

Louvain School of Management

**THE RELATIVE PERFORMANCE OF LEVERAGED
BUYOUTS: A COMPARISON BETWEEN EUROPE
AND THE UNITED STATES**

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Introduction

In mid-July 2021, the French Council of State decided to tax more heavily the gains generated by Private Equity (PE) funds. The idea of wanting a higher tax threshold on the income earned by PE funds managers is not a revolution; many countries such as the United States, Great Britain, and Belgium are planning to introduce a tax reform for unlisted investments. The Biden administration recently announced that a rate of 39.6%, as opposed to the current 20%, would allow for a readjustment of the taxation of the world's leading PE market.

This tax proposal, shared by several countries, aims at PE funds that acquire companies with debt to resell them at a possibly higher price a few years later. These operations, called Leveraged Buyouts (LBO), cause a real earthquake through strategic reorientations, cost reductions, and management change. Some companies, such as the Hilton hotel chain or the Dell computer group, managed to generate enough cash to repay the interest on the debt, grow in their respective markets, and some cases even to the point of going public. However, other companies such as Pages Jaunes or the clothing group Vivarte, owner of brands such as André, La Halle, or Naf Naf, have come close to disappearing after being bought by funds via LBOs.

Therefore, the question of the success of these takeovers is legitimate because they have strong consequences for the various stakeholders: creditors, shareholders, employees, or suppliers. Each stakeholder thus defends its interests, creating conflictual relations within the entity (Jensen and Meckling, 1976). Therefore, as it affects the course of the LBO, it is necessary to put in place a series of measures aimed at unifying the interests of the parties to preserve the smooth running of the company. However, the operation also depends on many external factors such as the economic, legal, and fiscal environment. These variables directly influence the company's operational performance and, by extension, the success of the takeover.

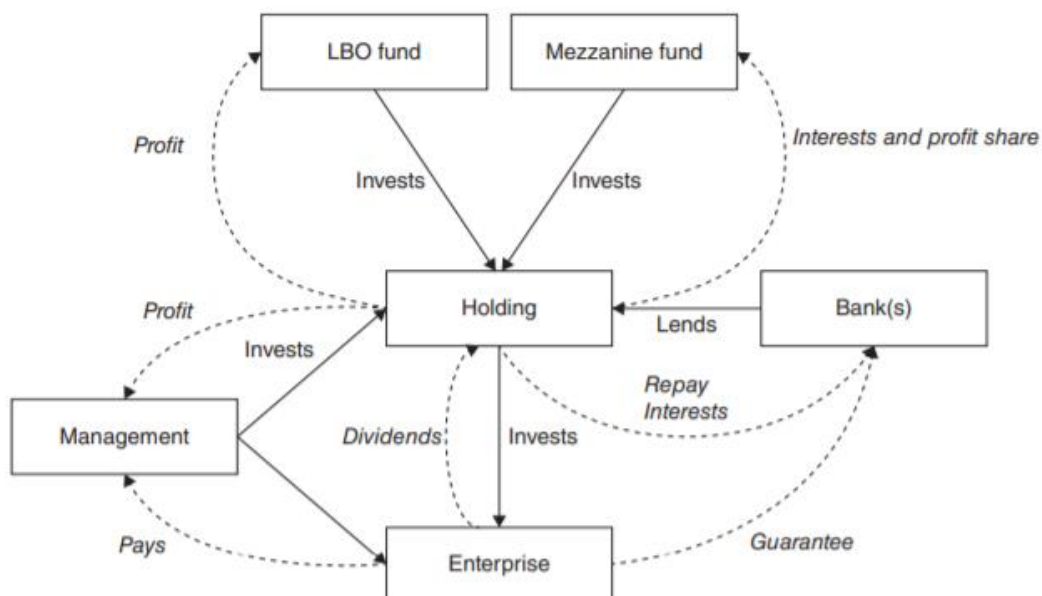
PE funds are investing heavily in data analysis to integrate all these specificities of geographical areas into their decision-making. The U.S. is now the world's largest PE market, with \$300.1

billion in funds raised by 2020, 60% of the total amount raised in the world (McKinsey & Company, 2021). Europe is taking second place with \$218.6 billion, or 22% of the global market. The share of Asia and the rest of the world is still in the minority compared to these two continents. Given the fundamental differences between the U.S. and Europe at various levels, it would be interesting *to compare the performance of companies acquired via LBO in these two regions with respect to several key financial ratios*. To conduct this comparison, the study will measure the differences between treatment groups and a control group for each area.

I: The general functioning of LBOs

An LBO can be defined as "the acquisition of control of a company by one or more specialized investment funds, financed with a high level of debt" (Vernimmen, 2021). Thus, it is possible to acquire an entity with little equity investment: the amount of debt represents on average 70% of the value of the target's shares.

Scheme 1: A Classic MBO



Source: *Introduction to Private Equity, Debt and Real Asset*. Demeria, C., 2020, p185, Wiley .

This operation allows to benefit from several leverage effects. First, it generates financial leverage: thanks to the debt, an investment fund can buy a company that would have a valuation much higher than the investment fund's own financing capacity in normal circumstances. The second lever is fiscal: thanks to tax consolidation, the holding company created by the investors and the targeted entity can form a group, allowing the deduction of interest and financial expenses. The acquisition costs and the financial interests linked to the debt contracted by the investment fund will be charged to the net result of the acquired company. In addition, thanks to the parent-daughter tax regime, the dividends will also be distributed based on this result and are also tax-exempt in most cases.

The third lever is legal; it is the consequence of creating a succession of holding companies allowing to limit the initial contribution while multiplying the control over a company. An LBO also provides social leverage: through various mechanisms, the management team will be encouraged to do everything possible to increase the company's performance.

Finally, the last lever is operational: the fund will be able to implement measures aiming to increase the company's profitability to generate a maximum of Cash-Flow used to repay part of the contracted debt and the related financial interests.

These different effects can be found in these operations which can take several forms: here are the most common.

Firstly, the Management Buy-Out (MBO) is the purchase of an entity by its managers thanks to specialized external investors. This practice is very widespread. In some cases, companies can also be bought out by the employees of the company.

There is also Management Buy-Ins (MBI): in this case, managers from outside the company, with the help of investors, buy the company. This type of operation occurs when investors judge that the company does not have a management team capable of properly managing the debt.

Finally, another form of a leveraged buyout is the Owner Buyout (OBO): The principal shareholder joins with investors through a holding company to buy out minority shareholders. Once the company is acquired, the investors take a more or less active part in the company's management like financial and strategic advice, performance monitoring.

Graph 1: Contribution of LBO investors



Source: *Introduction to Private Equity, Debt and Real Asset*. Demeria, C., 2020, p193, Wiley .

The objective of an LBO is, therefore, to improve operating performance to generate sufficient cash flow to repay a portion of the debt and associated interest.

It is thus hoped that "the combination of debt converted to equity and improved operating performance will significantly increase the company's value" (Pignataro, 2014).

An LBO can be qualified as a success or failure only after the exit operation has taken place. This operation can take various forms.

We can witness a sale of the company to a strategic buyer. Indeed, the company can be resold at a price higher than the purchase price to an industrialist. However, this exit is only possible if the company's profile has strongly evolved since its purchase. Indeed, the targets of LBOs are often not valued at their fair value; consequently, major changes are required for the company's profile to interest a competitor. The sale of Nueva Castelli in 2019 to the world leader Lactalis by the fund specialized in LBO operations Charterhouse illustrates a sale to a strategic buyer.

The fund can also decide to go public; this is a very technical exit and not always advantageous. An Initial Public Offer (IPO) does not allow the fund to obtain a control premium and is only suitable for certain profiles and sizes. The Appolo fund and BPIfrance had jointly floated Verallia in 2019.

Depending on the strategy, the owners can also resell to another investment fund: the entity can be sold to another investment fund via a buyout operation. To reorient the strategy, this fund can be of a different nature (for example, a fund specialized in private equity).

Depending on the debt management, one can sometimes witness a takeover by the creditors (a high level of debt finances the LBO). For example, suppose the creditors (often they are institutional banks) judge that the contracted debt is too important and that it cannot be repaid. In that case, they can then transform (thanks to the Mezzanine debt) their debts or at least part of them into equity to dilute the shares and thus sanction the shareholders who did not want to inject new liquidities. Many examples of companies being bought out by their creditors: IKKS, Solocal, Terreal, etc.

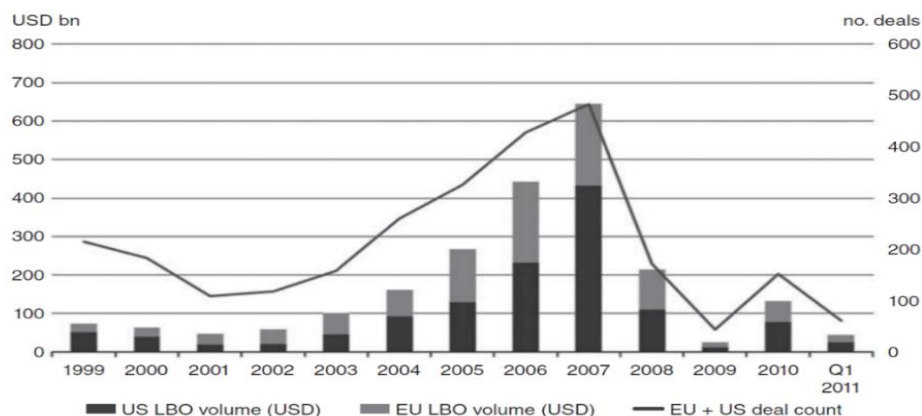
Finally, the company may be declared bankrupt. If the entity cannot generate enough cash to allow the holding company to repay its debt, and the shareholders and creditors cannot reach an agreement on a recapitalization, it can be declared bankrupt.

II: LBOs in a few figures

II.1: A brief history of LBOs

Leveraged buyouts originated in the United States in the 1960s. However, it only gained significant momentum in the 1980s with financial liberalization, development of institutional investors, reorganization of the American economy, appearance of securitization, etc. Certain investors such as Jerome Kohlberg, Henri Kravis, or Carl Icahn brought visibility to these operations and strongly contributed to their development. Between 2006 and 2007, the peak of LBOs was recorded in the United States, with 260 billion dollars (Flallo & Madelaine, 2007). The liberal vision of Margaret Thatcher's British government allowed the arrival and expansion of this style of buyouts from the 1990s. However, the number of LBOs and their value was very low compared to the American market. Since 2002, the LBO market in Europe has seen an explosion in the number of deals, following a cyclical up-swing. Indeed, these transactions remain very dependent on the economic situation (alternating between economic expansion and contraction) and on the "popularity" of risky debt.

Graph 2: Value and volume of LBOs in the USA and Europe



Source: *Introduction to Private Equity, Debt and Real Asset*. Demeria, C., 2020, p202, Wiley .

It is important to note that the specificity of the LBO market in Europe finds growth in the increasing value of deals rather than in the number of deals. In 1996, the 1,073 LBOs represented a value of €22.8 billion (including €10.2 billion in the U.K. alone). In 2005, the 1,405 LBOs (+18% compared to 2004) totaled a value of €124.7 billion (+449%), of which €89 billion were in the U.K. (Morgan Stanley, 2006).

