

Long-Term Impact of Private Equity Funds on Target Companies Performance and Innovation

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Abstract

This study examines the long-term impact of private equity (PE) funds on the performance and innovation of their portfolio companies in Spain and Portugal between 2011 and 2019. Using a quantitative difference-in-differences (DiD) regression analysis, the research evaluates financial data to determine whether PE interventions improve performance and foster innovation of their invested companies post-acquisition compared to a control group of similar companies not supported by these funds. The sample includes 159 Iberian deals (80 from Spain and 79 from Portugal). The findings indicate that, while PE support leads to statistically significant improvements in some operational efficiencies and financial metrics, such as the EBITDA margin, it negatively impacts innovation. This negative impact is evidenced by a progressive reduction in Intangible Assets as a percentage of Total Assets in the target companies. This suggests that private equity funds may prioritize short-term financial returns over long-term innovation in their portfolio companies. The study contributes to the understanding of the dual role of private equity funds in shaping financial performance and innovation in mature markets.

Keywords: Private Equity, Long-term Impact, Performance, Innovation

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Topic: Long-Term Impact of Private Equity Funds on Target Companies Performance and Innovation

Sumário

Este estudo examina o impacto de longo prazo dos fundos de capital de risco (private equity) na performance e na inovação das suas empresas participadas em Espanha e Portugal entre 2011 e 2019. Utilizando uma análise de regressão de diferenças em diferenças (DiD), a investigação avalia dados financeiros para determinar se as intervenções dos fundos melhoram a performance e promovem a inovação das empresas investidas após a aquisição, em comparação com um grupo de controlo de empresas semelhantes que não foram apoiadas por estes fundos. A amostra inclui 159 deals ibéricos (80 de Espanha e 79 de Portugal). Os resultados indicam que, embora o apoio dos fundos conduza a melhorias estatisticamente significativas em eficiências operacionais e métricas financeiras, como a margem EBITDA, tem um impacto negativo na inovação. Este impacto é evidenciado por uma redução progressiva dos Ativos Intangíveis em percentagem do Total dos Ativos nas empresas participadas. Isto sugere que os fundos de capital de risco podem priorizar retornos financeiros de curto prazo em detrimento da inovação a longo prazo nas suas empresas participadas. O estudo contribui para a compreensão do duplo papel destes fundos na formação do desempenho financeiro e na promoção da inovação em mercados maduros.

Palavras-chave: Fundos de Capital de Risco, Impacto de Longo-prazo, Performance, Inovação

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Tópico: Impacto a longo prazo dos fundos de capital de risco na performance e na inovação das empresas-alvo

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Chapter 1: Introduction

Private equity (PE) funds have become influential financial intermediaries in today's global financial world, transforming investment strategies and corporate governance of established firms by serving as proactive board members and strategic advisors. This dual involvement highlights their significance in financial transactions and emphasizes their effect on shaping corporate strategies within the mature market environment (Metrick & Yasuda, 2009).

Private equity firms have leveraged buyouts (LBOs) as a mechanism to achieve significant stakes in mature companies with sustainable growth. The process is typically characterized by a combination of equity investments and substantial debt financing, a strategy not without its difficulties and challenges, especially the increase in risk. Berg & Gottschalg (2005) detail the nuances of this process, highlighting the unique blend of financial acumen and strategic foresight required for successful LBOs.

The historical background of these transactions reveals a great deal about their size and extent. Kaplan & Strömberg's (2009) influential research thoroughly documents the completion of more than 17,000 leveraged buyouts from 1970 to 2007, totalling an enterprise value (EV) exceeding \$3.6 trillion. Looking at today's financial environment, Bain's private equity report (2023) suggests that despite a significant 35% decrease in 2022 and a slow down during the COVID-19 pandemic, the global buyout value, not including add-ons, reached an astounding \$654 billion, highlighting the turbulent but persistent pace of private equity involvement.

This paper aims to analyse the impact of private equity funds on the performance and innovation of their portfolio companies, specifically during the post-deal period from 2011 to 2019. This study will analyse various key performance indicators such as return on assets, EBITDA margin, sales efficiency, total employment, and debt-to-equity (D/E) ratio to provide a comprehensive understanding of private equity's influence on their portfolio companies. Furthermore, it will explore how private equity investment intersects with innovation within portfolio entities, highlighting the interaction between capital management and ideation.

Academic views on the impact of private equity investments on the operating efficiency and profitability of target companies have varied over the decades. Initial research in the 1980s, particularly in the U.S. and UK, showed positive outcomes with studies by Kaplan (1989) and Smith (1990) indicating that private equity enhances their portfolio companies' operational performance and profitability. These studies demonstrated improvements in strategic capital management and

operational efficiency without negative impacts on employment. However, later studies from the 1990s through the 2000s, such as those by Guo et al. (2011) and Leslie and Oyer (2008), presented a more mixed picture, finding that such improvements were not as sustainable compared to earlier periods. This shift in findings suggested a complex and variable impact of PE on corporate performance, challenging earlier optimistic assessments.

Regarding innovation, the academic perspective is also mixed. Some authors argue that the short-term financial focus of leveraged buyouts (LBOs) could undermine long-term innovation by reducing R&D investments. For example, studies by Lichtenberg and Siegel (1990), Long and Ravenscraft (1993), and Ughetto (2009) support this view, showing a reduction in R&D spending and innovative output post-buyout. In contrast, other researchers like Amess, Stiebale, and Wright (2015), and Lerner (2003) have found that private equity can actually foster innovation within their portfolio companies. Their research indicates that some private equity-backed firms see an increase in patent quality and frequency of citations, suggesting that PE might enhance the innovation capabilities of target companies under certain conditions. This divergence in findings highlights the nuanced influence of PE on innovation, with outcomes varying significantly depending on the specifics of the buyout and management strategies implemented.

To achieve its goals, this study will adopt a quantitative methodology, by collecting and analysing financial data from selected companies before and after private equity (PE) investments. It will employ a difference-in-differences (DiD) regression analysis and the Propensity Score Matching (PSM) method. PSM will help mitigate selection bias by ensuring that comparisons between PE-backed companies and their non-PE counterparts are made on the basis of similar observed characteristics before the PE deal. This approach helps isolate the impact of PE interventions from other potential confounding variables.

This research aims to provide a detailed understanding of how Iberian PE funds impact not just the operational and financial outcomes but also the innovative capacities of firms following acquisition. This study will significantly contribute to the existing body of knowledge by offering empirical evidence on the dual role of PE in boosting corporate performance and fostering innovation within mature markets.

Chapter 2: Literature Review

2.1. Private Equity Definition

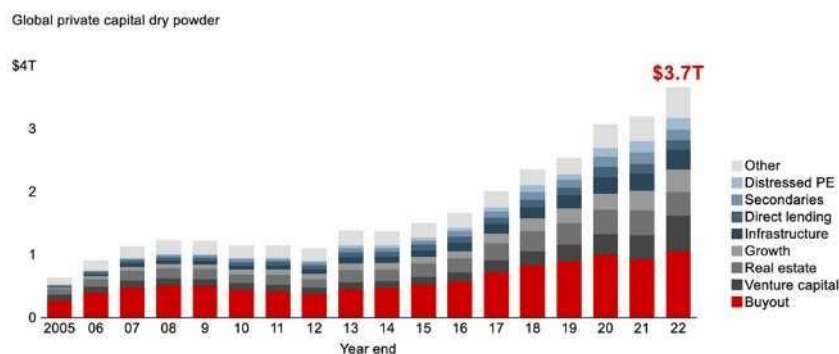
Private equity (PE) consists of investments in unlisted companies, covering venture capital (VC) and buyouts. Private equity firms, traditionally organized in the form of limited liability corporations (LLCs), include key players like Blackstone, Carlyle, and KKR (Kaplan & Stromberg, 2009). According to Jensen (1989), they should be "streamlined, decentralized institutions with a modest number of investment professionals and staff members". It was assessed that private equity funds under management hold one trillion dollars of capital (Yasuda and Metrick, 2009).

2.2. Private Equity Current Outline

Bain's private equity report (2023) points out that the private equity sector has been living through a very relevant period of change in the most recent years, basically motivated, on the one hand, by the challenges that the COVID-19 pandemic generates and, on the other, by geopolitical tensions due to the Russian invasion of Ukraine and the current conflict between Israel and Palestine. With setbacks like project delays and remote work, private equity firms showed resilience and adaptability at a time when the situation was very uncertain.

Despite a cautious and stricter lending policy from banks leading to a substantial decrease in the average deal size, the industry still managed to accumulate a significant amount of <dry powder= i.e. cash or high-liquid securities that PEs have but have not invested yet, with global private capital reserves reaching a record amount of \$3.7 trillion, as noted in **Figure 1**. This actually means that investors are not discouraged or turned away from investing their capital but, in fact, they are finding an immensely competitive environment in which high demand has kept asset valuations at high levels.

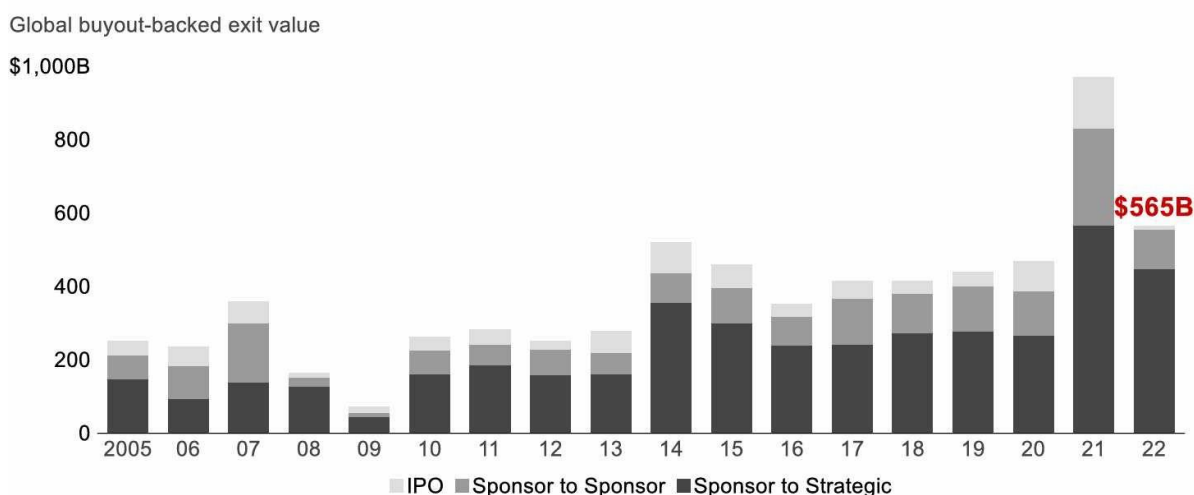
Figure 1: Evolution of Global private capital <dry powder=



Source: (Bain Global Private Equity Report, 2023)

The slow pace of transactions did not, therefore, inhibit the chasing of quality since firms were paying much emphasis on operational excellence rather than financial engineering. That makes this strategic shift a must in a market where buyout-backed exits fell sharply to \$565 billion, as noted in **Figure 2**, and many of the limited partners had a slowdown in distributions that pushed some of them into cashflow negative positions.

Figure 2: Evolution of Global buyout-backed exit value

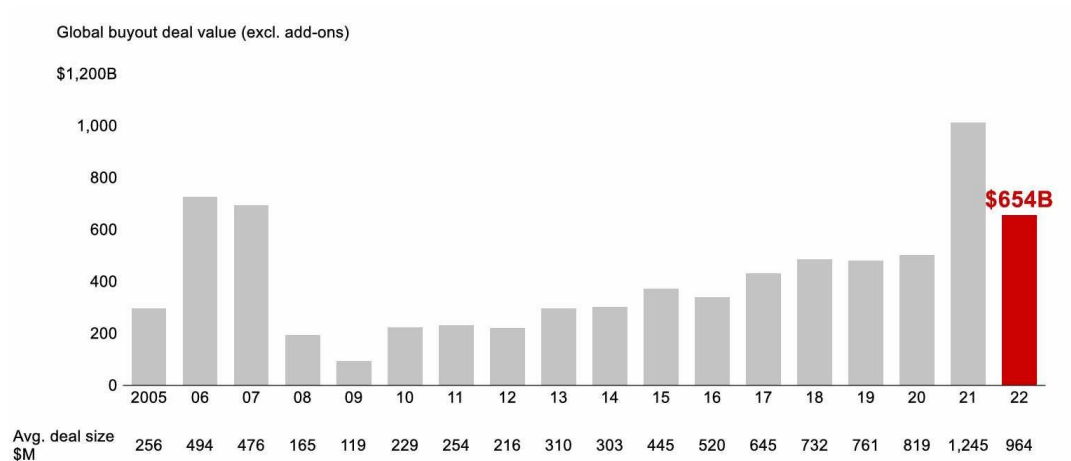


Source: (Bain Global Private Equity Report, 2023)

Furthermore, despite these fundraising challenges, especially for smaller funds, the sizable <dry powder> highlights a readiness to invest in robust opportunities and a continued belief in the potential for high-quality assets to yield significant returns. The report also highlights the vital trends poised to redefine the industry, including the pivotal role of the energy transition, which presents dual benefits: an investment opportunity and, at the same time, the chance to lead in decarbonization. Additionally, alternative asset managers, like private equity funds, are eyeing the vast pool of retail investors, embodying half of the global wealth, as a target to support their growth ambitions.

