inflating standard errors, especially as some years contain very few observations. Therefore, our two models serve as valuable complements to each other. To further examine the difference in IPO underpricing between SBO- and PBO-backed IPOs, we run the additional regression.

$$Underpricing_i = \alpha_i + \beta_1 SBO_i + \beta_2 Grossproceeds_i + \gamma_j + \delta_t + \epsilon_i$$

The only newly introduced variable in this regression is *IPO year*.

1. *IPO year, δ.* Year fixed effects are included to account for unobserved time-specific factors. Each year captures a unique variation, ensuring consistent treatment of IPOs across time periods. The year fixed effects replace the Hot IPO market variable.

5.2 After-market performance methodology

There is no widely established best-practice approach for assessing after-market performance in academic literature. That said, we have divided up the section on after-market performance into two distinct methodologies. First, we conduct a static analysis of BHARs of individual IPOs in our sample. Second, we study return characteristics with respect to whether the listed company was SBO-backed or PBO-backed by running Fama and French (1993) three-factor model regressions. The intercepts of these time-series regressions are indicators of risk-adjusted abnormal performance for the two groups of IPOs.

Consistent with Cao and Lerner (2009) and Levis (2011), we report BHARs in contrast to cumulative abnormal returns. The choice of method is largely dependent on the underlying assumption of trading strategy. BHARs accurately reflect the return an investor could have realised through a passive multi-period investment by incorporating the compounding effect of returns over time on a deal-by-deal basis. Another important parameter is the time interval. A longer measurement period facilitates the opportunity to observe abnormal performance and identify time-varying performance patterns. A shorter measurement period, on the other hand, allows us to investigate the speed at which potential overoptimistic market expectations are revised. Consequently, we use a measurement period of 36 months but also report BHARs for 12 and 24 months. Extending the measurement period beyond 36 months would be less relevant in this study, as the influence of PE ownership on market perception is likely to have diminished by then. It also enables the inclusion of more recent IPOs in the sample, since a longer return horizon would reduce the number of observations that have been publicly traded during the full measurement period. To clearly isolate the after-market performance from the effects of IPO underpricing and acknowledging that not all investors are allocated shares in the IPO, we exclude the first-day return when calculating each individual BHAR across our sample. We calculate the BHAR by compounding monthly returns for all companies using the closing price reported by Capital IQ.

We calculate both unadjusted (raw) buy-and-hold returns (BHRs) and BHARs accounting for appropriate benchmarks. Raw BHRs reflect the return an investor would have achieved from investing on the day after the IPO and holding the stock over 12, 24 and 36 months, respectively. However, these raw returns neglect the impact that the general stock market and industry-specific characteristics have on firm-specific returns. Hence, in accordance with Cao and Lerner (2009) and Levis (2011), we also measure BHARs using representative benchmarks. To adjust for general stock market movements, we use the value-weighted market return from the Kenneth R. French data library, which includes all CRSP listed firms on the NYSE, AMEX and NASDAQ. In order to control for industry-specific effects on return behaviour, we use sector-level returns based on the GICS obtained from Capital IQ. Each company's raw BHR return is then benchmarked against its corresponding industry portfolio.

$$BHAR_{i,T} = \prod_{t=1}^{T}(1 + r_{i,t}) - \prod_{t=1}^{T}(1 + r_{b,t}),$$

where $r_{i,t}$ and $r_{b,t}$ are the raw returns on IPO i and benchmark b at month t. $BHAR_{i,T}$ is the buy-and-hold abnormal return on IPO i over the given time horizon T.

The calculation of BHAR for each individual stock in our sample serves the purpose of aligning our study with previous literature. This facilitates benchmarking and enables comparability with similar studies. While BHARs are commonly employed across research in the field of PE-backed IPOs, and we follow this convention, it should not be regarded as a suitable tool to draw conclusions about systematic differences between SBO- and PBO-backed IPOs. In general, this is because of large variations in timing, firm-specific characteristics and market conditions across IPOs in our sample. BHARs do not account for these factors and as such only serve as a tool to illustrate broad return patterns across the dataset, rather than support statistical interpretation. Accordingly, BHAR figures are presented in Section 6 and discussed in relation to previous literature.

To formally test whether the extent of prior PE ownership has a systematic influence on after-market performance, we implement two complementary methodologies based on the Fama and French (1993) three-factor model in line with Cao and Lerner (2009) and Levis (2011). This approach intends to address the inherent difficulty of drawing inferences from BHAR calculations due to timing- and firm-specific differences across the sample. For each firm in our sample, we collect daily stock price data starting from the day after the IPO in order to exclude the effect from underpricing. The data is structured in panel format and each observation is cut off at the earliest of 36 months and the delisting date if applicable. When testing this dataset, we first conduct stock-level regressions for each company in our sample, collecting coefficients and testing any statistical differences across SBO- and PBO-backed IPOs.

Second, we construct rolling portfolios replicating what risk and return an investor would get if algorithmically investing in all SBO- or PBO-backed IPOs and held each stock for 36 months. These portfolios are regressed with the Fama and French three-factor model on an equally- and value-weighted basis.

In the first set of statistical tests on after-market performance, we estimate a Fama and French (1993) three-factor model regression for each company in our sample over the 36-month holding period. For all individual stocks and indices, monthly returns are calculated by compounding daily returns during the period, which form the basis of the model. The purpose of estimating stock-level regressions is to extract each stock's abnormal return and factor loadings, thereby capturing performance adjusted for systematic risk exposures. After estimating the model for each company in our sample, we compare means of the intercept and the exposure on the market, SMB and HML factors between SBO- and PBO-backed IPOs to identify any systematic differences across the two groups. To assess the statistical significance of the respective group means, we employ conventional standard errors. Subsequently, we evaluate the significance of the inter-group differences in means using two-sample z-tests. We run the following regression on every stock in our sample.

$$R_{i,t} - R_{f,t} = \alpha_{i,t} + \beta_1(R_{m,t} - R_{f,t}) + \beta_2 SMB_t + \beta_3 HML_t + \epsilon_{i,t}$$

1. *Stock excess return,* $R_i - R_f$. The monthly excess return of IPO i. Calculated as the difference between the monthly return of the stock and the monthly return of the risk-free rate, which is the US one-month Treasury bill rate.

2. *Market excess return,* $R_m - R_f$. The monthly market excess return. It is calculated as the difference between the monthly market return, defined as the value-weighted return of all CRSP-listed stocks on the NYSE, AMEX or NASDAQ, and the monthly return of the risk-free rate.

3. *SMB*. The monthly difference between the return on small stocks and large stocks, defined by the market capitalisation.

4. *HML*. The monthly difference between the return of a portfolio of high book-to-market stocks and the return of a portfolio of low book-to-market stocks.

Next, we perform similar tests on after-market performance at the portfolio level. We identify three main advantages of running the models on portfolio-level data. First, we reduce idiosyncratic noise from individual stocks, resulting in more reliable and interpretable coefficients. Second, the longer time-series data at the portfolio level likely observes time-varying exposures in a more representative way. Third, it is a better representation of a real-world investment

strategy, and these regressions directly test its exposure to systematic risk factors. We construct one equally-weighted and one value-weighted portfolio each for SBO- and PBO-backed IPOs. Value-weighted portfolios are composed based on each stock's market capitalisation and are rebalanced monthly. Equally-weighted portfolios are insightful in trying to understand general patterns based on average stock performances and avoid dominance by large stocks. Value-weighted portfolios, on the other hand, better mimic the performance of the portfolios as the weight of poorly performing stocks diminishes while the weight of well-performing stocks amplifies. To test whether coefficients are statistically significant within groups, we use Newey–West standard errors to account for potential autocorrelation and heteroscedasticity in our data. Next, we test the inter-group statistical significance using two-sample z-tests. To study abnormal performance and return behaviour of the two groups, we run the following regression.

$$R_{p,t} - R_{f,t} = \alpha_{p,t} + \beta_1(R_{m,t} - R_{f,t}) + \beta_2 SMB_t + \beta_3 HML_t + \epsilon_{p,t}$$

The only newly introduced variable in this regression is *Portfolio excess return*.