II.2: LBOs in 2020

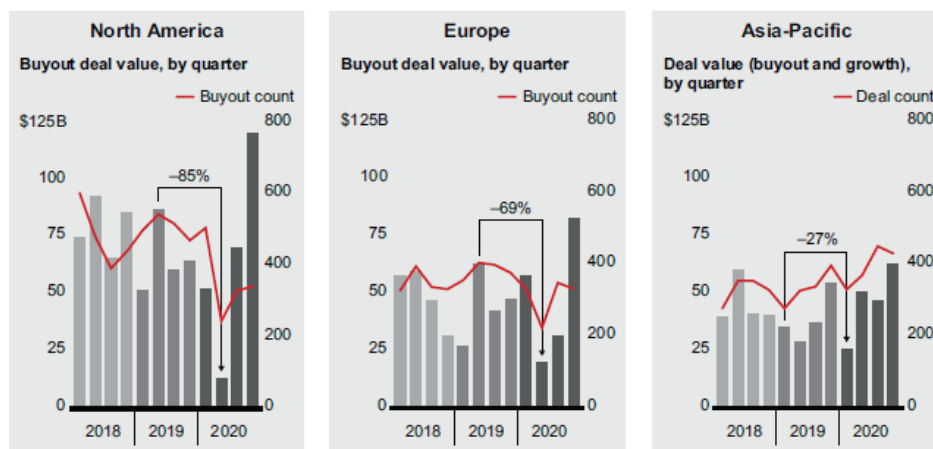
In 2020, PE was worth nearly \$4.2 trillion, of which \$1.4 trillion was for buyouts (McKinsey & Company, 2021). 61% of this amount came from the United States, 25% from Europe, and 14% from Asia and the rest of the world.

The number of operations decreased worldwide by approximately 24% in 2020 compared to 2019 (Bain & Company, 2021) because of the Covid-19 pandemic and the sharp economic downturn that followed. This slowdown did not occur at the same time around the world; Asia-Pacific experienced its greatest impact from the pandemic in the first quarter of 2020. The United States was particularly hard hit in the second quarter. Europe felt the effects in the second and third quarters of the year. Thus, except for the technology and telecom sectors, deals have drastically decreased in 2020.

However, this slowdown does not mean that buyback operations have stopped altogether; in fact, the injection of liquidity by central banks has encouraged PE funds to resume their activity.

The economic recovery at the end of 2020 has nevertheless allowed investment funds to improve their performance by about 8% compared to 2019, despite the sharp decrease in the number of deals (Bain & Company, 2021). This is due to a 23% increase in the size of buyout deals; on average a buyout deal amounted to \$776 million in 2020 (Bain & Company, 2021). Banks have been more willing to lend to buy out large and stable companies.

Graph 3: Buyout deals value around the world



Source: *Global Private Equity Report 2021*, (p7), (2021), Bain & Company

III: Measures of value creation

III.1: Performance Indicators

In a large majority of scientific articles dealing with LBOs, we find the notion of performance. This notion can be defined as "the company's success versus a set of target, objectives or industry peers" (Twin & James, 2021). Over the period from purchase to exit, one wishes to observe if the company's outlook has improved. The articles use different indicators to measure performance.

Performance can be read through two main categories: profitability and operational indicators.

First, profitability can be defined in different ways: the perceived return on capital employed (ROCE), earnings before interest taxes depreciation and amortization (EBITDA), operating margin, and cash flow. It can also be an overall operational efficiency score (Alperovych, Hübner, & Lobet, 2014) composed of different aggregates measuring sales, the evolution of equity, leverage, fixed assets, EBITDA, etc.

Second, performance can also be measured via different operational variables such as sales, company headcount, capital employed, capital expenditures.

There are, of course, other indicators to measure performance. Those are very often complemented by more global measures to determine the economic value of the company. Authors generally find the Economic Value Added; the economic Profit can be defined as the difference between the Return on Capital Employed (ROCE) and the Weighted Average Cost of Capital (WACC) multiplied by the Capital Employed. It measures "the enrichment of the firm over a financial year and takes into account not only the cost of debt, as does net income, but also the cost of equity" (Vernimmen, 2021).

The analysis of the Net Present Value is also relevant: this measure can be translated "as the creation or destruction of value released by the allocation of resources of the company" (Vernimmen, 2021). It is measured by taking the difference between the present value of cash-inflows and the present value of cash-outflow over a period (Cleartex, 2021)

III.2: Performance in the scientific literature

Most scientific articles agree that a company's operational performance improves following an LBO, thus outperforming its peers. Jensen (1989) poses this fundamental hypothesis: operations carried out by PE funds make it possible to improve a company's operational performance. However, this improvement is only possible through constant monitoring of managers and financial indicators and leverage to limit free cash flow. He concludes that companies that have been bought out via an LBO will see their performance improve but will push other companies via competitive pressure to improve their management.

This hypothesis was then taken up by various empirical studies, including that of Kaplan (1989), which measured the performance of 76 public companies that had been subject to an LBO between 1980 and 1986. He concludes that the operating result, cash flow and productivity, will improve over the three years following the buyout. Net cash flow increased by 16.5% on average over the three years following the transaction (Opler, 1992). This clear improvement is particularly striking in the first two years, according to Lichtenber & Siegel (1990)

However, this temporal finding is not the consensus; the Kohlberg-Kravis-Roberts (1989) investment fund states that this is only true for the first year following the transaction. Cohn, Mills, Towery (2014) also add that the performance of companies gradually declines to their pre-LBO level, starting in the fourth year. This notion of short-termism is supported by Wright (1995) who highlights the exit of funds between the third and fifth year.

However, this very short-term vision advocated by the funds does not prevent them from enjoying an excellent reputation with the banks. Indeed, they consider them as actors capable of managing a company, solvent and efficient. They will have easier access to credit on advantageous terms (low cost of borrowing) if they have a good reputation (Demiroglu & James, 2010).

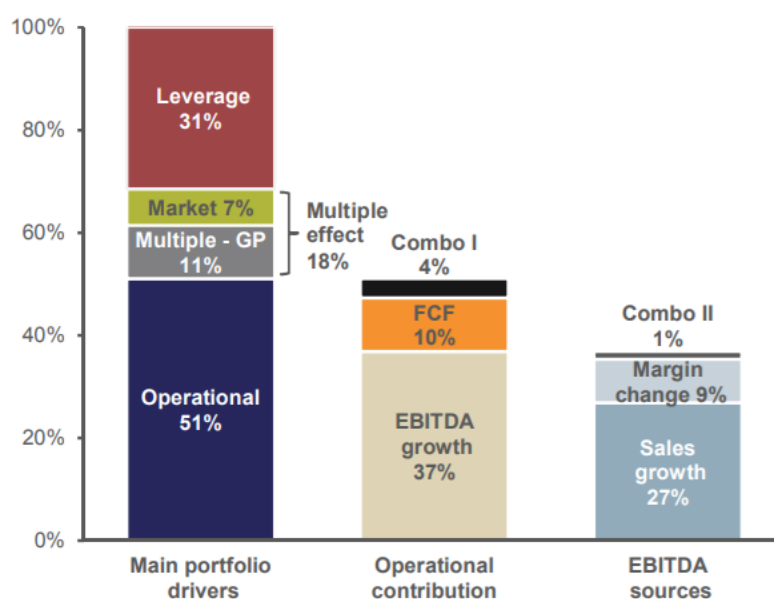
These improvements noted above are direct consequences of the incentives for change demanded by the Kohlberg-Kravis-Roberts (1989) and Singh (1990) funds. The pressure on the management team is very strong, and the funds do not hesitate to replace them if the minimum level of performance set is not achieved, according to Anders (1992), Kaplan (1989),

who thus noted that in 19 out of 76 companies studied, i.e., 25%, the CEO or the chairman of the board left following the LBO.

The board of directors plays a key role in improving performance and creating value by changing management, increasing meetings, and motivating teams using incentives (Harbula, 2008). Very ambitious business plans are then set, imposing higher performance standards, and eliminating certain projects/compartments deemed ineffective or non-essential (Anders, 1992; Baker & Wruck, 1989) to create value quickly and generate sufficient cash flow to service the debt. The PE fund thus plays an important role in the strategic reorientation of the company (Easterwood, Singer, & Lang, 1994) by making it less complex, more fit. It includes adjusting the management of working capital by accelerating the payment of receivables, reducing the holding time of inventories, and lengthening the average payment period to suppliers.

The Capital Dynamics study (2014) highlights these operational changes made in the acquired company as a key vector of value creation (51% of creation explained by operations) in the context of an LBO. It also highlights the important role of financial leverage in value creation (31%).

Graph 4: Value Creation Drivers (%)



Source: *Value Creation in Private Equity*, (p3), (2014), Capital dynamics

The operational strategy also aims to reduce capital expenditure. In general, this reduction in investment and cost is an important vector for improving profitability (Muscarella & Vestsuypens, 1990). Research and development intensity, which can be defined as "R&D expenditure divided by the industry's value-added" (Ledezma, 2009), is thus better for acquired firms than for industries in the same sector that have not been acquired (Long & Ravenscraft, 1993).

According to Phalippou & Gottschalg (2009), the country of origin can influence the performance of LBOs. It is important to note that the authors cannot explain the origin of the results of their study. The Netherlands, Sweden, and Italy are the three most successful countries, at the European level, in terms of LBOs. Conversely, Germany and the United Kingdom are the two least successful countries.

The industry is also highlighted as a source of performance in the study; companies operating in the technology, and finance sector perform well on average after a buyout, while those in the consumer goods and natural resources sector do not.

Finally, value creation can change over time, as highlighted in the Capital Dynamics (2014) note and circumstances. As explained above, LBOs follow a cyclical rhythm, and the resulting value creation can be strongly impacted in case of a crisis.

IV: Financial theories

IV.1: Agency cost theory

Jensen and Meckling (1976) developed this theory, which highlights the differences in interest between two individuals. It is based above all on a contract: "We define an agency relationship as a contract by which one or more persons (the principal) engage another person (the agent) to perform on his behalf some tasks which involve a delegation of some decision-making power to the agent" (Jensen & Meckling, 1976).

Thus, several stakeholders may have diverging interests.

First, the managers may, for example, use the company's resources excessively to favor their interests to the detriment of the shareholders. Indeed, if a high level of indebtedness leads to bankruptcy, they will be directly affected by the situation. They will then be tempted to remunerate themselves in kind during their mandate, which will impact the distribution of dividends.

Creditors and shareholders may also find themselves in a conflictual relationship that entails costs; shareholders may appropriate part of the wealth generated (Stulz, 1990). It is for example the case when the shareholders decide to issue a new debt that will be repaid separately from the initial debt, thanks for example to a new project. Thus, the holders of the first debt are deprived of the return on the project.

Conversely, if new shares are issued, then the debt will be less risky, thus favoring the creditors (Masulis, 1980).

To solve this problem, Jensen and Meckling (1976) advocate a form of monitoring. Indeed, the manager has information that the external investor does not have (theory of information asymmetry) and can act in his unique interest. Therefore, it is necessary to put in place a system to verify, control, and monitor those decisions taken in the owner's interest.