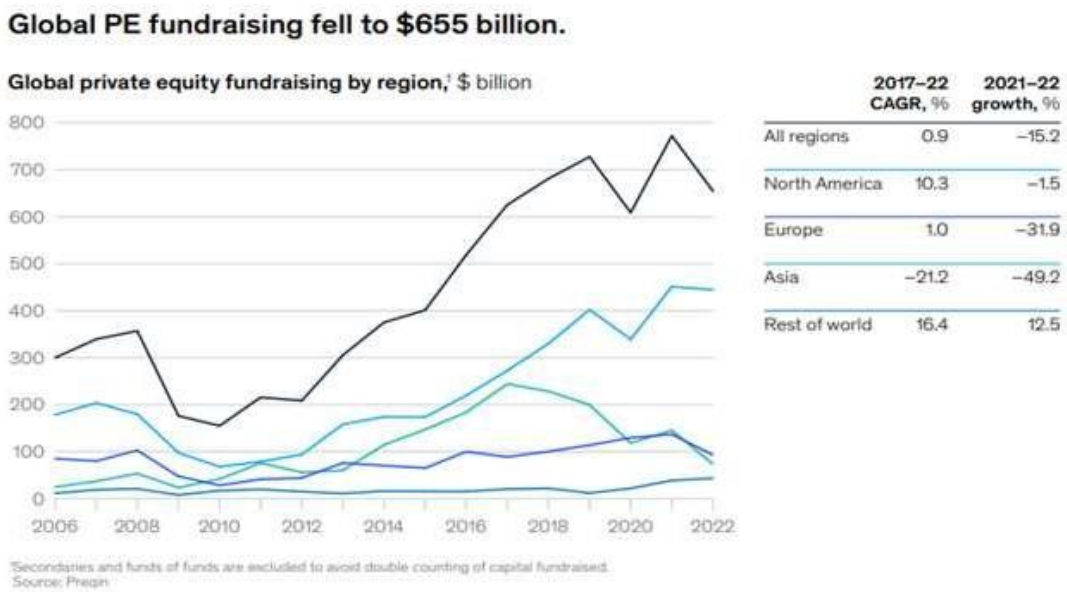
As the financing climate for large deals became more difficult, the consequence was a tightening in global buyout value by over a third to \$654 billion, as noted in **Figure 3**, with direct lending becoming a growing solution. Total loans issued for leveraged buyouts declined across regions, as can be observed in **Figure 4**, illustrating the more challenging environment for fund operations (Bain, 2023).

Figure 3: Evolution of Global buyout deal value



Source: (Bain Global Private Equity Report, 2023)

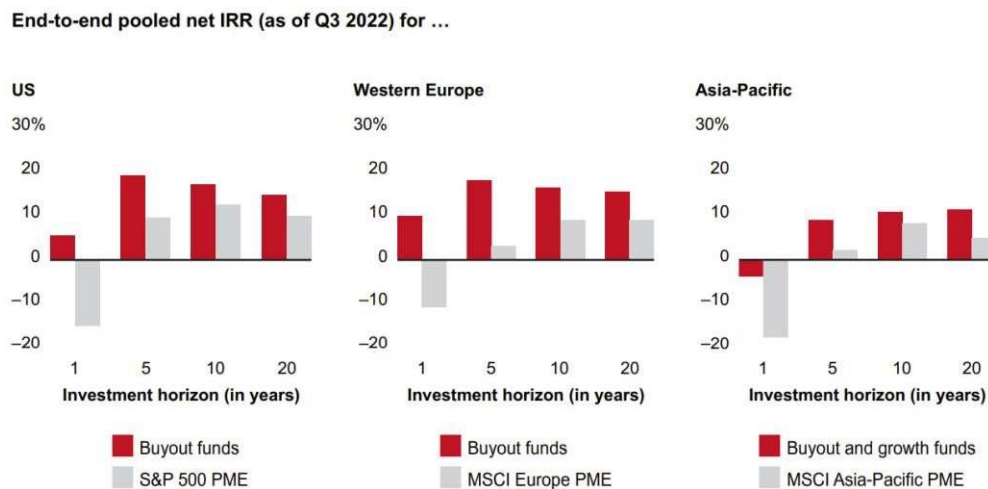
Figure 4: Evolution of PE fundraising



Source: (McKinsey Global Private Markets Review, 2023)

Despite these trends, investors have sustained interest in the private equity sector, which consistently outperforms public market indexes, especially in 2022 as public markets tanked, further demonstrating its resilience, as noted in **Figure 5**. It is this adaptability that is going to be key in one's ability to manoeuvre in these uncertain exit scenarios in a landscape characterized by substantial levels of unallocated capital and inflated asset prices that underscore the sector's ability for strategic capital allocation and value creation.

Figure 5: Evolution of PE End-to-end pooled Net IRR (Internal Rate of Return) as of Q3 2022 for the US, Western Europe, and Asia-Pacific



Source: (Bain Global Private Equity Report, 2023)

2.3. Venture Capital (VC) VS Buyouts

Venture capital (VC) and leveraged buyouts (LBOs) represent distinct yet significant vehicles of investment within the private equity landscape.

Both PE and VC firms raise money from investors, who are then referred to as <limited partners=> (LPs) and invest them in private companies. Their objectives are similar: to look for opportunities within which they can grow the value of the business into which they have both made investments and at a later point sell these businesses or the ownership for profit. VC, according to Cumming, Siegel, & Wright (2007), consists of long-term, unquoted risk equity finance aimed at nurturing early-stage ventures and startups. Therefore, VC investments normally target companies in their emerging stages where, through default or refinancing, it could lead to control but more often than not, minority stakes are the case. Valuation in the VC domain often leans heavily on experiential judgment, especially for technology, software, or life sciences sectors (Precup, 2017).

In contrast, private equity buyouts4often referred to as LBOs4are the acquisition of a company by an investment firm, using a large debt financing from outside parties, and a smaller stake of equity (Kaplan & Stromberg, 2009). Unlike VC, where the goal of control may not always be a primary goal, LBO transactions typically result in the acquiring private equity firm obtaining a majority position of a mature firm. This firm financial theory, underpinned by a focus on control, is consistent

with focusing on PE buyouts targeting larger enterprise values of more mature firms, and often using bank debt to aim for profitability (Breuer & Pinkwart, 2018).

In a nutshell, while VC investments are characterized by a focus on growing startups and smaller enterprise values (EVs), LBOs often involve more mature firms pursuing strategies that require a significant amount of capital and involve high levels of risk (Breuer & Pinkwart, 2018). The versatility of LBOs allows for investments across various sectors, in contrast to the more industry-specific focus of VC investments. Furthermore, LBOs are a usual form of company restructuring, occurring when a PE acquires a majority stake in a firm for a specified period, typically up to five years (Breuer & Pinkwart, 2018).

In this study, the focus will be specifically on private equity firms and the LBOs they perform. The terms <private equity and leveraged buyout will be used interchangeably= (Kaplan & Strömberg, 2009).

2.4. Type of Buyout Investments: IBO, MBO, MBI, BIMBO

In academic literature, there are various types of buyout investments, each with its unique characteristics and implications (Morrell and Clark, 2010).

2.4.1. IBOs: Institutional buyout

When a private company is acquired by new owners who are uniquely primarily institutional investors or private equity firms, these deals are commonly referred to as institutional buyouts= i.e. <IBOs= (Renneboog & Simons, 2005). In certain IBOs, the continued participation of the management team is a key factor in the acquisition's success. However, in other instances, the management team may be replaced. In traditional IBOs in which management continues to be involved, it is customary to recognize their performance by granting them ownership shares in the newly privatized company (Wright et al., 1991).

2.4.2. MBOs: Management buy-out

When the current management team takes over the company, typically with support from private equity investors, it is referred to as a management buyout i.e. <MBO= (Renneboog & Vansteenkiste, 2017). Management buyouts are commonly motivated by the existing team's desire to assume control of the firm and influence its future direction. Private-equity investors typically provide funding and expertise to assist the management team. MBOs can benefit both the management team and the company by enabling a more direct involvement in decision-making and strategy implementation.

2.4.3. MBIs: Management buy-in

In the cases in which an external management team purchases a company and makes it private, this type of transaction is known as a management buy-in i.e. <MBI= (Renneboog & Vansteenkiste, 2017). In contrast to MBOs, MBIs involve an external management team who do not have the same amount of company-specific knowledge as the current managers, which creates an added risk factor (Gilligan & Wright, 2014). External management teams typically pursue companies where the current management is unable or unwilling to unlock the full corporate value, leading to a higher frequency of hostile transactions in MBIs (Robbie and Wright, 1998).

2.4.4. BIMBO: Buy-in-management buyout

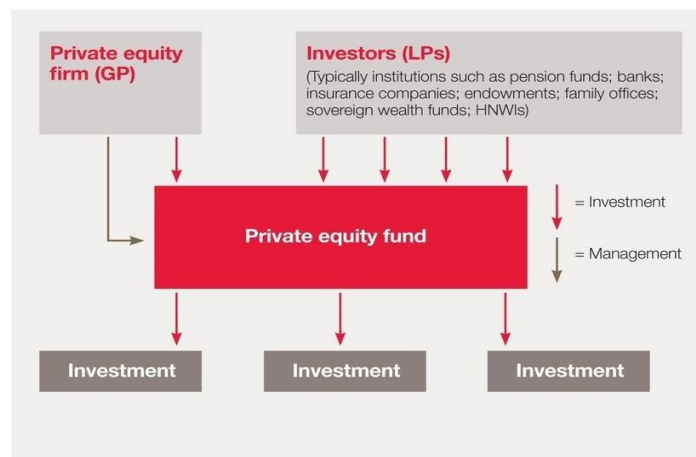
When the bidding team includes members of the former management team and externally hired managers, the deal is denoted as a buy-in-management buyout i.e. <BIMBO= (Renneboog & Vansteenkiste, 2017). In a BIMBO deal, the combination of the former management team and externally hired managers brings a profound grasp of the company's functioning and industry expertise of the existing team with fresh perspectives and expertise of the new managers. This approach can help drive innovation, enhance operational efficiency, create new opportunities for growth within the company, and help diminish the risk inherent to MBIs (Wright et al, 2007).

2.5. Private Equity Funds dynamics and management

2.5.1. Structure and Organization of PE Funds

A private equity firm collects equity capital by creating a private equity fund. Most of these funds are structured as "closed-ended" entities, with investors pledging to provide a set amount for business investments and management fees to the PE. These funds operate as limited partnerships, where general partners (GPs) supervise and administer the daily operations of the fund, while limited partners (LPs) contribute the majority of the capital. (Kaplan & Strömberg, 2009). LPs usually consist of institutional investors like pension funds and family offices. PE firms act as the GP for the fund and typically contribute at least 1% of the total capital, to ensure that it keeps <skin in the game=, and enhances the alignment of incentives (Sorensen & Yasuda, 2022).

Figure 6: PE Funds dynamics



Source: (Bolton, 2015)

2.5.2. Life Cycle of a PE Fund

The usual lifecycle of a private equity fund is around ten years, potentially extendable by up to three years. The initial five years are designated for investment activities, followed by a period for divestment and capital return to LPs. LPs have limited control over investment decisions and limited liability, highlighting the trust placed in GPs' expertise. Once they have invested their capital, the LPs do not have much influence on how the GP manages the amount invested, as long as they comply with the terms and clauses agreed between the two parties at the beginning of the fund. This will include restrictions to set a maximum limit to the amount of fund capital that can be placed in a single company, restrictions over the types of securities in which the fund can invest, and debt restrictions at the fund level. The capital provided by LP is not transferred upfront to the Fund. It calls and draws down progressively, corresponding to the requirement of investing in a regular and periodic series of "Capital Calls". Upon receiving a capital request, the LPs provide the requested amount to the fund. Following a period of holding this equity investment, typically spanning several years, the fund will sell or exit it. The resulting proceeds from this sale after deducting fees are then distributed back to the LPs (Kaplan & Strömberg, 2009)

2.5.3. LPs & GPs Compensation

2.5.3.1. LPs Compensation

LPs are prioritized in the exit proceeds distribution, entitled first to their <Return of Capital>, which is the initial tier where 100% of the cash flows invested are directed to investors as the return of capital. This ensures the preservation of their initial investment (Kaplan & Strömberg, 2009).

Following the full return of their capital, the subsequent allocation, termed <Preferred Return=, is the investors' minimum guaranteed return or hurdle rate, also called watermark (typically set at 8%). This rate represents the profits above the initial investment, establishing a financial benchmark before the GP can claim their share. (Gilligan & Wright, 2008).

After achieving the Preferred Return, the distribution enters the <Catch-Up Tranche stage=. Here, the GP receives all cash flow until reaching their specified participation percentage, ensuring a fair compensation mechanism for the GP after fulfilling obligations to the LPs (Gilligan & Wright, 2008).

The final tier called Carried Interest kicks in once the hurdle rate is met. This stage determines the investment returns accruing to the GP, marking their profit share from the fund's overall success. This comprehensive compensation framework ensures both GPs and LPs are aligned in their goals, promoting a balance between risk and reward in the investment landscape.

2.5.3.2. GPs Compensation

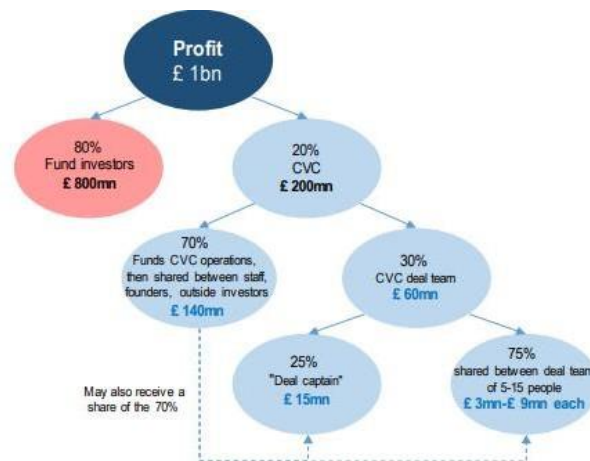
General partners (GPs) in private equity funds benefit from a complex compensation structure, which includes an annual fixed management fee, the aforementioned carried interest, and occasionally, fees from deals and monitoring services offered to portfolio companies.

The management fee usually represents a fraction of the invested capital, transitioning to a percentage of the capital exercised as the acquisitions are performed (Kaplan & Strömberg, 2009). This fee is generally around 2% annually of the fund's committed capital and is charged to cover the costs of managing the fund (Metrick & Yasuda, 2009).

Beyond the management fee, GPs can earn a portion of the fund's profits, known as "carried interest=". Typically, this is 20% of the fund's total profits, activated once the hurdle rate is met. The compensation structure of carried interest is seen as successful in ensuring the alignment of interests between the GPs and LPs as a significant portion of the GP's profits are linked to those of the LPs, thus it incentivizes the GP to maximize value for the LPs as well (Kastiel & Nili, 2024).

Additionally, revenue from buyout funds may include transaction fees and monitoring fees, which are more prevalent in buyout funds than in VC funds. Transaction fees are collected similarly to M&A advisory fees by investment banks when a company is bought or sold by a buyout fund. The GP may retain a portion of this fee, especially if they own less than 100% of the company and choose not to share all transaction fees with their LPs (Metrick & Yasuda, 2009).