1. *Portfolio excess return,* $R_p - R_f$. The monthly excess return of portfolio p. It is calculated as the difference between the monthly return of the portfolio and the monthly return of the risk-free rate. We calculate one equally-weighted and one value-weighted portfolio for the SBO- and PBO-portfolio.

We perform a number of additional tests aimed at affirming the robustness of our results as well as studying our research question from complementary perspectives. These tests are further elaborated in Section 7.3.

6 Comparative statistics

6.1 General comparison

Appendix A provides details of the annual composition for the sample of 376 PE-backed US IPOs, of which 58 are SBO-backed and 318 are PBO-backed. This corresponds to 15% and 85% of the sample, respectively. A total of $494 billion in market capitalisation has been introduced to the US equity market by PE firms during the period, while $104 billion has been issued to the public. SBO-backed IPOs account for 17% of the market capitalisation and 21% of gross proceeds. Equivalently, PBO-backed IPOs represent 83% of the market capitalisation and 79% of gross proceeds. Further, the table reflects the high volatility and noticeable cycles of the IPO market. The sample contains two periods of particularly significant activity, namely 1996-2000 and 2005-2007. These two periods constitute 51% of the entire sample's observations. The cluster of observations prior to the year 2001 is consistent with the sample composition of Cao and Lerner (2009), and is attributed to the evidenced peak of IPO activity in the years leading up to the dot-com bubble in 2000, whereas the second cluster precedes the global financial crisis in 2008. We note a difference in the proportion of total SBO- and PBO-backed IPOs occurring during these two periods being 31% and 55%, respectively. While this indicates that SBO-backed IPOs take less advantage of windows of opportunity for a successful exit, SBOs have become increasingly common over time, as stated by Kaplan and Strömberg (2009). Hence, the number of SBO-backed IPOs prior to 2005 was very few according to our data, meaning no such conclusion can be drawn.

Naturally, PE-backed IPOs have become larger over time, although exhibiting great variations from year to year, a trend similarly observed by Cao and Lerner (2009). Neither for market capitalisation nor issuance size can we find a clear pattern between the number of IPOs and the average size of the IPOs. Bergström et al. (2006) expect positive investor sentiment to contribute to average issue sizes being greater during high volume years. On average, SBO-backed IPOs are larger in terms of market capitalisation ($1.5 billion) compared to PBO-backed IPOs ($1.3 billion). The same holds true for gross proceeds where SBO-backed IPOs average $368 million, while PBO-backed IPOs average $259 million. A closer examination reveals that the average gross proceeds in relation to market capitalisation, i.e., the share of the company being sold in association with the IPO, is higher for PBO-backed IPOs (63%) than for SBO-backed IPOs (41%). This finding relates to Bergström et al., who report that the average PE-backed IPO has gross proceeds equivalent to approximately 46% of its post-IPO market capitalisation. Levis (2011) finds a positive relationship between the relative superior long-term performance of PE-backed IPOs over non-PE-backed IPOs and the proportion of equity maintained by the PE firm. Nevertheless, the presence of non-PE sellers, the lack of information

on primary versus secondary issuances and post-IPO sell downs limit our ability to form a comprehensive picture of PE ownership retention. A further analysis demonstrates that 29% of all PE-backed IPOs in the sample have a market capitalisation at or above $1 billion once they go public. For SBO-backed IPOs this figure increases to 43%, while the corresponding proportion for PBO-backed IPOs equals 27%. This provides insights into the cross-sectional differing characteristics between the two groups as greater market capitalisation and issuance size decrease ex ante uncertainty of an IPO and as a result the expected underpricing.

The two groups also differ somewhat in terms of industrial distribution. Table 1 presents the number, market capitalisation and gross proceeds of all IPOs per industry. The proportion of IPOs in both consumer discretionary and industrials is approximately 20% for the overall sample, as well as for both SBO- and PBO-backed IPOs individually, highlighting the dominance of these industries in PE transactions. In general, the industrial distribution aligns well with the sub-sample of PE-backed IPOs employed by Levis (2011), where industrials and consumer services are two major industries, while utilities, oil and gas and telecommunications are less dominant. However, our sample has a higher proportion of healthcare IPOs (13.8%) compared to his sample (3.4%). This difference is likely attributable to the geographical focus of his study, which examines IPOs on the UK stock exchange, where the biotechnology sector is relatively less prominent than in the US, a point explicitly noted by Levis.

SBO-backed IPOs have approximately double the proportion of consumer staples observations (10.3%) compared to PBO-backed IPOs (5.0%), potentially suggesting that such assets are particularly suited to the PE-ownership model compared to other industries. In contrast, the financials sector represents more than double the proportion of PBO-backed IPOs (9.7%) compared to SBO-backed IPOs (3.4%), possibly indicating opposite characteristics of the consumer staples industry. Jenkinson and Sousa (2015) find that companies with higher debt capacity resulting from stable cash flow profiles and limited capex needs have a higher probability of ending up as an SBO target. Since such characteristics differ across industries, a somewhat varying distribution between SBO- and PBO-backed IPOs is to be expected. However, these relationships could simply be a coincidence and should be interpreted cautiously. Further, there is a significant difference in the proportion of healthcare SBO-backed IPOs, if measured by the number of observations, market capitalisation or gross proceeds. A similar pattern can be found for PBO-backed IPOs in communication services, where the proportion of observations deviates from that of market capitalisation. These relationships indicate the presence of IPOs of considerable size in these industries. Differences in industrial distribution across the two groups are intriguing, as they may impact after-market performance.

Table 1: Industry composition of IPOs by number, market cap and gross proceeds

	% Number			% Market cap			% Gross proceeds		
Industry	**All**	**SBO**	**PBO**	**All**	**SBO**	**PBO**	**All**	**SBO**	**PBO**
Communication services	6.9	5.2	7.2	13.8	6.3	15.4	8.4	5.5	9.1
Consumer discretionary	21.5	20.7	21.7	20.2	15.8	21.2	19.2	11.2	21.3
Consumer staples	5.9	10.3	5.0	5.4	7.1	5.1	4.8	8.3	3.9
Energy	4.0	5.2	3.8	2.7	6.1	2.0	4.1	5.1	3.8
Financials	8.8	3.4	9.7	6.7	2.1	7.6	8.6	2.9	10.1
Healthcare	13.8	15.5	13.5	11.8	37.3	6.5	14.1	36.9	8.2
Industrials	21.0	20.7	21.1	20.8	13.9	22.2	24.8	18.4	26.4
Information technology	15.2	15.5	15.1	17.0	9.9	18.4	13.6	9.7	14.7
Materials	2.9	3.4	2.8	1.6	1.5	1.7	2.4	1.9	2.5

This table shows the industry composition of PE-backed IPOs in terms of number, market capitalisation and gross proceeds. The sample is distributed across nine GICS industries.

Table 2 presents summary statistics for the size, operating performance and valuation of the two groups of IPOs. Specifically, it reports the median values of gross proceeds, enterprise value, market capitalisation, assets, revenue, EBITDA, EBITDA margin, asset turnover, net debt/EBITDA, EV/EBITDA and book-to-market. For companies in the financials sector, reported operating income is used instead of EBITDA. All estimates are computed at the time of the IPO, during the fiscal year of the IPO or on rare occasions using the closest available data point. As discussed above, there is a clear difference in terms of size between SBO- and PBO-backed IPOs. The table illustrates that this not only holds true for gross proceeds and market capitalisation, but also for enterprise value, assets, revenue and EBITDA. While the relative size difference is proportional across most metrics, it stands out when comparing the asset base between the groups. We see no notable differences in either EBITDA margin or asset turnover between the two groups, implying equal levels of efficiency once going public. This pattern aligns with the findings of Wang (2012) that SBOs generally add value through expansion rather than increased efficiency, as well as Kick and Schwetzler (2024) showing evidence of SBOs tending to be larger but failing to find significant differences in operating performance.