They then deal with the issue of company takeovers, particularly via LBOs; thanks to a referent shareholder base and strong use of debt, PE funds are better able to reduce these divergences of interest, in particular by setting up a new management team, using the available cash flow to repay the debt and its interests to the detriment of the managers (Kaplan, 1989; Smith, 1990) and adopting incentive methods to align the interests of the shareholders and managers to the maximum.

IV.2: Free-Cash Flow Theory

This theory was developed by Jensen (1986) and is part of the agency cost theory; it highlights the conflicts that arise from the use of FCF within a company. Indeed, this available cash should normally be paid out in the form of dividends to shareholders.

In the context of an LBO, these liquid assets are used to repay part of the debt contracted, or else the bondholders will use their right to liquidate the company. Therefore, the amount of dividends will be reduced, and by extension, there will be fewer conflicts between the stakeholders.

Another point raised by Jensen (1986) is a match of interests between shareholders and managers. Indeed, it is in their interest to improve the firm's performance because the management teams are also shareholders in the firm. Therefore, the value of the company must be increased to pay dividends.

IV.3: Tax saving theory

Companies can generate tax savings and, consequently, increase their value thanks to a high level of debt (the interest on which is exempt from income tax). Thus "the value of the economic assets of a firm with debt is equal to the value of the economic assets of the same firm without debt plus the value of the tax savings due to the deductibility of financial expenses" (Vernimmen, 2021). Modigliani and Miller (1958) formalized this fundamental theorem of modern corporate finance, which applies to all entities. A limitation of this theory is that high debt levels increase the probability of bankruptcy and/or the costs associated with that debt exploding. In addition, certain tax exemptions substitute for debt are lost in bankruptcy (De Angelo, 1986).

IV.4: Theory of information asymmetry

Managers are paid in part according to the value of the firm. The issuance of new shares lowers the firm's value and leads to a reduction in investment, particularly if the capital base is weak (Stiglitz, 1985). This issue will de facto lead to a dilution of the managers' share; this will be interpreted as an asymmetry of the market's denial that they are aware of harmful elements to the firm (Leland & Pyle, 1977). The use of debt is then favored because managers

have no incentive, through their remuneration, to reduce the value of the firm and are thus inclined to bear a high level of debt (Ross, 1973).

V: Development of hypotheses

The effects of an LBO on a company are a subject that scientific studies have frequently addressed; numerous articles are studying the short, medium, and long-term effects of the arrival of a PE fund in a company. Generally, these studies are made on international operations, "super-deals". This study aims to establish a comparison of performance between the LBO market in Europe and the United States. Our analysis is based on the 1989 paper "Financial Performance of Leveraged Buyouts: an empirical analysis" by Ivan Bull (University of Illinois at Urbana-Champaign) to carry out this research. Indeed, this paper compares the average performance of 25 companies two years before the buyout and the average performance two years after the LBO between 1971 and 1983. The objective is to repeat the methodology used in this paper and apply it to more recent data.

H1: This article having a quantitative approach is based on the hypothesis that the improvement in the firm's value following an LBO is not solely due to the tax savings.

Tax savings are an important lever in the creation of value by PE funds. However, this improvement is also driven by other more operational factors.

H2: Companies that have been bought out by a P.E. fund benefit from the improvement in post-LBO operating performance above their peers over three years.

The literature suggests that the operational performance of buyout firms is superior to that of their peers but that this superiority is limited in time. The articles generally agree that the operational changes bear fruit over the three years following the buyout.

H3: The operational performance of acquired companies depends on the country of origin of the companies.

Due to different business management and economic structure, the improvement of a company's performance depends on the company's country of origin.

VI: Data Collection and Methodology

VI.1: Data collection

The data collection mainly followed the methodology used in our reference article. Indeed, like the authors, we have selected a certain number of companies that have been the object of an LBO for over fifteen years.

For both geographical areas, we constructed two samples; one of the companies that were acquired via an LBO and another representing the control group.

VI.1.a: LBO sample

The construction of the LBO sample was done thanks to the Bloomberg terminal, mainly for the quality of its databases and the ease of exporting them to Excel. The use of databases such as Diane or Orbis would have been relevant, but access is very expensive.

By using the "M.A." function, we can quickly obtain all M&A transactions, and more specifically, buyouts by PE funds.

A few filters had to be set to get the right data. First, the data was taken for 15 years (from 2000 to 2015). The goal is to have a wide enough spectrum to choose a relevant reference year and be able to measure certain variables over the following years. The data search targeted companies based in the United States and 9 European countries: France, Germany, Italy, Spain, Belgium, Holland, Portugal, England and Ireland. These countries have the highest concentration of LBO deals in Europe. We selected deals that were fully completed. Finally, the companies targeted before the buyout were listed on the stock exchange ("public to private" transactions).

The choice of selecting public companies is explained by the difficulty of obtaining financial information on a private company. Indeed, for each of the companies, we collected five years of financial data to compare them.

It is also important that the deal was completed to measure the effects it has on the company. In order not to limit our samples too much, no filter was applied to the announced buyout value: however, the average deal for the American companies in our sample are \$1.3 billion, and \$980 million for the European companies.

We obtained 329 European companies and 623 American companies for a total of 942.

Table 1: Number of LBO transactions per year

Years	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
US	25	16	30	41	30	39	92	88	32	20	47	38	27	38	26	34
EU	17	14	17	27	23	26	46	45	24	6	16	13	12	6	22	15

The year with the highest number of LBO transactions in both geographical areas was 2006. This year will thus be our reference year. We also notice a clear drop from 2008 onwards; this fall is explained by the Great Financial Crisis (GFC). Thus, we can already assume that the crisis will directly impact the creation of value and on the nature of LBOs; for example, we note that after the crisis, Buy-and-Builds have taken on considerable importance. We will come back to the impact of the crisis in more detail later.

Table 2: LBOs in 2006 by sector

Industries	Communications	Basic Materials	Consumer	Energy	Financial	Industrial	Technology	Utilities
US	9	5	44	2	8	17	6	1
EU	6	0	23	1	5	7	3	1

VI.1.b: Control sample

To measure the effects of an LBO, it was essential to construct a control sample. Like the two LBO samples, we obtained data from a Bloomberg terminal. For the European zone, we chose the STOXX 600 index. This index is composed of 600 companies with heterogeneous capitalizations: small, medium, and large. The companies come from 18 European countries. It is often used as a benchmark as it is one of the most representative indices of the Eurozone market, notably due to its large number of companies with different capitalizations.

For the United States, we have taken the S&P500: composed of the 500 largest capitalizations of companies listed on the NYSE and the Nasdaq, and benefiting from a weighting of the value of the market company on the total value of all the companies on the market, it is very often used because it is the most representative index of the American market, and often acts as a "barometer" of the world economy

For these two groups of controls, it was decided to remove companies that had been the subject of a major M&A transaction (Target or Acquirers) over the period from 2005 to 2009, whether it was a success or not. The main purpose of those groups is to allow a comparison with a sample that has undergone treatment. So, it was therefore very important to remove them to limit the risk of bias as much as possible. Thus, in these two groups, companies have still carried out "second-tier" operations, but the impact of large operations is therefore limited.

For the year 2006, there were 482 American control firms and 579 European control firms. Because of the purpose of the study and the high representative nature of the STOXX 600, we have not broken down the 579 companies according to their country. We wish to compare the overall European performance of companies with that of the U.S. (as explained earlier, there are very few LBOs in the other countries; the nine selected countries are representative of operations throughout Europe).

VI.1.c: Choice of variables

Like the construction of the database, the choice of variables measuring the company's operational performance was made based on the reference article, which puts forward seven accounting variables. Several studies, including that of Graham and Dodd (1962), point to the relevance of the detailed analysis of a company's accounting statements to measure the intrinsic value of a company, in the absence of the company's market value, which is generally no longer available after the takeover. The article uses a variable: "Income from Continuing Operation (Earnings)" but this variable is too close to the Earning Before Interests and Taxes (EBIT) and Operating Income to be interpreted as a relevant result.

Table 4: Selected variables and their compositions

<i>Variable</i>	<i>Composition</i>
$\frac{\text{Operating Profit}}{\text{Sales}}$	$\frac{\text{Operating Revenue} - \text{Operating Expenses} - \text{Cost of Goods Solds} - \text{other to day expenses}}{\text{Sales}}$
$\frac{(\text{Cash} - \text{Flow})}{\text{Sales}}$	$\frac{(\text{Gross operating profit} - \text{tax on operating Profit} \pm -\text{change in working capital} - \text{Investments} + \text{diverstments})}{\text{Sales}}$
$\frac{(\text{Income Tax})}{\text{Sales}}$	$\frac{\text{Taxable Income} * \text{Tax Rate}}{\text{Sales}}$
Sales	$\text{Number of Unit Sold} * \text{Average Sales Price per Unit}$
$\frac{\text{EBIT}}{\text{Sales}}$	$\frac{\text{Net Income} + \text{Interest} + \text{Taxes}}{\text{Sales}}$
$\frac{\text{Capital Expenditures}}{\text{Sales}}$	$\frac{\text{Property, Plant \& Equipment (PPE)current period} - \text{PPE (Prior Period)} + \text{depreciation (Current Period)}}{\text{Sales}}$
Total Asset	$\text{NonCurrent Assets} + \text{Current Asset}$

VI.2: Descriptive statistics

It is necessary to calculate descriptive statistics before performing Analysis of Variance (ANOVA) and Multivariate Analysis of Variance (MANOVA) tests and linear regressions. To construct these statistics for our samples, it was first necessary to take all the data in 2005 (T-1) and express them as a percentage to compare them. Thus, for example, we took the EBIT of the LBO sample and transferred it to the sales of this same sample. Finally, the value obtained was reported on the one found for the control sample. As a reminder, the control sample for American companies is the S&P 500 index cleaned of companies that participated in a large merger or acquisition deal.

The means and medians obtained for the American companies are presented in the table opposite:

Table 5: Descriptive statistics for U.S. firms

US Companies/ S&P 500				
	Before LBO		After LBO	
Variable:	Mean	Median	Mean	Median
EBIT (% Sales)	71,07%	90,05%	127,62%	70,39%
Sales (%Assets)	229,00%	131,43%	227,18%	130,77%
Operating Profit (%Sales)	72,75%	85,03%	137,29%	72,05%
CF (%Sales)	66,24%	81,54%	73,24%	98,74%
Income Taxes (%Sales)	59,54%	27,92%	34,38%	26,22%
CAPEX (%Sales)	122,59%	106,36%	90,08%	88,56%

The same methodology was applied to find the descriptive statistics for the European LBO sample reported on the control sample (composed of the STOXX 600 index)

Table 6: Descriptive statistics for European companies

EU Companies / STOXX 600				
	Before LBO		After LBO	
Variables	Mean	Median	Mean	Median
EBIT (%Sales)	72,68%	59,46%	88,65%	57,65%
Sales (%Assets)	344,90%	129,07%	302,34%	119,42%
Operating Profit (%Sales)	55,83%	76,16%	57,47%	92,03%
CF (%Sales)	96,26%	66,68%	72,42%	77,77%
Income Taxes (%Sales)	210,27%	69,27%	123,10%	57,62%
CAPEX (%Sales)	125,34%	64,81%	98,87%	76,66%

These descriptive statistics are intended to prepare the MANOVA/ANOVA tests, as well as differential regressions. Each variable will be tested as a dependent variable by using only dummies (methodology presented below).