Figure 7: Typical Returns Distribution (Assuming a <80-20 Distribution=)

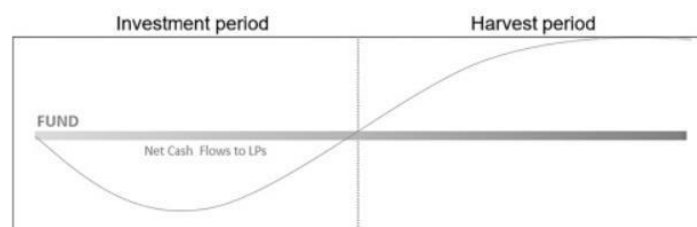


Source: (FT Research, 2022); Note: indicative, the precise proportions vary from one deal to another

2.5.4. Private equity J-curve

Private equity returns usually take the form of a J-curve, as shown in **Figure 8**, whereby the initial cash flows decline in value, made up of upfront fees, and delayed returns on investment before finally increasing. This pattern mirrors the structure of PE funds, which go through a period of valuation decline, triggered by management expenses and capital investments into portfolio companies, only to be followed by a value appreciation phase and maturation of these investments (Cendrowski et al., 2012, p. 47). Even though the fund demands enormous capital contribution and carries with it a long investment horizon of over ten years, there is developing flexibility for the investor through the development of a secondary market that provides liquidity options for PE interests (Stowell, 2013, p. 333).

Figure 8: Private Equity J-curve



Source: (Ivashina, 2023)

As previously mentioned, Private equity firms acquire companies with the purpose of selling them at a higher value than their initial investment. PE investors expect a high return to offset the lower

liquidity of their investment and often utilize debt as leverage to increase their returns (Folus & Boutron, 2015).

The PE fund manager relies on critical assumptions regarding factors such as potential exit multiple, represented by EV/EBITDA, P/E ratio, and the maximum leverage that the target firm can bear (to maximize interest tax shields). Kaiser and Westarp (2010) emphasize that "private equity firms frequently instruct management to prioritize cash flow as the most significant performance indicator. "Managers employ three main strategies for enhancing the exit value achieved by the PE fund: generating free cash flow (through deleveraging), EBITDA growth (through revenue growth and operational improvements), and multiples expansion (Folus & Boutron, 2015).

2.5.5. Performance Metrics of PE Funds

Regarding performance metrics used by PE funds, the two most utilized metrics are the as internal rate of return (IRR) and total value to paid-in capital (TVPI) or multiple on invested capital (MOIC) (Korteweg, 2022).

2.5.5.1. IRR: Internal Rate of Return

The IRR is the discount rate that sets the net present value (NPV) of the fund's cash flows to zero, as presented in **Figure 9**. An IRR of 25% is a common target, although it is not clear that IRRs of this magnitude closely reflect the cost of capital. (Jenkinson & Stucke, 2009). However, Harris, Jenkinson, and Kaplan (2014) found that the mean IRR for buyout funds during 1984-2008 was 14.2% (Korteweg & Sorensen, 2023).

Figure 9: IRR Formula

$$\sum_t \left[\frac{\text{Distribution}_t - \text{Contribution}_t}{(1 + \text{IRR})^t} \right] = 0$$

Source: (Korteweg & Sorensen, 2023); Note: Contributions are payments from the LPs to the PE fund, such as management fees. Distributions are payments from the fund back to the LPs

The IRR rule of thumb proposes pursuing a project only when the IRR is greater than the cost of capital and ranking competing projects via their IRRs: the higher IRR, the higher the rank of the project analysed.

The IRR is valued for its ability to calculate an investment's annual compound rate of return, offering a direct comparison to returns from similarly risky investments across different periods. Although it

is of great use, IRR is not free from some drawbacks. One of the basic economic assumptions of the IRR method is that interim cash flows could be reinvested at the rate of return of the project, which may not be a practical proposition always. Moreover, the IRR does not take into account the cost related to the capital that has been committed but remains unutilized i.e. 'dry powder' (Korteweg & Sorensen, 2013).

Another limitation to the calculation of the IRR methodology is that it is highly susceptible to being manipulated by fund managers in connection with the timing of the investment structures and cash flows so as to give an inflated IRR for their funds. Managers might undertake this kind of practice as a strategy to include capital outflows that need to be anticipated, delay of capital calls, or premature divestments of assets that can be conducted artfully to boost reported IRRs (Grillet-Aubert, 2013). This possible disadvantage may cause a divergence of interest between the fund manager and the investor, since the former may pursue short-term IRR enhancement even to the detriment of the long-run health of the fund. This is an admission of such downsides and some skepticism has prevailed in the ability of IRR to be relied upon as the single measure of fund performance. (Korteweg & Sorensen, 2023).

2.5.5.2. Cash Multiples: Total Value to Paid-In Capital (TVPI) or Multiple on Invested Capital (MOIC)

The Total Value to Paid-In (TVPI) or Multiple on Invested Capital (MOIC) compares the total distributions made to investors with the fund's residual value against the capital initially invested, as presented in **Figure 10**. It is derived from a diminishing proportion of estimates for the residual value throughout the fund's duration (Grillet-Aubert, 2023).

Harris, Jenkinson, and Kaplan (2014) provided an analysis of the past results of U.S. PE and VC funds, collected between 1984 and 2008. The mean cash multiple for buyout funds was 1.97x, indicating that LPs received \$1.97 in distributions for every \$1 they contributed (Korteweg & Sorensen, 2023).

Figure 10: TVPI Formula

$$TVPI = \frac{\sum_t Distribution_t}{\sum_t Contribution_t}$$

Source: (Korteweg & Sorensen, 2023); Note: Contributions are payments from the LPs to the PE fund, such as management fees. Distributions are payments from the fund back to the LPs

The main advantages of this indicator are its simplicity, ease of use, and transparency. It would be hard to manipulate and, thus, avoid the scenario where funds artificially inflate their multiples through manipulations of contributions and distributions with credit lines (Korteweg & Sorensen, 2023).

Unlike IRR, this ratio is highly used during the lifetime of the fund and does not emphasize the special importance of the return over time. It does not consider the timing of capital requests and disbursements at any other point than the particular valuation date in question. Thus, from a financial theory standpoint, the cash multiple is a basic measure that does not consider the timing and risk of cash flows from investments. As a result, comparing investments across different asset classes with varying risks and over distinct time frames using multiples becomes challenging (Grillet-Aubert, 2023).

2.6. LBO Financing

As previously mentioned, LBO deals entail funding a company with a small share of equity and a significant stake of debt. Using external debt to finance the investment amplifies potential returns by reducing equity while still retaining all of the capital gains. Besides, debt has certain benefits over equity, with the most notable being its potential for tax deductibility (through tax shields) and lower cost of funding. This can add value by allowing the company to use its free cash flow to repay high levels of debt (Atesagaoglu, 2012). Thus, private equity investors intentionally introduce financial risk through debt to increase the return on equity (Gilligan & Wright, 2008).

The final financial framework usually consists of multiple tiers of seniority, with 60-70% coming from debt segments and 30-40% from LBO sponsor's equity (Ivashina & Kovner, 2011).

Senior debt (usually provided by banks) can vary between 25% to 45%, while larger LBOs may also involve subordinated, junior debt (10-25%) and mezzanine financing, which consists of debt or preferred stock that is often paired with an equity <kicker= (Willis & Clark, 1989). The borrowed amount is typically only the responsibility of the borrower, not the LBO firm that supplied the equity apart from its initial investment (Ivashina & Kovner, 2011).

2.7. Exit Options

As aforementioned, PE investors' primary goal is to maximize their returns by strategically selling the portfolio company upon exit, as noted by Tykvova (2018). According to Cumming and MacIntosh (2003a), the pursuit of securing the highest valuation for their investment greatly impacts the choice and timing of the exit strategy.

The traditional exit options for PE investments are trade sales, typically to a strategic partner, secondary buyouts or secondary sales, and IPOs (Povaly, 2006). An exit can be full or partial.

2.7.1. Trade sales

Trade sale involves selling the whole company or its assets to a strategic acquirer, intending to achieve strategic goals such as market expansion, access to new technologies, or operational synergies (Folus & Boutron, 2015). This exit strategy is considered attractive within the PE context, as it has the ability to offer immediate liquidity and realize massive gains from portfolio company investments. Simply, strategic acquirers, such as companies in the same or similar industries, see the prospects of a trade sale as an occasion to enhance their competitive positions and market shares in the long term. This means that they are prepared to pay a premium for acquisitions aligned with their strategic objectives (Folus and Boutron, 2015). This serves to further underline the attractiveness of trade sales as a route for an exit, in that they offer a full exit to PE investors, who are then able to cash out fully. Indeed, buyers have sought to participate more actively in the harder market for securing debt leverage, namely, trade buyers who are usually seeking value-enhancing acquisitions and are prepared to pay fair (often premium) prices in cash (Johnson & Stephen, 2010).

2.7.2 Secondary Sales

A private equity firm sells a company from its investment portfolio to a different private equity in a secondary buyout or sale transaction. The deal may involve leverage, but not necessarily. One potential cause for this form of exit is the perception held by the current management team and the private equity firm selling their shares that a bigger private equity company can bring added value to the portfolio business as it progresses to its next phase of growth (Folus & Boutron, 2015).

Alternatively, if the selling financial sponsor has already generated a high return on its initial investment or is nearing the end of its minimum investment period, it may choose to sell to another financial sponsor. This decision could also be motivated by proximity to losing access to <dry powder>. Besides, typically, when there is a high level of debt available at a substantially low cost, and when private equity firms have substantial committed capital to invest, we see a rise in secondary buyouts at the expense of IPOs (Jenkinson & Sousa, 2015). Finally, selling to another private equity firm may offer additional benefits, such as greater leeway in organizing the sales process (Johnson & Stephen, 2010).

2.7.3 IPO

An initial public offering (IPO) is offering the shares of a company for the first time to be listed on the stock exchange. This mechanism provides an exit route to the private equity firm by selling its share in the company. This can potentially allow the seller to achieve maximum returns on his investment under favourable market conditions. Therefore, this is appropriate for the case of large portfolio companies or those who have demonstrated strong financial performance (Jenkinson & Sousa, 2015). However, the initiation of an IPO is quite costly in terms of transaction fees. This is the case especially due to tight legal and regulatory restrictions (Folus & Boutron, 2015).

2.8. How do PEs add value to Target companies?

As previously mentioned, academia holds various perspectives on the degree to which private equity firms contribute to the economic value and enhance the operational and financial performance of their portfolio companies. Kaplan & Sorensen (2009) suggested that private equity firms implement <three types of changes= in their portfolio companies, which can be classified as financial, governance, and operational adjustments, called by these authors: <financial, governance, and operational engineering=.

2.8.1. Governance engineering

Jensen (1989) and Kaplan (1989a) discussed the financial and governance engineering changes implemented by private equity in their portfolio companies. Private equity firms focus on aligning management incentives in their portfolio companies by providing significant equity stakes through stock and options (Sorensen & Kaplan, 2008). Research by Kaplan (1989b) indicates that management ownership percentages increase substantially when transitioning from public to private ownership. Additionally, private equity firms mandate meaningful investment from management to ensure not only significant potential gains but also risks. Furthermore, due to the illiquidity of their equity holdings as privately held companies, managers are discouraged from manipulating short-term performance (Sorensen & Kaplan, 2008). Besides, governance engineering results also private equity investors actively controlling the boards of the companies they invest in, which are <smaller and meet more frequently compared to public company boards= (Acharya and Kehoe, 2008). According to Acharya and Kehoe (2008), portfolio companies <have twelve formal meetings per year along with numerous informal contacts= (Sorensen & Kaplan, 2008), which enhances the more active involvement of PE in governance compared to public company boards.

2.8.2. Financial Engineering - Leverage impact

Leverage plays a crucial role in LBOs by requiring management to meet interest and principal obligations, thereby preventing the misuse of cash flow, and helping to mitigate the "Agency Costs of Free Cash Flow" existing in poorly managed companies as Jensen (1986) denoted. This is especially important in mature industries where there is an incentive to invest in low-return (risk-shifting) projects or waste cash (debt overhang). By limiting available cash flow through debt obligations, leverage promotes efficient resource utilization and reduces agency costs associated with free cash flow, as noted by Jensen (1986). Additionally, the tax deductibility of interest enhances the value of leverage by reducing taxable income, since, with increasing leverage, the higher will be the interest payments, which will increase the present value of Interest tax shields, increasing the firm's value levered, *ceteris paribus* (Sorensen & Kaplan, 2009).

However, as previously mentioned, leveraging comes with the risk of financial distress if the borrowed amount becomes unmanageable, affecting the firm's flexibility compared to equity financing. The balance between using debt for discipline and avoiding financial distress highlights its complex role in corporate finance. Debt issuance without retaining proceeds can serve as a stronger commitment than dividend payouts and limits managerial discretion over cash flows, aligning interests more closely with shareholders and increasing firm value according to Jensen (1986) and Strömberg & Kaplan (2009).

2.8.3. Operational Engineering

Private equity firms have greatly improved their value creation strategies by integrating industry and operational expertise in-house, achieved through the hiring of specialized individuals with specific backgrounds. Strömberg & Kaplan (2009) observe that in addition to traditional financial and governance methods, private equity has increasingly focused on operational tactics. This shift involves leveraging industry-specific knowledge to choose investment opportunities, develop strategic plans for adding value, and execute these plans effectively. By combining operational insight with financial strategies, private equity firms are making significant progress in driving enhancements and creating value for their portfolio companies (Mortenson & Yasuda, 2022). This holistic approach combines deep industry knowledge with financial skills to inform investment decisions.

2.9. Do PEs positively impact their target companies?

Throughout the years there has been an intense debate among academia about whether private equity firms contribute positively to the operational performance of their portfolio companies. Jelic and

Wright (2011) defended that, to assess the real impact of private equity on target companies' performance, the assessment of company performance should be based on at least four distinct aspects: **profitability, operational efficiency, workforce levels, and leverage.**

Supporters of leveraged buyouts, such as Jensen (1989), defend PEs play a crucial role in improving the operational and financial performance of their portfolio companies. By utilizing the aforementioned financial, governance, and operational strategies, these firms not only enhance company operations but also generate significant economic value. This viewpoint is backed by research showing that buyouts can lead to substantial enhancements in the operating performance of acquired companies, as evidenced by Kaplan (1989a), Smith (1990), and Lichtenberg & Siegel (1990). These improvements are linked to the high leverage and strong incentives inherent in private equity deals, which are believed to mitigate the aforementioned agency issues stemming from free cash flows and entrenched management ultimately benefiting shareholders and enhancing social welfare.

Nevertheless, critics like Shleifer and Summers (1988) challenge the idea that private equity firms contribute to creating operational value. They argue that these firms mainly benefit from tax advantages and superior information without necessarily improving the day-to-day aspects of their portfolio companies, compromising the long-term performance of the companies and their investments in R&D and Capital Expenditures. Moreover, some assert that the activities of private equity firms often reflect opportunistic market timing tactics used to exploit differences between debt and equity markets for their gain. Such a view shows that in the case of certain circumstances, if the private equity creates value, such an impact could never be uniformly positive for all members of financial groups or even stakeholders, raising issues about the acceptability of social influence from such takeovers. (Sorensen & Yasuda, 2022).

