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Factor effects on Private Equity Activity

Investigating the explanatory power of country-specific structural factor effects on private equity activity

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Abstract

This thesis investigates the explanatory power of country-specific structural factor effects on private equity activity using a sample of 108 countries for a 5-year period from 2014-2018, with data sourced from Preqin and The Venture Capital and Private Equity Country Attractiveness Index. By use of both descriptive and econometric analysis, this thesis analyses the effects of 6 structural economic factors on private equity activity, represented by deal count and deal volume. We formulate an hypothesis for each of the 6 factors, and test these by running an OLS regression with both normal and logarithmic data, and extend the analysis through a POLS. The discussion looks at the economic interpretation of the results, and features a small case study of one country in the sample that has improved significantly, with accompanying policy proposals. We conclude that government policy should focus on Investor protection along with Entrepreneurial opportunities in order to encourage growth within the private equity industries.

Keywords – Economics, Finance, Private Equity, Venture Capital

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1 Introduction

1.1 Motivation

The private equity industry has grown tremendously during the previous decades, but the understanding of which factors facilitate the industry remains meager. The industry has been shown to aid innovation and economic growth due to its pooling of capital combined with professional investor services, providing an compelling case for policymakers. Simultaneously, the industry has been able to provide positive returns even in a prolonged low-yield economic environment, providing an attractive option for investors. However, the industry is geographically dispersed with substantial clustering, indicating that there are structural differences in where the industry prospers.

While there exists literature that has looked at factor effects on private equity activity and on cross-country differences in private equity activity separately, there is little literature that has considered these perspectives in combination. This thesis aims to improve the understanding of how country-specific factors affect private equity activity, by conducting a cross-country empirical analysis of factor effects on private equity activity. The research question of this thesis is thus *"To what extent does structural factor effects explain cross-country differences in private equity activity?"*.

By conducting an empirical analysis of six factor effects on private equity activity, we are able to dismiss some factors, provide support for some, and accept two factors as being deterministic of private equity activity. Namely these factors are; Economic activity, Depth of capital markets, Taxation, Investor protection, the Human and social environment, and Entrepreneurial opportunities. Our results therefore provide an interesting case for discussion. The definition of these factors, our hypotheses for their effect and observed results will be presented in due course. The economic interpretation of the results and policy implications will be elaborated on in the discussion. Through the analysis performed in this thesis, we have improved the understanding of how structural factors affect private equity activity, which explains in part the cross-country differences in activity. Based on this, we are able to reflect on the economic interpretation of the results, and the consequences for policy proposals.

1.2 Background

The private equity industry has grown significantly in recent years, and has thus naturally received increasing attention from academics. Especially the impact of a growing private equity industry on the rest of the economy has been researched, both due to the potential for accelerated economic growth and a fear of enforced economic cyclically.

Existing literature, such as Muscarella and Vetsuypens (1990), Korteweg and Sorensen (2017) and Link et al. (2014), concludes that well-established professional private equity industries can have a positive effect on both the individual company level, aggregated on industry level, and drive innovation or boost start ups that contribute to overall economic growth.

While it has been widely established that there are significant geographic differences in private equity industries and there exists some sort of clustering, quantifying exactly what makes private equity agents successful proves rather complex. Some of the countries that have well-functioning private equity environments have deep capital markets and high economic activity, while other countries with seemingly similar conditions do not have the same success. Are there other factors that play a role, and if yes, to what extent? This thesis aspires to understand which structural factors drive private equity activity.

Although a significant amount of academic literature has been published about how private equity funds operate, their success rates and strategies - in other words what profit they deliver to their stakeholders, and the impact private equity investing have on the firms they invest in, there are still some gaps to fill in. There are especially still some unanswered questions regarding why private equity activity seems to cluster geographically, and what factors enable profession private equity firms to flourish. These clusters are country-based, indicating that there are structural factors or policy structures that drives private equity activity. While it is well established that professional private equity firm clusters can contribute to growth, it has been difficult to understand which factors enable private equity clusters to form and be successful, and thus equally difficult to formulate appropriate policy proposals.

1.3 Problem statement

By writing this thesis, we the authors aspire to not only improve the understanding of to what extent structural factors affect the activity of private equity firms out of our own interest for the topic. We also to aim to reach a level of understanding where we are able to articulate some policy proposals and thoughts for a discussion around the area. It is of interest to both governments, investors and companies to understand how private equity firms operate and which factors affect their activities. In particular, it is of interest to policymakers to understand why private equity activity clusters, and which factors drive this clustering, as the industry has been proved to aid innovation and thus economic growth. While there exists literature on factor effects on private equity activity and on cross-country differences in separation, there has to our knowledge been few attempts at combining these perspectives. By doing exactly that, this thesis will quantify the country-specific factor effects on private equity activity.

1.4 Schematic outline of the remainder of this thesis

The remainder of this thesis is structures as follows: First, we will give an account of the private equity industry, before exploring the existing literature surrounding private equity investing and its impact on the economy. Then, we will describe our data, before moving on to explaining our hypothesis and methodology. Naturally followed by the analysis, discussion and subsequent conclusion. We will present both a descriptive and a statistical analysis, and feature a small case study in the discussion to exemplify our findings. Economic interpretation of our findings and thoughts with regards to policy proposals will be considered in the discussion.

2 Private Equity

Before moving on to existing literature on the topic and the theoretical background for our research question, we will need to define our interpretation of 'private equity', and simultaneously provide some background information about the industry.

2.1 Introduction to private equity and definitions

The term venture capital is usually defined as early stage investing, such as seed investing, investing in start-ups, or expansions by young firms. Private equity on the other hand is a wider term used to cover both early-stage investments such as venture capital, but also later-stage investments such as buyouts and turnaround investments. Venture capital and private equity are often abbreviated to VC and PE. This thesis considers both VC and PE investments per se, but we will stick to using the term private equity (or its abbreviation PE) as it subsumes all investments by private firms as previously mentioned. Similarly, we will use "PE firm" to cover both VC firms and PE firms, "PE industry" to cover all VC and PE firms, and "PE manager" to the person in charge of making managerial or investment decisions at the firm.

Private equity funds are used to pool significant amounts of free capital from stakeholders, such that the fund can take near-majority or majority ownership of companies. PE managers often have the competence to act as highly professional investors, and can thus be of value to the companies in question outside of the sheer capital availability. PE firms look to invest in companies that have significant scope for growth, either because of product innovation or the potential for process innovation. The professional investor capabilities of PE managers allow PE funds to aid start-up and expanding companies in their strategies, while supplying capital, often with the intention to take a private company public and then make a significant profit post IPO (initial public offering). PE funds sometimes take public companies private - for instance through an LBO (leveraged buyout) - with the intention of gaining majority ownership such that internal process innovation in the company can be conducted before the company is re-listed (through an RLBO, or reversed leveraged buyout). PE firms by their nature use a high level of

leverage relative to other investors, and usually commit to investments for a longer time period. Private equity firms can thus potentially both add value to companies and create significant profits for its stakeholders by combining a pool of capital with professional investor services.

2.2 Historical development

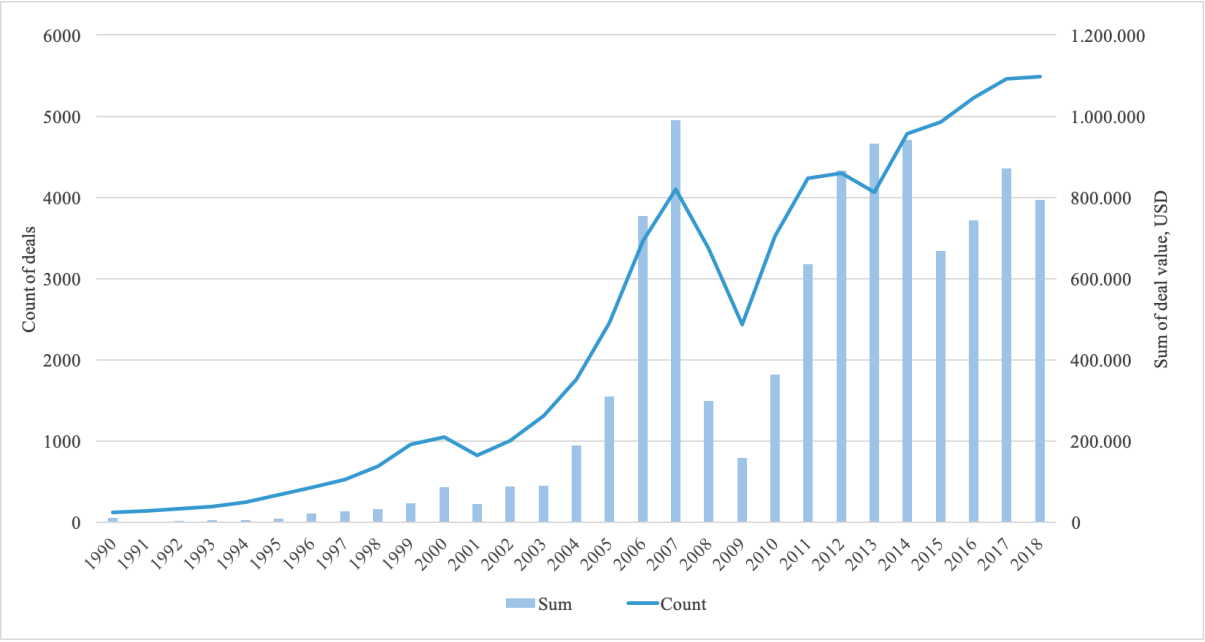
Private equity as we know it emerged in the mid-20th century in America, and gained traction in the 1980's. Prior to the mid-20th century, investor activities similar to those of private equity already existed, usually referred to as "development capital", and was mostly the realm of substantially wealthy families or individuals who sought to invest long-term in specific companies or aid companies with establishment. A frequently quoted case of private equity activity is the 1901 LBO of Carnegie Steel Company by J.P. Morgan, which was allegedly carried out using private equity. However, the establishment of private equity as we now know it is usually accredited to Georges Frédéric Doriot and his establishment of American Research and Development Corporation (ARDC), for which he has been given the soubriquet "father of venture capitalism". What differentiated ARDC from then-existing development capital firms was that it opened up to receiving capital from a wider range of sources instead of limiting itself to wealthy families or individuals. Doriot famously went on to co-establish INSEAD business school.

While the industry slowly gained traction from the establishment of ARDC onwards, it was not until the leveraged buyout boom of the 1980's that private equity became a household term. It is estimated that around 2,000 LBOs[1] were carried out through the decade, at a value estimated to be in excess of 250 million USD. Figure 2.1 shows how the industry has grown in more recent years, and shows how much larger the industry is now relative to the figures for the 1980's.[2]

[1]By 'deal' and 'deals' we refer to completed private equity deals such as buyouts.

[2]For a thorough understanding of the private equity industry and its historical development, we recommend studying the course notes of Lerner (1997) for his classes given at Harvard, as well as the books Fraser-Sampson (2011), Cendrowski et al. (2012), and Stowell (2017).

Figure 2.1: Worldwide private equity activity for the period 1990-2018



This figure illustrates the growth of private equity activity worldwide for the period 1990-2018, in both count of deals and sum of deal value in millions USD. This shows how large the industry has become in recent years. Data sourced from Prequin. Graph made by the authors.

2.3 The case for researchers

The private equity industry has grown tremendously during the past decades, and the academic attention given to the industry has followed suit. We will elaborate further on the academic background in the next section of this thesis, which is the literature review. However, here is a short account as to why the private equity industry is of academic interest.

On one hand, the private equity industry is an interesting case for academic researchers because of how these firms operate as investors and their impact on the overall economic environment. On the other hand, the industry is interesting because of how they use and apply existing academic theories of best-practice governance and financial operations in order to maximise company value and as a result return a profit to their shareholders.

With regards to the latter, private equity firms often act as majority owners and have specialised professional investor background at hand. Combined with the amount of available capital and shorter time horizon, this enables private equity managers to actively test the latest of academic theories on optimal governance strategies, organisation and

management. Not just is it interesting for researchers to observe the effects of this application of theory, but also to study the secondary effects on industry competition and concentration, and broader on the overall economy.

More recently, and especially since the financial crisis of 2007-2008, the majority of financially mature countries have witnessed an unparalleled low interest rates, and simultaneously experienced a historically low-yield financial climate. Despite this, the private equity industry has persisted to deliver above-market returns. This has caught attention from low-risk institutional investors such as pension funds, who have struggled to achieve sustainable returns. At the same time, the same investor group has also seen it as a chance to diversify their risk through so-called alternative investments (of which private equity is considered a part) in the factor investing framework. The interest from this investor group has further accelerated the growth of the private equity industry, but simultaneously provided more questions as to the risk involved in their operations. Although private equity firms invest for a relatively short time period considering the nature of their investments, there is significant illiquidity risk due to the holding periods required to harvest returns. The entrance investments are usually of significant value, and shareholder options limited through the holding periods. Despite this risk, private equity is attractive because it has the potential to deliver returns above the market even in prolonged low-yield periods.

With regards to the former, it is of interest how these firms operate as investors and their impact on the overall economic environment because of their management and governance practices, the opportunity to positively contribute to economic growth, and the worries of the system risks attached to their activities and their use of leverage. This will be elaborated on in the literature review.

2.4 Geographical differences

Another aspect that interests not just academic researchers, but also policymakers, is why the private equity industry is geographically dispersed the way it is, with some significant clusters. With 'clusters' we refer to how some nations have a majority of worldwide private equity activity, such as The United States and The United Kingdom. As many researchers

agree that private equity activity can boost economic growth, especially through aiding innovation, countries wish to design their policies and financial infrastructure in a manner that benefits the prosperity of the private equity industry. While some countries have blossoming industries, other countries that have attempted to replicate related policies and financial infrastructure has not experienced comparable results. This question relates to the discussion on which factors affect the successfulness of private equity firms and the attractiveness for where they choose to invest. As we will see shortly, this is a discussion with many threads, and one that this thesis will add to.

3 Literature Review

This section presents and describes the existing academic literature on the topic at hand, which will form the basis for the analysis conducted in this thesis. The literature has been split into a handful of categories:

1. Foundations of private equity research
2. Particularly influential pieces of literature
3. Private equity investment and operational performance
4. Private equity and the use of leverage
5. Private equity industry returns and success
6. Private equity investment and effect on industry concentration and competition
7. Private equity investment and its effect on innovation and growth
8. Country differences in private equity

Foundations of private equity research, which will deal with the basic understanding of the industry and the most well-known publications associated with this; Particularly influential pieces of literature, which covers two publications that have been instrumental for the understanding for and analysis conducted in this thesis; Private equity investment and operational performance, which covers literature dealing with the impact private equity activity has on acquired companies; Private equity and the use of leverage, which primarily looks at the risks associated with use of high leverage and how it impacts acquired companies; Private equity industry returns and success, which looks specifically at the performance of private equity firms; Private equity investment and effect on industry concentration and competition, which looks at spill-over effects of private equity activity on industries; Private equity investment and its effect on innovation and growth, which studies the impact private equity activity has on economic growth, incremental innovation and disruptive innovation; last but not least, Country differences in private equity, which presents relevant literature that aims to explain the geographical dispersion of the private equity industry. Within these subsections, papers are dealt with in chronological order.

Some of the papers referenced in this literature may well fit within several of the above mentioned categories of literary discussions. We have sorted them as we see fit in light of the analysis at hand. This literature review will end with a concluding section on the existing background for the analysis.