Moreover, the table reveals that SBO-backed IPOs exhibit higher levels of leverage (3.75x EBITDA) relative to PBO-backed IPOs (2.17x EBITDA). Achleitner and Figge (2014) argue that SBOs employ more leverage at the time of acquisition because of greater accessibility to debt financing thanks to lower information asymmetry. It should, however, be stressed that the precision of the leverage ratio in connection to the IPO is sensitive to the flotation in relation to

the fiscal year-end. Finally, we observe variation in valuation multiples. The EV/EBITDA multiple is slightly higher for SBO-backed IPOs (11.4x) than for PBO-backed IPOs (10.8x). This is reasonable as SBOs typically are acquired at higher multiples as a consequence of higher leverage and lower informational asymmetry according to Achleitner and Figge. Further, Table 14 in Appendix B, shows that SBOs go public at higher multiples in six out of nine industries, suggesting that industry affiliation is unlikely to be the primary driver of valuation differences. In contrast, the book-to-market ratio is higher for SBO-backed IPOs (0.36x) than for PBO-backed IPOs (0.27x), indicating that PBO-backed IPOs go public at a relative premium compared to SBO-backed IPOs. We see a clear link between this valuation difference and the disproportional relative size difference in the asset base. One possible explanation could be that SBOs engage in more add-on acquisitions compared to PBOs, as acquisition-driven growth typically results in a larger balance sheet relative to organic growth. This aligns with the argument put forward by Kick and Schwetzler (2024), suggesting that PBOs provide a professionalised foundation which can be further developed by new PE owners, and Wang (2012) arguing that SBOs focus relatively more on expansion than efficiency gains. In this context, the optimised company can be viewed as an asset facilitating additional growth through acquisitions. However, Table 15 in Appendix B suggests that the outcome may be influenced by industry composition, as SBOs exhibit a higher book-to-market ratio in only four of nine industries, out of which two are the prominent consumer discretionary and industrials sectors.

Table 2: Comparative statistics for the two groups of IPOs

Metric (median)	**All**	**SBO**	**PBO**
Gross proceeds	162	211	155
Enterprise value	825	1,332	774
Market cap	510	826	473
Assets	507	1,154	439
Revenue	423	612	370
EBITDA	58	91	53
EBITDA margin (%)	13.9	14.0	13.7
Asset turnover (x)	0.84	0.84	0.84
Net debt/EBITDA (x)	2.41	3.75	2.17
EV/EBITDA (x)	10.9	11.4	10.8
Book-to-market (x)	0.28	0.36	0.27

This table presents median firm characteristics at the time of IPO across the full sample and the two subgroups. All values are calculated as of, or in close proximity to the IPO date. All metrics are reported in USD millions unless stated otherwise.

6.2 IPO underpricing

Table 3 reports comparative statistics for underpricing for the sample as a whole and the two groups. The average underpricing across all PE-backed IPOs from 17 December 1991 until 1 October 2021 in the US was 13.6%. Cao and Lerner (2009) report an average underpricing of 12.9% for PE-backed IPOs in the US between 1981 and 2003. Moreover, Levis (2011) finds the average underpricing of PE-backed IPOs in the UK between 1992 and 2005 to be 9.1%. Further, Bergström et al. (2006) finds an average underpricing for PE-backed IPOs in the UK and France between 1994 and 2004 of 9.3%. The higher reported underpricing in our study can likely be explained by two factors. First, unlike Cao and Lerner and Bergström et al., our sample includes periods both prior to and following the global financial crisis, capturing greater levels of underpricing across our sample. Second, in contrast to Levis, our US-based sample is likely to have a greater exposure towards the dot-com bubble. In fact, the average underpricing during the 1999-2000 dot-com bubble in our data was 27% whereas the underpricing of PE-backed IPOs in his data was practically unaffected. The author theorises that this is due to the relatively few PE-backed IPOs in London during the period and the low exposure towards the technology sector for such issues. In terms of average underpricing, SBO-backed IPOs exhibit lower numbers (12.5%) relative to PBO-backed IPOs (13.8%) in line with our hypothesis.

For the sample as a whole, and for both groups, the value-weighted underpricing, based on the size of the offering, is lower than the average underpricing, supporting the theory that larger IPOs exhibit lower underpricing, all else equal. This is in line with the findings by Bergström et al. (2006) and Levis (2011) that the average underpricing is largely driven by smaller IPOs. Contrary to the average underpricing, SBO-backed IPOs have a higher median underpricing (9.1%) compared to PBO-backed IPOs (7.8%) indicating the presence of outliers particularly impacting the PBO group. This is further supported by the greater relative difference between hot and cold IPO markets where SBO-backed IPOs have a delta of 3.3 percentage points while the equivalent delta for PBO-backed IPOs is 7.9 percentage points. As SBO-backed IPOs experience lower underpricing than PBO-backed IPOs during hot IPO markets but higher underpricing during cold IPO markets, it could be the case that the hypothesised lower informational asymmetry is especially valuable during booming IPO markets. The higher standard deviation of PBO-backed IPOs points towards more dispersed reactions in general. Indeed, PBO-backed IPOs also have a higher fraction of observations exhibiting negative first-day returns compared to SBO-backed IPOs. According to Bergström et al., the presence of IPO overpricing may potentially be the result of PE firms having lower interest in leaving money on the table than suggested by the theory advocating that they are cautious about excessively aggressive pricing because of reputational concerns.

Table 3: First-day returns for the two groups of IPOs

Metric (%)	All	SBO	PBO
Average underpricing	13.6	12.5	13.8
Value-weighted underpricing	11.3	11.8	11.2
Median underpricing	7.9	9.1	7.8
Average during hot IPO market	15.1	13.5	15.4
Average during cold IPO market	8.1	10.2	7.5
Standard deviation	20.4	15.7	21.3
Proportion negative first-day returns	17.0	13.8	17.6

This table presents various first-day return metrics for PE-backed IPOs, comparing the full sample with the SBO and PBO subgroups. It includes average, median and value-weighted underpricing, performance in hot and cold IPO markets as well as measures of standard deviation and the percentage of observations with negative first-day returns. Underpricing is winsorised at the 1% level.

6.3 After-market performance

Table 4 summarises raw BHRs for all PE-backed IPOs and for the two respective groups calculated until the earlier of the explicitly stated time horizon or the delisting date. After 12 months, 99% of the companies are still publicly traded, decreasing to 93% after 24 months and 86% after 36 months. On average, the PE-backed IPOs exhibit positive returns across all three time horizons, although the 12-month return is higher than the 24-month return meaning that the average return in year two is negative. SBO-backed IPOs, however, tend to deliver positive returns in all three years while PBO-backed IPOs follow the same pattern as the sample as a whole. For all three time horizons, SBO-backed IPOs experience lower returns than PBO-backed IPOs in accordance with our hypothesis. Looking at value-weighted returns, the IPOs display positive returns first after 36 months, suggesting that the average returns after 12 months are inflated by smaller companies. This metric also shows another relationship between the two groups, as SBO-backed IPOs outperform PBO-backed IPOs after 24- and 36-month periods. Another pattern is found over time when assessing median returns, being positive after 12 months but negative after 24 and 36 months. This pattern aligns with that suggested by Bergström et al. (2006), where PE-backed IPOs experience a price appreciation in the short run but deteriorate in the long run once the PE firm reduce their ownership stake step by step. The median returns being significantly lower than the average returns indicate that the average returns are boosted not only by smaller companies, but also by positive outliers. Again, SBOs outperform PBOs after 24 and 36 months which is inconsistent with our hypothesis, although it is important to note that these are raw BHRs and do not account for exposure towards conventional risk factors or timing. In general, there is a high variability in the returns over

time, across the groups and depending on the metric. Long-term performance patterns differing across weighting methods is consistent with Bergström et al.