VI.3: ANOVA/ MANOVA

The reference article uses MANOVA tests to determine whether there are significant differences in the means between the two samples, i.e., the LBO and control samples. The difference between these two tests is that the ANOVA method includes only one dependent variable while the MANOVA method includes multiple, dependent variables" (Kose, 2017)

We performed the same MANOVA tests (appendix 1) on our two groups, completed with ANOVA tests that allow us to see for each variable that makes up the groups if there are significant differences.

We performed three different ANOVA tests.

VI.3.a: Treatment group vs. control group

For this first test, the means of the variables of the treatment samples and those of the control samples are compared over the whole period, without distinction, at three significance levels: 1%, 5%, and 10%. The aim is to see if, in general, there are differences between the two groups and for which variable specifically.

VI.3.b: Pre LBO vs Post LBO

For this second test, we select only the LBO samples and divide them into two groups: the data for the 2005 variables (Pre-LBO) and the post-LBO period (2007-2008-2009). The objective is to see within the firms that have undergone the treatment if there are significant differences in mean and for which variable exactly.

VI.3.c: Treatment group vs. control group over two periods

For this last ANOVA test, we again compare the treatment group and the control group, splitting these two samples into two "sub-samples": first, we take only the 2005 data for the

two groups and compare them. Then, we take the data of the post-LBO variables of two samples and compare them. Thus, it adds a time dimension to the first test.

VI.4: Regressions used in the study

It is important to note that the scientific reference study stops at the MANOVA test. To test our hypotheses, we decided to adopt the double-difference method. Indeed, this method allows us to estimate the effect of a treatment (in our case an LBO) by determining the difference between the control group and the treatment group before and after the introduction of the treatment. For our study we added a third difference, expressed by the origin of the companies; American or European.

So, we have the following dummies:

<i>Coefficient</i>	<i>Composition :</i>
$D1x_t$	$PostLBO : t = 1$ $PreLBO : t = 0$
$D2x_i$	$TreatmentGroup : i = 1$ $ControlGroup : i = 0$
$D3x_j$	$US : j = 1$ $EU : j = 0$
$D4x_{it}$	$D1x_t * D2x_i$
$D5_{tij}$	$D1x_t * D2x_i * D3x_j$

The linear regression equations used in this study thus take this form, where Y is respectively:

$$Y_{tij} = a + bD1_t + cD2_i + dD3_j + eD4_{ti} + fD5_{tij} + e_{tij}$$

Like the MANOVA and ANOVA tests, we use three thresholds: 1%, 5%, and 10%.

It is essentially the coefficients D5 and D6, if they are pertinent, we will use the most in our interpretation of the results. The D1 coefficient is indeed very similar to the ANOVA test performed previously.

A heteroskedasticity test is performed before proceeding with the linear regressions to ensure that our regressions are not biased.

We use the White and Breusch-Pagan-Godfrey tests with the following two assumptions:

H0: Homoscedasticity

H1: Heteroscedasticity

The tests applied on our different variables indicate a value lower than 5% (appendix 2). Therefore, we reject the null hypothesis (homoscedasticity) and conclude that the error terms are heteroscedastic. To overcome this bias, we use robust standard error. The robust standard error "is based upon the deviation of individual data points to the median of the population" (BD Biosciences, 2012). One of the objectives of Robust Statistics is to reduce the impact of outliers, and unsuspected correlations.

This technique, also called White-Huber standard errors, allows to estimate standard errors without having a heteroscedasticity bias.

VII: Empirical Analysis and Results

VII.1.a: Analysis of American descriptive statistics

Table 7: U.S. Business Statistical Data

US Companies/ S&P 500				
Variable:	Before LBO		After LBO	
	Mean	Median	Mean	Median
1) Operating Profit (%Sales)	72,75%	85,03%	137,29%	72,05%
2) EBIT (% Sales)	71,07%	90,05%	127,62%	70,39%
3) Income Taxes (%Sales)	59,54%	27,92%	34,38%	26,22%
4) CF (%Sales)	66,24%	81,54%	73,24%	98,74%
5) Sales (%Assets)	229,00%	131,43%	227,18%	130,77%
6) CAPEX (%Sales)	122,59%	106,36%	90,08%	88,56%

At first glance, the descriptive data make it difficult to draw conclusions about the operating performance of U.S. LBO firms.

Indeed, we notice that the 1) Operating Profit before the buyout represented approximately 72.8% of the control index (with a median of 85%). The post-LBO ratio shows a clear increase in the average to 137.3% (with a median of 72.1%). This difference reflects the inclusion of very large companies. Thus, the largest companies see their operating Profit improve and exceed that of the control companies.

This difference is also observed for 2) EBIT: the average EBIT represented 71.1% of the EBIT of the pre-LBO control index, against 127.6% post-LBO. The median has decreased (90.1% vs. 70.4%). Therefore, we can conclude that the management's changes have a real positive effect on large companies. On the other hand, the operating Profit decreases for small companies and remains below the control companies. However, it is important to remember that the companies that make up the American index (S&P500) are large-cap companies, thus accentuating the difference between small and large entities.

There is also a decrease in the taxes paid on the 3) revenues generated; pre-LBO, the taxes paid by the companies in the LBO sample represented 59.5% of the taxes paid by the

controlling companies (with a median of 27.9%). The average decreases after the buyout to 34.4% (median 26.2%). It shows that, in general, companies manage to optimize their taxation following an LBO.

Finally, the 4) cash flow generated by companies generally tends to increase following a buyout; with an average of 66.2% (and a median of 81.5%) before the buyout, it increases to 73.2% (median: 98.7%).

This operational improvement is contrasted with other variables. Indeed, 5) Sales seem to decrease after the buyout; the average sales in 2005 represented 229% of the sales of the control companies (with a median of 131.4%) and decreased to 227% after the buyout (median 130.8%). They remain higher than those of the control sample but follow a slight post-LBO decline.

The same is true for 6) Capex, which falls sharply after the buyout, from an average of 122.6% to 90.1% after it (with a median of 106.4% before the LBO and 88.6% after).

Therefore, it is difficult to draw conclusions about the operational performance of companies because there is a significant difference between the median and the mean for several variables. The size effect thus plays an important role in value creation; large companies can, for example, cut costs more easily, whereas smaller companies will have difficulty. However, we notice that CAPEX and Sales seem to deteriorate generally, while Income Tax and Cash-Flows improve.

Nevertheless, part of this decline can be explained by the economic crisis. We will come back in more detail to the arrival and management of the crisis.

VII.1.b: Analysis of European descriptive statistics

Table 8: Descriptive data for European companies

EU Companies / STOXX 600				
	Before LBO		After LBO	
Variables	Mean	Median	Mean	Median
1) Operating Profit (%Sales)	55,83%	76,16%	57,47%	92,03%
2) Income Taxes (%Sales)	210,27%	69,27%	123,10%	57,62%
3) EBIT (%Sales)	72,68%	59,46%	88,65%	57,65%
4) CF (%Sales)	96,26%	66,68%	72,42%	77,77%
5) CAPEX (%Sales)	125,34%	64,81%	98,87%	76,66%
6) Sales (%Assets)	344,90%	129,07%	302,34%	119,42%

As with the US data, it is difficult to draw conclusions from the descriptive data. The size effect is strongly felt in the results obtained, which makes interpretation complicated.

First, we notice that the 1) Operating Profit improves following the LBO. Indeed, the average of the firms in the sample was 55.8% of that of the control sample (with a median of 76.2%). The mean increases to 57.5% following the buyout (with a median of 92%).

2) Income taxes also decrease after the LBO; with an average of 210.3% (and a median of 69.3%) before the buyout, this decreases to 123.1% (and a median of 57.6%). Therefore, we can assume that large entities have seen their income taxes decrease significantly more than smaller entities in the context of LBOs and the economic crisis.

We note that the presence of very large entities in our treatment sample impacts the results obtained. Indeed, there is a difference between the evolution of the average and the median for several variables.

The 3) EBIT of companies that have undergone an LBO improves on average (72.7% to 88.7%), but the median decreases (59.5% to 57.6%). Again, as with US companies, this difference is explained by very large companies that seem to take better advantage of the measures taken after the buyout than smaller entities.

Conversely, we note that 4) cash flow and 5) Capex improved following the buyout for smaller companies. Moreover, the median of these two indicators improved over the period, while the average tended to decrease.

Finally, we note that like the American companies, 6) Sales generally decrease after the LBO; with an average of 344.9% pre-LBO (and a median of 129.1%), sales decrease sharply after the buyout (average of 302% and a median of 119.4%).

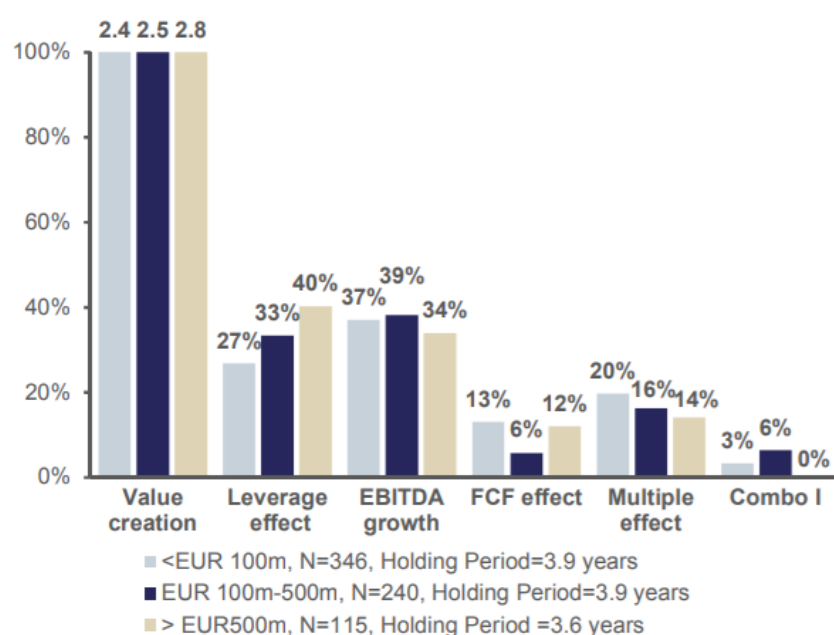
VII.1.c: General interpretations

It is very perilous to draw conclusions based on these descriptive statistics; due to size effects and the crisis, one cannot draw relevant conclusions based on descriptive statistical data alone, but one can see developments at the European and American levels.

We note that the Sales and Income Taxes variable decreases after an LBO for the groups tested, which is in line with the scientific literature. However, the interpretation of the descriptive statistics by the size effect and the omission of other factors such as the economic crisis does not allow us to draw any conclusions.