3.1 Foundations of private equity research

Since the private equity industry established itself around the middle of the 20th century, it has been of interest to academics and policymakers alike to understand this body of financial actors. Some of the discussions related to the private equity industry fitted well into an existing narrative where academics were defining and evolving ground-breaking theoretical concepts of the financial sector, and increasingly quantifying and explaining the works of financial markets and other related actors. Some of the below-mentioned pieces of literature are therefore known to many as cornerstones of present day financial theory. In this thesis we have emphasised their relation to thoughts about the private equity industry specifically.

The central pillar of private equity research is the theory by Jensen (1989), that private equity has the ability to significantly improve the operations of firms. Jensen argues that organisation innovation should be encouraged in order to resolve the primary problem found within public companies, which is the conflict between managers and shareholders. Firms that have private equity backing are seen to have made organisation gains in terms of efficiency due the active nature of the investors in their monitoring capabilities. Jensen additionally argues that increasing debt within a company has the benefit of reducing the free cash flow problem, in that managers sit on large sums of cash in order to increase company size rather than spending or redistributing it to shareholders to increase company value. Indeed, Jensen even argues that over leveraging can be positive in that it forces companies to restructure and focus on the core practices that are creating value while selling off the undesirable sectors. These arguments that LBOs were good extended into the competitive environment with Jensen reasoning that increasing debt increased competitive pressure on rivals that then forced rivals to improve their own capabilities thus making the whole market more efficient.

Andrade and Kaplan (1998) looked at the costs of financial - not economic - distress within a number of companies that undertook a highly leveraged transaction in the 1980s. The authors use 124 management buyouts as the sample for this study over the period 1980 to 1989, where the companies were publicly owned before the buyout and the total transaction value exceeded $100 million.

Andrade and Kaplan define financial distress as the first year that a firm either has EBITDA less than interest expense, attempts to restructure its debt, or defaults on its debt. One important difference between their study and other studies of distress, is that they are careful not to include firms that are economically distressed - which is defined as having a negative operating income. They aim to investigate the results caused by financial distress exclusively. Due to this difference the authors have a better understanding of the true causes and costs of financial distress, which they estimate to be ten percent of the firm value, from the beginning of experiencing financial distress until the distressed is resolved.

High leverage was found to be the leading driver of the financial distress within the sample companies with poor firm performance, industry performance, and interest rate changes having a negligible effect in comparison. However,

Chevalier (1995a) conducted an event study in 1995 in order to determine the effects of leverage on competition after LBOs within an industry. The author shows that in Metropolitan Statistical Areas (MSA's) with supermarket competition, rival supermarkets that do not receive the LBO aggressively invest in order to increase the number of stores that one owns. The author focuses on a 30-day window prior to the first public announcement of the LBO and ends of the final announcement that the firm was undertaking said LBO. The four LBOs that were studied within this paper occurred in response to a unsuccessful take-over attempt prior the the announcement. As the paper focuses on the period in-between, we can see that the change in stock prices reflects the markets expectations of a rival firm due to the LBO. The results suggest that the rivals increase their own leverage in response to other firms obtaining private equity capital which could result in the whole market increasing value.

3.2 Particularly influential pieces of literature

There are two previous papers that have been particularly influential for this thesis, namely Bernstein et al. (2016) and Groh et al. (2018). These two works will therefore be elaborated on in detail before moving on to a wider scope of background material. As our data sample also consists of data from the latter, we will revisit their data management in the subsequent section of this thesis.

3.2.1 Bernstein et al. (2016), "Private Equity and Industry Performance"

"Private Equity and Industry Effects" by Bernstein et al. (2016), was a collaboration paper between 4 professors spanning 4 institutions, all with connections to well-established national centres on financial-, economic-, and economic policy research. This paper sought to investigate the impact of the growth of the private equity industry on the rest of the economy.

Prior to publication of this paper, there had been questions about whether the impact of private equity investment was able to affect economic growth, and also if the operations of private equity funds - not just their activities on firm-level, but their accumulated activities as an industry and by their nature as investors - affects cyclicality of the economy or not. While there was an interest to find out if private equity firms could positively affect economic growth, there were also worries that the high level of leverage used by private equity firms, and their need to deliver a profit to their shareholders, could have a negative impact on the economy. Briefly explained, the latter could impact employment levels in the companies invested in, and aggregated possibly on industry level, while the first could amplify credit cycles, as the need for leverage could entail that private equity firms have high activity levels when credit is cheap, and low activity when credit is expensive or unavailable, spurring concern that they accelerate credit cycles.

Of course these questions were of high interest to policymakers, as a positive impact on economic growth would mean that policies could be developed to encourage and assist the operations of private equity firms, using the industry to boost the overall economy or

specific segments of it, depending on the maturity and structure of the economy. On the other hand, if private equity firms did indeed amplify credit cycles, appropriate policies would have to be put in place to manage any negative effects on the economy and minimise the possible effect in case of any larger, systematic financial or economic crisis.

While the literature published prior to this paper did attempt to investigate the effects of private equity on the overall economy, this literature was primarily based on specific case studies on the company level, and conclusions were contradictory. Bernstein et al. (2016) thus took a step outwards to look at the wider picture, while addressing the existing conflicting view on the effects of the private equity industry.

More specifically, the authors examined the juxtaposition between the presence of private equity investments in industries and growth rates of factors such as employment, total production, and capital formation. The growth rates of these factors were used to represent aggregate growth and to investigate cyclicality. Their sample covers 20 industries in 26 nations, for the period from 1991 to 2009. By meticulous use of ISIC codes, they linked two datasets: one from Capital IQ (an S&P database) with information about private equity investments, and one from OECD's STAN databases on industry activity and -performance. Their total sample consisted of 11,135 country-industry-year observations.

They investigate the relationship between some industry characteristics and private equity activity in the given industry, with economic growth being the dependent variable, either represented by employment, production, value added, capital formation and capital consumption.

This paper has two interesting results: First, that those industries that private equity firms have invested in during the past 5 years have grown faster that their comparatives, and second, that it is difficult to find evidence that private equity investment increases cyclicality. These results hold both for common law nations (United States and United Kingdom) and for continental Europe.

Their findings open up for several lines of future research, such looking at more detailed data and mechanics of industry performance, especially with respect to employment and innovation. They point out that the buyout boom of the mid 2000s was so significant that the results of their analysis might have been different during a different economic

cycle, pointing out that it would be of interest to do a similar analysis in the future. They also refer to the supermarket case study of Chevalier (1995a) as an example of an investigation of the impact private equity investment has on competition and the industry being invested in as a whole - in other words the spillover effects of private equity investments - and how this is a topic where much is still unanswered.

In the context of this thesis, this paper is of special interest due to its methodology and exploration of the effect private equity investment has on the rest of the economy through industry effects.

3.2.2 Groh et al. (2018) "The Private Equity and Venture Capital Country Attractiveness Index"

The Private Equity and Venture Capital Country Attractiveness Index is more of a project than a normative academic paper, and is published as an annual report. It has been published for several consecutive years, and while we have primarily based our research on the most recently published version presenting the index, we have also considered other papers published by the research team behind the project on other topics that are relevant to the index and/or our work with this thesis. Any papers related to the project will be cited in the bibliography. This section will briefly present the project and review the most recent version of the main publication, Groh et al. (2018).

The research team behind the index began their work in 2006, with the aim to create an index that would rank the attractiveness of countries to private equity investors and firms in such a way that countries can be benchmarked against each other. Since the start of the project, the team has meticulously selected and collected more than 300 data series in order to construct the index.

They have identified six factors that affect a country's attractiveness to private equity: Economic Activity; Depth of Capital Market; Taxation; Investor Protection and Corporate Governance; Human and Social Environment, and; Entrepreneurial Culture and Deal Opportunities. We refer to these as structural factors.

As mentioned above, the index is based on more than 300 data series. Since the 6 structural factors cannot be directly observed in each and every country, they have divided

the factors into sub-factors or proxies that are more easily accumulated across countries, then aggregate them to get an overall factor score for each of the 6 structural factors per country. An overview of the factors and sub-factors can be found in Appendix A3.1.

A detailed explanation of the weighting scheme used to balance the data series and aggregate the factors can be found in the European index published in 2010, Groh et al. (2010).

As some of the data used in this thesis comes directly from this index, we will return with further description of it in the next section of this thesis.

It is important to mention that the index is not fully comparable across time periods, as some of the underlying data series have been discontinued and the research team have therefore had to replace some of them. This predicament does not apply to the data from the index that has been used in this thesis.

The index has contributed to the discussion on geographical differences in the private equity industry, by identifying which structural factors affect where private equity firms choose to invest, and by providing a tool for benchmarking and comparing countries and regions - including over time. In addition to the annually published paper, the project has a website with interactive components and detailed graphs to compliment the index.

This index is very useful to the analysis conducted in this thesis in that it provides quantitative scores for the 6 structural factors included in the index.

For an account of the factor composites, please refer to A1.1 in the appendix. Because these factors are used in the analysis conducted in this thesis, we will revisit their components both in the sections Data and Methodology of this thesis.

3.3 Private equity investment and operational performance

The above mentioned papers, Bernstein et al. (2016) and Groh et al. (2018), also added to another, existing debate about the operational performance effects private equity investment can entail.

Based on the theories of Jensen (1989) among others about optimisations of financial management practices, the papers considered below investigate how private equity backing affects these financial management practices.

We have considered some literature from the end of the 1980's/beginning of the 1990's, following the buyout boom of the 80's. Then another wave of literature a while after, with more empirical research.

Kaplan (1989) investigates the effects buyouts has on operating performance and company value, by analysing the results of 76 large buyouts. All buyouts from the sample were completed in the period 1980-1986. The primary conclusion is that these firms make operative changes, which result from incentives for improvement, rather than managerial self-interest or layoffs. These operative changes include an increase in income net depreciation in the three years after completion of the buyout, a decrease in expenditures, and increased cash flow. As a result of this, the median and mean increases in market value are 77% and 96% prior from pre- to post buyout. This paper is often referenced as proof that firms with private equity backing have improved operations compared to prior to being taken private and comparable to competitors.

While Kaplan (1989) considered a sample of buyouts and looked at their overall financial performance, Baker and Wruck (1989) looked closely at one specific case to identify where and how the firm in question improved its operational performance. The findings showed that it was the significant debt burden pre-buyout and the presence of management equity ownership (in other words profession investors as majority shareholders) that led the firm to improve its operations. This paper points out that in this case, it was specifically the debt convents restricting cash flows that led to the improvement, which would not have been identified in large-scale studies such as Kaplan (1989). In conclusion, this paper argues that it is specifically the debt burden and the reorganisation of decision making that drives the financial improvement - closely aligned with the theories presented in Jensen (1986).

Muscarella and Vetsuypens (1990) took a different approach than the two papers previously mentioned, but also investigated the financial gains of organisational improvements in relation to buyouts. While the two papers above analysed the operational performance directly, either up-close or for an aggregated sample, Muscarella and Vetsuypens (1990)

looked at reverse leverage buyouts (reverse LBOs, also known as RLBOs). The advantage of using this approach is that it allows the market to evaluate the change in value of these companies from prior to and post private ownership. The sample is similar to that of Kaplan (1989) at 72 firms, and spans some of the same period, making them good compliments and tests against each other. All firms in the sample went public after 1983, but had previously been taken private either fully or partially. This paper concludes that "the change in the governance structure of these firms towards more concentrated residual claims creates a new organizational structure which is more efficient than its predecessor."

The papers above are widely cited and well-known for their evidence of how leverage, and especially management buyouts, improve how firms are managed, operate and perform. The papers we will cover from here onward are more recent, and thus have much more complete and complex data sets.

While Sarin et al. (2002) has a perspective of an investor and investigates the returns private equity firms make at exit, when selling the company it has previously taken private, this paper has been allotted to this section of the literature review because it provides an interesting account of the value of companies prior to and post being taken private. More specifically, this paper studies the "private equity discount", and tries to understand the risk premium involved in private equity activity, by conducting an empirical study of 52,322 financing rounds in 23,208 unique private equity-backed companies, through the period 1980-2000. This paper finds the expected multiples of private equity investment to be between 1.12 for later stages and 5.12 for firms that were financed early in their growth cycle. It also concludes that the returns of private equity investments depend strongly on the stage at which financing took place, the valuation at the time of financing, and the firm industry.

Cao and Lerner (2009) has a similar approach to Muscarella and Vetsuypens (1990), in terms of looking at reverse leveraged buyouts to understand the performance of private equity investments. The empirical study presented in Cao and Lerner (2009) is rather impressive, with a sample of 496 reverse leveraged buyouts (RLBOs) executed in the period 1980-2002, and considers both their 3-year and 5-year stock performance. This paper finds that RLBOs consistently outperform not just ordinary IPOs, but the stock market itself, with strong returns. This paper, like some of the papers presented in section

3.5, Private equity industry returns and success, of this literature review, has considered the persistence in the returns of private equity investments, and finds that although the buyout market has grown significantly, there has been no deterioration of returns. One of the most interesting finds of this paper is that "quick flips", ie. when private equity firms acquire and sell an investment within a year, have returns subpar the market. Another interesting find is that private equity firms with more capital under management execute RLBOs that preponderate.

Boucly et al. (2011) focus on the firm-level operational improvements resulting from an LBO. By analysing changes in firm behaviour following an LBO relative to a control group for a sample of 839 deals in France. This paper finds that the firms grow faster than their peers and become more profitable in the 3-year period following the LBo. They also find that firms issue additional debt and increase expenditures in the same period. One major hypothesis of this paper is that private equity backing allows firms to explore hitherto unused potential for growth because of relaxed credit constraints, which the paper provides evidence for. The authors argue that this in turn explains how private equity firms create value in their investments. This paper also points out, like Sarin et al. (2002), that returns are strongly dependent on the industry the firms operate in.

Guo et al. (2011) asked the question "Do buyouts (still) create value?", and answered it by using a more recent and updated set of data than the studies of LBO performance presented earlier in this literature review. Specifically, it considered 194 buyouts during 1990-2006. This paper finds that returns benchmarked against the market to be 78%. It also compares the prices and returns of this sample against the activity in the 1980s, and finds that this sample has less leveraged deals and more conservatively priced offerings than the antecedents. A striking conclusion from this paper is that when the authors considered potential determinants of the returns, they find that in addition to improvements in operating performance, another strong driver is increases in industry valuation multiples, which emphasises the importance of the industry perspective in the private equity performance debate, and presents some intriguing discussions for the effect of private equity investments on competition and industry performance.

Bloom et al. (2015) considers the management practices of private equity backed firms, and questions if the operational advances as proved by Kaplan (1989), Baker and Wruck (1989)

and Muscarella and Vetsuypens (1990) are really just a result of stronger management incentives brought about by the rearrangement in decision making and the restricted cash flows due to increased leverage, or if there are other mechanisms at play. By using a sample of data collected from more than 4,000 medium-sized manufacturing firms across Europe, the U.S. and Asia on management practices, this paper provides evidence of private equity backed firms having improved people management practices and surpassing operations management practices, such as monitoring and process systems. Perhaps most importantly, this paper states that private equity firms purposely target firms where there is an opportunity for improvement of management practices, and utilises its ownership type to exploit this opportunity.

Bernstein and Sheen (2016) takes a different approach to the above papers. Instead of looking solely to prove operational changes following buyouts or investigating their core provenance, Bernstein and Sheen (2016) questions if the short-term incentives of the private equity firms for returns affect the operational activities of the backed entity. However, the conclusion is strongly focused on how private equity creates value through optimising operational performance, without much consideration of the impact the mentioned incentives might have and/or any analysis of the operational performance over time after exit of the private equity fund.