Table 4: BHRs for the two groups of IPOs

Metric (%)	**All**	**SBO**	**PBO**
Average 12-month BHR	13.3	6.6	14.5
Average 24-month BHR	10.8	10.2	10.9
Average 36-month BHR	22.0	19.8	22.4
Value-weighted 12-month BHR	-3.7	-7.5	-3.0
Value-weighted 24-month BHR	-6.4	-0.5	-7.6
Value-weighted 36-month BHR	3.2	13.3	1.1
Median 12-month BHR	4.8	-1.7	6.3
Median 24-month BHR	-0.7	-0.1	-0.7
Median 36-month BHR	-5.6	1.2	-8.0

This table presents BHRs for PE-backed IPOs over 12-, 24- and 36 months. Results are reported for average, value-weighted and median returns and are shown separately for the full sample, SBO-backed IPOs and PBO-backed IPOs.

Further, Table 5 presents BHARs in relation to the wider development of the US stock exchange over the subsequent explicitly stated time period after each IPO. The underperformance for the sample as a whole, and for the two groups, is notable. This is in stark contrast to the results found by Levis (2011) but relatively aligned with Bergström et al. (2006). Levis finds that PE-backed IPOs, as opposed to VC-backed and non-PE-backed IPOs, outperform the market over 12, 24 and 36 months. Bergström et al., on the other hand, see positive abnormal returns only during the first six months, while negative over three and five years. Our data suggest relationships confirming the findings of Loughran and Ritter (1995) that IPOs severely underperform relative to non-issuing stocks over the long term. Cao and Lerner (2009) find that PE-backed IPOs exhibited stronger buy-and-hold performance prior to 1996, with three-year abnormal returns of 17.6% while post 1995 IPOs performed negatively. This suggests a structural shift in market dynamics, helping to explain the overall underperformance of our more recent sample. Examining the relative performance across the two groups reveals that SBO-backed IPOs underperform across all time horizons when looking at average returns or median returns, supporting our hypothesis. The contrasting evidence to median raw BHRs points towards SBO-backed IPOs typically enjoying more favourable post-IPO market conditions. Again, however, PBO-backed IPOs underperform over 24 and 36 months when looking at value-weighted returns.

Table 5: Market-adjusted BHARs for the two groups of IPOs

Metric (%)	**All**	**SBO**	**PBO**
Average 12-month BHAR	4.2	-2.3	5.4
Average 24-month BHAR	-5.4	-7.9	-4.9
Average 36-month BHAR	-3.5	-8.8	-2.5
Value-weighted 12-month BHAR	-12.9	-16.5	-12.1
Value-weighted 24-month BHAR	-20.7	-16.4	-21.6
Value-weighted 36-month BHAR	-24.1	-18.1	-25.3
Median 12-month BHAR	-6.6	-11.1	-5.7
Median 24-month BHAR	-18.9	-18.9	-18.1
Median 36-month BHAR	-30.7	-36.3	-25.2

This table reports market-adjusted BHARs over 12-, 24- and 36 months for PE-backed IPOs. Results are shown for average, value-weighted and median BHARs and are presented separately for the full sample, SBO-backed IPOs and PBO-backed IPOs.

Lastly, Table 6 provides BHARs relative to underlying industry portfolios over respective time periods after the IPOs. Across all time periods and for all measurement metrics, the returns are higher than the equivalent market abnormal returns. This signals that the clear underperformance in relation to the wider market appears slightly exaggerated, as the PE-backed IPOs seem to have exposure towards industries, on average, not yielding the same returns as the market in general. Still, the IPOs underperform relative to their underlying industries across all time periods and irrespective of the measurement metric, except for average returns over 12 and 36 months. Similar to market abnormal returns, Levis (2011) finds that PE-backed IPOs outperform their industry and Bergström et al. (2006) observe outperformance during the first 12 months and underperformance after three and five years. Constant for all studies, however, is the fact that industry abnormal returns tend to be higher than market abnormal returns.

Table 6: Industry-adjusted BHARs for the two groups of IPOs

Metric (%)	**All**	**SBO**	**PBO**
Average 12-month BHAR	5.8	0.8	6.7
Average 24-month BHAR	-2.3	-2.9	-2.2
Average 36-month BHAR	1.3	-2.3	2.0
Value-weighted 12-month BHAR	-10.2	-12.9	-9.7
Value-weighted 24-month BHAR	-18.0	-15.7	-18.5
Value-weighted 36-month BHAR	-20.4	-15.1	-21.5
Median 12-month BHAR	-4.4	-8.0	-4.2
Median 24-month BHAR	-11.7	-8.9	-12.0
Median 36-month BHAR	-23.6	-30.9	-22.5

This table presents industry-adjusted BHARs over 12-, 24- and 36 months. Results are reported for average, value-weighted and median BHARs and are shown separately for the full sample, SBO-backed IPOs and PBO-backed IPOs.

7 Results

7.1 IPO underpricing

Below, we present the results from regressing the *SBO* variable on *IPO underpricing*. This provides an indication of whether SBO-backed IPOs go public with a lower ex ante uncertainty and, if so, receive a differentiated first-day reception among public investors compared to PBO-backed IPOs. Since the type of issuer is identical in both cases, and hence can be assumed to receive equal treatment by underwriting investment banks and attract similar type of investors, the effect should be isolated to the perception of public market investors.

Table 7 shows that there is no statistically significant relationship between the variable *SBO* and the degree of *IPO underpricing*. In other words, contrary to our hypothesis there is no evidence of a lower ex ante uncertainty resulting in lower underpricing for SBO-backed IPOs. Further, there is unexpectedly no statistically significant effect from the variable *Gross Proceeds*. Bergström et al. (2006) find a significant negative relationship between the issuance size and the level of underpricing on the London Stock Exchange, although not on the Paris Stock Exchange. The average intercept across the industry fixed effects is 8.8%. However, none of the industries show statistical significance and we can consequently not conclude evidence of the underpricing phenomenon, in contrast to Bergström et al. The variable *Hot IPO market* stands out as the single variable with statistical significance, confirming the importance of the underlying activity on the IPO market's impact on underpricing. On average, going public in a hot IPO market climate increases underpricing by 6.8 percentage points. This aligns with previous studies, including Bergström et al., Levis (2011) and Ljungqvist (2007), who also recognise the increase in underpricing under hot market conditions.

Table 7: Regression of *SBO*, *Gross proceeds* and *Hot IPO market* on *Underpricing* with industry fixed effects

Underpricing	Coefficient	Std. err	t	p	95% confidence interval	
SBO	-0.010	0.025	-0.39	0.70	-0.059	0.040
ln Gross proceeds	-0.001	0.011	-0.11	0.91	-0.023	0.020
Hot IPO market	0.068***	0.022	3.04	0.00	0.024	0.112
Ajusted $R^2 = 0.03$				Number of observations = 376		

This table reports the results of an OLS regression of an SBO dummy, controlling for gross proceeds and IPO market conditions, with industry fixed effects, on underpricing. Underpricing is winsorised at the 1% level. Heteroscedasticity-robust standard errors are used. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

While Table 7 clarifies the importance of the timing effect on underpricing in general, Table 8 goes one step further by including year fixed effects to study the effect during narrower time periods. Unsurprisingly, we still lack statistical significance for the variables *SBO* and *Gross proceeds*. Out of the 30 groups of *IPO year*, five of them show statistical significance at a 10% level and are reported in the table. Two of them (1999 and 2000), as to be expected, coincide with periods of large sample sizes. These periods clearly help drive the significance of the variable *Hot IPO market* in Table 7. In 1999, the average underpricing was 28 percentage points higher than the sample period in general, while it was 11 percentage points higher on average during 2000. This echoes the outcome of Bergström et al. (2006) who find positive significant coefficients in 1999 for the London and Paris stock exchanges, and in 2000 for the London stock exchange. However, 1992, 2008 and 2012 only have one, one and seven observations, respectively. In 1992, the significant outcome is driven by the sole observation exhibiting an underpricing of 45%. In 2008, the single IPO experienced an overpricing of 3.6%. As such, no general conclusions can be drawn for these years despite the significant outcomes. Lastly, in 2012 IPOs had a 17 percentage points higher underpricing than the wider sample.