The 2014 Capital Dynamics study highlights the difference that can exist in the value creation process in companies with greater or lesser values, as shown in the following graph:

Graph 5: Comparison of value creation drivers by size



Source: *Value Creation in Private Equity*, (p5), (2014), Capital dynamics

We will thus use MANOVA and ANOVA tests to determine which variables change significantly following the buyout.

VII.2 MANOVA/ANOVA test results

Following the MANOVA and ANOVA tests, we notice that for the two groups tested, there are significant changes to different degrees.

As a reminder, we performed three different tests to understand the variations between the treatment and control groups as much as possible. The first test determines which variable evolves significantly between the treatment group and the control group over the studied period (2005 to 2009). The second test examines the significant differences, within the treatment groups, between the pre-buyout period (2005) and the post-buyout period (2006-2009). Finally, the third ANOVA test seeks to determine which variables differ between the treatment group and the control group in the pre-buyout period and then in the post-buyout period.

VII.2.a: ANOVA Results for American companies

Table 9: ANOVA results for American companies

US		
Treatment Group vs Control group (2005-2009)	EBIT/ Asset (**) Income Taxes/ Sales (***)	
Before LBO (2005) vs After LBO (2007-2009) Treatment Group	No results	
Treatment Group vs Control group	Before LBO (2005)	Before LBO (2007-2009)
	Income Taxes/ Sales (***) Mean : 5.21% Median : 3.22% Sales/ Asset (***) Mean : 107.34% Median : 43.35%	Income Taxes/ Sales (**) Mean : 3.33% Median : 2.32%

We note that for the first test, two variables differ between the treatment and control groups at different significance levels: first, there is a difference at a 5% level between the two groups

for EBIT. We also see that the average income tax differs for both groups at a 1% significance level.

For the second test, no variable is significant.

Finally, Income Taxes and Sales are significant in our tests for the pre-purchase year, i.e., 2005, at a threshold of 1%. In the post-repurchase period, only Income Taxes differentiates the two groups at the 5% level. By the mean and median of this variable, we notice that the taxes paid decrease after the LBO transaction.

Concerning sales, the effect of the economic crisis has undoubtedly had a very strong negative impact on both groups, making the LBO effect on sales more "secondary". We also note the size effect, which is strongly felt for Sales with an average of 107% (and a median of 43%). Due to the nature of the benchmark index (S&P 500) and its composition, the disparity between companies may have been amplified.

VII.2.b: ANOVA/MANOVA Results for European companies

Table 10: ANOVA results for European companies

EU		
Treatment Group vs Control group (2005-2009)	Operating Profit/ Sales (**)	
	Cash-Flow/ Sales (***)	
Before LBO (2005) vs After LBO (2007-2009) Treatment Group	Sales/ Beginning Asset	
Treatment Group vs Control group	Before LBO (2005)	After LBO (2007-2009)
	Income Taxes/ Sales (*) Mean : 22.29% Median : 2.22%	Income Taxes/ Sales (*) Mean : 15.14% Median : 1.55%
	Operating Profit/ Sales (**) Mean : 202.44% Median : 9.07%	Sales/ Asset (***) Mean: 107.34% Median : 43.35%

The first test is about the Operating Profit and the Cash-Flow, which differ at different significance levels (5% for the Operating Profit and 1% for the Cash-Flow).

For the second test, the Sales differ between the pre- and post-treatment group periods at a 1% significance level.

Finally, as for the American group, the Income Taxes differ between the treatment and control groups in the pre-purchase period at a threshold of 10% and post-purchase at the same threshold. The Operating Profit, which was significant in the first test, is no longer significant in the post-repurchase period. There is a very large difference between the median (9%) and the mean (202%) of this variable for the year 2005. The years 2005 and 2006 were exceptional in terms of operational profitability for the large structures, which may explain this difference. The fact that the Operating Profit averages no longer differ significantly after the takeover is perhaps partly explained by the effect of the crisis on the companies.

However, we notice that the Sales, at a threshold of 1%, differentiate the treatment group and the control group on the post-repurchase period.

VII.2.c: General interpretation

We use the results of the third test because it is the most relevant to our research.

For both American and European companies, income taxes differ strongly (but always at a significant threshold) between the treatment and control groups. It is indeed lower according to the averages and medians obtained. Through tax consolidation, it is possible to deduct the financial interest on the debt. We also note that the tax reduction is the strongest on average in the United States (36% reduction vs. 32% in Europe), but the median value falls the most in Europe (30% vs. 28% in the United States).

It is also interesting to note that LBOs do not impact sales in the same way in the United States and Europe. Indeed, Sales was a variable that differentiated the treatment group from the control group in the US. As of 2007, it is no longer as relevant, highlighting the economic crisis's effect on all companies. Sales in Europe have become a discriminating variable between the treatment and control groups. It is possible that due to the later onset of the economic crisis in Europe and the different management of the crisis, the Sales have "felt" the effect of the crisis less than in the US. However, there is still a significant size effect within the treatment and control group.

VII.3: Result Regression

The linear regression equations used in this study thus take this form, where Y is respectively:

$$Y_{tij} = a + bD1_t + cD2_i + dD3_j + eD4_{ti} + fD5_{tij} + e_{tij}$$

However, thanks to the ANOVA tests, we detected that two variables were significant after the LBO buyout: Income Taxes (% Sales) and Sales(%Asset). This avoids an omission bias. We only add significant variables detected post LBO because we want to compare the two groups over this period. We therefore add these two variables to the equations in our regressions, as control variables.

It is essentially the coefficients D5 and D6, if they are pertinent, we will use the most in our interpretation of the results. The D1 coefficient is indeed very similar to the ANOVA test performed previously.

VII.3.a: R-Squared Adjusted

It is important to judge the models used in our regressions to see how relevant they are. To do this, we use the adjusted R-squared. It consists in seeing how the dependent variable (in our case, the variables selected to measure the performance of the companies) will vary.

The dependent variable Capex (expressed in % of sales) is explained at 90.18% by the dummies. For the dependent variable Cash-Flow (expressed in % of sales), the model explains at 90.34% the variations of it.

For the dependent variable Operating Profit (expressed in % of sales), its variations are explained at 94% by the variations of the explanatory variables, i.e., the dummies.

The EBIT is a dependent variable (expressed in sales) whose model explains 95.79% of the variations.

Income Taxes is a dependent variable whose variations can hardly be explained by the model (0.18%) (the threshold remains significant even if it is not as significant as the previous variables). This adjusted R-squared is quite surprising given the results previously obtained by the ANOVA tests. Finally, the Sales variable (expressed as a % of assets) is not explained by the model (0.33%). Variations in its two variables are more difficult to explain by including

dummies and control variables alone. Indeed, sales and income taxes are strongly influenced by macroeconomic factors (such as interest rates, fiscal and monetary policies). These external factors are not considered in our model.

It is likely that important control variables were omitted from our regression explaining this R squared.

Table 11: R-Squared

	Capex/ Sales	Cash-Flow/ Sales	Operating Profit/ Sales	EBIT/ Sales	Income taxes/ Sales	Sales/ Asset
Adjusted R-Squared	90.20%	90.34%	94.21%	95.79%	0.1795%	0.33%

VII.3.b: Regression result Capex over Sales

The dependent variable tested is Capital Expenditure (expressed as a percentage of Sales).

Dependent Variable: CAPEXOVERSALES

Method: Least Squares

Date: 07/25/21 Time: 15:40

Sample: 1 2496

Included observations: 2315

White-Hinkley (HC1) heteroskedasticity consistent standard errors and covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.578106	1.290700	-0.447901	0.6543
D1	0.023706	0.438448	0.054069	0.9569
D2	7.491568	4.076446	1.837770	0.0662
D3	2.149163	1.955992	1.098759	0.2720
D4	-7.482219	2.955296	-2.531800	0.0114
D5	14.00914	8.119369	1.725397	0.0846
INCOMETAXOVERSALES	-2.701827	0.205868	-13.12409	0.0000
SALESOVERASSET	-7.77E-05	2.98E-05	-2.605102	0.0092
R-squared	0.902728	Mean dependent var	-4.481944	
Adjusted R-squared	0.902433	S.D. dependent var	251.8500	
S.E. of regression	78.66704	Akaike info criterion	11.57178	
Sum squared resid	14276878	Schwarz criterion	11.59164	
Log likelihood	-13386.33	Hannan-Quinn criter.	11.57901	
F-statistic	3058.586	Durbin-Watson stat	2.020130	
Prob(F-statistic)	0.000000	Wald F-statistic	28.42122	
Prob(Wald F-statistic)	0.000000			

We notice that in D5, the P-Value is significant (at a 90% confidence level) and the D4 dummy at a 95% confidence level. The Sales are also significant at the 99% confidence level.

Thus, if the company is between 2006 and 2009, and is part of the treatment group (has been acquired via an LBO), then it will see its Capex decrease by 7% point compared to its reference category, i.e., a company that has not been the subject of an LBO. This makes sense because the management will seek to reduce investment costs to generate cash flow.

We can also see that if the company is part of the processing group (it was bought via an LBO), and is American, then it will see its Capex increase by 14% point over the post-buyout period

compared to a European company. This can be explained in part by the massive US stimulus packages implemented since 2008.

In the general conclusion of the hypotheses, we will develop the effects of the crisis on companies and the plans implemented in Europe and the United States.

VII.3.c: Regression result Cash-Flow over Sales

The dependent variable tested is the Cash-Flow (expressed as a percentage of Sales).

Dependent Variable: CFOVERSALES

Method: Least Squares

Date: 07/25/21 Time: 15:39

Sample: 1 2496

Included observations: 2318

White-Hinkley (HC1) heteroskedasticity consistent standard errors and covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.978290	3.141896	0.947927	0.3433
D1	-0.486129	1.024340	-0.474578	0.6351
D2	-7.804049	9.688310	-0.805512	0.4206
D3	-3.996618	4.595471	-0.869686	0.3846
D4	6.602001	6.926652	0.953130	0.3406
D5	-7.971066	14.98247	-0.532026	0.5948
INCOMETAXOVERSALES	5.659882	0.506843	11.16694	0.0000
SALESOVERASSET	5.25E-05	6.74E-05	0.778676	0.4363
R-squared	0.904267	Mean dependent var	16.00053	
Adjusted R-squared	0.903977	S.D. dependent var	527.1679	
S.E. of regression	163.3569	Akaike info criterion	13.03320	
Sum squared resid	61643445	Schwarz criterion	13.05304	
Log likelihood	-15097.48	Hannan-Quinn criter.	13.04043	
F-statistic	3117.077	Durbin-Watson stat	1.869520	
Prob(F-statistic)	0.000000	Wald F-statistic	19.78643	
Prob(Wald F-statistic)	0.000000			

No variable has a significant impact on the dependent variable at different levels of significance.

VII.3.d: Regression result Operating Profit over Sales

We test the Operating Profit (expressed as a percentage of Sales) as the dependent variable.