3.4 Private equity and the use of leverage

There are two main reasons for why the use of leverage by private equity firms has been researched. First, the high level of leverage used in transactions such as LBOs would from a financial academic point of view indicate that these transactions carry significant default risk due to a narrowed margin, and would expose the company invested in by the PE firm to risk of financial distress. Second, the use of leverage by private equity firms could potentially have an impact on credit cycles, as they acquire significant amounts of debt when cash is cheap, which could exaggerate otherwise-existing credit cycles.

Kaplan and Stein (1993) investigated changes in the financial structure and buyout pricing of the 1980s. As mentioned earlier in this thesis, the 1980s witnessed a wave of large LBOs. At the time, understanding the consequences of the substantial use of leverage

was uncertain and disputed. Kaplan and Stein (1993) saw to investigate the quantitative evidence of these transactions and the consequences of their nature.

By looking at data on deal size, i.e. the price paid, the buyout capital structure, and the incentives of buyout investors, and whether these incentives changed over time.

One of the noticeable discussions in this paper related to the capital structure in relation to the LBO. It states that "Even if the price paid to take a company private is a reasonable multiple of cash flow, a poorly designed capital structure can, by raising the likelihood and costs of financial distress, lower the prospective returns to some classes of investors.", and further argues that the cost of financial distress is dependent on the capital structure and debt structure, where even a small coverage in principle may not incur financial distress as long as renegotiation of debt is frictionless, with references to Jensen (1989). Therefore, the paper also meticulously consideres the structure of the debt used, such as contractual features. This is interesting in our private equity framework with regards to holding periods and the illiquidity risk private equity investors are subject to.

This paper has 4 striking conclusions, that over time: public junk debt replaced bank debt and private subordinate debt; the comparable ratio of cash flow to buyout price increased in absolute terms; dealmakers and management teams earned more from the transactions, consistent with the patterns of the phenomenon known as "overheating" in the buyout market; and the ratios of cash flow to total debt obligations sharply declined due to an acceleration of required bank principal repayments.

More than a decade later, Axelson et al. (2007) expanded the discussion with the title "Leverage and pricing in buyouts: An empirical analysis". This paper offers a more detailed look at the relationship between capital availability and the buyout activity conducted by private equity funds.

Axelson et al. (2007) is also an empirical analysis of the financial structure of large LBOs, with more recent examples. Their sample totalled 153 LBOs with an average enterprise value at more than 1 billion USD. Like Kaplan and Stein (1993), this paper meticulously analyses the capital structure of these deals, documenting how the transactions are financed. While Kaplan and Stein took great care to analyse the evolution of capital structure over time during the 1980s, Axelson et al. emphasised the relationship between

leverage in public firms and leverage in buyouts. They find that cross-sectionally, the factors that explain capital structure in public firms have no explanatory power for the capital structure in buyout firms. More specifically, leverage seems to be driven by the economy-wide cost of borrowing. Ultimately, they find that leverage has a strong impact on the prices of deals, which supports the argument that availability of financing significantly impacts cycles in the private equity market, resulting in booms and busts.

Axelson et al. extended their analysis with the 2013 paper titled "Borrow cheap, buy high? The determinants of leverage and pricing in buyouts." This paper elaborated on the findings of Axelson et al. (2007), by further investigating how private equity funds pay special attention to capital structure when executing LBOs.

As we mentioned in the introduction to this literature review, private equity activity is an interesting platform for researching academic capital structure theories empirically. This is pointed out in Axelson et al. (2013), and is what they aspire to do.

By using a significant international sample of LBOs from 1980 to 2008, they find - as in the previous paper - that cross-sectional factors are unrelated to buyout leverage. This supports traditional capital structure theories of public firm leverage. Axelson et al. (2013) instead finds that variations in economy-wide capital availability is the main determinants of leverage in buyouts. We shall return to this point in subsequent chapters of this literature review, and later in the analysis and discussion where applicable.

Axelson et al. (2013) also concludes that higher transaction leverage is associated with higher deal prices and lower private equity fund returns, which they attribute to acquirers overpaying when access to credit is easier. This connects to the debate on private equity and its impact on credit cycles, as noted by Bernstein et al. (2016). It also begs the question if there is an ideal economy-wide access to credit for the private equity industry to maximise returns.

Hotchkiss et al. (2014) investigates resolution of financial distress is a private equity framework. By examining a sample of 2,151 leveraged loan borrowers between 1997 and 2010, they investigate the costs of financial distress to private equity backed firms. They conclude that firms with private equity backing are more likely to default on their debt than other firms with similar leverage who are not backed by private equity firms.

However, they also find that private equity backed firms are more likely to restructure fast and out of court. Private equity firms are also more likely to maintain ownership of the distressed firm comparable to other investors. Hotchkiss et al. attribute these results partly to the ability of private equity firms to inject more capital as their invested firms approach distress, and further conclude that private equity firms therefore do not exacerbate the likelihood of financial distress in their invested firms, and their invested firms resolve distress more efficiently than comparable firms. While Hotchkiss et al. (2014) state that private equity backing does not exacerbate the likelihood of financial distress for the companies they invest in, on the other hand, other papers such as Kaplan and Stein (1993) have concluded that substantial leveraging increases the risk of financial distress. We assume that Hotchkiss et al. (2014) by their argument mean that firms with private equity backing are not more likely to encounter financial distress compared to similar companies with a similar capital structure. It can thus be argued that private equity backing increases risk of financial distress if it changes the capital structure by for instance using more leverage.

While the effects of private equity use of leverage on the firms they invest in and economy-wide are not fully explored here, the above-mentioned papers provide a framework for understanding the impact private equity investment has on companies and risk of financial distress.

3.5 Private equity industry returns and success

There is some literature that has specifically looked at the performance of private equity companies. The quantitative performance of these companies are interesting for some of the reasons mentioned earlier in this literature review, such as they ability to increase the value of companies they invest in before selling them again, and the wider impact of these activities on competition, innovation, and economic growth. Their performance is also interesting as a measure of their ability to deliver returns to shareholders, for investment purposes.

Cochrane (2005) is a comprehensive econometric analysis of the risk and return of venture capital. The paper has a strong focus on the statistical challenges involved in analysing

private equity industry returns and success, with special emphasis on overcoming selection bias. According to Cochrane, the focus on looking at the return to IPO is looking 'only at the winners', thus involving an upward bias of the ex-ante returns to potential investors. Analysis's that do not correct for the bias will therefore be too optimistic. In the analysis of Cochrane, adjusting for the selection bias yields a mean log return of about 7% for the sample, with an intercept of -2%. The arithmetic average returns is found to be about 53%, and the CAPM alpha to be about 45%.

Kaplan and Schoar (2005) investigates the performance of private equity funds by studying their capital inflows and their persistence. The paper finds returns to be, on average, insignificantly different from those of the market, as measured by the S&P 500. It also finds returns to be strongly persistent. This paper also looks at cyclicality in the industry, and finds that at the industry level, fund performance is procyclical, and that private equity funds have significantly different cycles and responses to cycles than mutual funds. While this paper is interesting, it emphasises the need for further research to understand the returns of private equity funds and their risk profile.

Hand (2005) investigates the value of financial statement data and non-financial statement information. Using a sample of U.S. biotechnology firms, this paper finds that financial statement data is highly valuable for the private equity market. The author compares their value to that for the public market, and finds that there are little differences in their apparent value, despise significant structural differences between the public and the private market.

Nielsen (2007) looks at the relationship between private equity and institutional investors, so it also related to the discussion presented in section 3 of this literature review on how private equity investment relates to operational performance. This paper also complements the literature on entrepreneurial finance, with has concluded that institutional investors are the main contributors of private equity firms. This paper looks at how institutional investors invest directly in private equity firms, and how a significant concern for such an investment is higher agency costs. Nielsen (2007) shows that private equity firms invest in firms with governance mechanisms that limits agency costs. Finally, it concludes that these investments tend to be followed by other improvements in corporate governance, and tend to occur in high-growth firms within research and development intensive industries.

Nielsen (2011) expanded on the analysis conducted in the above-mentioned paper, from a different angle. Nielsen (2011) addressed what has become known as 'the private equity premium puzzle', as defined by Moskowits and Vissing-Jørgensen (2002), which is the puzzle about how even professional investors with well-diversified portfolios, such as pension funds, get a poor return from investing directly in private firms when return is adjusted for risk. This paper analysed the returns of pension funds who invested directly in private firms, and found that they underperformed public equity investments by 393 basis points annually, and that this gap in return from investing in private firms is due to initial over-optimism, misprising, and/or misconception of risk.

Sorensen et al. (2014) looks specifically at the returns to private equity firm stakeholders, by looking at private equity fund returns in relation to returns delivered to stakeholders, to see if they are sufficient to compensate for the long-term illiquidity, adjusted risk exposure, and the incentive- and management fees charged. By defining the shareholders portfolio-choice problem, they find that private equity funds must generate considerable alpha in order to compensate shareholders for their costs. Sorensen et al. (2014) conclude that conventional interpretations of private equity fund performance measures seem optimistic compared to their findings, and suggest that shareholders may just break even.

Harris et al. (2014a) provides an account of the academic theories on private equity performance up to this point in time. With a sample of almost 1400 U.S. private equity funds sourced from more than 200 institutional ivnestors, they present evidence about private equity returns. By comparing specific cash-flow data from a wide range of sources (including Burgiss, Venture Economics, Prequin and Cambridge Associates) as well as other research, they are able to compare venture capital and buyout returns to those of public markets. Their results suggest that precious research has understated the performance of private equity, which they attribute to data limitations in data used by previous studies. Not only does this paper provide further support to private equity performance exceeding that of public markets, it finds the outperformance against S&P 500 to be between 20-27% through the lifetime of buyout funds, and more than 3% per annum for buyout funds. Venture capital funds, on the other hand, outperformed the market in the 1990s, but underperformed in the 2000s.

Harris et al. (2014b) investigates the persistence of persistence in private equity returns, by looking at a dataset sourced from over 200 institutional investors for U.S. buyout and venture capital firms (what this thesis has defined to be included in the concept of private equity). Most research on persistence of returns up to this point had been on pre-2000 data, while this paper studied both data pre-2000 and post-2000, taking care to analyse persistence pre and post the financial crisis. They find that previous findings of persistence for pre-2000 is sustained, while post-2000 there is mixed evidence of persistence in buyout funds, while venture capital is remains persistent. When sorting firms for their quartile based on past performance, performance of the current fund is found to be statistically insignificantly distinguishable regardless of quartile. However, they also find that all quartiles had performance exceeding that of public equity, when benchmarked against the S&P 500. While some private equity firms are found to deliver below-market returns in some years, the two top quartiles consistenly delivers above market.

These findings are interesting, as they prove that even bottom-quartile private equity firms provide better returns than the market over time, despite previous assumptions about only the top quartile being successful enough. At the same time, the top two quartiles, in other words 50% of private equity firms, are found to consistently deliver above-market returns.

Korteweg and Sorensen (2017), like Harris et al. (2014b), investigate the persistence of private equity performance. Using a new decomposition model to identify 3 factors of persistence, they find evidence of high long-term persistence. They find that private equity performance is persistent, irregardless of the returns net-of-fees being wither high or low persistently. The spread between top and bottom quartile private equity firm returns is found to be 7-8% per annum. At the same time, they find that performance is noisy, which makes it difficult for investors to single out which private equity funds are persistent provide high returns. This paper is titled "Skill and luck in private equity performance.", and also provides some interesting discussions on why and how some private equity firms are successful while others are not.

In this section we have seen that initial literature was divisive in the opinion about the actual returns of private equity investments, while more recent literature is confident that private equity firms delivers higher returns net of fees that comparable investment

alternatives, when adjusted for risk. Some of the factors that enable private equity firms to succeed has been mentioned, and it has been established that private equity firms are persistent in their returns.

So far, the previous subsections of this literature review has considered the returns of private equity firms themselves and their operational impact on the firms in which they invest. The next two subsections will deal with the effect these activities have on industries, competition, innovation, and other economy-wide consequences.

3.6 Private equity investment and its effect on industry concentration and competition

In section 3 and 4 of this literature review we covered literature dealing with the effects of private equity investment on operational performance of the company invested in, and private equity fund's use of leverage. An important question is whether these two activities have any spill-over effects on the competitors of the firm that has been invested in by a private equity firm. Basic economic theory on competition has taught us that when a company in an industry process innovate or optimise management practices that affects performance, other companies in the same industry will have to follow suit or loose market share to competition.

Although it is difficult to single out the competitive effects stemming from private equity activities without influence of any other competitive factors, there are some papers that have researched the effects of private equity investment on competition and firm concentration. Among the most notable are two papers by Chevalier in 1995. "Capital structure and product-market competition: Empirical evidence from the supermarket industry" Chevalier (1995a) is widely cited, and is a case study of how private equity affects competition by looking specifically at the supermarket industry. The subsequent paper, "Do LBO supermarkets charge more? An empirical analysis of the effects of LBOS on supermarket pricing" Chevalier (1995b), continued the case study of the previous paper, but now considered use of leverage and price competition rather than market concentration. These two papers are widely cited as proof for private equity activity having a positive impact on the companies in which they invest, and for having an impact

on industry competition.

The debate was continued by Hsu et al. in 2010, with the notable papers "The new game in town: Competitive effects of IPOs "Hsu et al. (2010a) and "Competitive effects of private equity investments" Hsu et al. (2010b), which were both more general than the preceding case study by Chevalier, but also more specific in the understanding of the driver of these effects.

3.7 Private equity investment and its effect on innovation and economic growth

Guo et al. (2011) examine the current impact of LBOs on firm performance and value in comparison to those that occurred in the 1980s. The 1980s era literature suggested that LBOs led to "large gains in operating performance following the buyout; theories attribute these gains to reduced agency costs through the disciplining effects of leverage and better governance." However, Guo et al find that for the sample of 192 buyouts that occurred between 1990 and 2006 with a value of over $100 million there were no substantial cash flow gains as seen within the 1980s nor are there significant operating enhancements in comparison to the benchmark case of other firms in the industry without PE investment.

Lerner (2000) investigates the influence of private equity on patent inventions in the U.S., using a sample of twenty industries spanning 3 decades. It finds that increased private equity activity in an industry is associated with significantly higher patenting rates. This paper estimates that private equity backing may have accounted for 8% of industrial patent innovations in the relevant period.

While Lerner (2000) focused on the U.S, Ughetto (2010) provides a similar analysis of private equity contribution to European innovation. This paper presents an empirical analysis of patenting activity for a sample of firms that had undergone a buyout between 1998 and 2004. This paper finds evidence that private equity firms affect the innovation activities of the firms they invest in, by looking at the number of patents following acquisition relative to pre-acquisition and non-acquired peers. Perhaps more interesting for this thesis, this paper finds that the characteristics of the private equity firm and of

the deal, such as geograhical location, specialisation, deal size, etc., differently affect the post-acquisition innovation in the sample.

Lerner et al. (2011) investigates the effect of private equity backing on innovation. Some of the questions they set out to answer are whether LBOs alleviate pressure from public shareholders, and whether private equity funds themselves have short-term incentives that cede long-term performance for the acquired firm. This paper analyses 495 transactions and the patenting activity of the acquired firms pre and post acquisition, and finds no evidence of LBOs decreasing innovation activities. On the contrary, this paper find some evidence of private equity backed companies having patents that are more frequently quoted.

The same group of authors continued their analysis with the article "Private equity and long-run investment in innovation: Evidence from patents." Lerner et al. (2013), which summarised and extended on thir previous paper.