To assess the influence of private equity on their portfolio companies, two primary methods are commonly used in academic research. The first one compares the performance of the portfolio companies before the buyout and some years after the buyout, measuring the private equity added value post-deal and the second compares the performance of the portfolio companies before the buyout and after the exit deal, measuring the private equity added value after exit deal. According to the literature, the first approach is much more used, typically examining up to three years after the buyout, as noted by Amess (2003) and Wright et al (2009). In this study, the methodology adopted will be the first one to rigorously evaluate the post-deal value creation by private equity in portfolio companies, reflecting the dominant practice in current literature.

While the first approach is more commonly utilized in the literature, likely due to the availability of data and the clear temporal definition of private equity involvement, both methods offer valuable perspectives on the multifaceted impact of private equity investments. Each approach provides a different approach to analyse the value creation mechanisms of private equity firms, from immediate operational enhancements to lasting strategic transformations.

2.9.1. Do PEs positively impact their target companies' Operating Efficiency & Profitability?

Early studies:

The first research on this topic dates back to the 1980s and 1990s and was essentially focused only on UK and US buyouts. Empirical data regarding the operational performance of companies following their acquisition through a buyout generally presents favourable results, largely supporting the theory that private equity firms improve operational performance and value creation in portfolio companies (Wright, Gilligan & Amess, 2009).

Kaplan (1989) was one of the first researchers in this line of study. Among the first to offer a breakthrough to research management buyouts (MBOs), Kaplan examined how these acquisitions impact the operating performance and value of the PE-backed companies. This study was groundbreaking in that it showed buyouts could vastly improve a firm's operational efficiency and financial position (Yasuda & Sorensen, 2022). Kaplan presents evidence from 48 management buyouts (MBO) in the years 1980 through 1986 that based on empirically collected data, MBOs increased operating income before depreciation and net cash flows, while recording decreases in capital expenditures. However, these increases were due to a higher incentive alignment and at the same time led to a reduction in the level of agency issues but not at the cost of the employees. Notably, Kaplan revealed from his studies that the U.S. public-to-private deals during the 1980s decade proved the absolute increase of ratio to sales from the operating income/sales to be as high as 20% and relative to the same margin. The ratio FCF/Sales (Free cash flow to sales) increased by approximately 40% (Kaplan & Stromberg, 2009).

Smith (1990), Lichtenberg & Siegel (1990), Muscarella and Vetsuypens (1990), and Baker and Wruck (1989) built on Kaplan's work by presenting a strong body of evidence supporting the positive impact made by private equity firms on portfolio companies. Smith's (1990) study of 58 MBOs highlighted "improvement in the operation" and "enhancement of strategic working capital management," all without "downsizing the employees". Lichtenberg & Siegel's (1990) analysis of over 12,000 manufacturing plants revealed a notable productivity jump from 2% to 8.3% above the

industry mean, without affecting employment adversely. Muscarella and Vetsuypens' (1990) study on 72 reverse LBOs¹ highlighted profitability gains driven by operational efficiencies rather than layoffs. Similarly, Baker and Wruck's (1989) investigation into the O.M. Scott & Sons Company buyout demonstrated significant sales and EBIT increases due to high leverage, managerial compensation adjustments, and better oversight, without relying on cost-cutting measures, respectively 25% and 56% (Yasuda & Sorensen, 2022). These findings collectively illustrate PE's role in driving strategic operational improvements, enhancing financial performance, and fostering growth without detrimental employment or expenditure cuts.

Later studies (1990s-2000s):

More recent research on this subject, particularly focusing on buyouts in the US and Europe, presents a more complex picture compared to findings from the 1980s. There is no clear trend towards improved operating performance and profitability after an acquisition.

Guo et al. (2011) examined 192 LBOs conducted in the US between 1990 and 2006. They discovered that operating improvements were not as substantial as those documented in studies from the 1980s, nor were there significant operational enhancements compared to non-PE firms. Numerous studies have shown mixed results regarding post-buyout performance in the US, some indicating deteriorating performance while others report inconclusive findings or improvement (Jelic & Wright, 2011). Moreover, Leslie and Oyer (2008) found that while portfolio companies demonstrated a higher sales per employee metric, there were no statistically significant changes in other key performance measures such as profitability and operational efficiency for 144 LBOs in the US between 1996 and 2004.

European research presented a generally positive view of leveraged buyouts, citing significant improvements in operations and productivity. Firstly, Wright, Wilson, and Robbie (1996) found that British companies undergoing a management buyout achieved considerably greater growth in return on assets compared to similar firms that did not undergo such a buyout within two to five years post-acquisition. Similarly, a more recent study by Boucly, Sraer, and Thesmar (2011) discovered positive effects of PE activity in a study of 839 French buyouts from 1994 to 2004. Their findings indicate substantial and statistically significant improvements in profitability, employment rates, and sales figures. Over the span of four years before the transaction to four years after it, there was an average

¹ Transactions in which a company held in a portfolio that was formerly publicly traded is subsequently acquired by a private equity firm, and later reissued through an initial public offering.

increase of 18% in employment levels, a 12% rise in assets, and a similar growth rate for sales when compared with similar companies (Yasuda & Sorensen, 2022). Besides, Bergström, Grubb, and Jonsson's (2007) study of 73 Swedish buyout exits (between 1998 to 2006) further reported that there were substantial operational benefits in the form of a considerable increase in EBITDA margins, along with other potential benefits of private equity for firms. However, there are still some studies indicating that there is a post-buyout operating performance decrease, as the study carried out by Desbrieres and Schatt (2002) analysed 161 MBOs in France for the period 1988-1994, from which they conclude that "from pre-buyout values, acquired firms outperformed similar ones pre-buyout and post-buyout; unlike French MBO firm performance declined post-transaction."

2.9.2. Do PEs positively impact their target companies' Employment?

Regarding employment, as previously mentioned, buyout critiques like Shleifer and Summers (1988) argue that these deals primarily favour private equity investors over employees, leading to potential job losses and reduced wages. However, the majority of the authors don't share this perspective.

According to Kaplan & Strömberg (2009), the available evidence indicates that companies undergoing buyouts tend to see an increase in employment. However, this growth is slower compared to similar firms not involved in such buyouts i.e. non-PE backed (control groups). This vision is shared by many authors like Lichtenberg and Siegel (1990), Davis, Haltiwanger, Jarmin, Lerner, and Miranda (2008 & 2014), and Amess & Wright (2007a).

These findings do not align with fears of job losses but also do not support the notion that privately owned businesses experience exceptionally robust employment growth, defended by Boucly, Sraer, and Thesmar (2008) in their analysis of French LBOs.

2.9.3. Do PEs foster innovation in their target companies?

Regarding innovation, concerns have been expressed that enhancements in operational performance and profitability following the buyout may lead to a decline in long-term performance, particularly affecting R&D spending and innovation investments. Critics argue that buyout funds are motivated by short-term profits and prioritize immediate performance over long-term growth. However, Harford & Kolasinski (2013) and many other studies rejected that hypothesis.

Many authors defend that private equity firms do not foster and enhance the innovation of their target companies, asserting that the financial constraints of LBOs may lead to a focus on short-term gains and narrow managerial perspective, ultimately impacting innovation negatively, creating a

<managerial myopia= (Hitt et al.,1991). The research of Lichtenberg and Siegel (1990), Long and Ravenscraft (1993), and Ughetto (2009) all indicate a negative pattern when it comes to the influence LBOs have on innovation in the targeted business. While Lichtenberg and Siegel (1990) had originally proposed that LBOs did not lead to a significant decrease in R&D spending, other studies found quite the opposite. Long and Ravenscraft (1993) state that after LBOs, the R&D intensity is reduced by 40%. Indeed, Ughetto (2009) adds to these findings through a comprehensive analysis particularly focused on investment in innovation. It points out to a consistent trend of buyouts along with post-buyout restructuring initiatives coinciding with reductions in innovative investment, such as reduced patent activity among affected firms. Ughetto's findings suggest that the participation of private equity firms in such transactions may unintentionally inhibit innovation within targeted companies. These findings underline the necessity for thoughtful consideration and potentially revised strategies when it comes to private equity involvement to mitigate these adverse effects while promoting a more conducive environment for innovation within target entities.

However, as previously mentioned, this topic generates a lot of controversy among academics, and there is substantial research that indeed shows that private equity firms foster innovation in their target companies. Amess, Stiebale, and Wright's (2015) research explores 407 UK buyouts conducted between 1998 and 2005. The study reveals a notable rise in quality-adjusted patent stock three years after the buyout. Lerner (2003) examines the impact of private equity on innovation fostering the US, analysing a dataset covering twenty industries over a period of three decades. The study reveals that greater involvement of private equity in an industry is linked to notably increased rates of patenting. According to this analysis, it is suggested that private equity support could have contributed to approximately 8% of industrial patent advancements during this time frame. Besides, Lerner, Sorensen, & Strömberg (2011) conducted a study on the influence of private equity investment on innovation by analysing 495 transactions. They aimed to investigate if leveraged buyouts alleviate pressure from public shareholders and whether private equity funds prioritize short-term gains over long-term performance for the companies they purchase. Their examination of the patenting activity before and after acquisition showed no evidence of LBOs hindering innovation efforts. Instead, their results suggested that companies backed by private equity tend to have patents that are cited more frequently, indicating a positive impact on innovation activities. This finding aligns with the notion that private equity investments contribute to alleviating financial constraints within portfolio companies, thereby enabling increased investment in innovative activities.

In summary, previous research findings presented a manifold character of this relationship, indicating that while some instances of private equity involvement led to reduced R&D spending and patent

activity, others showed a clear improvement in innovation measures. All in all, more in-depth explorations and nuanced methods need to be taken into account to reconcile these inconsistent conclusions.

Chapter 3: Hypothesis

Considering the existing literature and the huge variety of opinions among researchers about this topic, this thesis aims to conduct a thorough analysis that offers new insights based on up-to-date data. The study is structured into two main hypothesis: 1) Evaluating the effect of private equity investment on the operational performance of portfolio companies post-investment. This will assess whether PE-backed companies demonstrate tangible improvement in key performance metrics compared to non-PE-backed peers, and 2) Studying how Private Equity promotes innovation within its portfolio companies after the investment compared to non-PE-backed peers. This involves testing if and how PE investments enhance a company's innovation capabilities by increasing its intangible assets in percentage of total assets.

Based on the findings from previous studies, the following hypothesis have been formulated:

H1: Private Equity-backed companies exhibit higher performance, in comparison to their non-private Equity backed peers, after the PE deal;

The first hypothesis states that portfolio companies backed by private equity investment register improved operational performance and profitability post-investment compared with non-PE-backed peers. This hypothesis, in fact, points to the possibility of PE interventions bringing very substantial changes in management practices and operational procedures that would assist in getting better financial results. As mentioned earlier, past research on this topic reflects a balanced view. Most of the studies adhere to the fact that in the presence of PE involvement, there are marked improvements in operational performance metrics and profitability metrics. For example, studies have captured improvements in the Return on Assets (ROA), EBITDA margins, and cost efficiencies, all from the effects of PE investments. These benefits can be expected from the strategic restructuring by PE firms, management expertise, and proper capital allocation, ultimately leading to profitability enhancement (Barber and Lyon, 1996; Kaplan, 1989). The results, however, are not globally uniform in all cases or geographic areas. Some of the studies identify that the performance improvement in companies exhibiting significant performance improvement post-PE investment is not identified in many

companies, or even performance had declined, and it might have been the industry-specific or business-specific characteristics of the PE deals (Guo et al., 2011).

H2: Private Equity-backed companies exhibit higher innovation enhancement, in comparison to their non-private Equity backed peers, after the PE deal;

The second hypothesis wants to prove that PE firms indeed contribute much to the development of innovation activity in their portfolio companies on a post-deal basis. This is based on the fact that PE investors bring capital, strategic insights, and resources that allow carrying innovation activities within the firm⁴activities related to research and development (R&D).

As previously mentioned, according to the literature, the influence of private equity investments on innovation is intricate and diverse. Certain research results uphold the theory, demonstrating that firms backed by private equity often boost their R&D expenditures and introduce more patents in comparison to non-private equity-backed counterparts. This occurrence is particularly evident when private equity companies introduce new technologies or business strategies that encourage innovative procedures. Conversely, alternative research promotes a more careful viewpoint, indicating that the demand to attain instant financial benefits could cause private equity firms to prioritize short-term profits over long-term investment in innovation. This situation may result in a decrease in R&D expenditure to improve immediate financial results, potentially constraining long-term innovative capacity (Lichtenberg and Siegel, 1990; Ughetto, 2009).

Chapter 4: Data

This chapter will give detailed information on data obtained to analyse the impact of PE funds on the performance and innovation of their portfolio companies.

The data collected concerning PE deals done in the period 2011-2019 was a massive and arduous process. Primarily, previous research on this topic usually uses data available from subscription-based platforms such as Capital IQ, CMBOR, and Mergermarket, among others. Without having access to these platforms, the study took data from three main primary platforms: Refinitiv Eikon, Orbis, and Sabi. This elaborate process, therefore, finally gave way to a data set that contained very solid and thorough samples of deals conducted within this period.

The dataset from 2011 to 2019 was used in testing the 2 hypothesis. This period was purposively chosen to ensure enough pre- and post-investment data were available. The starting year, 2011, was

selected considering a possible sample bias, particularly related to the 2008 subprime crisis. The last year included in the analysis is 2019 because the most recent available data for the vast majority of the companies is from 2022. This is the case because audited financial statements of some of the companies participating in the 2020 deals have not yet been provided. This would span nine years of investment activities (from 2011 to 2019), being every deal analysed over a 4-year horizon—from pre-investment ($t-1$) to three years post-investment ($t+3$).

Finally, due to the COVID-19 pandemic, some financial results for the years 2020, 2021, and 2022 were affected. However, the impact was relatively minor for the majority of the firms in the sample and affected the control group companies similarly. Consequently, it was decided to include these years in the analysis to maintain the sample size and statistical power. Excluding these years would have significantly reduced the number of deals with available financial data, potentially rendering the sample statistically insignificant. This approach ensures the robustness of the results despite the pandemic's effects.