Dependent Variable: NOPATOVERSALES

Method: Least Squares

Date: 07/25/21 Time: 15:39

Sample: 1 2496

Included observations: 2306

White-Hinkley (HC1) heteroskedasticity consistent standard errors and covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.196568	3.089395	1.358379	0.1745
D1	0.249871	0.520116	0.480415	0.6310
D2	-17.94949	10.27570	-1.746790	0.0808
D3	-7.263167	4.756129	-1.527117	0.1269
D4	15.25135	7.324733	2.082171	0.0374
D5	-19.54860	15.29869	-1.277796	0.2015
INCOMETAXOVERSALES	7.497151	0.581791	12.88632	0.0000
SALESOVERASSET	0.000145	7.36E-05	1.967156	0.0493
R-squared	0.938336	Mean dependent var	17.53740	
Adjusted R-squared	0.938148	S.D. dependent var	687.0830	
S.E. of regression	170.8784	Akaike info criterion	13.12324	
Sum squared resid	67100252	Schwarz criterion	13.14317	
Log likelihood	-15123.10	Hannan-Quinn criter.	13.13051	
F-statistic	4995.458	Durbin-Watson stat	2.020071	
Prob(F-statistic)	0.000000	Wald F-statistic	27.58498	
Prob(Wald F-statistic)	0.000000			

We notice that in D4, the P-Value is significant (at a 95% confidence level). The Sales are also significant at the 95% confidence level.

Thus, if the company is between 2006 and 2009, is part of the treatment group (was acquired via an LBO), it will see its Operating Profit increase by 14% point compared to its reference category, i.e., a company that has not been the subject of an LBO.

Sales have a very slight influence on Operating Profit; this data is interesting because we can see that companies are implementing different measures to improve margins and therefore Operating Profit without increasing sales significantly.

VII.3.e: Regression result EBIT over Sales

The dependent variable tested is EBIT (expressed as a percentage of sales).

Dependent Variable: EBITOVERSALES

Method: Least Squares

Date: 07/25/21 Time: 17:40

Sample: 1 2496

Included observations: 2308

White-Hinkley (HC1) heteroskedasticity consistent standard errors and covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.663407	7.163724	0.790567	0.4293
D1	0.665891	1.517049	0.438938	0.6607
D2	-38.26819	23.35006	-1.638891	0.1014
D3	-14.37208	11.00098	-1.306437	0.1915
D4	35.14270	16.63526	2.112543	0.0347
D5	-48.18858	34.04727	-1.415343	0.1571
INCOMETAXOVERSALES	15.04276	1.348956	11.15141	0.0000
SALESOVERASSET	0.000348	0.000168	2.073728	0.0382
R-squared	0.921199	Mean dependent var	31.29956	
Adjusted R-squared	0.920959	S.D. dependent var	1390.642	
S.E. of regression	390.9686	Akaike info criterion	14.77859	
Sum squared resid	3.52E+08	Schwarz criterion	14.79850	
Log likelihood	-17046.49	Hannan-Quinn criter.	14.78585	
F-statistic	3841.049	Durbin-Watson stat	2.025189	
Prob(F-statistic)	0.000000	Wald F-statistic	21.16002	
Prob(Wald F-statistic)	0.000000			

We notice that in D4, the P-Value is significant (at a 95% confidence level). The Sales are also significant at the 95% confidence level.

If we are between 2006 and 2009, and the company is part of the treatment group (has been acquired via an LBO), then it will see its EBIT increase by 33% point compared to its reference category, i.e., a company that has not been the subject of an LBO.

This improvement is in line with the previous result of improved operational performance.

As in the case of operating Profit, sales have a very slight influence on EBIT; in line with the commentary on operating Profit, companies are implementing various measures to improve margins and thus operating Profit without significantly increasing sales.

VII.3.f: Regression result Income taxes over Sales

The dependent variable tested is Income Taxes (expressed as a percentage of Sales).

Dependent Variable: INCOMETAXOVERSALES

Method: Least Squares

Date: 07/25/21 Time: 15:33

Sample: 1 2496

Included observations: 2318

White-Hinkley (HC1) heteroskedasticity consistent standard errors and covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.483786	0.471146	-1.026828	0.3046
D1	-0.046020	0.101942	-0.451432	0.6517
D2	2.929748	1.545121	1.896129	0.0581
D3	1.130806	0.723440	1.563097	0.1182
D4	-2.616110	1.104739	-2.368079	0.0180
D5	14.98896	10.91711	1.372978	0.1699
SALESOVERASSET	-3.04E-05	1.36E-05	-2.231913	0.0257
R-squared	0.004208	Mean dependent var	3.359968	
Adjusted R-squared	0.001622	S.D. dependent var	88.61332	
S.E. of regression	88.54141	Akaike info criterion	11.80783	
Sum squared resid	18117271	Schwarz criterion	11.82519	
Log likelihood	-13678.28	Hannan-Quinn criter.	11.81416	
F-statistic	1.627535	Durbin-Watson stat	2.086513	
Prob(F-statistic)	0.135444	Wald F-statistic	3.993638	
Prob(Wald F-statistic)	0.000554			

We notice that in D5 the P-Value is significant (at a 95% confidence level). The Sales are also significant at the 95% confidence level.

Thus, if the company is between 2006 and 2009, is part of the treatment group (was acquired via an LBO), then it will see its Income Taxes decrease by 2.6% point compared to its reference category, all other things being equal.

This result is consistent with the scientific literature that highlights the tax leverage effect created following an LBO. The Tax Savings theory seems to be confirmed by this result. Thus, the value of the company will be able to increase

We will develop in the conclusion of the hypotheses the tax artillery released by the Obama administration, and conversely, the drastic plans put in place in Europe.

We also notice that sales have an impact on the variation of income taxes. Indeed, at a 95% confidence level, a one percentage point change in sales will result in a very small decrease in taxes paid. Given the coefficient, it is not relevant to take this result into account.

It is important to remember that the model only explains very weakly the variations of the dependent variable (adjusted R^2 of 0.16%). The difference between the models used previously is quite striking.

VII.3.g: Regression result Sales over Asset

We test as dependent variable the Sales (expressed as a percentage of the Assets).

Dependent Variable: SALESOVERASSET

Method: Least Squares

Date: 07/25/21 Time: 15:35

Sample: 1 2496

Included observations: 2318

White-Hinkley (HC1) heteroskedasticity consistent standard errors and covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	214.0696	154.5404	1.385201	0.1661
D1	-0.604087	9.293437	-0.065001	0.9482
D2	481.3642	322.9799	1.490385	0.1363
D3	-330.4632	239.8982	-1.377514	0.1685
D4	-693.2946	474.9034	-1.459864	0.1445
D5	355.6554	240.6451	1.477925	0.1396
INCOMETAXOVERSALES	-0.040004	0.039837	-1.004176	0.3154
R-squared	0.005489	Mean dependent var	104.6458	
Adjusted R-squared	0.002907	S.D. dependent var	3214.960	
S.E. of regression	3210.284	Akaike info criterion	18.98912	
Sum squared resid	2.38E+10	Schwarz criterion	19.00648	
Log likelihood	-22001.39	Hannan-Quinn criter.	18.99545	
F-statistic	2.125905	Durbin-Watson stat	2.077819	
Prob(F-statistic)	0.047506	Wald F-statistic	0.899815	
Prob(Wald F-statistic)	0.493960			

No variable has a significant impact on the dependent variable at different levels of significance.

Table 11: Summary table of the results obtained

Variables	Adjusted R-Squared	D1	D2	D3	D4	D5	Income Taxes/ Sales	Sales/ Asset
Capex/ Sales	90.27%	0.9569	0.0662	0.2720	0.0114(**)	0.0846(*)		0 0.0092(***)
Cash-Flow/ Sales	90.40%	0.6351	0.4206	0.3846	0.3406	0.5948		0 0.4363
Operating Profit/ Sales	93.82%	0.6310	0.0608	0.1269	0.0374(**)	0.2015		0 0.0493(**)
EBIT/ Sales	92.10%	0.6607	0.1014	0.1915	0.0347(**)	0.1571		0 0.0382(**)
Income Taxes/ Sales	0.16%	0.6517	0.0581	0.1182	0.0180(**)	0.1699		/ 0.0257(**)
Sales/ Asset	0.29%	0.9482	0.1363	0.1685	0.1445	0.1396	0.3154	/

As a reminder, all the variables studied in our regressions reject the null hypothesis H0 and do not reject the alternative hypothesis H1 (at different confidence levels). We also did not consider significant results for the first three dummies.

VII.3.h: General interpretation of the regression results

The results show that the Capex of companies that have undergone an LBO decreases over the period following the buyout (+7% point), compared to companies that have not been bought out (at a confidence level of 10%).

This result is quite logical since the logic is that a P-E Fund seeks to reduce costs and investments as much as possible to generate enough cash flow to pay the interest on the debt (Muscarella & Vestsuypens, 1990). What is more surprising is that if the company is American,

then (at a 90% confidence level) its Capex will be 14% higher than that of a European company. The management methods and the hunt for cost are more aggressive in the US. Many variables strongly influence investment choice, such as the sector in which the company operates, the interest rates of financial institutions, the economic cycle, etc. All these different factors will be discussed in the next section.

The Operating Profit of a company that has undergone an LBO will improve by 15% point over the three years following the buyout, compared to a company that has not been bought out (at a 95% confidence level). This result can be translated into a battery of measures implemented by the company to improve its profitability; new supplier, price increase, change of materials, staff reduction, etc. The variable Sales verify this desire to achieve the highest operating margin; with a confidence level of 95%, these only have a very small impact on Operating Profit.

In line with the Operating Profit, the EBIT of acquired companies increases strongly in the period following the acquisition (+35% point) compared to the indicator of an untreated company. This strong increase is partly explained by the will to improve operational profitability and a will to improve its "non-operational" revenues; for example, revenues from Fixed Assets sales (because deemed not profitable enough) will improve the EBIT will not be considered as an operational profit. At a 95% confidence level, Sales have only a very weak influence on the company's EBIT, reinforcing the idea of wanting to generate cash by disposing of unprofitable assets.

Finally, we notice that the Income Taxes decrease by 2.6% point over the period (3 years as a reminder) following the purchase of a company by a PE fund. This reduction is often highlighted in the scientific literature because the company can charge its acquisition costs and debt-related expenses (including financial interest) to its income. The dividend payout, tax-free based on the parent-Daughter model, is also based on the net income of the acquired company.

VIII: General conclusion on our hypotheses

VIII.1: Conclusion of the hypotheses

H1: This article having a quantitative approach is based on the hypothesis that the improvement in the firm's value following an LBO is not solely due to the tax savings.

The regressions show that the Operating Profit and the EBIT of the companies acquired via an LBO improve during the three years following the acquisition. Indeed, the Operating Profit increases on average by 15 % point in the post-buyout period, an improvement explained by different factors. Under pressure from the new owners, the management will undertake a series of measures to increase the profitability of the company as much as possible; change of suppliers, price increases, reduction of production and personnel costs, etc. All these measures will allow the company to operate more efficiently. All these measures allow for a higher operating result and thus generate cash flow. These indicators, therefore, contribute directly to the creation of value for the company. The study of Capital Dynamics (2014) highlights that 51% of the company's value comes from the operational vector.