Link et al. (2014) addressed one of the large questions of interest at the time of authoring, namely the impact private equity investments have on economic growth, and more specifically on innovation. By analysing detailed data on project-level innovation strategies from small businesses, they find that those firms in the sample who attract private equity backing are significantly more prone to register patents and sell intellectual knowledge rights. Thus, this paper concludes that private equity backing increases the development, and especially the commercialisation of, intellectual property, therefore contributing to economic growth.

Maas et al. (2018) provides a more in-debt analysis of the effect of private equity investment in different innovation phases. Since innovation can increase the value of the investment for a private equity firm that has acquired or invested in a company, this paper argues that private equity firms have an incentive to boost innovation. This paper therefore analyses innovation from a perspective of investment returns for the private equity firm, by looking at phases of the innovation process. While the majority of papers presented in this literature review are quantitative, this paper is qualitative, and based on interviews with investment professionals from 30 German-based private equity firms. One of the findings is that the importance of innovation to the private equity firm depends on the respective strategic focus of the firm in question. They also conclude that there is potential for

these firms to be more actively involved in their portfolio companies. Further, this paper presents an interesting account of methods, criteria, strategies and mechanisms that the private equity firms use to foster innovation in acquired companies.

Breuer and Pinkwart (2018) is an short study of the importance of private equity activity to economic development, which summarises the recent discussions and opinions about the role private equity plays in economy-wide growth. It argues that the availability of funds that these firms provide to early-stage portfolio companies is key for economic growth. Some of the arguments this paper mentions are the one from (Rosenbusch et al., 2012) about how private equity backing not always is profitable for the entrepreneur, how private equity backing increases performance due to stronger finances (Cumming et al., 2007), and how private equity, although increasing financial foothold, limits the financial flexibility and therefore decreasing long-term growth (Ernst et al., 2013).

3.8 Country differences in private equity

The volume of literature covering country differences in the private equity industry is steadily increasing. Some literature - including Kendall and Aizenman (2012), Baygan and Fredenberg (2000), Wright et al. (2005) and Guler and Guillén (2010) - suggest that the private equity investment pattern is shifting towards increased global distribution. A shift like this is of interest to policymakers, for many of the same reasons as mentioned above for understanding how the private equity industry operates. However, this topic is also of great interest to researchers and academics, as its sources might give insight into other important patterns of institutional financial economics, such as cross-border investing and geopolitical effects.

With venture capital and private equity more generally becoming more of a global endeavour, Groh et al. (2010) examine 42 different factors in order to create a composite indices to rank European countries based on their attractiveness to PE firm investment. These indices are supported by real fundraising activities that serve as a surrogate robustness check to the research.

Another paper that is important within the literature is that of Cumming and Walz (2010), who look at two questions within their paper "Private equity returns and disclosure

around the world". Firstly, they look into how unrealised returned are reported with respect to different countries. Whether that be due to "superior accounting and legal standards" or countries that are experiencing "weak stock market conditions" After which their hypotheses three and four state that overvaluation of these unrealised returns may be caused by the inexperience of the manager or the time stage of the investment. Cumming and Walz (2010) find that results that confirm all four hypotheses although the first of which is not statistically significant due to high variance within the IRRs. This paper expands on previous studies such as Cochrane (2005); Hand (2005) and Sarin et al. (2002). Who analyse private equity returns at firm level but fail include the sample size that is included within Cumming and Walz (2010)'s paper for which there are 5040 investments in comparison that that 194 analysed by Hand (2005). Additionally, the authors expand the previous literature by being the first paper which looks at the biases existing within the reporting of unrealised returns.

Bernoth and Colavecchio (2014) takes a different approach, and investigates the differences in the private equity industry for 17 European countries. Bernoth and Colavecchio (2014) argues that private equity is paramount to innovation and development in modern economies. Therefore, it sets out to identify the macroeconomic determinants of private equity activity. This paper finds robust results indicating equity market capitalisation, corporate tax rates, bank lending and labour costs are significant determinants of private equity activity.

Precup (2015), like Bernoth and Colavecchio (2014), investigates country-specific differences in the private equity industry from a European perspective, and evaluates the future of the industry. More specifically, this paper looks at how the private equity industry evolved through the last financial crisis in Europe, and identifies determinants of the market through an empirical analysis. The most important contribution of this paper is that it shows a change in deterministic factors of the market during the financial crisis, including new factors such as corruption and productivity becoming significant.

Marasová et al. (2017) presents a similar approach as Groh et al. (2010) by looking at the attractiveness of European countries for private equity firms. This paper does this by taking an industry-focused approach. It then considers how this impacts the private equity industry in Europe. One of the most interesting contributions of this paper is its discussion

of how countries that are shown to be attractive to private equity experienced significant growth of private equity activity despise recessions, with similar results observed in most of the countries included in the analysis.

3.9 Concluding remarks on background

In this literature review we have summarised some of the previous literature that has been influential to our understanding of the private equity industry and the problem at hand. We have focused on the foundations of private equity research, the two pieces of literature that have been particularly influential in the making of this thesis, and the effect private equity firms have on operational performance in the companies they invest in, as well as their use of leverage and relative success. We have covered the effects private equity activities have on industry concentration, competition and innovation, and how the industry affects economic growth and systemic risk. Last but not least, we have presented some existing literature that attempts to explain the observable country differences in private equity activity. Some of these discussions are separable, but most of them are significantly intertwined. While these papers do reference each other noticeably, there are some connections that could be made and some voids in the research than can be filled.

Though many aspects of the private equity industry has been investigated and analysed already, there are still many exiting, unanswered questions surrounding the industry and its impact. This thesis aims to answer one of these intriguing questions, by exploring the quantitative effects of six significant structural factors on private equity activity. The approach we have chosen directly references two of the above-mentioned existing debates: private equity activity quantitatively treated and structural factors for private equity attractiveness. The other discussions or sub-categories of existing literature presented above are relevant to the understanding of the investigation in this thesis for reasons that will be further elaborated on in the discussion. This thesis aims to add to the debate on country differences in private equity activity, but draws on all the other lines of discussions presented previously. The authors believe that combining the perspective of factor effects with the perspective of private equity activity, we can contribute to the debate with an improved understanding of what makes private equity activity cluster.

4 Data

This section will present the methodology used within the paper in terms of choosing and collecting the data used. First, the reasons for selecting the six factors will be discussed followed by the methods of data collection. Finally, the sources from where the data is obtained will be shown before the empirical analysis procedure is presented in the next section.

4.1 Overview

In order to investigate our hypotheses, we required a measure of country level factors related to the industry and a measure of private equity activity levels across the same years and countries.

The first data set contains 75,413 private equity deals between 1953 and today, across various levels of closure and acts as a measure of private equity activity. Our data set 2 is comprised of relevant data from The Venture Capital and Private Equity Country Attractiveness Index. In combination, these two data sets gives us a time range from 2014 to 2018, with 125 countries included, 6 underlying attractiveness factors, and a total of 6250 data points for analysis. Table 4.1 gives a breakdown of the countries that are investigated based on their respective region.

By combining The Venture Capital and Private Equity Country Attractiveness Index, which gives countries an attractiveness rank for private equity investment based on 6 factors, with data on private equity operations such as deal volume and number, we can investigate the effect of changing these underlying 6 factors on operations. Using these measures, we are able to quantify the effect of each factor on private equity investment. Understanding this relationship is of importance both to policymakers and investors alike.

Table 4.1: Countries included in the data set

Region	Countries
Africa	Algeria · Angola · Benin · Botswana · Burkina Faso · Burundi · Cameroon · Chad · Egypt · Ethiopia · Ghana · Ivory Coast · Kenya · Lesotho · Madagascar · Malawi · Mali · Mauritania · Mauritius · Morocco · Mozambique · Namibia · Nigeria · Rwanda · Senegal · South Africa · Tanzania · Tunisia · Uganda · Zambia · Zimbabwe
Asia	Armenia · Azerbaijan · Bangladesh · Cambodia · China · Hong Kong · India · Indonesia · Japan · Kazakhstan · Korea, South · Kyrgyzstan · Malaysia · Mongolia · Pakistan · Philippines · Russian Federation · Singapore · Sri Lanka · Taiwan · Thailand · Vietnam
Australasia	Australia · New Zealand
Eastern Europe	Albania · Belarus · Bosnia-Herzegovina · Bulgaria · Croatia · Czech Republic · Estonia · Georgia · Hungary · Latvia · Lithuania · Macedonia · Moldova · Montenegro · Poland · Romania · Serbia · Slovakia · Slovenia · Turkey · Ukraine
Latin America	Argentina · Bolivia · Brazil · Chile · Colombia · Dominican Republic · Ecuador · El Salvador · Guatemala · Jamaica · Mexico · Nicaragua · Panama · Paraguay · Peru · Uruguay · Venezuela
Middle East	Bahrain · Israel · Jordan · Kuwait · Lebanon · Oman · Qatar · Saudi Arabia · Syria · United Arab Emirates
North America	Canada · United States
Western Europe	Austria · Belgium · Cyprus · Denmark · Finland · France · Germany · Greece · Iceland · Ireland · Italy · Luxembourg · Malta · Netherlands · Norway · Portugal · Spain · Sweden · Switzerland · United Kingdom

This table is an overview of all the countries included in the data set from Prequin the authors have used for the analysis conducted in this thesis.

4.2 Data set 1 - Private equity activity

Data set 1 consists of the dependent variable used to conduct testing of the hypotheses. A proxy for private equity activity was required for this variable that included both the time of the activity and the country that the activity occurred in. One such data set exists in the form of the deals database within Preqin, that like comparative databases contains information relating to all private equity-back buyouts and exits globally.

4.2.1 Preqin

Preqin is one of the leading sources of alternative asset data in the world today. The extensive database houses information dating back to 1950 in addition to material updated daily. Access to this system was provided by Copenhagen Business School.

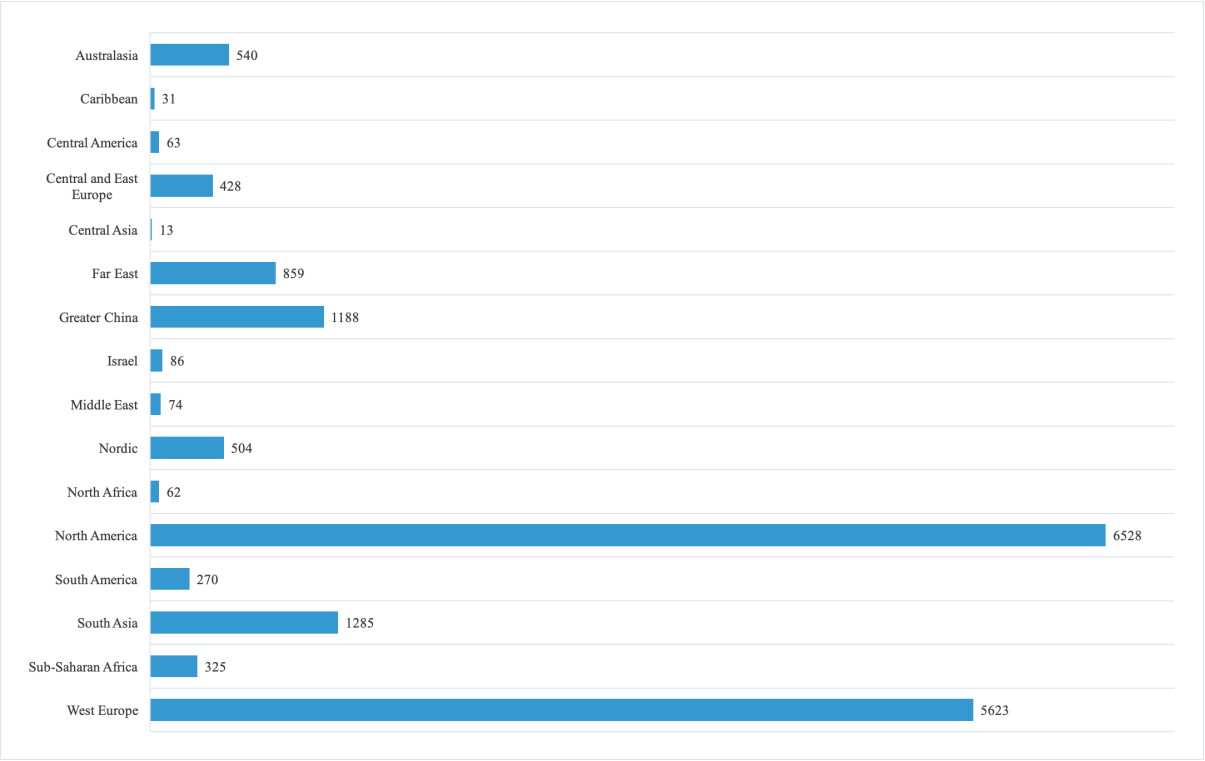
The service has been used extensively within literature recently with examples such as Gori et al. (2017); Harris et al. (2014a); Phalippou and Athanassiou (2012). Harris et al. in their 2014 paper "Private equity performance: What do we know?" compared a number of data sets. Namely these are Burgiss, Cambridge Associates, Preqin, and Venture Economics (a subsection of the Thomas Reuters database). The authors find that Burgiss, Cambridge Associates, and Preqin have qualitatively similar data on private equity while the Thomas Reuters performance data had a downward bias which confirmed an earlier study by Stucke (2011). As such we chose to select the Preqin database due to the relative ease of access compared to other competitors.

4.2.2 The buyout deals module

In total the database consists of 75,413 private equity deals that consists of the following statuses; Abandoned, Announced, Bidding, Completed, and Rejected. In order to maintain accuracy, only completed deals are selected which reduced the number of deals to 70,327. Furthermore, the number of deal between 1953 and 1990 totalled 589 and thus was considered too small a sample to move forward with any certainty thereby reducing the total to 69,738. Due to limitations within the Attractiveness index a five year period from 2014 to 2018 was selected which further reduced the sample of deals available within this data set to 28,036.

This data set is used in order to obtain country level observations for number and size of deals for the years 2014-2018. For observations with $deal.size$ the figures are in the local currency and in nominal terms. The latter is not problematic as each year is assessed individually and thus inflation does not need to be accounted for. Additionally the exchange rate to United States Dollars (USD) at the time of each deal is evaluated so that comparisons between deals are not skewed.

Figure 4.1: Number of deals per region, 1990-2018



This graph graphically shows the number of deals per region in the period 1990-2019. The data is sources from Prequin, the table is made by the authors.

The nature of the data enables us to focus on the initial investment of each buyout deal rather than the performance of the deal and thus what factors attract GPs to certain countries. This focus means that unlike previous studies we do not have to estimate the required IRRs of the funds nor the performance of each deal.

One problem associated with the data set is that 80% of deals that are considered completed do not have the deal size associated with them. This problem has been addressed by additional testing on the number of deals per country per year along with the aggregate total deal size.

The reason for this is in fact the reason the study was first theorised, that being the large skew towards the traditional centres of Private equity investment. The following table showing the top 5 countries by number of deals presents the problem clearly with the the count of deals within the United States making up 48% of the sample deals.

Table 4.2: Number of deals per country

	Total	2014	2015	2016	2017	2018
Total	25,889	4,787	4,928	5,228	5,458	5,488
US	12,655	2,314	2,397	2,473	2,663	2,808
UK	2,369	436	455	469	506	503
France	1,291	217	258	289	270	257
Canada	1,151	194	230	243	238	246
Germany	1,108	169	169	236	248	286

This table shows the top five countries by number of deals included in the data set used for the analysis conducted in this thesis. The data was sourced from the Prequin buyout deals module.