Table 8: Regression of *SBO* and *Gross proceeds* on *Underpricing* with industry- and year fixed effects

Underpricing	Coefficient	Std. err	t	p	95% confidence interval	
SBO	-0.008	0.025	-0.32	0.75	-0.057	0.041
ln Gross proceeds	-0.007	0.013	-0.49	0.62	-0.033	0.020
1992	0.338***	0.065	5.24	0.00	0.211	0.465
1999	0.275***	0.083	3.31	0.00	0.112	0.439
2000	0.109*	0.060	1.81	0.07	-0.010	0.228
2008	-0.108**	0.044	-2.46	0.01	-0.193	-0.022
2012	0.173*	0.098	1.77	0.08	-0.019	0.364
Adjusted $R^2 = 0.07$				Number of observations = 376		

This table reports the results of an OLS regression of an SBO dummy and gross proceeds, with industry- and year fixed effects, on underpricing. Compared to Table 7, year dummies are introduced to account for time-specific effects, substituting the variable *Hot IPO market*. Underpricing is winsorised at the 1% level. Heteroscedasticity-robust standard errors are used. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

7.2 After-market performance

We next display the outcome from regressing the Fama and French (1993) three-factor model on stock- and portfolio excess returns, suggesting whether SBO-backed IPOs and PBO-backed IPOs differ in terms of after-market abnormal performance. This complements the analysis of underpricing in order to understand the two groups' potential difference in public market reception. Apart from the performance, by studying the magnitude and direction of each group's coefficients against the risk factors, we can provide further nuances to the comparison of SBOs and PBOs while being aware of the inherent selection bias stemming from the endogenous choice of PE firms of which assets to exit by taking public.

Table 9 reveals evidence of average negative abnormal performance among SBO-backed IPOs given the statistically significant intercept of -1.0%, while PBO-backed IPOs exhibit an insignif-

icant intercept of -0.2%. This points in the direction of our hypothesis, that SBO-backed IPOs exhibit lower abnormal performance compared to PBO-backed IPOs. However, based on the insignificance in the test comparing the two average intercepts, we cannot draw such a conclusion. In fact, none of the tests comparing average coefficients for SBO-backed IPOs and PBO-backed IPOs show statistical significance. In other words, we cannot infer any differences in characteristics as public companies between the two groups based on these averages. However, apart from significant negative abnormal performance, SBO-backed IPOs show significant exposure towards the market and SMB risk factors. According to these regressions they have an average beta against the market of 1.24, indicating above average systematic market risk. This is likely impacted by the high level of financial leverage discussed above. This is precisely in line with the market coefficient on the equally-weighted portfolio of PE-backed IPOs constructed by Cao and Lerner (2009). Moreover, SBO-backed IPOs have an average exposure to the SMB factor of 0.90, meaning that they tend to perform well when small stocks outperform large stocks. Likewise, PBO-backed IPOs exhibit significant coefficients to the market and SMB factors, but also to the HML factor. They have an average beta of 1.11, an average coefficient to the SMB factor of 0.96 and an average HML exposure of 0.24. Similar to SBOs, this indicates market risk slightly above average and return behaviour correlating with a relative outperformance of small stocks. Lastly, it indicates that PBOs show a mild exposure towards value-oriented stocks. Notably, Levis (2011) finds contradicting results with significant negative exposure to the HML risk factor for an equally- and value-weighted portfolio of PE-backed IPOs, suggesting return characteristics in line with growth-oriented stocks.

Table 9: Fama-French regressions on all individual stocks and inter-group comparisons of coefficients

Stock excess return	SBO	PBO	z	p
Avg. market excess return	1.24***	1.11***	1.01	0.31
(Std. err)	(0.010)	(0.082)		
Avg. SMB	0.90***	0.96***	-0.33	0.74
	(0.146)	(0.123)		
Avg. HML	0.01	0.24**	-1.29	0.20
	(0.141)	(0.106)		
Avg. intercept	-0.010***	-0.002	-1.29	0.24
	(0.004)	(0.004)		
Average adjusted R^2	0.21	0.17		
Number of companies	58	318		

This table reports the results from Fama-French regressions on individual stock excess returns for SBO- and PBO-backed IPOs. The table presents average factor loadings for the market, SMB and HML factors, as well as average intercepts. Average coefficients are tested using conventional standard errors. Z-values and p-values refer to two-sample z-tests on the difference in coefficients between SBO- and PBO-backed IPOs. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

In Table 10 we break down the results from running Fama and French (1993) regressions on equally-weighted portfolios. There is no longer statistical significance in the intercept for SBO-backed IPOs, nor for PBO-backed IPOs. Thus, we cannot establish negative abnormal performance for the two groups of IPOs, as indicated by the intercepts. Similarly, we cannot validate any differences between the groups. Likewise, Cao and Lerner (2009) report an insignificant intercept for their equally-weighted portfolio of PE-backed IPOs. However, Levis (2011) finds significant abnormal performance for an equally-weighted portfolio of PE-backed IPOs of 0.8%. Interestingly, the order of magnitude of the coefficients on the market risk factor changes as SBO-backed IPOs exhibit a lower beta (1.08) compared to PBO-backed IPOs (1.20), likely due to time-variation in exposures being captured better by the portfolio-level data and higher measurement error on stock-level data. Still, the test fails to establish significance in the inter-group variation. The coefficients on the SMB factor leads to similar interpretations as Table 9, although being of somewhat lower magnitude with 0.64 and 0.90 for SBO- and PBO-backed IPOs, respectively. The test does not find a significant difference in the expo-

sures. Further, while the coefficient on HML was significant for PBOs and insignificant for SBOs in Table 10, this test leads to opposite patterns. The coefficient of 0.45 for SBO-backed IPOs confirms exposure towards value stocks, resonating with the findings that SBO-backed IPOs typically go public at a higher book-to-market ratio than PBO-backed IPOs. Indeed, the test validates the statistical significance of SBO-backed IPOs having greater exposure towards value stocks relative to PBO-backed IPOs at a 5% level.

Table 10: Fama-French regressions on equally-weighted portfolios and inter-group comparisons of coefficients

Portfolio excess return	SBO	PBO	z	p
Market excess return	1.08***	1.20***	-0.97	0.33
(Std. err)	(0.108)	(0.064)		
SMB	0.64***	0.90***	-1.11	0.27
	(0.204)	(0.110)		
HML	0.45***	0.09	2.38	0.02
	(0.126)	(0.078)		
Intercept	-0.001	-0.002	0.27	0.79
	(0.004)	(0.002)		
Adjusted R^2	0.40	0.70		
Number of monthly observations	341	391		

This table presents the results from Fama-French regressions on equally-weighted portfolios of SBO- and PBO-backed IPOs. The table displays portfolio loadings on the market, SMB and HML factors, as well as intercepts. Newey–West standard errors are used. Z-values and p-values refer to two-sample z-tests on the difference in coefficients between SBO- and PBO-backed IPOs. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Building upon this, as seen in Table 11, the intercepts regain their statistical and economic significance after running Fama and French (1993) regressions on value-weighted portfolios. SBO-backed IPOs demonstrate an abnormal return of 0.9% significant at a 5% level, while PBO-backed IPOs display an abnormal return of 1.2% significant at a 1% level, alluding to our hypothesis. This indicates that abnormal performance is mainly driven by larger IPOs. In his value-weighted portfolio of PE-backed IPOs, Levis (2011) reports a significant abnormal performance of 0.7% and Cao and Lerner (2009) report an insignificant intercept in their corre-

sponding test. Nonetheless, we fail to identify varying abnormal performance between the two groups with any meaningful degree of significance. Just like for equally-weighted portfolios, SBO-backed IPOs have a lower exposure to the market risk of 0.95 than PBO-backed IPOs of 1.03. According to these results, SBO-backed IPOs experience below average systematic market risk, although marginally. The test dismisses significance in the difference between the groups' coefficients. Put in perspective, Levis reports systematic market risk for a portfolio of PE-backed IPOs below one and lower than the corresponding exposure for VC-backed and non-sponsor-backed IPOs. Once more, the magnitudes of the coefficients on the SMB factor diminish yet remain statistically and economically significant with 0.49 and 0.69 for SBO- and PBO-backed IPOs, respectively. These loadings are consistent with those found by Cao and Lerner of 0.55 and 0.48 for the equally- and value-weighted PE-backed portfolio, respectively. Again, the difference is insignificant between the two groups. Notably, the coefficients on the HML factor being significant for PBO-backed IPOs in Table 9 and for SBO-backed IPOs in Table 10, lose their significance. This infers that the evidenced value effect in the SBO portfolio largely is driven by smaller stocks, and that larger SBO-backed IPOs lack strong value-growth differentials in returns. This rationale aligns with the findings of Cao and Lerner, who reveal a moderately significant positive exposure in equally-weighted portfolios, whereas value-weighted portfolios exhibit no statistically significant exposure.