4.1. Private Equity Deals (2011-2019)- Treatment Group

The data collection process first assessed Private Equity deals within the aforementioned period, constructing a preliminary sample completed by using the Refinitiv Eikon platform. It is worth noting that Refinitiv offers Private Equity screening with specific updated information concerning recent PE transactions. Further, a set of four guiding essential filters was applied to control this assessment:

- **Investment Time Range:** The date range for the deal date was extensively customized to make use of the maximum capability of the platform features in Refinitiv Eikon. Parameters were also set to have a scope from the year 2011 to 2019. This is clearly a type of customization within the methodological framework since the aim is to have comprehensive data, which cuts across some time to make the analysis robust.
- **Singular Portfolio Company Inclusion:** Filters for "Formerly PE/VC backed" status were applied to make sure that the single-company inclusion is not coming across multiple times in the case of multiple transactions.
- **Investment Stage Classification:** The investment stage was classified into three categories: LBOs, MBOs, and MBIs

From this initial filtering, a total of **850 deals** were successfully extracted for analysis.

Moreover, access to some Iberian PE funds websites enabled the inclusion of deals not covered by Refinitiv, particularly focusing on smaller enterprise value transactions in Iberia during the period in

analysis. This comprehensive approach involved a meticulous process of individually visiting the websites of leading Portuguese and Spanish private equity funds as well as searching for deal news from reputable press sources to identify relevant deals and create a comprehensive list of Iberian deals. Despite the huge scarcity of available information, this challenging and time-consuming effort yielded a discovery of **180** significant deals. This methodological innovation significantly enhances the literature, as the majority of these transactions had not been previously included in any research studies.

From this initial filtering, a total of **1030 deals** were successfully extracted for analysis.

4.2. Portfolio companies' financials (2011-2019)- Treatment Group

The second stage of data collection employed the Orbis and Sabi databases in the collection of detailed company financial information required for this analysis to be able to understand the effects that private equity firms have on performance and innovation within the portfolio companies. The collected transactions were grouped systematically concerning the year of investment: one year before the year of investment ($<Y-1=$), up to three years after the year of investment, comprising the year immediately after the investment ($<Y+1=$), the second year after the investment ($<Y+2=$), and lastly the third year after the investment ($<Y+3=$).

The main objective at this stage was to obtain specific financials that represent performance and innovation indicators of PE-backed firms found in the last stage. The main challenge was, however, that there was a considerable lack of financial data for some companies in the transactions by Orbis and Sabi while equally lacking data for some key financials of the portfolio companies, hence needing to reduce the size of the dataset to **159** firms.

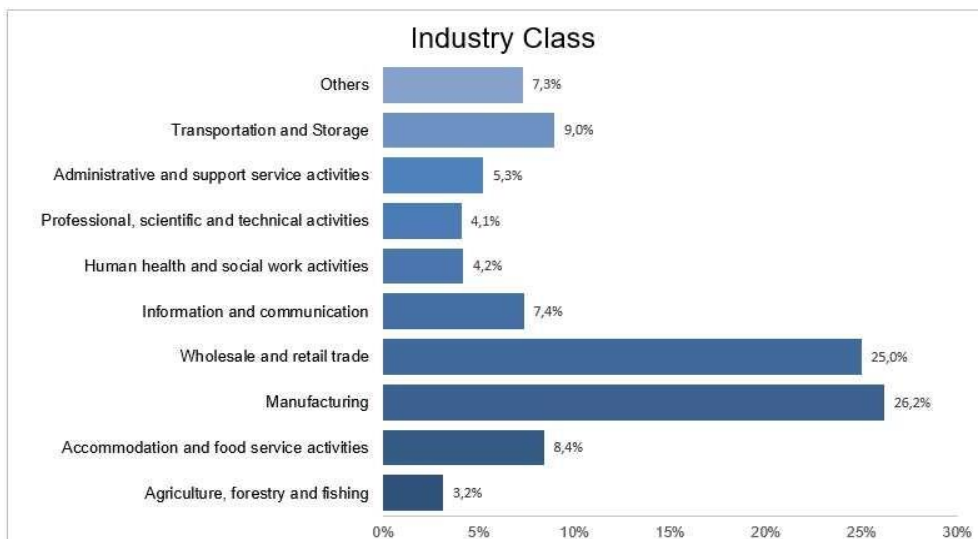
Therefore, the treatment group i.e. the group of firms being backed by a PE fund in the sample of this study is composed of 159 firms. Of the 159 companies in the treated group, 80 are from Spain, and 79 are from Portugal, as can be observed in *Figure 11*.

Figure 11: Geographic Distribution of Deals



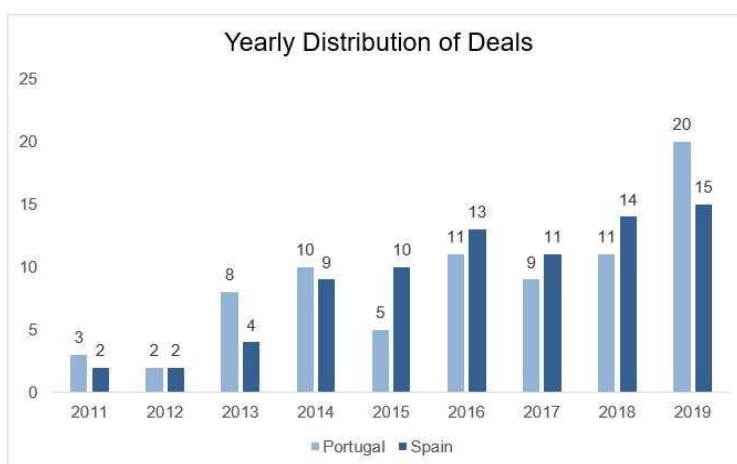
Trade, representing 25% of the sample. This distribution highlights the preference of private equity firms for industries with established operations and the potential for significant returns on investment.

Figure 13: Distribution of the companies that constitute the sample by Industry Classification



The yearly distribution of PE deals from 2011 to 2019 showcases a general increase in investment activity throughout the years, as shown in *Figure 14*. The data reveals a consistent upward trend in the number of PE deals in Iberia, particularly in the latter years being analysed. This trend is aligned with the observations detailed in **Chapter 2**, which discusses the significant growth in PE activity during this period. The peaks in deal activity can likely be attributed to favourable economic conditions and heightened investor confidence following the post-crisis recovery. However, not all deals from the Iberian region were included in this sample due to the absence of data on deal activity from certain funds and the lack of financial information for some PE-backed companies

Figure 14: Yearly distribution of PE deals (number of deals per year analysed)



Conversely, for *Hypothesis 2*, the sample size was reduced to 123 companies due to missing "Intangible Ratio" data for 36 of the original 159 PE-backed companies. The final H2 sample included 63 companies from Spain and 60 from Portugal, preserving both the industry distribution and the yearly deal trends of the full sample used in H1, ensuring consistency in the analysis across both hypothesis.

4.3. Propensity score Matching (PSM)- Control Group

To conduct the Propensity Score Matching (PSM) method, Orbis and Sabi platforms were utilized to collect data on performance indicators for the companies of the future control group. The analysis aimed to establish a "synthetic" control group of non-PE-backed companies with similar characteristics to the PE-backed firms, by examining several variables for the pre-investment year (i.e., "Y-1"). These variables included Qualitative variables: NACE Industry code and Country (matching by country and industry) and Quantitative variables: Number of employees, Operating Revenue, Current ratio, and EBITDA (to match by size and profitability). The initial data extraction required that companies have known values for all these variables for the years under study. Additionally, other performance indicators such as Return on Sales (ROS), Return on Capital Employed (ROCE) using Profit/Loss before tax (%), Return on Equity (ROE) using Profit/Loss before tax (%), average wages, and cash flow were considered, though these variables had substantial missing data. Another criteria used was to ensure that none of these companies was/were PE-backed during the time of analysis.

The first data extraction resulted in a sample of **52.678** companies, from Portugal and Spain. To ensure the integrity of the control group, it was verified that no firms in the treatment group were also present in the control group. Subsequently, PSM was performed, using XLSTAT software, matching each company in the treatment group with the closest company in the control group based on the previously mentioned indicators. PSM analysis was performed yearly, from 2011 to 2019, to find the best $match$ for each of the companies, according to the year of the PE investment.

Therefore, for H1 this matching process yielded a final sample of **159 matched deals**, consisting of **79 Portuguese companies and 80 Spanish companies**. For H2, this matching process yielded a final sample of **123 matched deals**, consisting of **60 Portuguese companies and 63 Spanish companies**.

The data obtention process is summarized in *Table 1* for a better understanding of the whole process:

Table 1: Data analysis process explained

Step	Platform	Activity/Filter Applied	Number of Deals	Variation
1	Refinitiv Eikon	Screened PE deals from 2011-2019.	850	
1	Fund's Website	Identified additional Iberian deals by visiting leading Portuguese and Spanish PE funds	180	
1	Total	Combined initial sample from Refinitiv Eikon and fund websites.	1030	NA
2	Orbis	Collected financial data for PE-backed firms from Orbis database.	159	
2	Total	Total financial data collected for PE-backed firms.	159	(851)
2	Total	Final Treatment group sample for H1	159	NA
2	Total	Final Treatment group sample for H2	123	(36)
3	Orbis	Extracted data on performance indicators for control group. Performed PSM.	52678	
3	Xlstat (Excel)	Matched treatment group with control group based on various indicators.	159	
3	Total	Final matched Control group sample for H1	159	NA
3	Total	Final matched Control group sample for H2	123	NA

In summary, the sample of deals for the treated group comprises 159 companies (480 from Spain and 79 from Portugal for H1) and 123 companies (463 from Spain and 60 from Portugal for H2), all of which are PE-backed. The control group, obtained through the Propensity Score Matching (PSM) process, also consists of 159 companies (480 from Spain and 79 from Portugal for H1) and 123 companies (463 from Spain and 60 from Portugal for H2). These control group companies are similar in terms of the quantitative and qualitative characteristics used in the pre-deal PSM process but are not PE-backed. This matching process ensures a robust comparison between the two groups, allowing for a more accurate assessment of the impact of private equity investment on the company's performance.

This similarity is further supported by the results shown in **Table 2**, which presents the descriptive statistics of the treatment and control groups and the outcomes of the difference in means and medians tests for the year before the investment i.e. $t-1$. The p-values presented in **Table 2** suggest that it is challenging to reject the null hypothesis that the treatment and control groups have different pre-treatment characteristics. This finding is a necessary condition for conducting this study to obtain robust and accurate conclusions, ensuring that the two groups of companies have similar characteristics before the t -treatment i.e. before the PE investment.

Table 2 3 Descriptive Statistics of Treatment and Control Groups

Variable	PE Sample (Treatment Group)			Non-PE Sample (Control Group)			Similarity Check		Similarity Check	
	N	Average	Median	N	Average	Median	Mean Diff	P-value	Median Diff	P-value
EBITDA (%)	159	10,58	10,83	159	10,26	10,11	0,32	0,87	0,72	0,81
WOR	159	137,44	111,15	159	131,85	111,26	5,59	0,81	-0,11	0,36
REV/WOR	159	325,22	300,25	159	266,78	285,52	58,44	0,33	14,73	0,11
ROA(%)	159	2,85	4,79	159	3,19	3,81	-0,34	0,85	0,98	0,51
LEV (in x)	159	2,03	1,68	159	1,80	1,77	0,23	0,60	-0,09	0,13
IR (%)	123	10,85	5,61	123	9,18	5,25	1,67	0,33	0,36	0,46

Chapter 5: Methodology

This chapter details the entire process and methodology applied in this research. All the dependent variables used as measures of performance and innovation in both hypothesis are summarized in *Table 3*.

For the first hypothesis, very rigorous quantitative research was adopted in this study, highly inspired by the approach of Jelic and Wright (2008) as an extension of the framework originally laid out by Barber and Lyon (1996). This methodology looks at the selection of financial metrics to identify unusual operating performance and profitability following private equity investment. This study systematically reviewed key financial metrics to uncover the nuanced impact of private equity on portfolio company operational efficiency.

Jelic and Wright (2008) emphasize the importance of using a comprehensive set of accounting and financial performance indicators to assess the long-term effects of MBOs on company performance accurately. Similarly, this study extends this approach to explore the broad spectrum of performance impacts resulting from private equity investments. Aligned with this approach, this study scrutinizes the performance of the company from four different perspectives: **Profitability, Operational Effectiveness, Workforce Impact, and Financial Leverage**. In this study, financial and operational performance across various companies is measured similarly using key metrics categorized under leverage, profitability, operating efficiency, and employment. **Leverage (<LEV=)** is assessed through the **Debt-to-Equity Ratio (D/E Ratio)**, which measures the balance of debt and equity financing. For **Profitability**, the indicator **EBITDA Margin (<EBITDA (%)=)** was utilized, illustrating earnings before interest, taxes, depreciation, and amortization as a percentage of total sales, alongside **Return on Assets (<ROA=)** which measures how effectively a company's assets are used to generate earnings. **Operating efficiency** is examined through **Sales Efficiency (<REV/WOR=)**, determining the revenue generated on a <per employee= basis. Lastly, the **Total Number of Employees (<WOR=)** is monitored to gauge the company's **Employment** scale and workforce size.

For the second hypothesis, various approaches have been proposed in the literature, such as measuring changes in R&D spending, as suggested by Lichtenberg and Siegel (1990), and assessing patent quality and frequency of citations, as proposed by Amess, Stiebale, and Wright (2015). In this research, the chosen variable to measure innovation was the ratio of intangible assets to total assets i.e. **Intangible Ratio (<IR=)**:

$$\text{Intangible Ratio (<IR=)} = \text{Intangible Assets (excluding goodwill)} / \text{Total Assets}$$

In computing the Intangible Ratio, only metrics directly related to innovation, such as R&D, patenting, and copyrighting (i.e., intellectual property-related intangible assets), were included when intangible assets were detailed and categorized on Sabi and Orbis platforms. Goodwill, trademarks, and customer-related intangibles were excluded in those cases. If detailed categorization of intangible assets was unavailable, the total value of intangible assets was used for the computations.

Although this is not the ideal proxy for innovation, it was considered the best indicator given the data available on the platforms provided by ESCP and Católica Lisbon. This proxy captures a broad spectrum of innovative activities within firms and aligns with the available data, providing a quantifiable measure of a company's commitment to innovation relative to its overall asset base. By including specific aspects of intangible assets related to innovation, this ratio encompasses technological advancements and brand-building efforts, offering a comprehensive scope. Additionally, given the data availability constraints, this ratio was the most feasible and practical measure compared to other proxies like detailed R&D spending or patent citation analysis, which might not have been consistently available for these PE-backed companies in the platforms already mentioned. However, it is important to consider the challenges in accurately valuing intangible assets, the industry differences in the importance of these assets, the potential time lag in reflecting current innovation activities, and, although goodwill and other customer-related intangibles were excluded from the computation in some of the companies, additional variables unrelated to innovation ended up being incorporated. Despite these limitations, the Intangible Assets Ratio (IR) remains a practical and broad-based proxy for innovation, leveraging available data effectively and providing insights into the relative innovative capacity of firms. Future research could complement this approach with additional indicators to create a more nuanced and comprehensive measure of innovation.