4.3 Data set 2 - The attractiveness index

Data set 2 consists of the independent variables used to conduct testing of the hypotheses. The professors Alexander Groh, Heinrich Liechtenstein, Karsten Lieser and Markus Biesinger provided their index to be used within this testing, which was especially helpful as it is split both over time and at a country level.

4.3.1 The index

The project initiated at IESE Business School Barcelona in 2006 combines a data set of 300 variables, for which there are 200,000 observations, into six factors (Groh et al., 2010). These six factors are used to construct an index that enables comparison, in terms of investment conditions, between the 125 countries contained within the report each year.

1. Economic.activity
2. Capital.market
3. Taxation
4. Investor.Protection.and.Corporate.Governance
5. Human.and.Social.Environment
6. Entrepreneurial.Opportunities

Over time, one is able to see the changes in the investment landscape within each country. This point is crucial to the index as changes made within a country can significantly

change the opportunities that an fund has available to them. However, due to the changes within the creation of the index, comparisons prior to 2014 are no longer available and thus a five year sample was obtained from the authors of the project.

Since the six factors themselves are not directly observable or measurable, they need to be estimated via a number of sub factors. Each of these factors will be examine more thoroughly within the following sections.

4.3.2 Economic activity

The factor economic activity is made up of three level-2 constructs which means that it has a weighting in the overall country ranking of 3/22 or 13.6%. Total economic size (GDP), Expected Real GDP Growth, and Unemployment are the three factors which make up this measure.

Each of these are very important to a growing economy which Gompers and Lerner (1998) assert that GDP growth is key for new VC firms to enter a market. GDP growth in general may increase the demand for entrants and funds invested as companies and investors alike seek opportunities, which through factors such as more efficient management (Bloom et al., 2015), outperform the market. On the other hand, it can be argued that increases in this factor may have a dampening effect on PE and VC growth in an economy due to an expectation of increasing interest rates. This argument is not backed up in the literature however which states that the amount of leverage used within a PE investment is more significantly related to the Senior Loan Officer Opinion Survey on Bank Lending Practices (Leary, 2009; Lown and Morgan, 2006).

4.3.3 Depth of capital markets

Six level-2 constructs make up the factor "Depth of capital markets". While similar, each construct represents a different perspective on why markets such as the United States and United Kingdom are so prestigious. The six factors are as follows:

1. Size of the stock market
2. Total trading volume

3. M&A Market activity
4. Debt and credit markets
5. Bank non-performing loans
6. Financial market sophistication

These factors are key in assessing the level of capital markets within each of the target countries. Additionally each level-2 construct is made up of multiple level-3s which can be seen in Appendix A1.1, such as fundamental components like the Market volume, Ease of access to loans, and the lending rate.

The ability for general partners to easily exit an investment through an IPO is strongly argued for by Black and Gilson (1998). They state that the strongest private equity markets in the world have this capability. In particular they demonstrate that countries with strong stock markets are better equipped, to encourage the entrepreneurial activity and thus venture capital, in comparison to a bank dominated market.

4.3.4 Taxation

Taxation as a factor is the least weighted in total of the index due to only having one second tier. This level-2 construct is the Entrepreneur tax income and administration burdens which in turn is made up of Entrepreneurial incentives, number of tax payments and time spent on tax issues. Unlike other factors taxation increases the index when the second and third tiers decrease. This is due to the negative nature of the construct which is will hamper investments and decreases the incentives for entrepreneurs to innovate.

Both the corporate tax rate and capital gains tax have been found as important determinants of entry and funding for the private equity and venture capital markets. This has been shown in previous studies around the world; for example in the United States (Gompers and Lerner, 1998, 2004), within Europe (Armour and Cumming, 2006) and worldwide (Jeng and Wells, 2000). The impact of taxation was most publicly researched by Poterba (1989) in a seminal contribution to the topic area. The author found that a decrease in the capital gains tax would in fact increase the amount of entrepreneurs and thereby increase the demand for venture capital within an region. On the other hand, one

can argue that in markets a lower tax rate may decrease private equity activity. This is because a lower tax rate will reduce the amount of tax shield that occurs in debt financed transactions.

4.3.5 Investor protection and corporate governance

The importance of obtaining funds from institution investors is the major question of Groh et al.'s 2007 study. The authors found that the protection of property rights was key to limited partners in the questionnaire. This study thereby concurs with the previous literature of La Porta et al. (1997); Porta et al. (1998) that external funding is dependent of the legal environment within a country.

This legal environment hypothesis was tested by Cumming et al. (2006) on 468 venture-backed companies from 12 Asia-Pacific countries. The authors concluded that in contrast to Gompers and Lerner (1998) the countries legal environment was more significant than the size of a country's stock market in allowing VC exits. This finding was later expanded worldwide across 39 countries using data from 3848 portfolio firms (Cumming et al., 2010).

With the importance of certain subsections demonstrated in their previous literature, Groh et al. (2018) include the following level-2 constructs into the calculation of the factor:

1. Quality of corporate governance
2. Security of property rights
3. Quality of legal enforcement

4.3.6 Human and social environment

The human and social environment describes the socio-economic factors present within a country such as the labour market, human knowledge, behaviour, and incentives (Coussens et al., 2001). As such the following level-2 constructs are included within the factor:

1. Education and human capital
2. Labour market rigidities

3. Bribing and corruption

Education and human capital contribute to the expansion of venture capital due to the growing knowledge of the industry given by universities. Developing the supply of better entrepreneurs through schooling enables better industries (Megginson, 2004).

On the other hand, bribing and corruption are seen to negatively impact the PE/VC industries to a greater extent than normal business. This is because the additional costs, both in terms of time and money, represented by bribery and corruption effect smaller businesses more so than their larger counterparts (Kaufmann et al., 2003).

4.3.7 Entrepreneurial opportunities

This section can be seen as the most important factor both logically and through the existing literature. One can argue that without innovation and opportunities for entrepreneurs to thrive in a country then a successful venture industry is highly unlikely. The following level-2 constructs are seen to be vital for the factor:

1. Innovation
2. Scientific and tech journal articles
3. Ease of starting & running a business
4. Simplicity of closing a business
5. Corporate R&D

The number of Scientific journals produced within a country has previously been highly correlated to activity within the VC sector as shown by Gompers and Lerner (1998). Furthermore, this can be seen as related to the innovation component with the number of patents produced within a country mirroring the rise of venture capital fund-raising in the middle of the 1990s (Kortum and Lerner, 1998).

Exit strategies have previously been considered in prior factors however this version focuses less on the legal environment and more towards the time and cost level-3 constructs. Entry on the other hand, focuses on the bureaucracy that can limit the activity within the industry and can be a key aspect to slow growth (Baughn and Neupert, 2003).

4.4 Data management

When combining data sets, certain compromises must be made so that one is able to match the explanatory and dependent variables. For the two data sets in question compromises on the number of countries and number of years have been made.

Data set 1 from Preqin contains information relating to 138 countries while the second data set from the attractiveness index has information on 125 countries. When combining these a number of changes were made to the names of the countries within both sets to enable the matching. Unfortunately, there existed cases where countries were found in only one set which resulted in the total number of countries under observation to be 108.

As previously mentioned in their respective sections, Preqin encompasses deals from 1953 until 2019 although the majority of those deals are found post 2000. On the other hand, the attractiveness index has only existed since 2006, and recent changes to the index have made in impossible to compare ranking prior to 2014 with the more recent results. Due to the restrictions a five year sample of both samples is taken from 2014 to 2018.

The American private equity industry being the oldest and largest in the world accounts for more than 48% of the sample within the preqin data set. This in addition to the index set forth by Groh et al. (2018), with 100s across the six measures, means that the sample is heavily skewed. The authors have therefore made the decision to remove extreme outliers within the sample. This decision was made in order to obtain results that pertain more closely to the developing PE nations and what factors are causing investment in the regions. The results of these changes can be seen within tables 6.3 and 6.4.

In order to aid the comparison between countries such that large countries did not overshadow the number and size of deals obtained by smaller countries a scaling factor was implemented on data set 1. The authors decided that scaling the dependent variable by the population in millions of people would be the best measure in order to give more insight into which factors are most important in terms of policy. The data for each countries population per year was accessed from the World bank's "World development indicators" database.

5 Methodology

In this section, the methods will be presented on which the empirical analysis of the relationship between the private equity activity and the attractiveness to GPs of a country will be based.

5.1 Aims and objectives

As mentioned previously, the method of this thesis builds on that of Bernstein et al. (2016) and The Venture Capital and Private Equity Country Attractiveness Index, but adds to the existing literature by combining these two approaches to better understand the effects of the underlying 6 structural factors from the The Venture Capital and Private Equity Country Attractiveness Index on the operations of the private equity industry.

This thesis aims to expand on existing literature such as that of Bernstein et al. (2016) who presented results surrounding the performance of private equity within different industries around the world. They were unable to present results concluding that performance differed across countries. This finding would have to some extent explained the large inequalities that can be seen within both the number and size of private equity deals around the world. If performance is not the key driver in choosing the destination of investment then other factors must influence the decision making of fund managers. Groh et al. (2010) presented six factors that measure the attractiveness of a sample of countries based on 300 different data series. It can be therefore inferred that these factors represent a large majority of the publicly available macro and socio-economic determinants of private equity investment and thus can to some extent explain the cross country investment differences.

In the previous section, our two data sets were outlined. Combined, the analysis builds on 6250 data points, spanning the time period from 2014 to 2018 and 108 countries. Using this data we are able to investigate the topic "Why is the private equity industry so geographically unequal?". By looking at these factor effects on private equity activity, and conducting a cross-country analysis, we hope to better illuminate the above question and provide answers in the form of which policies have been implemented by countries

that enable growth within the industry.

5.2 Research question

The research question of this thesis is as follows: *"To what extent does structural factor effects explain cross-country differences in private equity activity?"*

5.2.1 Hypotheses

Given the research question above, we seek to explain if higher results in the Attractiveness index increase the number and size of deals within a country. Our specific hypotheses to address this are based on the six structural factors:

1. Economic.activity.
2. Depth.of.capital.markets
3. Taxation
4. Investor.Protection.and.Corporate.Governance
5. Human.and.Social.Environment
6. Entrepreneurial.Opportunities

More formally our hypotheses are:

Hypothesis 1: Countries characterised by high economic activity will have an increased aggregate deal value associated with them.

Hypothesis 2: A more developed capital market will increase the number and size of private equity activity.

Hypothesis 3: A lower tax burden, shown by an increase in the Taxation variable will increase the number of deals of a country.

Hypothesis 4: A higher investor protection and corporate governance score will increase number and size of investments for the respective country.

Hypothesis 5: A high human and social environment score within a country will lead to an increased investment size.

Hypothesis 6: Countries characterised by high entrepreneurial opportunities will have an increased number and aggregate value of investments associated with them.

5.3 Econometric Methodology

The hypotheses outlined previously are tested using a cross sectional regression. The procedure used is outlined below and followed by a choice of discussion on the alternative choices for methodology that were not selected. Robustness tests are then presented before the methodology of the extended analysis is shown.

5.3.1 Choice of method

First and foremost, a cross sectional study is used in order to determine, ceteris paribus, that there exists some causal relationship between the independent and dependent variables in question (Wooldridge, 2010).

Fundamentally, a cross sectional regression refers to the data in use with all observations in a single time period. As such, five cross sections are used, one for each year of data in the sample. This enables the findings to be compared to one another to see if the results are consistent for each time period.

This process allows the authors to look across the countries within the sample in order to find similar relationships in regards to the effect of the factors on the number and size of

deals. More formally the regression can be seen as:

$$\begin{aligned} Private.equity.activity = \alpha &+ Economic.activity \\ &+ Capital.market \\ &+ Taxation \\ &+ Investor.Protection.and.Corporate.Governance \\ &+ Human.and.Social.Environment \\ &+ Entrepreneurial.Opportunities \end{aligned} \tag{5.1}$$

The regressions within this study are estimated using the Ordinary Least Squares estimator (OLS). OLS is the most common estimator used within econometrics due to it being the Best Linear Unbiased Estimator (BLUE). The estimator will produce a consistent and unbiased estimation if the following assumptions are fulfilled:

1. Linear in parameters
2. Observations obtained from random sampling
3. No perfect collinearity between independent variables
4. Zero conditional mean of errors such that: $\mathbf{E}(u|x_1, x_2, \ldots, x_k) = 0$

Furthermore in order to be considered BLUE, the homoskedasticity assumption must also be met which states that the error u has to have the same variance given any values of the explanatory variables (Wooldridge, 2015).

The most basic form of a multivariate OLS model is:

$$y_i = \beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k + u_i$$

where u_i u is an unobserved random error because it contains all factors affecting y_i other than the explanatory variables.

5.3.2 Alternative methods

An alternative choice for the method is panel analysis, otherwise known as longitudinal analysis, which consists of repeated observations on the same cross section (Wooldridge, 2010). The nature of the data used meant that this choice would have been sub-optimal given the unbalanced and short characteristics of the panel data.

A short panel as described by Cameron and Trivedi (2009) is a panel which has many different types of entities, in this case countries, but few time periods. This is problematic in that it gives rise to increased Type II error if the number of entities (N) is too large in comparison to the number of time periods (T) (Park, 2011). In addition to being a short panel, the data in question is also unbalanced. An unbalanced panel is defined as one in which time periods are missing for an entity (Wooldridge, 2010). This problem is due to the lack of sufficient data on deals within some countries in the data set and exacerbates the problem of a short panel.

Although panel analysis would have given more insights into the causal relationships between private equity activity and the six factors the choice to use a cross section was prudent. In addition to the problems illustrated previously surrounding the data, further problems arise when dealing with longitudinal data such as the serial correlation of residuals. This thus requires less manipulation of the data if for example first differencing were required and makes drawing conclusions more intuitive.

5.3.3 Omitted variable bias

An omitted variable bias generally occurs when one does not include a relevant variable and thus under-specifies the model (Wooldridge, 2015). To ensure that this does not occur all factors that are correlated with the independent variables must be included within the regression that is estimated. If this is not the case then one can expect that the coefficients that remain will be biased.

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + u \tag{5.2}$$

$$y = \beta_0 + \beta_1 x_1 + \tilde{u} \tag{5.3}$$

$$E(u|x_1, x_2) = 0 \tag{5.4}$$

$$\tilde{u} = \beta_2 x_2 + u \tag{5.5}$$

This bias can be seen when $(x_1; x_2) \neq 0$ and $\beta_2 \neq 0$.

5.3.4 Model specification

Multiple regression models often suffer from a misspecified functional form when one does not account correctly for the relationship between the dependent and explanatory variables (Wooldridge, 2015). In order to investigate private equity activity differences between countries the first step is to identify factors that should influence the variable. Within the first step economic theory and previous literature is used to ensure that each factor has a plausible relationship to the dependent variable, this is expanded upon in section 4.

While economic theory and prior literature are adequate methods for selecting variables, tests such as Ramsey's (1969) regression specification error test (Ramsey RESET test) have proven themselves useful in detecting a misspecified functional form. The test states that if the zero mean condition is satisfied then there should be no nonlinear functions of the independent variables which are significant when added to the equation. If this is not the case then one is able to say that the model is indeed misspecified.

5.3.5 Heteroskedasticity

The assumption of homoskedasticity is universal when estimating with OLS. This assumption stated by Wooldridge (2015) is that the "error u has the same variance given any value of the explanatory variable. In other words, $(u|x) = \sigma^2$". Heteroskedasticity is the reverse of this assumption and thus if one has an error term that depends on the

independent variables then heteroskedasticity is present within the regression.