Table 11: Fama-French regressions on value-weighted portfolios and inter-group comparisons of coefficients

Portfolio excess return	SBO	PBO	z	p
Market excess return	0.95***	1.03***	-0.64	0.52
(Std. err)	(0.107)	(0.069)		
SMB	0.49**	0.69***	-0.87	0.39
	(0.217)	(0.068)		
HML	0.12	-0.06	0.99	0.32
	(0.158)	(0.075)		
Intercept	0.009**	0.012***	-0.53	0.59
	(0.004)	(0.002)		
Adjusted R^2	0.29	0.58		
Number of monthly observations	341	391		

This table reports the results from Fama-French regressions on value-weighted portfolios of SBO- and PBO-backed IPOs. The table displays portfolio loadings on the market, SMB and HML factors, as well as intercepts. Newey–West standard errors are used. Z-values and p-values refer to two-sample z-tests on the difference in coefficients between SBO- and PBO-backed IPOs. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

7.3 Extended empirical assessment

Given our findings, we cannot conclude that SBO-backed IPOs exhibit lower underpricing than PBO-backed IPOs. Although the estimates from both tests on underpricing are economically meaningful and align with the direction of our hypothesis, they do not display statistical significance. Nonetheless, as highlighted in Table 3, the cross-sectional comparison reveals a noticeably higher standard deviation in underpricing among PBO-backed IPOs, along with a greater proportion of these IPOs experiencing overpricing. While this pattern may partly reflect the larger sample size of PBO-backed IPOs relative to their SBO counterparts, it also raises the possibility of underlying differences in the pricing dynamics between the two groups. If the greater dispersion in underpricing for PBO-backed IPOs is found to be statistically significant, it may suggest that public investors face greater challenges in pricing these offerings accurately. This phenomenon could be attributed to higher ex ante uncertainty associated with PBO-backed IPOs. In contrast, SBO-backed IPOs may benefit from reduced information

asymmetry due to a more extensive history of established disclosure practices and increased familiarity of the asset among public investors. These characteristics may collectively reduce the scope for adverse selection and contribute to more precise pricing when going public. In light of this, we view the variance in underpricing as an adjacent but complementary dimension to our hypothesis. Accordingly, we conduct a Levene's test to formally assess whether the variance in underpricing differs significantly between SBO- and PBO-backed IPOs.

Similarly, the results from our analysis of abnormal performance do not allow us to conclude that SBO-backed IPOs underperform PBO-backed IPOs in the long run. While the average alpha for SBO-backed IPOs is significantly negative, the equally-weighted portfolio of SBO-backed listings yields an insignificant alpha and the corresponding value-weighted portfolio produces a significantly positive intercept. Moreover, neither of the two-sample tests indicate statistically significant differences in abnormal performances across the two groups. Although these findings do not confirm our hypothesis, they also do not contradict the underlying notion that lower information asymmetry, increased optimisation and an extended history of meeting the demands of private equity ownership, characterised by elevated standards of transparency and disclosure, may contribute to reduced required returns for the SBO group. To explore this line of reasoning from a complementary perspective, we examine the dispersion of abnormal returns across the two groups. Analysing differences in variance serves as a valuable way to assess heterogeneity in post-IPO outcomes. Specifically, a statistically significant difference in the variance of alpha would indicate greater intra-group dispersion in risk-adjusted returns. This could reflect varying quality of assets coming to market or increased investor uncertainty in forecasting future performance. To empirically analyse this, we conduct a Levene's test to compare the variance in abnormal performance across the SBO- and PBO-backed IPO groups.

Table 12 indicates that the differences in the variances of underpricing and alpha between the two groups are not statistically significant. Consequently, we cannot reject the possibility that the higher variation observed among PBO-backed IPOs is attributable to the larger sample size rather than underlying structural differences. In other words, this complementary empirical approach does not provide sufficient evidence to support our hypotheses.

Table 12: Levene's tests on underpricing and alpha for the two groups

	Variance			
	SBO	PBO	f	p
Underpricing	0.025	0.045	1.82	0.18
Alpha	0.001	0.005	1.12	0.29
Number of observations	58	318		

This table presents Levene's tests comparing the variance of underpricing and the variance of alpha between SBO- and PBO-backed IPOs. Underpricing is winsorised at the 1% level. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

To further assess the robustness of the observed insignificance in the difference in IPO underpricing between SBO- and PBO-backed IPOs, we conduct a series of supplementary regressions. These are estimated both with and without industry- and year fixed effects, and with and without the inclusion of *Gross proceeds* as a control variable. In addition, we examine interaction terms between *SBO* and both *Gross proceeds* and *Hot IPO market* to explore potential conditional effects. A summary of these regression results is presented in Appendix C. As anticipated, the findings remain unchanged across all specifications. The coefficient on *SBO* is consistently statistically insignificant. Accordingly, our conclusion of no economically or statistically meaningful difference in IPO underpricing between SBO- and PBO-backed firms remains.

Additionally, to solidify our findings of an insignificant difference in abnormal performance between SBO- and PBO-backed IPOs, we extend our analysis beyond the Fama and French (1993) three-factor model by using the Fama and French (2015) five-factor model. This extended model introduces two additional factors: robust minus weak (RMW) which is the difference between returns of stocks with robust and weak profitability, and conservative minus aggressive (CMA) which is the difference between the returns of stocks with low and high levels of investments. Given the added variables and some companies' short return histories due to early delisting, we conduct this test only at the portfolio level to avoid overfitting at the stock level. These tests are presented in Appendix D. None of the tests reveal a statistically significant difference in abnormal performance or factor loadings between the SBO and PBO groups. Among the newly introduced factors, only CMA exhibits a stable and interpretable relationship, showing a negative association with PBO portfolios. This suggests that PBO-backed IPOs tend to behave more like companies with relatively aggressive investment strategies once they go public. The reduced HML exposure discrepancy relative to the three-factor model, combined with the high correlation between HML and CMA, partly helps explain the significant cross-sectional difference in HML shown in Table 10.

7.4 Implications of findings

Based on both primary results and the extended empirical assessment, we are unable to establish a significant relationship between the level of IPO underpricing and the number of preceding rounds of PE ownership. Although we cannot validate our initial proposition, that SBO-backed IPOs would exhibit lower levels of underpricing compared to PBO-backed IPOs, we view our findings as informative. Our hypothesis is grounded in the assumption that successive rounds of PE ownership enhance several uncertainty-reducing characteristics of companies, including strengthened corporate governance, increased transparency, greater disclosure and higher asset awareness among public investors. Collectively, these attributes should theoretically reduce ex ante uncertainty and, consequently, IPO underpricing. The inability to substantiate this assumption implies that public investors may not meaningfully differentiate between SBO- and PBO-backed IPOs, suggesting a convergence in their perceived quality. This observation is particularly notable in light of critiques concerning the rise of SBO activity. Achleitner and Figge (2014), for instance, discuss that SBOs have been subject to scrutiny for being overpriced and overleveraged compared to PBOs. Similarly, Jenkinson and Sousa (2015) and Degeorge et al. (2016) address that SBOs are criticised for often serving as vehicles for capital employment aimed at maximising management fees. If such critiques had significantly influenced investor sentiment, we would expect heightened scepticism regarding the quality of SBO-backed assets, potentially manifesting as greater pricing difficulties. However, our findings provide no evidence of such effects. On the contrary, our comparative statistics indicate that SBO-backed IPOs enter the public market at higher valuations, as measured by EV/EBITDA multiples, and with higher leverage levels. This constancy suggests that the elevated leverage and valuation multiples observed at entry may not primarily reflect opportunistic pricing or exploitation of favourable credit conditions. According to Achleitner and Figge, they rather stem from diminished informational asymmetries. If this is the case, it is, however, not reflected in the public market's first-day reception.