Table 3: Variable Definitions and Computation Formula

Hypothesis	Category	Variable	Formula
1	Leverage	D/E ratio ("LEV")	Total Debt / Total Equity
1	Profitability	EBITDA Margin ("EBITDA (%)") Return on Assets ("ROA")	EBITDA / Sales NI / Assets
1	Operating Efficiency	Sales Efficiency ("REV/WOR")	Sales / Number of Employees
1	Employment	Total Employment ("WOR")	Total number of Employees
2	Innovation	Intangible Ratio ("IR")	Intangible Assets / Total Assets

5.1. Propensity Score Matching (PSM)

In this study, Propensity Score Matching (PSM) is utilized to examine the causal impacts of private equity (PE) investments on the performance and innovation of their target companies. Specifically, it addresses the need to comprehend the performance outcomes that PE-backed companies would obtain in the absence of investment, thereby creating a synthetic control group. This approach has been widely adopted in similar research.

The method proposed by Caliendo & Kopeinig (2008) is a quasi-experimental method that helps to overcome the problem of omitted variables, and, in the specific case of this study, to create the control group. The Average Treatment Effect ($\langle ATE \rangle$) compares the average effect of the treatment (PE-backed) across designated variables with that of $\langle \text{untreated firms} \rangle$ (non-PE-backed) (Caliendo & Kopeinig, 2008).

The decision to use PSM addresses the specific challenge of selection bias inherent in PE investments, where PE firms do not randomly select companies but instead choose based on certain desirable characteristics (Austin, 2011). By matching private equity-backed companies with a control group of non-PE-backed firms that have similar characteristics before the treatment i.e. in the period $\langle Y-1 \rangle$, the PSM method provides a strong comparison similar to a randomized trial framework. This approach is essential for isolating the impact of PE investments from other factors, enabling observed differences in outcomes such as operational efficiency and innovation to be linked specifically to PE interventions and not to other external confounding factors (Rosenbaum & Rubin, 1983; Caliendo & Kopeinig, 2008). Matching groups with similar characteristics enable any future differences in outcomes between treated and control groups to be associated with the PE investment.

To perform this analysis in order to obtain the $\langle \text{synthetic} \rangle$ control group, the variables used to perform the matching were: NACE Industry code (first three numbers), Country, number of employees, Operating Revenue, Current ratio, and EBITDA. The statistical software XLSTAT (add-on from Excel) was used to perform this analysis, which has the goal of matching each one of the $\langle \text{Treated} \rangle$ companies with the closest $\langle \text{Control} \rangle$, in terms of the characteristics defined. The specific method employed was the Optimal algorithm using **Mahalanobis Distance Matching** (MDM). MDM is a statistical technique used to match treated and control units based on multiple covariates (Stöckl & Hanke, 2014). It calculates the distance between each pair of units (one from the treatment group and one from the control group). Afterwards, a propensity score (p-score) is computed for each company in the control group. The companies with the highest propensity scores \rightarrow indicating the highest probability of belonging to the treatment group \rightarrow were selected to from the control group. This

approach ensures that the control group closely mimics the treatment group, thereby demonstrating that any differences in the analysed indicators are attributable solely to the treatment, which, in this case, is the PE intervention (Stuart and Rubin, 2008).

5.2. Difference-in-Difference (DiD)

The Difference-in-Difference (DiD) approach was used in this study to compare average changes in the outcome variables (performance and innovation) before and after PE investment between treated (PE-backed) and control (non-PE-backed) firms. This approach is a statistical method that aims to provide causal estimates of the treatment of interest to relevant outcome variables (Lechner, 2010). Usually, DiD design comparison is inferred to take four groups of comparison objects. The underlying idea of this empirical strategy is that if both the treated (Treatment group) and the untreated (Control group) groups exhibit parallel trends before the treatment, and if there are no pre-treatment implementation period influences from the treatment-affecting groups, then the estimated effect of the treatment in a period where it is supposed to be equal to zero can be a good way to purge off bias along with confounding factors while comparing the post-treatment outcomes between the treated and untreated group (Lechner, 2010). It involves adding to the mean level of the outcome variable for the treated group before treatment the average changes in outcome variables observed for the untreated group over time to see what their mean outcome would have been had they not received the treatment. In this sense, the DiD analysis in this study is structured as follows to measure the effect of PE on the firms:

$$Y_i = \alpha + \beta_1 \text{PE-Backed}_i + \beta_2 \text{After}_i + \beta_3 (\text{PE-Backed}_i \times \text{After}_i) + \epsilon_i$$

Here, y_i represents the outcome variable, which measures performance for **H1** and innovation for **H2**, with i representing the index of each firm included in the sample. The term a represents the intercept, the baseline level of the outcome variable when all predictor variables are set to zero. The variable PE-Backed_i is a dummy variable where 1 indicates that the firm is backed by private equity (PE) and 0 otherwise. Thus, all firms that belong to the treatment group, i.e., PE-backed firms, will take the value 1, and all firms that belong to the control group, i.e., non-PE-backed firms, will take the value 0. The coefficient β_1 measures the average difference in the outcome variable between PE-backed firms and non-PE-backed firms before the treatment.

The variable after_i is another dummy variable that takes the value 1 if the observation is in the post-investment period (i.e., in the first ($<Y+1=>$), second ($<Y+2=>$), and third ($<Y+3=>$) year after the investment) and 0 if in the pre-investment period (i.e., in the year before the investment ($<Y-1=>$)),

independently of belonging to the treated or control group. The coefficient β_2 captures general time trends that affect all firms, reflecting changes in the outcome variable over time, regardless of PE investment.

The interaction term **PE-Backed** \times **After** is critical in this statistical analysis, and its results will be analysed thoroughly in **Chapter 6**. It indicates whether the firm is both PE-backed and in the post-investment period. The coefficient β_3 captures the additional effect of being a PE-backed firm during the post-investment period relative to the pre-investment period, compared to the control group. This coefficient is essentially the DiD estimator, quantifying the causal impact of PE investment on the outcome variable by comparing the changes in outcomes over time between PE-backed and non-PE-backed firms. Finally, ϵ_{it} is the error term, which accounts for the random variation in the outcome variable that is not explained by the model.

To ensure that the standard errors of the estimated coefficients are consistent and unbiased in the presence of heteroskedasticity, the T-stats were computed using robust standard errors, commonly referred to as White's (1980) standard errors. This approach is particularly relevant in this context, where the variance of the outcome variables may differ across firms and over time due to various unobserved factors. By using these robust standard errors, the risk of making incorrect inferences about the statistical significance of the treatment effect (β_3) due to heteroskedasticity is mitigated.

To perform the previously explained DiD analysis, STATA software was used. The analysis was conducted across three distinct timeframes to capture the varying impacts of private equity (PE) investment over different periods. First, regressions were run comparing the period from one year before the investment (i.e., "Y-1") to one year after the investment (i.e., "Y+1"). Next, regressions were conducted comparing the period from one year before the investment (i.e., "Y-1") to two years after the investment (i.e., "Y+2"). Finally, regressions were performed comparing the period from one year before the investment (i.e., "Y-1") to three years after the investment (i.e., "Y+3"). In each regression, the period "Y-1" was compared to the subsequent periods to assess the impact of the PE investment over time.

Chapter 6: Empirical Results

In this section of the study, the main results of the Difference-in-Differences (DiD) regressions for both hypothesis under analysis are presented and then discussed.

The results and discussion are presented first for Hypothesis 1 and then for Hypothesis 2.

6.1. Results and Discussion: Hypothesis 1

H1: Private Equity-backed companies exhibit higher performance, in comparison to their non-private Equity backed peers, after the PE deal;

6.1.1 Results: Hypothesis 1

For the first hypothesis, the primary findings are summarized in *Tables 4, 5, and 6*. *Table 4* presents the Difference-in-Differences (DiD) analysis results comparing "Y-1" with "Y+1". Similarly, *Table 5* showcases the DiD analysis outcomes for the comparison between "Y-1" and "Y+2". Finally, *Table 6* illustrates the DiD analysis results for the comparison of "Y-1" with "Y+3".

The dependent variables: ROA, and EBITDA (%) correspond to percentages. The variable WOR is measured in number of employees. In contrast, the variable REV/WOR is expressed in thousands of euros per worker, and Leverage (<LEV=) is presented as a ratio. The tables present coefficients along with their p-values in parentheses, indicating the effect of each variable on the outcomes measured. The significance levels, represented by asterisks (*** for $p < 0.01$, ** for $p < 0.05$, and * for $p < 0.1$), indicate the statistical significance of the coefficients at 1%, 5%, and 10%.

In the discussion section, the coefficient analysed is β_3 which represents the interaction term <PE-Backed x after=. This coefficient captures the additional impact of being a private equity-backed firm during the post-investment period relative to the pre-investment period, in comparison to the control group. This analysis aims to determine the specific effect of private equity backing on the firm's performance outcomes over time, aligning with the primary objective of this study.

Table 4: Regression Results for DiD for <Y-1= vs <Y+1=

VARIABLES	Difference-in-Differences ("Y-1" vs "Y+1")				
	(1) ROA	(2) EBITDA %	(3) WOR	(4) REV/WOR	(5) LEV
PE-Backed	-0.827 (0.565)	1.683 (0.359)	0.442 (0.984)	12.13 (0.860)	-0.310 (0.346)
After	0.286 (0.819)	-1.327 (0.405)	3.563 (0.848)	-41.88 (0.483)	0.0931 (0.744)
PE-Backed x After	2.390 (0.198)	1.886* (0.063)	18.46 (0.507)	102.8 (0.247)	0.788* (0.064)
Constant	3.720*** (0.001)	8.847*** (0)	137.1*** (0)	278.0*** (0)	2.377*** (0)
Observations	1264	1264	1264	1264	1264
R-squared	0.004	0.028	0.002	0.005	0.009
Adj. R-squared	0.001	0.024	-0.002	0.001	0.005

Robust pval in parentheses
 *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 5: Regression Results for DiD for <Y-1= vs <Y+2=

VARIABLES	Difference-in-Differences (“Y-1” vs “Y+2”)				
	(1) ROA	(2) EBITDA %	(3) WOR	(4) REV/WOR	(5) LEV
PE-Backed	-0.940 (0.585)	1.715 (0.383)	0.114 (0.996)	5.041 (0.921)	-0.395 (0.261)
After	0.384 (0.746)	-1.271 (0.216)	5.235 (0.780)	-30.02 (0.381)	0.00530 (0.986)
PE-Backed x After	2.224 (0.284)	7.091*** (0.009)	29.22 (0.298)	133.2 (0.264)	1.330*** (0.002)
Constant	3.794*** (0.001)	8.869*** (0)	137.3*** (0)	282.3*** (0)	2.426*** (0)
Observations	1256	1256	1256	1256	1256
R-squared	0.004	0.038	0.004	0.005	0.020
Adj. R-squared	0.001	0.034	0.001	0.002	0.016

Robust pval in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

Table 6 Regression Results for DiD for <Y-1= vs <Y+3=

VARIABLES	Difference-in-Differences (“Y-1” vs “Y+3”)				
	(1) ROA	(2) EBITDA (%)	(3) WOR	(4) REV/WOR	(5) LEV
PE-Backed	-0.986 (0.469)	1.961 (0.267)	2.117 (0.921)	31.03 (0.798)	-0.263 (0.427)
After	0.192 (0.871)	-1.228 (0.425)	7.350 (0.691)	-43.66 (0.679)	0.119 (0.682)
PE-Backed x After	2.228 (0.205)	8.827*** (0.001)	31.64 (0.250)	284.1* (0.069)	0.914** (0.033)
Constant	3.803*** (0.000)	8.686*** (0)	136.2*** (0)	267.1*** (0.002)	2.353*** (0)
Observations	1272	1272	1272	1272	1272
R-squared	0.004	0.059	0.006	0.011	0.012
Adj. R-squared	0.000	0.056	0.002	0.008	0.009

Robust pval in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

6.1.2. Discussion: Hypothesis 1

The results from the DiD regressions conducted to test this hypothesis indicate that over the three horizons analysed, PE-backed companies showed overall superior performance and profitability metrics compared to non-PE-backed companies post-deal. This superior performance is evident in key indicators such as EBITDA margins, and operating revenue efficiency. These findings support the hypothesis that private equity investments lead to enhanced performance for the portfolio companies relative to their non-PE-backed counterparts, post-deal.

As previously mentioned, Performance was assessed from four different perspectives:

Profitability

The variables used to measure profitability were ROA and EBITDA (%), as proposed in previous studies on this matter. Over the three horizons analysed, the results indicate that private equity-backed firms consistently exhibit superior EBITDA margins in the years after the buyout deal, in comparison with their non-PE-backed counterparts. This finding is supported by positive, increasing, and statistically significant coefficients across the three DiDs conducted.

In the first DiD analysis ($<Y-1=$ vs $<Y+1=$), the initial comparison showed that the coefficient for the EBITDA margin was positive and statistically significant at the 10% level. This indicates that, on average, PE-backed firms experience an increase in EBITDA margin of **1.886 pp** one year after the investment compared to the pre-investment period, relative to non-PE-backed firms. These findings indicate that PE-backed firms begin to exhibit minor improvements in profitability within the first-year post-investment compared to the control group. Although the observed increase is relatively small, it establishes a baseline for tracking trends over time.

The results of the second DiD analysis ($<Y-1=$ vs $<Y+2=$) showed that the coefficient for the EBITDA margin was positive and statistically significant at the 1% level. This indicates that, on average, PE-backed firms experience an additional increase in EBITDA margin of **7.091 pp** two years after the investment compared to the pre-investment period, relative to non-PE-backed firms. This suggests that PE-backed firms begin to show noticeable improvements in profitability within two years post-intervention, in comparison to the control group.

In the third DiD analysis ($<Y-1=$ vs $<Y+3=$), the coefficient was, once again, not only positive but also statistically significant at the 1% level, with a really low p-value of 0.001. This indicates a robust and substantial enhancement in EBITDA margins three years after PE intervention, specifically showing an average additional increase of the EBITDA margin for PE-backed firms of approximately **8.827 pp** three years after the investment compared to the pre-investment period, relative to the control group firms.