Heteroskedasticity unlike the breaking the Gauss-Markov assumptions does not cause the OLS estimator to become unbiased. However, when this problem exists t statistics do not have the standard t distributions while F statistics similarly are not F distributed. This makes the estimator asymptotically inefficient as the prior statistics are not usable in partnership with heteroskedasticity which will cause problems in terms on any inference that may occur and OLS is no longer BLUE (Wooldridge, 2015).

Multiple tests for heteroskedasticity exist with some of the more prevalent being the Breusch-Pagan 1979 test along with the White 1980 test. The former will be used within this paper due it's prevalence within the literature and more general format.

5.3.6 Multicollinearity

Multicollinearity is defined as high but not perfect correlation between two or more independent variables (Wooldridge, 2015). While multicollinearity will mean that OLS estimators are still unbiased, the estimators will have large variances and co-variances. This makes precise estimation of each variable, ceteris paribus, very difficult. Another effect of this problem is that it will widen the confidence intervals, which may result in the inability to reject certain hypotheses. Furthermore, due to the large variances present some regression coefficients may be statistically insignificant even though a large R^2 is presented.

Multicollinearity is tested using a number of procedures such as coefficient of determination (R^2), variance inflation factor/tolerance limit (VIF/TOL), and eigenvalues along with a number of other alternatives (Imdadullah et al., 2016). VIF is the most widely used and thus will be estimated within the paper.

5.3.7 Normality

The sixth and final assumption in the classical linear model set of assumptions is that of normality, which states that the unobserved error is normally distributed in the population (Wooldridge, 2015).

This assumption affects our ability to perform statistical analysis such as t, F or other parametric tests on the variables. One reason for this is that these tests have an underlying assumption that the data is of a normal distribution or Gaussian distribution.

The traditional tests for this assumption are that of the Kolmogorov-Smirnov (K-S) normality test (1933) and Shapiro-Wilk's test (1965). The later is used within this testing due to the larger power associated with the test especially in cases where there is a lower sample size (Razali et al., 2011). The test has a null hypothesis that a sample came from a normally distributed population with a test statistic of:

$$W = \frac{(\sum_{i=1}^{n} a_i x_i)^2}{\sum_{i=1}^{n} (x_{(i)} - \overline{x})^2}$$

where $x_{(i)}$ is the ith-smallest number in the sample and $\overline{x}$ is the sample mean. The test has a null hypothesis that the sample is normally distributed and thus if a p-value is obtained with a lower value than 0.05, then we will reject the hypothesis and conclude that the sample is not normally distributed.

5.4 Extended analysis

Four additional analyses are included within this section that aim to further develop the results of the previous model. Firstly a case study of a country will show that changes in policy and the outlook of a country can and have affected private equity activity over the sample period. Furthermore, three panel data models will be used to give insights into the effect of time on the causality between the index factors and the number of investments.

Further analysis of private equity activity enables some of the questions that are left unanswered by the prior model to be explained. While cross sectional models are powerful, they do not include the effect over time and thus lose the ability to determine the causality of a result. This is not the case for panel data and although this option was criticised previously and chosen not to be the main focus of the paper the authors believe that it will form a base for future research to be built on once limitations within the data are rectified.

While explained previously in the section 5.3.2, the data set would have produced a

non-balanced and short panel. To remedy this a change to the way in which the number of deals is calculated has been conducted such that there are now 1+number of deals each year. This enables observations for each country at every point in time and thus we obtain a balanced panel once logged. This both increases the sample size and permits the analysis of countries that failed to close deals within a given year.

To remedy the effect of serial correlation within the estimates, Clustered Standard Errors (CSEs) are used within each of the models described hereafter. If CSEs are not used then clustering of errors may occur which would lead to the authors obtaining misleading inferences about the population (Angrist and Pischke, 2008).

5.4.1 Pooled ordinary least squares estimator

When extending the analysis from the cross sectional methodology, previously estimated using OLS, to panel data one would intuitively use a similar estimator. The most widely used is that of Pooled OLS (Hereafter; POLS) named so because it corresponds to running OLS on the observations pooled across time (t) and cross section (i) (Wooldridge, 2010).

The estimator for POLS can be written as:

$$y_{it} = x_{it}\beta + u_{it}$$

with the assumptions:

1. $E[X_i'(y_i - X_i\beta)] = 0$, thus there is a zero conditional mean in the error term.
2. $\mathrm{A} \equiv E(X_i'X_i)$, A is a non-singular matrix with rank K.

5.4.2 Random effects estimator

The random effects estimator is one of unobserved effects models that has the general form:

$$y_{it} = \mathbf{x_{it}}\beta + c_i + u_{it}, t = 1, 2, \ldots, T$$

This estimator requires more strict assumptions than seen previously with stick exogeneity as well as orthogonality between c_i and $\mathbf{x}_{it}$ (Wooldridge, 2010). Thus if the unobserved

effect exists and is uncorrelated with the explanatory variables, then the effect is random. In which case the model can be written as:

$$y_t = \beta_0 + x_{it1}\beta_1 + x_{it2}\beta_2 + \cdots + x_{itk}\beta_k + u_{it} \tag{5.6}$$

$$= \beta_0 + x_{it1}\beta_1 + x_{it2}\beta_2 + \cdots + x_{itk}\beta_k + a_i + v_{it} \tag{5.7}$$

with i = $1, 2, \ldots, N$, t = $1, 2, \ldots, T$ and k = $1, 2, \ldots, K$.

While POLS can still be used to obtain unbiased and consistent estimates while the unobserved effect is present, the random effects estimator will be more efficient.

5.4.3 Fixed effects estimator

Another of the unobserved effect models is the Fixed effects estimator. This version of the model relaxes the second assumption of the Random effects estimator such that $E(c_i|\mathbf{x}_i)$ is allowed to be any function of x. By doing this the model is more robust than random effects analysis (Wooldridge, 2010).

If the unobserved effect is correlated with the explanatory variables then the correct model choice would be the fixed effects estimator. The model can be written as:

$$y_{it} = x_{it} + u_{it} = x_{it}\beta + \alpha_i + v_{it}$$

with i = $1, 2, \ldots, N$, t = $1, 2, \ldots, T$.

5.4.4 Further robustness tests

The added dimension of time into the analysis means that additional tests are required to ensure that the model is robust.

The first test conducted on the models is a Breusch-Godfrey Lagrange multiplier test (Breusch, 1978; Godfrey, 1978). This tests for serial correlation in the error term, which if found would imply that the POLS model is inefficient. The test has a null hypothesis of

no serial correlation. More formally this is $\mathbf{H}0 : p_i = 0$ for all i, where p is the number of orders for which there is no serial correlation.

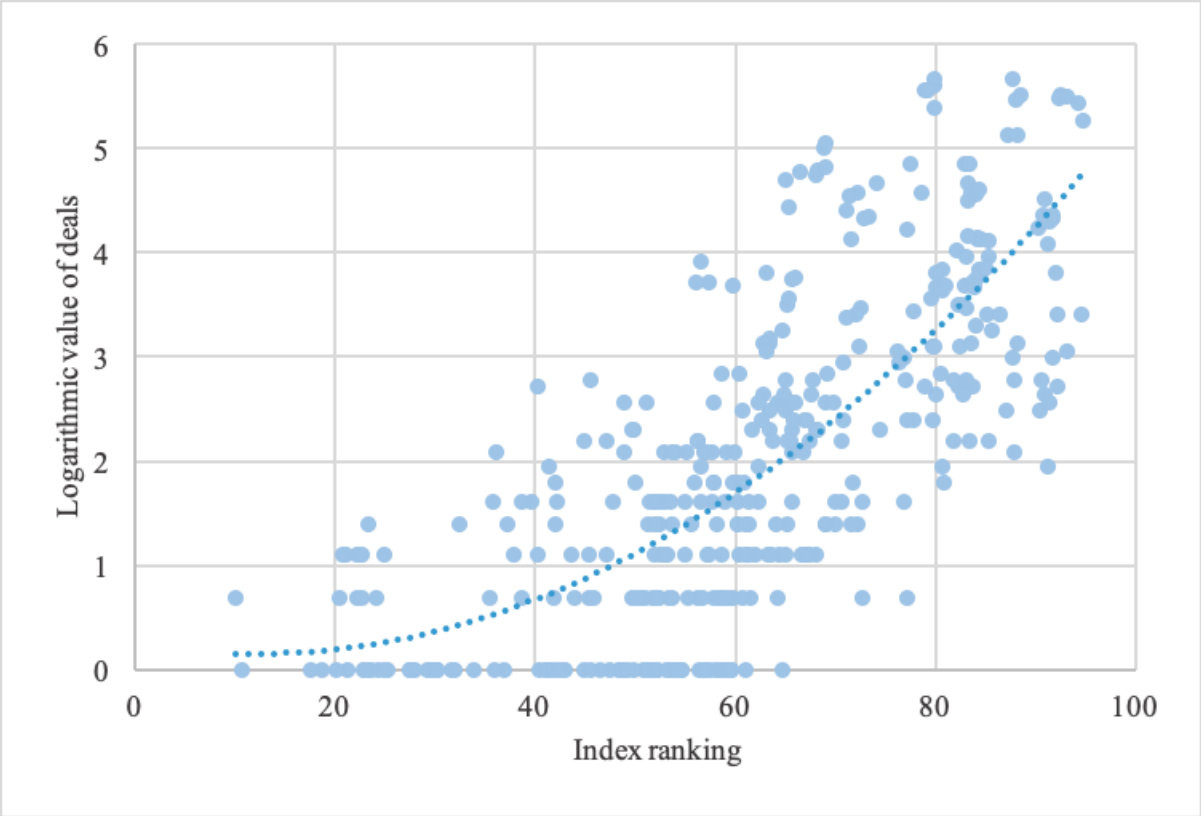
Finally, a Durbin-Wu-Hausman test (1978) is used to evaluate the consistency of the Random and Fixed effects models. If a statistically significant difference is found between the consistencies of the two models, then it indicates that the fixed effects model should be preferred. This conclusion is a result of the difference in assumptions between the models as when the unobserved effect and the parameters are correlated, the Fixed effect model will be consistent while the Random effect model is inconsistent.

6 Results and Analysis

6.1 Descriptive analysis

Before we progress to the statistical results from the regressions described in the methodology-section above, we will describe what we can observe from the data set without statistical treatment.

Figure 6.1: Logarithmic deal number against Venture Capital and Private Equity Country Attractiveness Index ranking

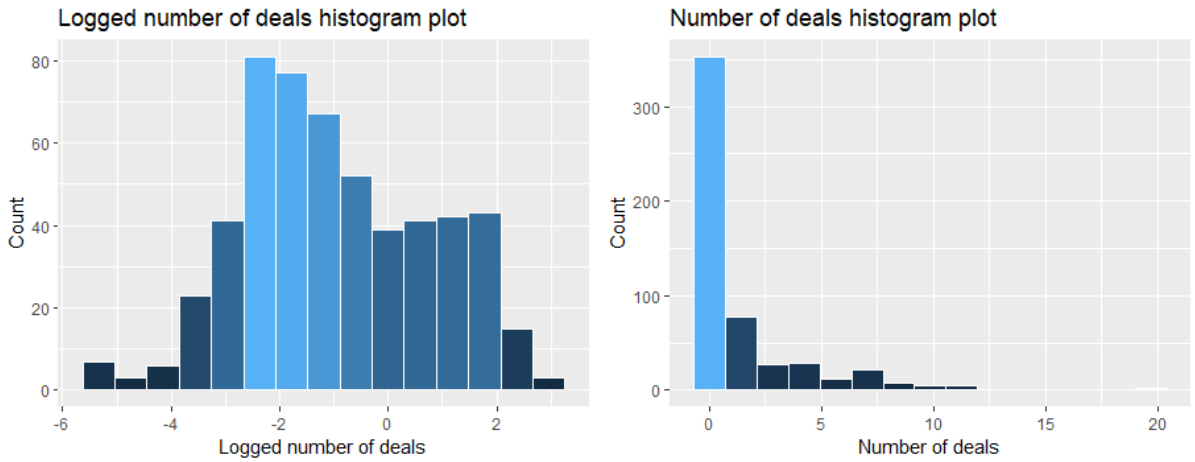


The above figure is a scatter plot of the logarithmic deal number against the Venture Capital and Private Equity Country Attractiveness Index ranking, with a polynomial second.order trend line. Data sourced from Preqin and The Venture Capital and Private Equity Country Attractiveness Index, graph by the authors.

Looking at a scatter plot of the logarithmic value of deals against the index ranking of countries shows that there are many countries with a logarithmic value of deals equal to or close to zero in the interval between index ranking 20 and 60. Countries with an index ranking above 65 have a value visibly different from 0. There appears to be a trend

towards larger values of deals for higher rankings, which intuitively makes sense as a higher ranking on the attractiveness index would indicate more private equity activity. A polynomial second-order trend line fits the scatter plot notably well. This graph gives an indication of the distribution of the data set. We will now look at the distribution of the determinant variables and independent factors in turn.

Figure 6.2: Distribution of number of deals, scaled by population



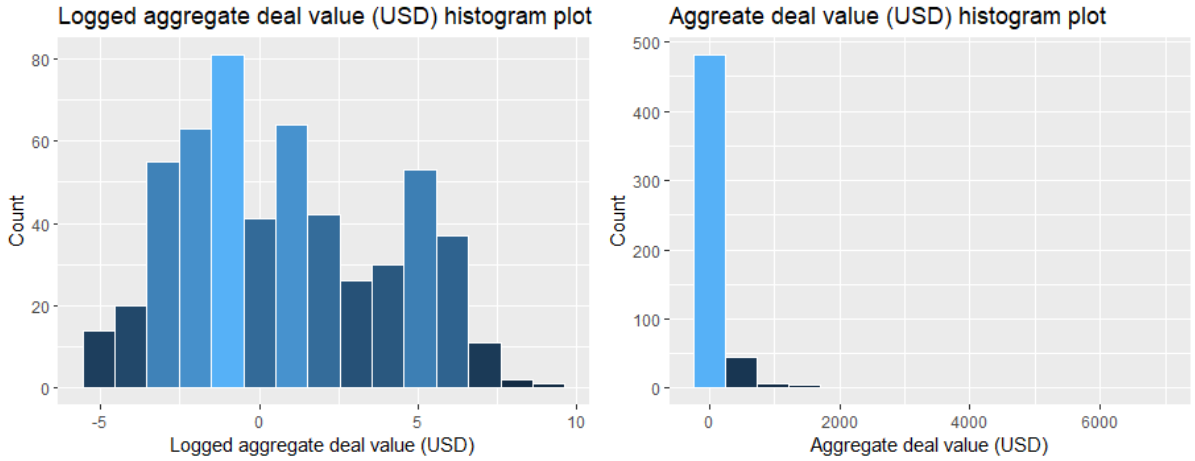
The above figures show a histogram plot of the number of deals with natural number of deals on the right and logged number of deals on the left. By logging the variable we can see that the number of deals becomes more normally distributed. Data sourced from Preqin and The Venture Capital and Private Equity Country Attractiveness Index, graph by the authors.

An examination of the histograms within figures 6.2:6.4 gives us the distribution of each of the variables for the underlying countries. These figures are built using all five years of data available and thus can show each country up to five times.

We can see from the plots of Logged and number of deals that these variables contain a large negative skew. This is due to a number of countries with a low amount of deals and along with a countries such as the UK and US which have a very high amount of deals per year. This will affect the predictive power of regressions due to the assumption of normality being violated.