Similarly, we are unable to conclude presence of lower abnormal performance among SBO-backed IPOs compared to PBO-backed IPOs with any meaningful degree of statistical significance. Our hypothesis of lower abnormal performance draws upon similar reasoning to our expectation of reduced underpricing. Strengthened corporate governance, lower information asymmetry and increased optimisation according to the PE model are theoretically expected to diminish the risk premium required by public investors. Over time, once a company has been publicly traded for a substantial period and the PE owners have fully exited, these characteristics should converge between SBO- and PBO-backed IPOs. Consequently, after controlling for relevant risk factors, SBO-backed IPOs should underperform relative to PBO-backed IPOs, as measured by alpha. Although we cannot provide empirical support for this hypothesis, the

results are intriguing. None of the tests reveal a significant difference in alpha between the two IPO groups. However, the value-weighted portfolio displays significant abnormal performance for both groups. Conversely, we observe a significant negative average intercept for SBO-backed IPOs on stock-level regressions. We attribute this contradiction to a reduction in noise within the portfolio regressions and the influence of larger companies driving the observed abnormal performance. Again, the results speak in favour of the two groups being of equal character, also from a long-term risk-adjusted return perspective. This means that public market investors do not price one group differently from the other. In other words, the effect from decreased informational asymmetry for PE-backed IPOs as discussed by Bergström et al. (2006) and Levis (2011) is not amplified by more than one round of PE ownership, and the level of homogeneity in expectations seems to be equal. Equivalently, the risk-mitigating track record of solid cash flow generation put forward by Bonini (2015) and Jenkinson and Sousa (2015) is not sufficiently strengthened by one additional PE owner to influence the investor sentiment.

Moreover, no significant disparity is found in the market risk factor or the SMB factor. In other words, higher leverage used to inflate equity returns, as proposed by the conventional wisdom on value creation in SBOs, does not result in meaningfully increased market risk. Additionally, the difference in size between SBOs and PBOs observed in our sample as well as by Kick and Schwetzler (2024) is not expressed through a significantly lower exposure to the SMB factor. Nevertheless, all tests reveal highly significant positive loadings on these factors. The positive exposure to the market risk factor is intuitive, whereas the positive exposure to small stock outperformance is somewhat unexpected given the typical maturity of PE-backed companies at exit and their larger size relative to non-PE-backed IPOs. However, this aligns with the results observed by Cao and Lerner (2009). Furthermore, we observe a significant positive average exposure to the HML factor for both PBO-backed IPOs and the SBO-backed equally-weighted portfolio. Interestingly, this is the only factor where we identify a statistically significant difference between the two IPO groups. We interpret these findings as evidence of SBO-backed IPOs exhibiting characteristics more aligned with value stocks compared to PBO-backed IPOs, and that it is primarily driven by smaller stocks as the significance vanishes for the value-weighted portfolios.

7.5 Limitations

Our inability to detect significant differences between groups may, at least in part, reflect the relatively modest size of our sample. While expanding the scope to include PE-backed IPOs from a broader geographical region would address this constraint, ensuring the accuracy of the sample has required extensive manual, case-by-case validation. Replicating such a process on a global scale would be considerably more challenging and resource-intensive. Furthermore, not

all stock markets possess sufficient liquidity to satisfy the assumption that companies trade at their fundamental value after the first day of trading. Accordingly, we have prioritised the accuracy and reliability of our data, and the validity of the underlying assumptions, over the pursuit of a larger sample size to avoid drawing conclusions based on potentially flawed evidence. However, we see the need for further empirical research into this phenomenon using a more comprehensive dataset in order to establish the practical evidence from a global perspective.

As previously discussed, our analysis is subject to selection bias given that PE firms select the optimal exit route for each individual portfolio company. Jenkinson and Sousa (2015) highlight that the choice of exit strategy is influenced by the PE firm's trade-off between maximising value for LPs and enhancing the IRR, as well as by the specific characteristics of the underlying asset. Further, Achleitner and Figge (2014) propose that liquidity needs also play a crucial role in exit decisions and Bergström et al. (2006) argue that PE firms are reluctant to take low-quality assets public, given the higher levels of scrutiny and publicity associated with IPOs. These perspectives underscore that exit decisions are dependent on timing, firm-specific attributes and fund-level considerations. Consequently, general conclusions about differences between SBOs and PBOs must be drawn with caution, taking into account the potential influence of selection mechanisms. Nonetheless, this does not prohibit the use of public market reception as a lens to explore potential dissimilarities between the two groups. Echoing the rationale of Levis (2011), it rather offers valuable complementary insights into the broader impact of the PE model by capturing outcomes across the full span of PE ownership and exit.

Lastly, there is a potential issue of reverse causality inherent in examining the effects of historical ownership. As noted by Bonini (2015) and Jenkinson and Sousa (2015), certain companies may possess characteristics making them particularly compatible with PE ownership, increasing their likelihood of becoming SBO targets. Consequently, we cannot entirely dismiss the possibility that, what we attribute to the effect of an additional round of PE ownership, may also originate from firm- or industry-specific characteristics. Nevertheless, this concern appears to be mitigated by our empirical observations. We find limited cross-sectional variation in industry affiliation between the groups, suggesting that systematic differences in industry characteristics do not predominantly drive the probability of SBOs. Furthermore, differences in size and industry affiliation are explicitly controlled for in our analysis of underpricing. Additionally, characteristics making certain companies and industries more compatible with PE ownership should be absorbed by the systematic risk factors in our examination of abnormal performance. Therefore, while we recognise the theoretical presence of reverse causality, we argue that its influence is both unavoidable in the context of ownership studies and addressed to the greatest extent possible.

8 Conclusion

We investigate differences in public market reception through underpricing and after-market performance between SBO- and PBO-backed IPOs. Specifically, we empirically test for cross-sectional variation in IPO underpricing and abnormal returns. Consistent with Levis (2011), we view this approach as a complementary method to study the influence of the PE model, with particular focus on the impact of a second round of PE ownership. Our findings reveal no meaningful distinction between SBO- and PBO-backed IPOs in terms of underpricing or abnormal returns. These results contrast with our hypotheses that SBO-backed IPOs would exhibit lower underpricing and abnormal performance, owing to reduced ex ante uncertainty and overall risk profile. Our conclusions are further strengthened by the supporting analyses. Nonetheless, we identify differentiated return behaviour with respect to the groups' exposure to the HML factor. In our Fama and French (1993) regression using equally-weighted portfolios, SBO-backed IPOs show significantly greater exposure to value stocks, a pattern driven by relatively smaller companies as significance fades in value-weighted portfolios.

Overall, our study downplays the distinction between SBOs and PBOs from the perspective of public market perception, contributing additional nuance to the ongoing debate comparing these two LBO types. Although we do not find evidence that risk-mitigating characteristics among SBOs, highlighted by previous literature, lead to lower underpricing or inferior abnormal performance, neither do we observe increased scepticism from public investors regarding concerns raised about SBOs by other studies. Specifically, SBOs are critiqued for involving questionable acquisition motives, such as the strategic deployment of committed capital to maximise management fees, and financing structures compensating for diminished value creation potential through increased leverage. This does not appear to translate into a higher risk premium or ex ante uncertainty of the asset's value in the equity markets.