This improvement can be put into perspective with financial theories: due to the willingness to use cash flow to repay debt and not to pay out the whole amount as dividends, there is a convergence of interests which also explains the improvement in operational performance

Based on our results, we also found that a change in Sales had only a very small impact on these operational indicators; therefore, we find ourselves in a logic of increasing profitability and not turnover. Unfortunately, it was not possible, at a meaningful level, to distinguish between American and European companies.

The company's value also improves thanks to the decrease in income taxes paid; indeed, based on the results obtained, we notice that for companies that have been bought out, income taxes decrease on average by 2.6% point over the three years following the LBO. As previously explained, the target company absorbs its costs through the integration of debt and acquisition expenses and consequently sees the amount taxed on its income decrease. This result is consistent with the findings of the scientific literature and tax savings theory.

Finally, the decrease in Capital Expenditures for the acquired companies over the post-purchase period is more delicate to interpret. In the short term, this decrease (-7% point) will increase the company's value (because it remains an expense to be financed). However, in the longer term, these expenses tend to increase productivity, innovation, and ultimately the company's profitability. Our study was based on a short-term vision (3 years following the buyout) and therefore following this logic, we can affirm that this decrease will temporarily increase the company's value but will harm its activity.

Based on these results, we do not reject the hypothesis that the firm's value is not solely due to the tax reduction. However, this finding of improvement is only based on the three years following the buyout: a finding shared by our reference article. Numerous studies show that from the fourth year onwards, the company's value tends to return to its pre-buyout level, which mitigates our results. We also did not obtain relevant results for the Cash-Flow and Sales variables.

H2: Companies that have been bought out by a PE fund benefit from an improvement in post-LBO operating performance above their peers over three years.

Based on the above results, we cannot reject the hypothesis that in the post-buyout period (3 years), the operational performance of the firms is superior to their peer. Indeed, the results obtained for the operational variable (Operating Profit; +15% point) outperform our control group. We consciously do not mention EBIT because it includes non-operating revenues (which explains the difference between Operating Profit of +15% point and EBIT of +35% point). Unfortunately, we did not obtain significant results for Sales.

H3: The operating performance of acquired companies depends on the country of origin of the companies.

We obtained relevant results that allow us to differentiate between US and European companies for the Capex variable.

Indeed, if the acquired company is American, its Capex will be 14% point higher than its European counterparts. This difference can be partly explained by the massive stimulus plans orchestrated by the Obama administration to revive the American economy at the end of 2008-2009. Indeed, this stimulus package of approximately \$789 billion aimed to stimulate

the economy through tax breaks, subsidies and state aid to companies financed by the Federal Reserve System.

This plan was in contrast with the European plan, which kept inflation very low through austerity policies. As a result, individuals and especially the public were not inclined to invest in infrastructure.

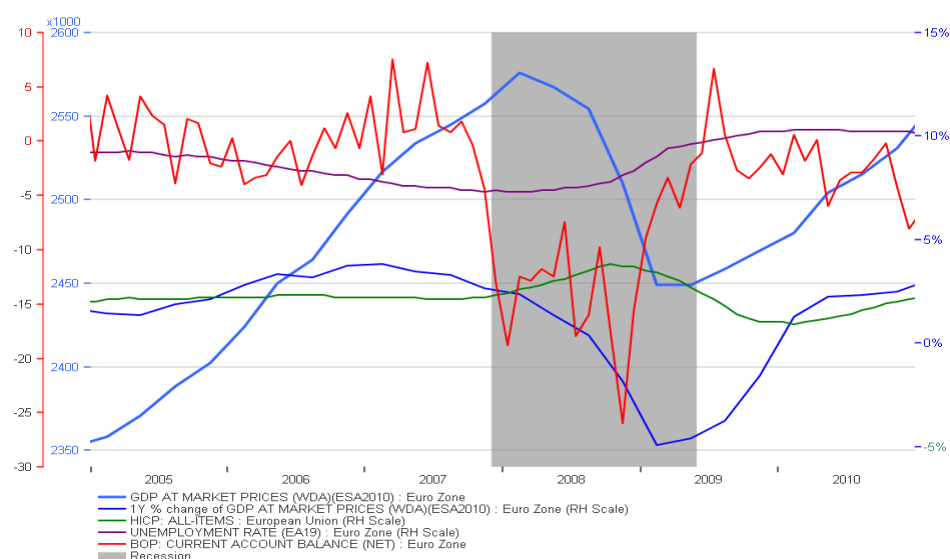
Nevertheless, it is not an indicator of operating performance, so we reject the hypothesis that the operating performance of acquired companies depends on the country of origin. This rejection is based on the results we have obtained from our models.

VIII.2: Conclusions drawn in a particular context

Our regressions were done over a very particular period; indeed, our reference year (2006) preceded a financial and then economic crisis that affected the entire world. As the Capital Dynamics study points out, value creation can change over time and circumstances. Macroeconomic factors diverged between Europe and the US during the crisis, in its management, in the later arrival of the crisis in Europe, in the management of loans. Therefore, it is imperative to keep in mind that the results obtained must be put in context.

From Data Stream (Reuters data software provided by BGL BNP Paribas), we have produced two graphs for the two geographical areas studied, showing the most important macroeconomic indicators: GDP, inflation rate, unemployment rate, and trade balance.

Graph 6: Evolution of macroeconomic variables in Europe

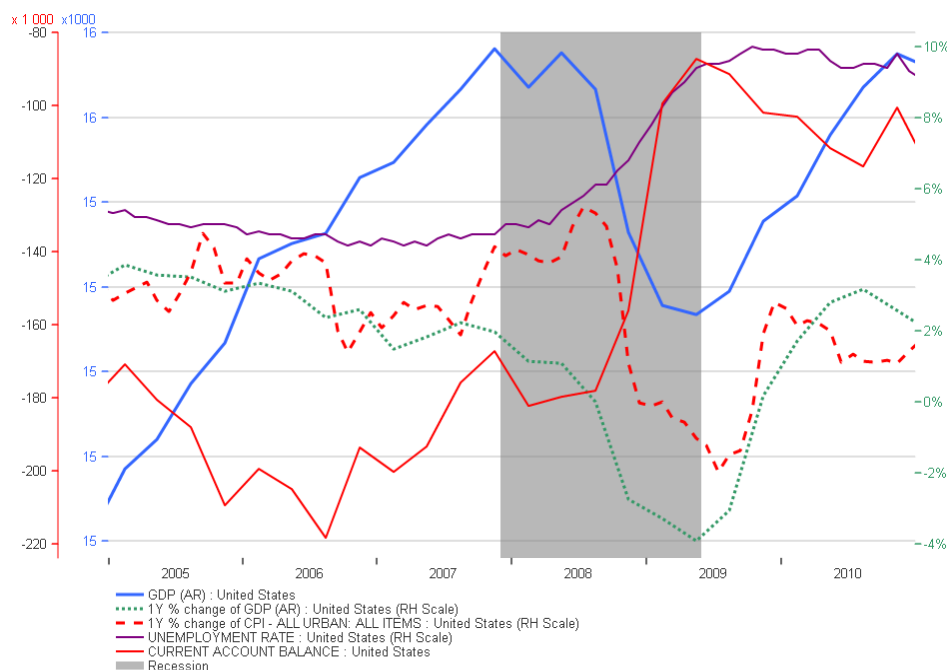


It is noticeable that in Europe the effects of the crisis are strongly felt from mid-2008. The financial crisis caused by the bankruptcy of Lehman Brothers in the United States and the economic crisis did not affect Europe immediately.

Inflation reached a peak in mid-2008 because of the economic crisis, perhaps allowing financial institutions to grant loans to companies, even though they were weakened. However, austerity measures were quickly put in place, thus sharply reducing inflation, and creating a deflationary movement. This then limited the access of investment funds to financing, or at least much less easily. Thus, following the principle of the Philipps curve, we notice that an increase in unemployment accompanies the strong decrease of inflation and from 2009.

The GDP of the Eurozone is also very strongly impacted, as shown in the two blues graphs. A sharp decline in economic activity will result in lower sales and corporate revenues. However, from the end of 2008-2009 onwards, a recovery in activity can be seen. The trade balance has followed a broadly similar trend, even if it has been much choppier; recovery can be seen from 2009 onwards.

Graph 7: Evolution of macroeconomic variables in the United States



The effects of the crisis were felt earlier in the United States; from the end of 2007 the US GDP plummeted (until mid-2009), accompanied by a sharp rise in unemployment.

This had a devastating impact on the US economy and consequently on the operational performance of companies. Inflation, as in Europe, has fallen sharply because of the austerity approach chosen by governments. As a result, investment funds have had difficulty accessing bank loans to finance their activities (see graph in appendix). They have been actively managing their loan portfolios (unlike European banks which have remained with their loans on their balance sheets).

The net balance of trade is more "dangerous" to interpret. Firms stopped importing which explains the trade balance exploded. However, exports have also fallen, impacting the commercial activity of companies.

Therefore, all these elements directly impact the performance of companies acquired by a fund, but it is difficult to quantify this impact on a sample.

XIX: Limits of this study

The methodology used in this work and consequently the results obtained have certain limitations.

First is the reference year: to maximize the data on American and European companies, 2006 was selected. However, this is the year before the financial and economic crisis. The impact of the crisis on operational performance and value creation, in general, is very important. It might have been more appropriate to select a reference year where the circumstances external to the buyout would have had less impact.

The data section can also be questioned; first, it would have been relevant to have American and European companies of the same size to see how they evolve after an LBO, and second, to avoid size effects.

The benchmark indices (S&P500 and STOXX 600) also contain biases that prevent a good reading of the results. Mergers, even secondary ones, partly lower the results obtained because the indices cannot be considered 100% "neutral". Furthermore, these indices were representative of the economy of the two geographical areas studied, but the structure of the companies is not homogeneous; the S&P 500 index, for example, is only composed of very large capitalizations. In general, taking companies on another platform (Diane or Orbis if it had been possible) would have allowed us to take companies, both at the treatment group and control level, with a similar structure. Concerning STOXX 500, we should have taken only companies from the nine countries selected (even if they represent the LBO in Europe).

The different financial theories about LBOs are difficult to verify through our study. Indeed, it is not via the selected accounting variables that we can verify the conflicts of interest between the stakeholders or the asymmetric information problem. The study of a specific company buyout by a fund could highlight the interactions between stakeholders through interviews, thus allowing us to verify the developed financial theories.

Finally, incorporating the notion of sectors in our dummy regressions would also have allowed us to identify which business area achieves the best operational performance following the LBO, and conversely, which one suffers from the operation.

X: General conclusion

Through this thesis, we sought to understand the functioning of LBO transactions and measure their impact on American and European companies.

It is indeed an acquisition method that completely disrupts the structure of the acquired entity due to its very high financial leverage and its short-term vision. The success of such an operation depends on many factors such as the economic context, the financial structure of the company, the country of origin, the sector etc.

Based on the study "Financial Performance of Leveraged Buyouts: an empirical analysis" by Ivan Bull, we selected American and European companies that had been bought out to analyze the effects and compare them. The year 2006 was chosen as the reference year for these companies; the various tests carried out thus sought to quantify the evolution of a certain number of economic variables over a period ranging from the year preceding the buyout, 2005, to the three years following the transaction. However, this measurement was only possible by creating a control group specific to the United States and Europe, based on stock market indices. To structure the research, three hypotheses were posed and tested.