Taking a look at the other variables, we can see that Taxation is highly skewed to the right, while the others are relatively normal although Capital markets is platykurtic. This indicates that there are many countries within the sample that offer tax incentives or a reduced administrative burden and thus are potentially attempting to draw private equity

Figure 6.3: Distribution of aggregate deal value, scaled by population



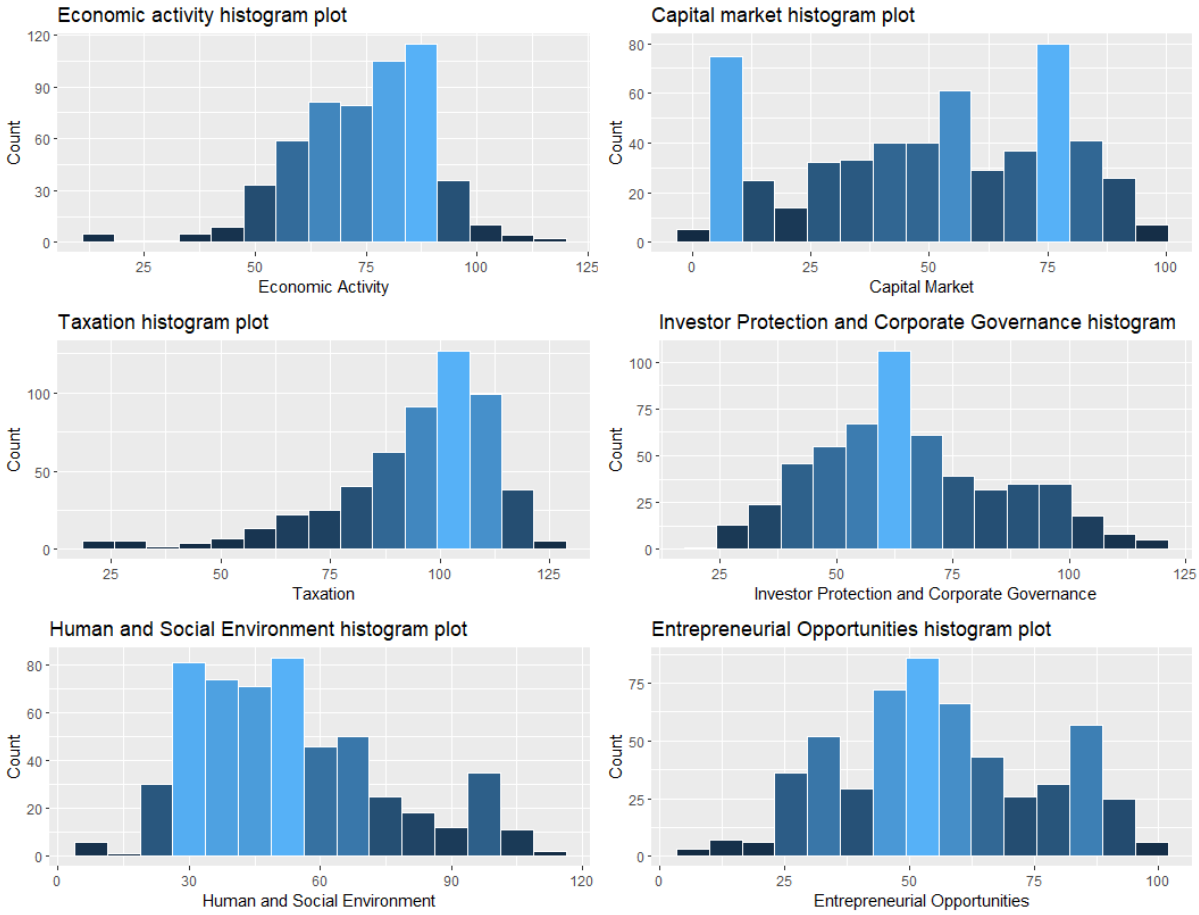
The above figures show a histogram plot of the aggregate deal value in USD with natural deal value on the right and logged deal value on the left. By logging the variable we can see that the number of deals becomes more normally distributed. Data sourced from Preqin and The Venture Capital and Private Equity Country Attractiveness Index, graph by the authors.

investment into the country.

Another view of the factors that is helpful before diving into the econometrics is how the number of deals is distributed among the quartiles of each factor. Figure 6.5 shows us that countries with the highest factor values generally dominate the number of deals even when scaled for population. This is especially the case for Investor protection and Corporate governance where 607 out of the 804 deals are located within the 4th quartile and thus significant results for this factor are likely.

Looking at the Economic activity section of 6.5 we can see this relationship is not as constant when compared to the other factors. A more even distribution on this factor indicates that economic activity is less important than other factors once population of a country is taken into account. This is not an unexpected result as GDP, a level-2 construct of economic activity, is often correlated with population size to some extent.

Figure 6.4: Distribution of the independent factors



The above figures show histogram plots for the distribution of data for the factors independently. Data sourced from Preqin and The Venture Capital and Private Equity Country Attractiveness Index, graph by the authors.

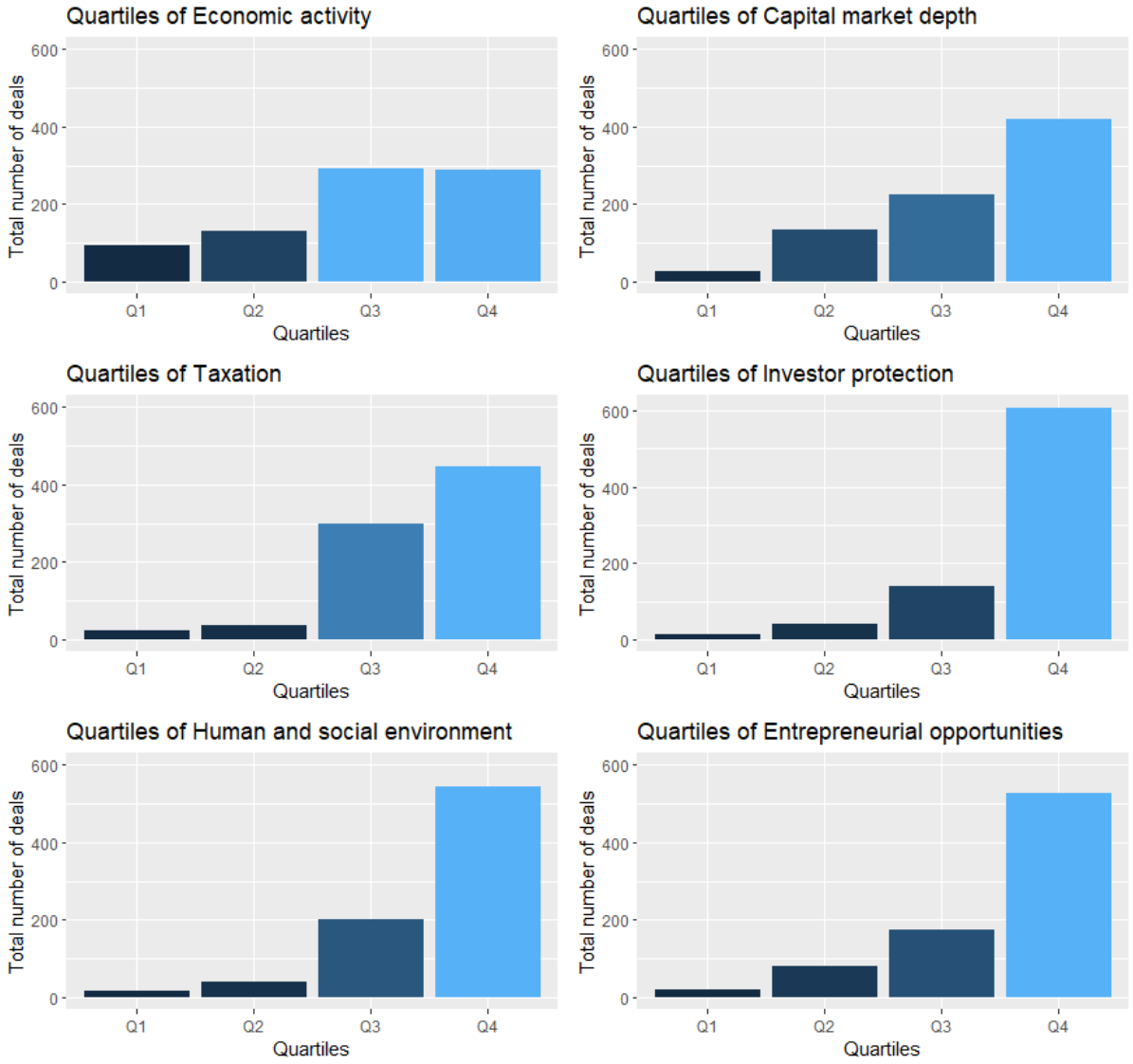
6.2 Statistical results

This section will present the results from the statistical analysis that was explained in section 05. Methodology. We will analyse what these results imply, and discuss the economic implications of the results in the subsequent section of this thesis, 07. Discussion.

6.2.1 Regression 1: Variables at levels

When running the regression with non-logarithmic values for the count of deals against the six factors, we get the results as shown in the table above. In this regression, the dependent variable has been scaled by the population of each country per year. The interpretation of a result is that a one unit increase in a significant factor gives the

Figure 6.5: Number of deals per quartile



The above figures show the number of deals scaled by population per quartile, independently for the factors. Data sourced from Preqin and The Venture Capital and Private Equity Country Attractiveness Index, graph by the authors.

coefficient multiplied by the population (in millions of people) extra private equity deals each year. Thus for Belgium with a population of 11.4 million in 2018 we expect that by increasing the Investor protection by one unit will increase the number of private equity deals by 1.08.

We can see from table 6.1 that three factors are significant for these regressions. Namely these are Capital market depth, Investor protection, and Entrepreneurial opportunities, for which the first two are significant in all of the cross sections while the later is not the for 2014 and 2018 cross sections.

Table 6.1: Dependent Variable: number of deals

Variable	2014	2015	2016	2017	2018
Intercept	-4.497***	-4.522***	-4.399***	-4.311***	-5.389***
Economic activity	0.001	-0.002	-0.005	-0.008	-0.010
Capital markets	-0.030*	-0.032**	-0.016**	-0.022***	-0.029*
Taxation	0.000	0.005	0.009	0.003	0.009
Investor protection and corporate governance	0.086***	0.073***	0.055***	0.054***	0.095***
Human and social environment	-0.007	0.001	0.010	0.015	-0.005
Entrepreneurial opportunities	0.037	0.044*	0.035**	0.050***	0.043
N	108	108	108	108	108
R^2	0.45	0.42	0.53	0.55	0.41

$***p < 0.01$,$**p < 0.05$, $*p < 0.1$

One unexpected outcome of the regression is that we found a negative coefficient for the depth of capital markets variable. This means that as the size of stock or debt/credit markets increases within a country, the number of private equity deals decreases which is contrary to the findings of Black and Gilson (1998). One reason for this negative coefficient could be the relationship between the variable and others, this correlation perspective will be examined in depth within the extended analysis.

Similarly, the table 6.2 below depicts the results obtained when the aggregate deal value in USD is used as the dependent variable instead of the count of deals. In this case, Investor protection and Entrepreneurial opportunities were found to again be significant although not a the same level found before. The authors expected to find reduced results within the value regressions due to the lower number of observations as a percentage of the sample that contain non-zero information. This can be seen by the lower R^2 values in comparison to the previous table.

The intuition for this variables is similar to the previous regression. The coefficient multiplied by the number of people within a country (in millions) will indicate the amount of extra activity in USD millions that a one unit change in the factor will create. With South Korea which has a population of 51m as an example, a one unit increase in

Entrepreneurial opportunities would increase the deals by $211m or 7.8%. The effects of these changes are disproportionate as in another example this same change would effect the Czech republic by $43m or 1.9%, however less developed nations are able to enact greater changes to the structure of their economies to enable better growth. This disproportionate increase is not carried over to the two giants of the industry, the US and UK where these increases only account for 0.5% and 0.6% respectively.

Table 6.2: Dependent Variable: Aggregate deal value (millions USD)

Variable	**2014**	**2015**	**2016**	**2017**	**2018**
Intercept	-719.973	-408.727*	-218.730	-204.039*	-337.529**
Economic activity	3.025	1.162	-1.679	-0.230	0.171
Capital markets	-5.433	-2.787	-0.980	-0.106	-1.893
Taxation	-1.657	-0.495	0.736	0.158	-0.036
Investor protection and corporate governance	18.556***	4.544	1.887	0.820	4.897***
Human and social environment	-8.753	-0.296	2.890	2.136	-0.958
Entrepreneurial opportunities	5.492	6.037	2.413	1.850	4.104*
N	108	108	108	108	108
R^2	0.12	0.17	0.16	0.29	0.33

$***p < 0.01$,$**p < 0.05$, $*p < 0.1$

6.2.2 Regression 2: Variables at levels, excluding US and UK

As explained in the methodology, we run the same regression as before but excluding data for the United Kingdom and and United States to allow the developing markets to take more precedence within the sample.

The table below depicts the results of the regression with the count of deals as the dependent variable. We see that in this case, the factor Investor protection and corporate governance is extremely significant in each of the cross sections. The coefficient of which is fluctuating over the cross sections from 0.088 in 2014 to 0.057 in 2016 and 0.097 in 2018, all of which are significant at the 99% confidence level. The magnitude of this factor is extremely important as at points it is more than double the size of other coefficients and thus requires half the population to increase the number of deals by the same amount. One thing to note within this regression is that every time Entrepreneurial opportunities is significant the factor's size is decreased thereby indicating some possible relationship between the two.

In comparison to the model which included the US and UK, we find that Taxation is significant for one of the cross sections. This relationship was likely not seen due to the skew placed upon the distribution by the two countries although scaling the previous scaling is likely to of limited this.

For the 2017 and 2016 cross sections, white standard errors (White et al., 1980) were required in order to adjust for the violation of the homoskedasticity assumption.

The table 6.4 below shows the results of the previous regression with the sum of deals in millions of USD as the dependent variable. The results of which are consistent with the previous model showing that again Entrepreneurial opportunities and Investor protection are significant. Furthermore, Capital markets is significant at the 10% level in the 2018 cross section although results across the others are less promising.

Table 6.3: Dependent Variable: Number of deals ex US UK

Variable	2014	2015	2016	2017	2018
Intercept	-4.245***	-4.245***	-4.126***	-4.091***	-5.192***
Economic activity	-0.001	-0.004	-0.008	-0.010	-0.011
Capital markets	-0.029*	-0.031**	-0.016**	-0.023***	-0.030*
Taxation	0.001	0.006	0.011*	0.006	0.011
Investor protection and corporate governance	0.088***	0.075***	0.057***	0.055***	0.097***
Human and social environment	-0.011	-0.003	0.004	0.010	-0.012
Entrepreneurial opportunities	0.033	0.040	0.032**	0.046***	0.039
N	106	106	106	106	106
R^2	0.42	0.39	0.50	0.52	0.39

$***p < 0.01$,$**p < 0.05$, $*p < 0.1$

Table 6.4: Dependent Variable: Aggregate deal value (millions USD) ex US UK

Variable	2014	2015	2016	2017	2018
Intercept	-712.772	-387.464	-212.879	-183.443	-312.522**
Economic activity	2.960	0.955	-1.818	-0.379	0.057
Capital markets	-5.417	-2.752	-0.973	-0.121	-1.960*
Taxation	-1.598	-0.292	0.924	0.430	0.262
Investor protection and corporate governance	18.628***	4.814	2.028	0.958	5.178***
Human and social environment	-8.876	-0.705	2.662	1.616	-1.786
Entrepreneurial opportunities	5.337	5.532	2.171	1.464	3.669*
N	106	106	106	106	106
R^2	0.12	0.14	0.14	0.23	0.30

$***p < 0.01$,$**p < 0.05$, $*p < 0.1$

6.2.3 Regression 3: Logarithmic variables

While the method of removing outliers such as the United Kingdom and United States corrected for some of the normality issues, a more complete solution is to log the activity variables to correct the skew. This section will present the outcome of this change.