In conclusion, our findings contribute to the existing work on the comparison between SBOs and PBOs, as well as on the performance of PE-backed IPOs, by downplaying the significance of cross-sectional variation between the two groups at the time of going public and demonstrating that multiple rounds of PE ownership do not result in differentiated or more homogeneous pricing among public market investors. In doing so, our study helps to bridge the gap in the academic literature at the intersection of SBO versus PBO comparisons and research on PE-backed IPO performance. From an IPO readiness perspective, there is no significant upside of undergoing more than one round of PE ownership. This finding is informative for PE firms, as it suggests they will not benefit from a differentiated market reception when taking an SBO public. Lastly, we reiterate the need for further research into this phenomenon to enable conclusions on a global scale and based on more comprehensive empirical evidence.

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A Annual distribution

Table 13: Annual distribution of IPOs by number, market capitalisation and gross proceeds

	Number			Avg. market cap ($m)			Avg. gross proceeds ($m)		
Year	**All**	**SBO**	**PBO**	**All**	**SBO**	**PBO**	**All**	**SBO**	**PBO**
1991	1	0	1	36	0	36	15	0	15
1992	1	0	1	870	0	870	115	0	115
1993	5	0	5	591	0	591	211	0	211
1995	4	0	4	524	0	524	78	0	78
1996	17	2	15	356	791	298	139	167	136
1997	23	1	22	272	244	273	102	142	100
1998	12	1	11	717	221	762	166	120	170
1999	21	1	20	642	695	639	119	201	115
2000	26	0	26	755	0	755	170	0	170
2001	13	0	13	647	0	647	185	0	185
2002	13	2	11	678	1,637	504	248	347	229
2003	8	0	8	907	0	907	291	0	291
2004	22	0	22	647	0	647	231	0	231
2005	30	5	25	526	452	542	227	241	224
2006	27	4	23	1,503	1,216	1,553	191	240	183
2007	15	4	11	731	437	837	259	258	260
2008	1	0	1	182	0	182	189	0	189
2009	9	1	8	1,601	799	1,701	408	184	436
2010	17	4	13	760	536	829	183	202	177
2011	13	5	8	2,764	2,942	2,653	719	997	546
2012	7	0	7	1,399	0	1,399	230	0	230
2013	15	2	13	3,195	1,963	3,384	519	460	528
2014	13	4	9	765	1,234	556	161	228	131
2015	12	5	7	1,993	1,278	2,503	448	286	563
2016	5	1	4	949	893	963	166	143	171
2017	8	2	6	4,116	1,417	5,015	541	295	623
2018	10	2	8	2,887	912	3,380	459	340	489
2019	2	2	0	1,329	1,329	0	240	240	0
2020	10	6	4	3,319	2,701	4,246	669	573	812
2021	16	4	12	4,413	3,249	4,801	610	525	639

B Industry valuation multiples

Table 14: EV/EBITDA multiples per industry

Industry (median x)	**All**	**SBO**	**PBO**
Communication services	9.6	7.3	9.9
Consumer discretionary	12.8	14.4	12.7
Consumer staples	8.8	9.8	8.8
Energy	10.8	31.7	10.0
Financials	9.6	20.1	9.4
Healthcare	9.4	15.2	9.1
Industrials	11.3	10.7	11.8
Information technology	11.1	10.1	11.5
Materials	7.2	8.2	7.2

Table 15: Book-to-market multiples per industry

Industry (median x)	**All**	**SBO**	**PBO**
Communication services	0.25	0.45	0.25
Consumer discretionary	0.19	0.34	0.17
Consumer staples	0.41	0.38	0.41
Energy	0.69	0.61	0.72
Financials	0.55	0.69	0.55
Healthcare	0.29	0.21	0.31
Industrials	0.34	0.42	0.30
Information technology	0.15	0.14	0.16
Materials	0.29	0.25	0.29

C Additional underpricing tests

Table 16: Regressions of *SBO* on *Underpricing* with additional control variables

Underpricing	1	2	3	4	5	6
SBO	-0.013	-0.010	-0.016	-0.08	0.160	-0.009
(Std. err)	(0.024)	(0.024)	(0.025)	(0.025)	(0.293)	(0.040)
ln Gross proceeds		-0.008	-0.003	-0.007	-0.004	-0.007
		(0.010)	(0.010)	(0.013)	(0.015)	(0.013)
SBOxln Gross proceeds					-0.014	
					(0.024)	
SBOxHot IPO market						0.001
						(0.047)
Intercept	0.138***	0.229*				
	(0.012)	(0.127)				
Industry fixed effects	No	No	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	Yes	Yes	Yes
Adjusted R^2	-0.00	-0.00	0.01	0.07	0.07	0.07
Number of observations	376	376	376	376	376	376

Underpricing is winsorised at the 1% level. Heteroscedasticity-robust standard errors are used. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

D Additional after-market performance tests

Table 17: Fama-French five-factor regressions on equally-weighted portfolios and inter-group comparisons of coefficients

Portfolio excess return	SBO	PBO	z	p
Market excess return	1.14***	1.15***	-0.05	0.96
(Std. err)	(0.112)	(0.073)		
SMB	0.78***	0.90***	-0.55	0.58
	(0.187)	(0.091)		
HML	0.33**	0.26***	0.35	0.73
	(0.157)	(0.092)		
RMW	0.39*	-0.02	1.55	0.12
	(0.220)	(0.141)		
CMA	0.08	-0.39**	1.59	0.11
	(0.237)	(0.176)		
Intercept	-0.00	-0.00	-0.40	0.69
	(0.004)	(0.002)		
Adjusted R^2	0.41	0.71		
Number of monthly observations	341	391		

Newey–West standard errors are used. Z-values and p-values refer to two-sample z-tests on the difference in coefficients between SBO- and PBO-backed IPOs. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Table 18: Fama-French five-factor regressions on value-weighted portfolios and inter-group comparisons of coefficients

Portfolio excess return	SBO	PBO	z	p
Market excess return	0.98***	1.01***	-0.20	0.84
(Std. err)	(0.112)	(0.070)		
SMB	0.54**	0.74***	-0.86	0.39
	(0.219)	(0.079)		
HML	0.04	0.05	-0.05	0.96
	(0.203)	(0.110)		
RMW	0.13	0.12	0.04	0.97
	(0.252)	(0.122)		
CMA	0.12	-0.30**	1.37	0.17
	(0.262)	(0.150)		
Intercept	0.01*	0.01***	-0.68	0.50
	(0.005)	(0.003)		
Adjusted R^2	0.29	0.58		
Number of monthly observations	341	391		

Newey–West standard errors are used. Z-values and p-values refer to two-sample z-tests on the difference in coefficients between SBO- and PBO-backed IPOs. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

AI disclaimer

Throughout this thesis, artificial intelligence has been utilised solely to support and enhance the overall quality. Specifically, ChatGPT was the only AI tool employed during the development of our thesis. First, the tool was used to refine the clarity and precision of language and sentence construction. For example, we would compose a sentence and, in collaboration with the AI, explore potential synonyms for specific words previously used, thereby promoting linguistic variety and improving readability. Second, the AI tool was utilised to review the grammar throughout the thesis. For example, we applied AI to ensure that all spelling complied with British English conventions, thereby maintaining consistency in language usage. Lastly, we utilised AI as a support tool to enhance our ability to analyse and write code in the R programming language. Specifically, it proved useful for identifying and resolving error messages, ensuring consistent usage of syntax, thereby enabling the code to run more smoothly without the need to spend time debugging simple mistakes ourselves.

We have never relied on, nor drawn information from, AI as a source. All text, ideas and arguments are solely our own. Furthermore, we are fully aware of the limitations of AI, such as its tendency to fabricate information, confirm prompts without formal evidence and fail to maintain a coherent thread when processing large volumes of information. To mitigate these risks, we determined that AI should only be utilised as a tool for reviewing grammar, suggesting wording and supporting code writing. It should never be used as a means to generate text itself, as doing so would compromise academic integrity and result in an inferior thesis.

While the drawbacks of using AI are numerous, there is also significant upside. By restricting AI's usage as described above, we ensure linguistic consistency which contributes to the overall quality of the thesis. This collaborative approach increases the likelihood that our ideas and arguments are clearly communicated to the reader. Specifically, by implementing a more precise language, which can convey the same message as long sentences, we ensure greater clarity and accuracy.