ANOVA and MANOVA tests were then conducted to see if the selected variables differed significantly between treatment and control groups. It appeared that the amount of Tax Income varied between the two groups at a significant level following a buyout. This result is consistent with the findings of numerous scientific articles; tax consolidation allows the investment fund to charge the expenses related to the transaction to the company's income and raise tax-free dividends.

To better capture the specific effects of LBOs on the selected companies, we conducted regressions based on the "Diff 'n' Diff" method. Using dummies, we were able to quantify the evolution of the variables following the buyout precisely. As a result, we observed an improvement in Operational Profit and EBIT, a decrease in Capex and Income Taxes for all companies. These results are in line with the conclusions of the scientific literature and validate the hypotheses that the operational performance of companies improves after an LBO for three years, as well as the value of the company.

Unfortunately, it was not possible to make a relevant distinction between American and European firms on enough variables; the regression carried out on Capital Expenditures is the only one that gave a significant result. It appears that American companies tend to have higher capital expenditures following an LBO than American companies. A plausible explanation for this lies in the massive stimulus package implemented by the Obama Administration from late 2008 to early 2009, which directly impacted corporate spending. We cannot therefore validate the hypothesis that firms' performance depends on their country of origin. Nevertheless, the rejection of this hypothesis, often confirmed in the literature, points to the limitations of this research.

The choice to study a period marked by a serious economic and financial crisis is not without consequences; indeed, the success of repurchase operations involving a high level of debt depends very strongly on the economic context. The economic recession of 2008 has had a strong impact on obtaining financial loans, on the turnover of companies, on the health and financial stability of those companies, etc. The management of this crisis was not done in the same way in the United States and Europe, which de facto impacts the reading of our results. Another limitation is the construction of our data, especially for our control groups. These groups do not have the same characteristics as our treatment groups, which may partially bias the results obtained, company size, sector, stock market listing, etc.

This thesis has thus highlighted the desire of investment funds to improve the operational performance of the company. This improvement is only possible through structural changes in the company, cost reduction, renewal of the management team, readjustment of the strategy, etc. American and European companies share this observation. Numerous examples, such as the recent Altice company, embody these convergences between the two continents in terms of LBOs and point to divergences in management, debt management, public perception, etc.

The study of companies acquired in Europe and the United States by the same investment fund, such as SFR in France and Suddenlink in the United States, would make it possible to note the divergences and convergences between these two geographical areas.

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XII: Appendices

XII.1: Results Tests MANOVA

1) MANOVA TEST: EU Treatment Group vs Index Group (2005-2009)

```
summary(mano, test = c("Pillai"))
      Df Pillai approx F num Df den Df Pr(>F)
DUMTREAT 1 0.04858 3.37 7 462 0.001617 **
Residuals 468
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Wilks"))
      Df Wilks approx F num Df den Df Pr(>F)
DUMTREAT 1 0.95142 3.37 7 462 0.001617 **
Residuals 468
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Roy"))
      Df Roy approx F num Df den Df Pr(>F)
DUMTREAT 1 0.051061 3.37 7 462 0.001617 **
Residuals 468
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Hotelling-Lawley"))
      Df Hotelling-Lawley approx F num Df den Df Pr(>F)
DUMTREAT 1 0.051061 3.37 7 462 0.001617 **
Residuals 468
```

2) MANOVA TEST: EU Before LBO vs After LBO

```
Df Pillai approx F num Df den Df Pr(>F)
DUMTREAT 1 0.066932 1.7114 7 167 0.1094
Residuals 173
---
> summary(mano, test = c("Wilks"))
      Df Wilks approx F num Df den Df Pr(>F)
DUMTREAT 1 0.93307 1.7114 7 167 0.1094
Residuals 173
---
> summary(mano, test = c("Roy"))
      Df Roy approx F num Df den Df Pr(>F)
DUMTREAT 1 0.071734 1.7114 7 167 0.1094
Residuals 173
---
> summary(mano, test = c("Hotelling-Lawley"))
      Df Hotelling-Lawley approx F num Df den Df Pr(>F)
DUMTREAT 1 0.071734 1.7114 7 167 0.1094
Residuals 173
```

3) MANOVA TEST: EU Treatment Group vs Index Group (before LBO)

```
> summary(mano, test = c("Pillai"))
      Df Pillai approx F num Df den Df Pr(>F)
DUMMY   1 0.025266  2.1107   7  570 0.04075 *
Residuals 576
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Wilks"))
      Df Wilks approx F num Df den Df Pr(>F)
DUMMY   1 0.97473  2.1107   7  570 0.04075 *
Residuals 576
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Roy"))
      Df Roy approx F num Df den Df Pr(>F)
DUMMY   1 0.025921  2.1107   7  570 0.04075 *
Residuals 576
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Hotelling-Lawley"))
      Df Hotelling-Lawley approx F num Df den Df Pr(>F)
DUMMY   1  0.025921  2.1107   7  570 0.04075 *
Residuals 576
```

4) MANOVA TEST: EU Treatment Group vs Index Group (after LBO)

```
> summary(mano, test = c("Pillai"))
      Df Pillai approx F num Df den Df Pr(>F)
DUMMY   1 0.027983  2.1098   7  513 0.04104 *
Residuals 519
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Wilks"))
      Df Wilks approx F num Df den Df Pr(>F)
DUMMY   1 0.97202  2.1098   7  513 0.04104 *
Residuals 519
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Roy"))
      Df Roy approx F num Df den Df Pr(>F)
DUMMY   1 0.028788  2.1098   7  513 0.04104 *
Residuals 519
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Hotelling-Lawley"))
      Df Hotelling-Lawley approx F num Df den Df Pr(>F)
DUMMY   1  0.028788  2.1098   7  513 0.04104 *
Residuals 519
```

1) MANOVA TEST: US Treatment Group vs Index Group (2005-2009)

```
> summary(mano, test = c("Pillai"))
      Df Pillai approx F num Df den Df Pr(>F)
DUMTREAT 1 0.094535 8.0839 7 542 2.278e-09 ***
Residuals 548
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Wilks"))
      Df Wilks approx F num Df den Df Pr(>F)
DUMTREAT 1 0.90546 8.0839 7 542 2.278e-09 ***
Residuals 548
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Roy"))
      Df Roy approx F num Df den Df Pr(>F)
DUMTREAT 1 0.1044 8.0839 7 542 2.278e-09 ***
Residuals 548
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Hotelling-Lawley"))
      Df Hotelling-Lawley approx F num Df den Df Pr(>F)
DUMTREAT 1 0.1044 8.0839 7 542 2.278e-09 ***
Residuals 548
DUMTREAT *** Residuals
```

2) MANOVA TEST: US Before LBO vs After LBO

```
> summary(mano, test = c("Pillai"))
      Df Pillai approx F num Df den Df Pr(>F)
DUMTREAT 1 0.047319 1.9087 7 269 0.0683 .
Residuals 275
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Wilks"))
      Df Wilks approx F num Df den Df Pr(>F)
DUMTREAT 1 0.95268 1.9087 7 269 0.0683 .
Residuals 275
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Roy"))
      Df Roy approx F num Df den Df Pr(>F)
DUMTREAT 1 0.049669 1.9087 7 269 0.0683 .
Residuals 275
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Hotelling-Lawley"))
      Df Hotelling-Lawley approx F num Df den Df Pr(>F)
DUMTREAT 1 0.049669 1.9087 7 269 0.0683 .
Residuals 275
```

3) MANOVA TEST: US Treatment Group vs Index Group (before LBO)

```
> summary(mano, test = c("Pillai"))
      Df  Pillai approx F num Df den Df  Pr(>F)
DUMMY   1 0.075748  6.8843   7  588 6.947e-08 ***
Residuals 594
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Wilks"))
      Df  Wilks approx F num Df den Df  Pr(>F)
DUMMY   1 0.92425  6.8843   7  588 6.947e-08 ***
Residuals 594
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Roy"))
      Df   Roy approx F num Df den Df  Pr(>F)
DUMMY   1 0.081956  6.8843   7  588 6.947e-08 ***
Residuals 594
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Hotelling-Lawley"))
      Df Hotelling-Lawley approx F num Df den Df  Pr(>F)
DUMMY   1  0.081956  6.8843   7  588 6.947e-08 ***
Residuals 594
```

4) MANOVA TEST: US Treatment Group vs Index Group (after LBO)

```
> summary(mano, test = c("Pillai"))
      Df  Pillai approx F num Df den Df  Pr(>F)
DUMMY   1 0.028417  2.4485   7  586 0.01762 *
Residuals 592
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Wilks"))
      Df  Wilks approx F num Df den Df  Pr(>F)
DUMMY   1 0.97158  2.4485   7  586 0.01762 *
Residuals 592
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Roy"))
      Df   Roy approx F num Df den Df  Pr(>F)
DUMMY   1 0.029248  2.4485   7  586 0.01762 *
Residuals 592
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
> summary(mano, test = c("Hotelling-Lawley"))
      Df Hotelling-Lawley approx F num Df den Df  Pr(>F)
DUMMY   1  0.029248  2.4485   7  586 0.01762 *
Residuals 592
```

XII.2: Results Tests Heteroscedasticity

1) Capex/Sales

Heteroskedasticity Test: White

F-statistic	40.75607	Prob. F(22,2292)	0.0000
Obs*R-squared	650.9706	Prob. Chi-Square(22)	0.0000
Scaled explained SS	203044.6	Prob. Chi-Square(22)	0.0000

2) Sales/Asset

Heteroskedasticity Test: White

F-statistic	1.682560	Prob. F(14,2303)	0.0526
Obs*R-squared	23.46921	Prob. Chi-Square(14)	0.0531
Scaled explained SS	12978.90	Prob. Chi-Square(14)	0.0000

3) EBIT/Sales

Heteroskedasticity Test: White

F-statistic	239.1393	Prob. F(22,2285)	0.0000
Obs*R-squared	1609.122	Prob. Chi-Square(22)	0.0000
Scaled explained SS	1632558.	Prob. Chi-Square(22)	0.0000

4) Incometaxes/Sales

Heteroskedasticity Test: White

F-statistic	0.398660	Prob. F(14,2303)	0.9758
Obs*R-squared	5.604005	Prob. Chi-Square(14)	0.9755
Scaled explained SS	5455.537	Prob. Chi-Square(14)	0.0000

5) Operatingprofit/Sales

Heteroskedasticity Test: White

F-statistic	362.4486	Prob. F(22,2283)	0.0000
Obs*R-squared	1792.725	Prob. Chi-Square(22)	0.0000
Scaled explained SS	482522.7	Prob. Chi-Square(22)	0.0000

6) Cash/Sales

Heteroskedasticity Test: White

F-statistic	232.3829	Prob. F(22,2295)	0.0000
Obs*R-squared	1599.827	Prob. Chi-Square(22)	0.0000
Scaled explained SS	358763.8	Prob. Chi-Square(22)	0.0000