In terms of Return on Assets (ROA), the coefficients were positive in all three regressions but failed to reach statistical significance in any of the DiDs, with p-values higher than 0,1 in all three scenarios. The analysis showed an increase in Return on Assets (ROA) in all three regressions, but the results showed no statistical significance. It can be deduced, therefore, that the positive drift that is observed in ROA post-PE investments should be carefully interpreted as to whether there is a real increase in the effectiveness of PE investments within the monitoring hypothesis. It may be that also other factors

are at play behind this increase, such as the macroeconomic environment factors, composed mostly of economic cycles and interest rate changes that may influence the efficiency and profitability of the assets. In addition, also other management practices within the firms, such as strategic changes and operational efficiencies, may influence the usage and profitability of the assets. Since there is no statistical significance in the results, this might encourage further research to isolate the real effect of PE investments on ROA and to control for the other possible confounding variables.

Conversely, the increasing trend in EBITDA margins shows the positive impact of private equity investments on firm profitability, aligning with findings from earlier research, such as Kaplan's 1989 study and the work by Bergström, Grubb, and Jonsson in 2007. These studies showed significant improvements in profitability due to PE interventions. However, this contrasts with more recent views, such as Guo et al.'s 2011 study, which argued that operating improvements were not as considerable as those documented in the 1980s and that there were no significant profitability enhancements compared to non-PE firms. The significant and increasing coefficients at the 10% level for the first time horizon and at the 1% level for the second and third periods reinforce the hypothesis that PE-backed firms experience superior profitability over time compared to their non-PE-backed counterparts. This improvement in profitability, specifically in EBITDA margin can be attributed to the financial and strategic enhancements typically implemented by PE firms as proposed by Kaplan & Kaplan (2009).

Workforce impact

The variable used to measure workforce impact was the number of employees ($\langle \text{WOR} = \rangle$), as previous studies on this topic proposed. All the coefficients of the Difference-in-Differences (DiD) analysis are positive, which indicates that PE-backed firms, on average, experience an increase in the number of workers in the post-investment period compared to non-PE-backed firms. However, none of these coefficients were found to be statistically significant, implying that PE investment has no definitive impact on workforce size, according to the data in the analysis.

The first DiD analysis (comparing $\langle Y-1 = \rangle$ to $\langle Y+1 = \rangle$) shows an average increase of approximately **18 employees** in PE-backed firms one year after the investment compared to the pre-investment period. The second analysis (comparing $\langle Y-1 = \rangle$ to $\langle Y+2 = \rangle$) and the third analysis (comparing $\langle Y-1 = \rangle$ to $\langle Y+3 = \rangle$) yield similar conclusions, with average increases of approximately **29 and 32 employees** in PE-

backed firms post-investment compared to the pre-investment period, relative to the control group firms.

These findings align with the perspectives of "Buyout supporters," such as Kaplan and Strömberg (2009), who suggest that PE investments can lead to business expansion and growth, potentially increasing employment. However, they challenge the arguments made by authors like Shleifer and Summers (1988), who argue that private equity transactions primarily benefit investors at the expense of employees, often resulting in job cuts and layoffs.

While the results of this analysis show a positive trend in workforce size following PE investments, the lack of statistical significance demands a careful interpretation. It is possible that the positive workforce impact could be due to strategic operational changes and expansions facilitated by PE backing, such as new business ventures, acquisitions, or market expansions. However, the potential for confounding variables that were not controlled for in this study suggests the need for further research to isolate the true effect of PE investments on employment.

Operational Effectiveness

The variable used to measure operational efficiency was operating sales per employee ($\langle \text{REV}/\text{WOR} \rangle$), as recommended by previous studies. Over the analysed period, PE-backed firms consistently showed higher sales per employee post-deal compared to non-PE-backed firms, as indicated by the positive coefficients across all three timeframes. However, the only statistically significant coefficient is the one from the third DiD analysis (comparing $\langle Y-1 \rangle$ to $\langle Y+3 \rangle$), significant at the 10% level. In the other two DiDs, the results were not statistically significant.

In the first DiD analysis (comparing $\langle Y-1 \rangle$ to $\langle Y+1 \rangle$), the results show an average increase of approximately **102.8 thousand euros in sales per employee** in PE-backed firms one-year post-investment compared to the pre-investment period, relative to non-pe-backed firms. The second analysis (comparing $\langle Y-1 \rangle$ to $\langle Y+2 \rangle$) yields similar findings, with an average increase of approximately **133.2 thousand euros in sales per employee** in PE-backed firms two years post-investment compared to the pre-investment period. The third DiD analysis, which extends the comparison to "Y-1" and "Y+3," reveals a more substantial increase, with an average rise of approximately **284.1 thousand euros in sales per employee** in PE-backed firms three years post-investment, relative to the pre-investment period and non-PE-backed firms. Notably, this is the only

statistically significant result at the 10% level, with a p-value of 0.069. This finding underscores the positive impact of PE funds on enhancing the operational efficiency of their portfolio companies.

These results align with previous research on this topic, such as the study by Leslie and Oyer (2008), which found that portfolio companies demonstrated a higher sales per employee metric following PE investment. In the literature, it is suggested that PE-backed firms tend to achieve greater sales per employee, possibly due to strategic and operational improvements implemented by PE firms, as discussed. Kaplan and Strömberg (2009) discussed how PE firms often implement governance and financial engineering strategies to enhance the performance of their portfolio companies. This typically includes better alignment of managerial incentives, rigorous performance monitoring, and strategic restructuring, which collectively contribute to improved operational efficiency. These mechanisms are likely responsible for the positive trends in sales per employee observed in this study, even if statistical significance was not achieved in all periods.

However, the lack of statistical significance in the initial periods of analysis calls for a more thorough analysis and might be attributed to several factors. The transition period immediately following PE investment might involve restructuring and initial costs that temporarily offset the gains in efficiency. This is supported by the findings of Kaplan and Stein (1993), who noted that the benefits of PE investments often become more apparent in the longer term as companies adjust to new operational practices and strategies.

Financial Leverage

The variable used to measure profitability was the Debt/Equity ratio as proposed in previous studies on this matter. Across the three horizons analysed, the results show that private equity-backed firms consistently exhibit higher leverage compared to their non-PE-backed counterparts on a post-deal basis. This is evidenced by positive and statistically significant coefficients across all three DiDs conducted. These findings indicate a robust and substantial increase in financial leverage in the three years following the PE intervention.

The first DiD analysis ($<Y-1=$ vs $<Y+1=$) showed that the coefficient for Leverage was positive and statistically significant at the 10% level indicating that, on average, PE-backed firms experience an additional increase in their leverage ratio of **0.79x** in the post-investment period compared to the pre-investment period, relative to the control group firms. This suggests that PE-backed firms begin to

show noticeable increases in leverage within one-year post-intervention, relative to the non-PE-backed firms.

In the second and third DiDs ($\Delta Y_{-1} = \text{vs } \Delta Y_{+2}$ & $\Delta Y_{-1} = \text{vs } \Delta Y_{+3}$), the coefficients are also positive and statistically significant at 1% and 5%. The coefficient of the second analysis (**1.33x**) is higher than that of the third (**0.91x**), probably indicating that the increase in leverage post-deal in PE-backed firms decreases as the exit process becomes closer. This suggests that the initial surge in leverage begins to moderate as firms adjust to their new capital structures and work towards stabilizing their financial positions since PE funds typically use $\Delta \text{Deleveraging}$ as a source of value creation (Hammer et al., 2022).

As previously observed in this study, specifically in Subsections **2.6** and **2.8.2**, this is the typical case in leveraged buyouts (LBOs). This high leverage is a strategic decision aimed at maximizing returns on equity by using debt to increase potential financial gains, which leads to a considerable increase in D/E ratio. While this increases the financial risk due to the higher debt burden, it also can lead to higher returns if the portfolio company performs well in the periods after the acquisition, which is typically the case. The findings of this study are consistent with previous literature, which highlights that PE-backed firms often adopt aggressive leverage strategies to finance their acquisitions, which ends up increasing the D/E ratio post-acquisition. Several experts, including Kaplan and Stein (1990) and Andrade and Kaplan (1998), have posited that private equity fund managers excessively burden their portfolio companies with debt in the years post-buyout. Similarly, Haque, Jang, and Mayer (2023) argue that there is a significant increase in leverage during buyouts, and this high level of leverage persists post-buyout. This indicates a lasting impact of private equity buyouts on the capital structure of firms, particularly concerning debt levels.

6.2. Results and Discussion: Hypothesis 2

H2: Private Equity-backed companies exhibit higher innovation enhancement, in comparison to their non-private Equity backed peers, after the PE deal;

6.2.1 Results: Hypothesis 2

For Hypothesis 2, the results are presented in *Table 7*. This table presents the DiD analysis results comparing "Y-1" with "Y+1", "Y-1" with "Y+2", and "Y-1" with "Y+3".

The hypothesis that private equity (PE) firms foster and enhance innovation within their portfolio companies was tested using the **Intangible Ratio** (ΔIR) as a proxy for innovation. The variable "IR"

represents a percentage. The tables present coefficients along with their p-values in parentheses. The significance levels, represented by asterisks (***) for $p < 0.01$, ** for $p < 0.05$, and * for $p < 0.1$), indicate the statistical significance of the coefficients at 1%, 5%, and 10%.

In the discussion section, the coefficient analysed is β_3 which represents the interaction term **<PE-Backed x after=**. This coefficient captures the additional impact of being a private equity-backed firm during the post-investment period relative to the pre-investment period, in comparison to the control group. This analysis aims to determine the specific effect of private equity backing on the firm's innovation outcomes over time, aligning with the primary objective of this study.

Table 7: Regression Results for Difference-in-Differences (DiD) Analysis for IR

Difference-in-Differences (“Y-1” vs “Y+1”)		Difference-in-Differences (“Y-1” vs “Y+2”)		Difference-in-Differences (“Y-1” vs “Y+3”)	
VARIABLES	(1) IR	VARIABLES	(1) IR	VARIABLES	(1) IR
PE-Backed	1.410 (0.368)	PE-Backed	1.410 (0.368)	PE-Backed	1.410 (0.398)
After	2.281* (0.0819)	After	2.281 (0.111)	After	2.281 (0.108)
PE-Backed x After	-2.651 (0.264)	PE-Backed x After	-3.889* (0.090)	PE-Backed x After	-4.682** (0.039)
Constant	9.182*** (0)	Constant	9.185*** (0)	Constant	9.186*** (0)
Observations	984	Observations	984	Observations	984
R-squared	0.008	R-squared	0.006	R-squared	0.010
Adj. R-squared	0.003	Adj. R-squared	0.003	Adj. R-squared	0.006
Robust pval in parentheses *** p<0.01, ** p<0.05, * p<0.1		Robust pval in parentheses *** p<0.01, ** p<0.05, * p<0.1		Robust pval in parentheses *** p<0.01, ** p<0.05, * p<0.1	

6.2.2. Discussion: Hypothesis 2

The results from the Difference-in-Differences (DiD) regressions performed over the three different horizons already mentioned, presented in **Table 7**, indicate that PE-backed companies consistently exhibited a lower Intangible Ratio (IR) compared to their non-PE-backed counterparts post-deal. This finding suggests that contrary to the hypothesis, PE-backed firms tend to invest less in innovation after the PE investment, compared to their non-PE-backed peers. This finding is supported by negative and increasing coefficients across the three DiDs conducted. As this ratio was used as a proxy for Innovation investment, it can be ascertained that, based on the sample chosen, PE investments do not foster innovation, but rather the opposite.

In the first Difference-in-Differences (DiD) analysis ($<Y-1=$ vs $<Y+1=$), the initial comparison did not show statistically significant results but indicated a negative coefficient. The second DiD analysis ($<Y-1=$ vs $<Y+2=$) revealed that the coefficient for the Intangible Ratio (IR) was negative and statistically significant at the 10% level, indicating an average decrease of approximately **3.89 pp** in

the IR of PE-backed firms two-years post-investment compared to the pre-investment period, relative to the control group firms. This suggests that PE-backed firms begin to show noticeable reductions in innovative investments within two years post-intervention. In the third DiD analysis ($<Y-1=$ vs $<Y+3=$), the coefficients were increasingly negative and statistically significant at the 5% level, indicating a more pronounced decrease in the IR of **4.68 pp**. This further supports the trend that PE-backed firms invest less in innovation-related activities over time.

One potential reason PE firms might hinder innovation is their excessive focus on financial performance and cost-cutting measures to boost their returns, given their typically short investment horizon of around five years. PE funds often aim for quick returns on their investments, which can lead to prioritizing short-term profitability over long-term innovation. This approach may result in reduced budgets for R&D, fewer resources allocated to innovative projects, and an overall decrease in the emphasis on developing new technologies and products. The pressure to meet financial targets and generate quick returns might overshadow the need for sustained investment in innovation, ultimately hindering creative and forward-thinking initiatives within portfolio companies.

These empirical findings align with some of the perspectives found in previous research on this topic. Several studies have highlighted the tendency of PE firms to prioritize short-term financial performance over long-term investments such as R&D and innovation. For instance, Long and Ravenscraft (1993) and Ughetto (2009) support the view that leveraged buyouts (LBOs) and other PE investments may lead to reduced innovation activities due to financial constraints and a focus on immediate profitability. However, it is important to note that the literature also presents different views where PE involvement has been shown to enhance innovation under certain conditions. For example, research by Amess, Stiebale, and Wright (2015) and Lerner (2003) found that PE-backed firms could see an increase in patent quality and frequency, suggesting that the impact of PE on innovation can vary significantly depending on the specific context and management strategies employed.

Finally, it is important to note that these conclusions are based on the proxy used in this study, the Intangible Ratio (IR), which measures the ratio of intangible assets to total assets, and in a small sample of deals, obtained from a specific geographical region. While this proxy provides a broad measure of innovative activities, it may not capture the full scope of innovation as effectively as direct measures such as R&D expenses or patent quality data, to which there was no access in this study. Therefore, the conclusions might slightly differ if a better proxy such as detailed R&D expenses or patent quality data were used.

Chapter 7: Limitations and Future Research

7.1. Limitations

This study experienced some limitations. The first one was in the temporal scope of the research. The period analysed (from 2011 to 2019) was selected to remove some bias that may have emanated from the worldwide financial crisis of 2008. Starting in 2011, the study managed to eliminate the effects of the crisis in the short run over the results.

Furthermore, the lack of available financial data is another limitation. The limit for including financial data up to 2022 is set by the fact that the audited financial statements for the years 2023 and 2024 are not available at this moment. Moreover, the decision to analyse only firms from Spain and Portugal was influenced by some factors, including the limited availability of financial data for non-Iberian companies, which could have introduced biases if included. Additionally, many funds only disclose information about their investments, such as the companies and the timing of these investments, to their stakeholders and investors rather than publicly, which further limited the potential sample size. For more thorough research access to platforms like Capital IQ, CMBOR, and Preqin would be recommended.

The study also faces limitations regarding proxy measures for innovation. The research relies on data from Refinitiv Eikon, Orbis, and Sabi, and uses the Intangible Ratio (IR) as a proxy for innovation. While this measure offers some insights, it does not fully capture the breadth of innovative activities compared to direct measures such as R&D expenditures or patent quality data, which were not accessible in this study. As previously mentioned, this can potentially lead to different conclusions if such detailed proxies are used.

Finally, the financial data for the years 2020, 2021, and 2022 was impacted by the COVID-19 pandemic. Although the effect was relatively minor for most firms in the sample, it introduced variability that complicates the interpretation of the results. The pandemic's impact on the control group companies was similar, but this factor still needs careful consideration in the analysis.

7.2. Future Research

Future research on this topic could benefit from expanding the temporal and geographical scope of the study. In this regard, a broader sample of PE deals and an extension to other European countries would set perfect conditions for better understanding the impact of PE investments on innovation and

performance. To this end, including data from more recent years may say much more and consider the long-term effects beyond 2022.

Moreover, future studies should aim to access more detailed and direct measures of innovation, such as R&D expenditures and patent quality data. Utilizing advanced data platforms like Capital IQ or CMBOR could help mitigate the data limitations faced in this study. Moreover, with access to more comprehensive and broader financial data, future research could be significantly enriched by conducting a more in-depth analysis of the effects of PE funds on their portfolio companies. This could include examining key factors such as changes in investment capacity, post-investment and other financial health indicators. This expanded analysis would offer deeper insights into the financial transformations these companies experience after PE investment, thereby providing a more thorough understanding of the overall impact of private equity on their growth and operational efficiency.

Finally, it may also be interesting to study the rise of an emerging trend in the PE landscape which is the increase in the number of Continuation funds. These funds allow PE firms to extend the holding period of their investments outside a traditional fund lifecycle and have become a major trend in the last few years. Research on how such funds affect innovation, performance, and general market dynamics could be pretty informative on how strategy development is occurring within private equity.

In conclusion, addressing these limitations and exploring these avenues in future research will significantly enhance the understanding of PE investments' long-term impacts on target companies, particularly concerning innovation and performance.

Chapter 8: Final Conclusions and Practical Application

8.1. Final Conclusions

This study thoroughly examines the long-term impact of private equity funds on the performance and innovation of their portfolio companies, focusing on the period from 2011 to 2019. To ensure a robust comparison, a Propensity Score Matching (PSM) analysis was performed in order to create a control group of firms with similar characteristics to those of the treatment group before the PE deal. To evaluate if PE-backed firms show superior performance (H1) and greater innovation (H2) post-deal in comparison to the control group firms, a Difference-in-Differences (DiD) regression was employed. This method compares pre and post-investment metrics of the treatment and control

groups, controlling for time-invariant differences and common trends, ensuring a robust analysis of performance changes post-deal, relative to the control group.

The findings from the DiD analysis conducted to test *Hypothesis 1* indicate that PE investments enhance the overall performance of portfolio companies compared to non-PE-backed firms, post-deal.

This improvement in profitability aligns with previous research, such as the works by Kaplan (1989) and Bergström, Grubb, and Jonsson (2007), which also identified substantial gains in financial performance following PE interventions. The analysis of EBITDA margin revealed that PE-backed firms consistently exhibited higher operating margins compared to their non-PE-backed counterparts post-deal, being the coefficients increasing throughout the years, and statistically significant in the three DiDs. The increase in EBITDA margins suggests that the strategic and financial enhancements implemented by PE firms, such as better governance practices and financial restructuring, contribute significantly to the superior profitability of their portfolio companies. While the Return on Assets (ROA) also exhibited an increasing trend (with all of the coefficients being positive), the lack of statistical significance indicates that other external factors, such as macroeconomic conditions and management practices, might influence this measure.

In terms of workforce impact, there was a positive trend in the number of employees post-investment, in comparison to the non-PE-backed firms. However, the trend did not reach statistical significance in any of the DiD regressions, suggesting that although there may exist a potential for job creation, that effect may not be caused by the PE investment. This finding refutes the claims of authors such as Shleifer and Summers (1988), typically known as critics of the 8Buyouts9, who argued that a PE transaction primarily benefits the investor while the employee suffers lower outcomes and supports the claims that PE-backed companies can still achieve corporate growth and expansion without conducting layoffs.

Operational effectiveness, measured by sales per employee, showed positive trends with statistical significance observed only in the third DiD. This indicates that PE investments can enhance the operational efficiency of their portfolio companies, likely due to the strategic and operational improvements implemented by PE firms. However, the lack of statistical significance in the initial periods suggests that the benefits of PE investments might become more apparent over time as companies adjust to new operational practices. These conclusions are in line with the findings of Kaplan and Strömberg (2009) and Leslie and Oyer (2008).

Regarding the analysis of financial leverage, measured by the Debt/Equity ratio, it can be ascertained that PE-backed firms presented higher leverage compared to their non-PE-backed counterparts on a post-deal basis. Alongside the EBITDA margin, leverage was the only performance variable that remained significant across all three Difference-in-Differences (DiD) models, respectively at 10%, 1% and 5%. This supports the idea that PE-backed firms increase considerably the leverage of their portfolio companies after the PE deal, in comparison to their non-pe-backed peers. However, the slight decrease from the second DiD coefficient to the third indicates that the initial increase in leverage begins to moderate as firms adjust to their new capital structures and work towards stabilizing their financial positions. This finding aligns with existing literature, which highlights the aggressive leverage strategies often employed in leveraged buyouts, as discussed by Kaplan and Stein (1990) and Andrade and Kaplan (1998).

The results from the Difference-in-Differences (DiD) analyses conducted to test *Hypothesis 2* indicate that private equity (PE) firms do not foster innovation within their portfolio companies, but rather the opposite. PE-backed firms consistently exhibited lower Intangible Ratios (IR) post-investment compared to their non-PE-backed peers, which suggests a reduction in investments in intangible assets such as R&D and intellectual property on a post-deal basis. This finding leverages the concerns raised by scholars like Long and Ravenscraft (1993) and Ughetto (2009), who argued that PE firms might prioritize short-term financial performance over long-term investments in innovation. The increasing negative coefficients across the three DiD analyses, combined with the statistical significance of the coefficients in the 2nd and 3rd DiD, suggest that PE investments might result in a strategic shift away from innovation. This shift could potentially jeopardize the long-term growth and competitive advantage of their portfolio companies.

These results contribute to the current debate on the impact of private equity on innovation. Some studies suggest that PE investments can strengthen innovation in their portfolio companies under certain conditions. For example, Amess, Stiebale, and Wright (2015) and Lerner (2003) concluded that companies backed by PEs can experience an increase in the quality and frequency of patents, indicating that the impact of PEs on innovation can vary significantly depending on the specific context and management strategies used. However, the findings of this study support the idea that PE investments can lead to a de-prioritization of innovative activities in the long term in favour of immediate financial returns.

In conclusion, although private equity investments can improve the operating performance and profitability of portfolio companies, they appear to do so at the cost of potentially reducing

innovation. This reinforces the need for a strategic balance between short-term financial gains and long-term value creation through sustained investment in innovation.

8.2. Practical Application

The findings of this paper contribute to the debate on whether PE investments impact their portfolio companies positively or negatively, with empirical evidence based on a sample of deals in the Iberian market. These findings highlight the dual role of PE firms in enhancing operational performance and profitability while potentially inhibiting innovation, aligning with some of the existing literature that points to the complex and variable impact of PE investments on different aspects of corporate performance. Besides, this study includes, for the first time, an analysis of the Iberian PE market for this specific time frame, making it a pioneering work in this sense.

This work is also relevant to private equity firms, shedding light on the nuanced effects of their interventions. By demonstrating significant improvements in operational efficiency and profitability, PE firms can validate their strategic use of leverage and managerial oversight to drive performance. However, the potential for reduced innovation activities poses a challenge for PE firms aiming for long-term growth and sustainability, especially in today's economic landscape where Innovation is one of the key drivers of success. The observed decline in R&D investments and innovative output suggests a need for PE firms to balance their short-term financial goals with longer-term innovation strategies.

Moreover, the findings emphasize the importance of carefully considering the trade-offs involved in PE investments. For policymakers, understanding these dynamics is crucial for designing regulatory frameworks that encourage both economic efficiency and innovation. These insights offer investors and management teams of PE firms the ability to make more well-informed decisions on whether the benefits of PE involvement outweigh the possible drawbacks.

Chapter 9: Appendix

Panel 1: Average values of key performance variables for Control (<C=>) and Treatment (<T=>) groups from two years before the investment (Y-2) up to three years after the investment (Y+3)

Table 8: Employees Evolution

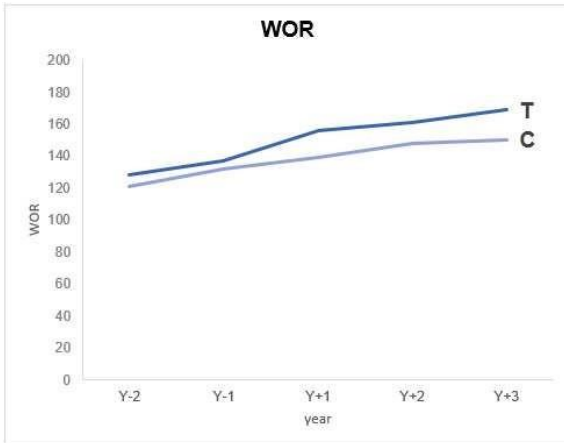


Table 9: ROA Evolution

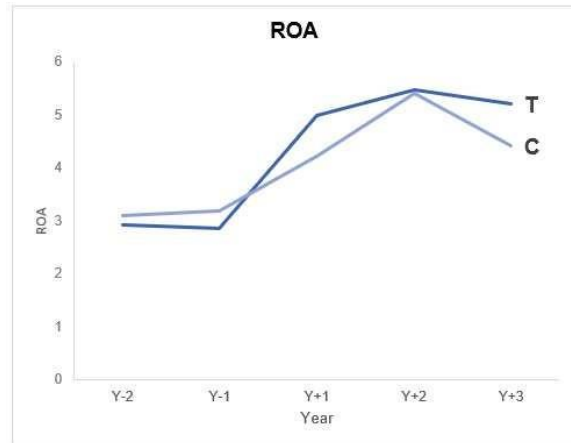


Table 10: Leverage Evolution

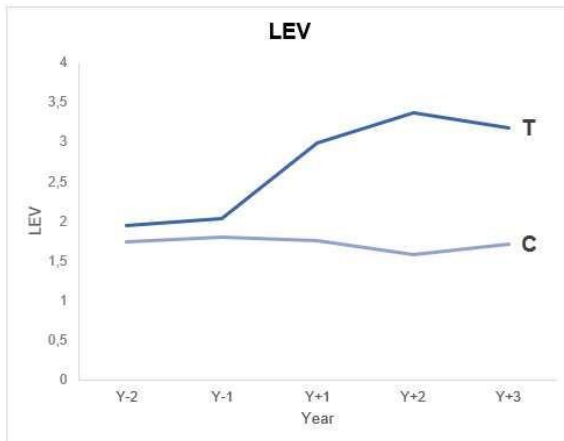


Table 11: Operating Efficiency Evolution

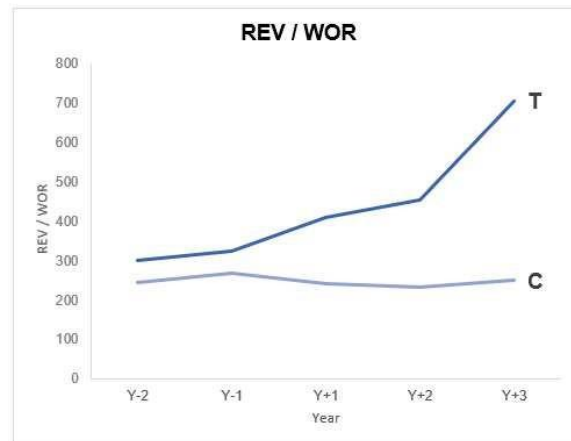


Table 12: IR Evolution

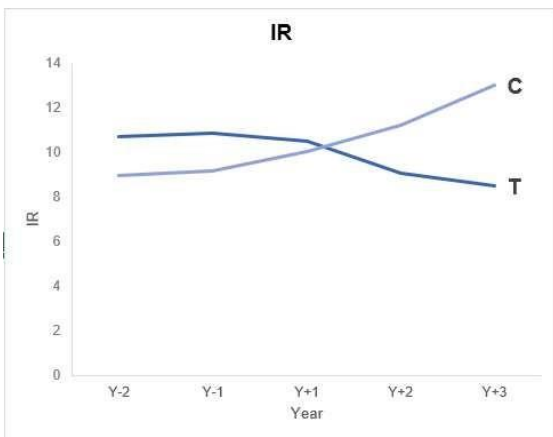


Table 13: EBITDA % Evolution

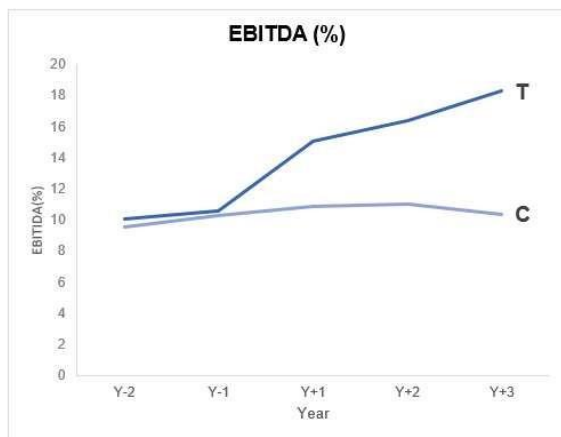


Table 14: Summary of the PSM for Hypothesis 1

Categories	Number	Matched	Percentages	Unmatched	Percentages
1 (PE-Backed)	159	159	100%	0	0%
0 (Non-PE-Backed)	52678	159	0,3%	52519	99,7%

Table 15: Summary of the PSM for Hypothesis 2

Categories	Number	Matched	Percentages	Unmatched	Percentages
1 (PE-Backed)	123	123	100%	0	0%
0 (Non-PE-Backed)	52678	123	0,2%	52549	99,8%

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