The first table shows the logged number of deals regressed on the index factors at levels. Initially, one is able to see that both Capital markets and Taxation are significant unlike in the previous regressions. Both Investor protection, Human and social environment, and Entrepreneurial opportunities are positive and significant at the 1%, 10% and 5% levels respectively. Thus, when each variable increases by one point in the index, the number of deals per capita (in millions) increases by 4%, 2% and 3% for 2018 cross section. On the other hand, Economic activity is negative throughout the cross sections which sense due to the relative under-performance of large economies within the sample. This can be seen by looking at the top three countries in terms of deals per capita, namely these are Luxembourg, Iceland, and Finland, and comparing them to China, Germany and India who sit in 101st, 15th and 86th place.

Table 6.5: Dependent Variable: Logarithmic number of deals

Variable	**2014**	**2015**	**2016**	**2017**	**2018**
Intercept	-3.437***	-4.139***	-4.677***	-4.149***	-4.221***
Economic activity	-0.034***	-0.024***	-0.026***	-0.039***	-0.042***
Capital markets	-0.005	-0.013*	-0.006	-0.004	-0.004
Taxation	0.002	0.004	0.009	0.009	0.011
Investor protection and corporate governance	0.040***	0.043***	0.042***	0.043***	0.044***
Human and social environment	0.013*	0.015*	0.015*	0.015**	0.018**
Entrepreneurial opportunities	0.032***	0.030**	0.026**	0.032***	0.030**
N	108	108	108	108	108
R^2	0.76	0.70	0.72	0.76	0.74

$***p < 0.01$,$**p < 0.05$, $*p < 0.1$

The second table refers to the logged aggregate deal value. When comparing to the previous

models we can again see that Investor protection and Entrepreneurial opportunities is significant. However, in contrast to previous regressions, we find that the depth of capital markets is positive and significant. This result fits more closely to the prior literature and with economic intuition, furthermore we again see that the magnitude for this coefficient is half that of the other significant variables.

Through logging the dependent variable we are able to significantly increase the R^2 of the regressions in comparison to that of previous tables. This means, with a close to normally distributed y variable, we are able to explain 70-76% of the variation of the size of deals compared to the 12-33% before. We therefore place much emphasis on these results than prior when validation of hypotheses occurs.

Table 6.6: Dependent Variable: Logarithmic aggregate deal value (millions USD)

Variable	**2014**	**2015**	**2016**	**2017**	**2018**
Intercept	-4.809***	-4.291***	-6.802***	-7.337***	-7.519***
Economic activity	-0.022	-0.019	0.000	0.000	-0.016
Capital markets	0.024*	-0.001	0.015	0.031**	0.023*
Taxation	-0.014	-0.008	-0.004	0.009	0.003
Investor protection and corporate governance	0.056***	-0.007	0.036	0.051**	0.065***
Human and social environment	0.005	0.024	0.019	0.009	0.012
Entrepreneurial opportunities	0.067***	0.119***	0.065***	0.032	0.049*
N	108	108	108	108	108
R^2	0.70	0.60	0.64	0.68	0.68

$***p < 0.01$,$**p < 0.05$, $*p < 0.1$

6.2.4 Robustness of results

A robust set of results refers to the strength of the statistical model in question as well as the underlying data meeting certain assumptions about its properties. While many many tests are robust even when assumptions are broken it is still good form to find the weaknesses in the data set and model. This section will present the results of the model tests as specified within the Methodology. Particular focus will be paid to the logarithmic regressions presented previously as they are the foundation for the results of this study.

Functional form

Table 6.7: Ramsey RESET test

	No. deals					Aggregate deal value				
	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018
df1	12	12	12	12	12	12	12	12	12	12
df2	89	89	89	89	89	89	89	89	89	89
Statistic	2.416	4.843	3.298	3.272	4.044	1.070	1.854	2.223	1.379	2.049
p-value	0.009	0.000	0.001	0.001	0.000	0.395	0.051	0.017	0.191	0.029

Alternative hypothesis: model suffers from misspecification

The results of the Ramsey reset test suggest that the functional form of the models using the count of deals could be misspecified. This is not the case, however, for the total size of the deals within a country and thus including additional power terms would be detrimental to the model.

Heteroskedasticity

Table 6.8: Breusch - Pagan heteroskedasticity test

	Number of deals					Aggregate deal value				
	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018
Statistic	5.488	9.292	6.805	1.686	4.129	4.949	6.575	3.664	8.517	4.535
p-value	0.483	0.158	0.339	0.946	0.659	0.550	0.362	0.722	0.203	0.605
df	6	6	6	6	6	6	6	6	6	6

Alternative hypothesis: model suffers from heteroskedasticity

As can been seen within the table, none of the cross-sections have a p-value less than 0.05 As such we have to cannot reject the null hypothesis of homoskedasticity. This is not the case for the variables at levels however, these are not shown within this table but are mentioned when discussing the results previously. When we reject the null hypothesis, White standard errors (1980) are applied to the regressions in order for correct inference to occur.

Multicollinearity

Table 6.9: VIF multicollinearity test

	No. deals					Aggregate deal value				
	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018
Economic activity	2.023	1.500	1.778	1.955	1.914	2.023	1.500	1.778	1.955	1.914
Capital markets	4.292	3.973	3.796	4.207	3.862	4.292	3.973	3.796	4.207	3.862
Taxation	1.583	1.573	1.653	1.953	1.758	1.583	1.573	1.653	1.953	1.758
Investor protection and corporate governance	5.350	5.667	5.597	4.777	4.822	5.350	5.667	5.597	4.777	4.822
Human and social environment	3.918	4.437	4.185	3.990	3.958	3.918	4.437	4.185	3.990	3.958
Entrepreneurial opportunities	6.220	6.477	6.452	7.447	7.239	6.220	6.477	6.452	7.447	7.239

The above table presents results of the multicollinearity tests conducted on the logarithmic regressions found previously. Lower VIF scores are generally best and while there is no standard upper value that would indicate a problem, Chatterjee and Price (1991) suggest that a score of 10 should be considered very high. No values within the table reach the

critical value of 10 and thus we can conclude that multicollinearity is not a major concern within the data.

Normality

Table 6.10: Shapiro-Wilk normality test

Variable	Statistic	p-value
Aggregate deal value	0.410	0.000
Number of deals	0.650	0.000
Log ADV	0.961	0.003
Log number of deals	0.967	0.009
Economic activity	0.971	0.017
Capital markets	0.946	0.000
Taxation	0.895	0.000
Investor protection and corporate governance	0.973	0.026
Human and social environment	0.954	0.001
Entrepreneurial opportunities	0.976	0.046

Alternative hypothesis: variable is not normally distributed

As stated within the methodology, a Shapiro-Wilk normality test is run on the underlying data to test if it is normally distributed. Table 6.10 contains the results of the normality tests conducted. If the p-value is less than 0.05 the null hypothesis that the data is normally distributed is rejected. This is the case for multiple of the variables and thus calls into question the power of the tests conducted previously, however in general t-tests are fairly robust to normality violations (Wooldridge, 2015) and thus the regressions results remain acceptable.

6.2.5 Correlation of factors

The attentive reader may have questioned why some of the coefficients in the regression results presented in tables 6.1-6.6 are negative. This primarily applies to the coefficients for the factors Economic activity and Capital markets.

A possible and not implausible explanation to this phenomenon is correlation between these factors. While the robustness checks did not indicate that multicollinearity was a problem for these variables, it also does not rule out some correlation between factors.

As the factor scores of countries in the index are aggregated values based on an extensive range of data series and data sources, finding the specific empirical factor correlation is outside the scope of this thesis. However, we will conduct an additional regressions within the extended analysis section, 6.4, in order to briefly investigate this phenomenon further.

6.3 Analysis

Within the following section the results presented above will be related back to the hypotheses set out previously. Furthermore, these results will be compared to previous literature to enable a discussion to be continued later.

6.3.1 Evaluation of hypotheses based on results

The six hypotheses presented within the methodology relate to each of the factors within the analysis. In this section, we revisit our hypotheses and expected results, and state the results obtained in the analysis. This will form the foundation for the next section of this thesis, 07. Discussion. A summary of the conclusions to the hypothesis is presented in table 6.16

> **Hypothesis 1**: Countries characterised by high economic activity will have an increased aggregate deal value associated with them.

We expected to find that the factor for economic activity would have a significant positive effect on private equity activity. In the literature review presented earlier in this thesis, we considered literature on how private equity firms operate and achieve returns. Based on the understanding of private equity firms, and given the nature of how they operate, we would expect them to thrive in markets with high economic activity and struggle in markets with less or little activity, as they rely on significant amounts of free capital and debt to finance their operations, and on a liquid M&A- and/or financial market in order to sell of investments once optimisations have been made on order to reap a profit. When considering the descriptive analysis, such as the histogram in figure 6.4 and the plot against logged deals in figures A2.1 and A2.2, the impression was that there would be some relationship between the variable and the aggregate deal value. Furthermore it was hypothesised that a weaker relationship would be found for the number of deals. The reason for this weak prediction is that both of these scatter plots feature a large number of zero deals for the countries across the time period and across the distribution of the variable. Furthermore, once scaled the effect of GDP was significantly less as seen within figure 6.5 being the only variable in which the highest quartile did not also have

the highest number of deals.

We find the factor for economic activity to be insignificant in regression 1 and 2. However, in the third regression, with logarithmic variables, this factor is found to be significant for all years when count of deals is the dependent variable at the 99% level with negative coefficients. When the sum of deals in millions USD is the dependent variable, the factor is insignificant.

We thus find no evidence of significance of this factor on the aggregate deal value, but some evidence of significance on the count of deals. This hypothesis is rejected.

> **Hypothesis 2**: A more developed capital market will increase the number and size of private equity activity.

We expected to find that the factor for capital market would have a significant positive effect on private equity activity. Since we know from existing literature that private equity firms rely on shareholders with a significant volume of free capital (who can also afford to hold these funds illiquid) and on availability of leverage, we would expect private equity activity to be larger in markets where the depth of capital markets is significant.

When considering the descriptive analysis, we can see that there is a clear positive association between both the number and size of deals and the factor although this is reduced when the dependent variable is scaled. One problem associated with the variable is the histogram depicted in figure 6.4. The variable does not seem to be normally distributed and thus failing the Shapiro-Wilk normality test was not unexpected.

In the first regression, none of the results are significant. In the second regression, with variables at levels and excluding The U.S. and The UK, we find the factor for capital markets to be significant when the dependent variable is count of deals. While 2014 and 2018 are significant at the 90% level, 2015 and 2016 are to the 95% level and 2017 to the 99% level. For the sum of deals all coefficients are insignificant but 2018, which is slightly significant at the 90% level.

In the third regression with logarithmic variables, this factor is found to be significant for the dependent variable count of deals at the 90% level for 2015. Here, all coefficients are negative. For the dependent variable sum of deals, the factor is significant at the 95%

level for the year 2017, and at the 90% level for 2014 and 2018. All coefficients but 2015 are positive.

Although we find some contradictory results, which might be explained by the correlation between the variable and our most significant variable Entrepreneurial Opportunities, we are able to accept the hypothesis that the depth of capital markets within a country is an important factor that contributes positively to private equity activity.

> **Hypothesis 3**: A higher tax burden, shown by an increase in the Taxation variable will decrease the number of deals of a country.

We would expect there to be a negative relationship between private equity activity and corporate taxation level, as higher corporate taxes would decrease the opportunity for PE funds to reap a profit my increasing the value of acquired companies.

One problem when considering the Taxation variable, is that many countries are competing to attract investment. Due to this we can see that the factor has a strong positive skew with a large amount of countries offering tax incentives. This can be seen when plotting the variable against the number of deals, with the figure indicating that a quadratic term would be a better fit than the linear model present. This is confirmed by the Ramsey RESET test (Ramsey, 1969) for number of deals for which we have to reject the null and accept the alternative that the model is misspecified.

In the second regression, with variables at levels and excluding The U.S. and The UK, we find the factor for taxation has a positive coefficient when the dependent variable is count of deals, and is significant for 2016 at the 90% level. When the sum of deals in millions USD is the dependent variable, all but two coefficients (2014 and 2015) are positive. None of the results are found to be significant.

When considering the third regression with logarithmic count of deals, the coefficients are all positive, and none are significant. When the dependent variable is logarithmic sum of deals in millions USD, results are insignificant.

As stated in the hypothesis, the factor on taxation was expected to have a negative effect on private equity activity, as a higher tax level would disincentivise investment. While we have found that the coefficient for taxation is indeed negative, we only have weak support

of this conclusion. This is likely due to the duel effect of taxation, whereby lowering the corporate tax rate increases profit but also lowers the benefit of debt financing which is so key in private equity markets.

> **Hypothesis 4**: A higher investor protection and corporate governance score will increase number and size of investments for the respective country.

We expected to find that the factor for investor protection would have a significant positive effect on private equity activity. Based on the nature of private equity funds and their operations, including the high entrance cost for shareholders, illiquidity of positions, required holding periods, limitations to diversification, and high use of leverage, we would expect private equity funds to have a preference for markets where investor protection and corporate governance is high.

When considering the descriptive analysis, the impression was that the variable could explain some variance in the either of the dependent variables. This is especially the case when looked at for the quartile splits with the highest quartile representing 75% of scaled deals. Figures A2.3 and A2.4 also so a strong linear relationship between the both the dependent variables and the factor. Furthermore the histogram was relatively normal with a slight negative skew and thus passed the normality test at the 99% confidence level.

In the first regression with dependent variable count of deals, this factor is significant to the 99% level for all years, with positive coefficients. For the other dependent variable, it is significant at the 99% level for 2014 and 2018. The coefficient in 2014 is especially noteworthy at 18.556, indicating that a 1-point increase in the country score for the investor protection and corporate governance factor gave an 1856% increase in private equity activity.

The result for the second regression also gives significant results at the 99% level for count of deals as dependent variable, while for sum of deals only 2014 and 2018 are significant at the 99% level. All coefficients are positive.

When looking at the results of the third regression with logarithmic count of deals as the dependent variable, all coefficients are positive and significant at the 99% level. However, when the dependent variable is logarithmic sum of deals in million USD, the coefficients for 2015 is negative, 2014 and 2018 are significant at the 99% level, and 2017 at the 95%

level.

We thereby find strong support for this hypothesis.

> **Hypothesis 5**: A high human and social environment within a country will lead to an increased investment size.

We expected to find that the factor for human and social environment would have a significant positive effect on private equity activity. Considering the nature of private equity operations with the sophistication of the investor role and the use of process optimisation and innovation, we would expect private equity firms to prefer markets with established governing infrastructure such as laws and regulations, little corruption, banking transparency, and high availability of specialised knowledge such as management services that they require to facilitate growth.

The descriptive statistics for this factor suggest that the variable will be somewhat powerful in describing the number of deals due to the increased dispersion of the plot. While the level-2 constructs for these factors, Education, Labour market rigidity and Corruption are notably important in the ability to enable the creation of small businesses. The lack of early stage venture capital observations within this study may have negatively impacted the significance of this variable. For the factor for human and social environment, all statistical results are insignificant in regressions 1 and 2. In regression 3, 2014-2016 are significant at the 90% level, and 2017 and 2018 are significant at the 95% level.

Thus, we find some support for this hypothesis.

> **Hypothesis 6**: Countries characterised by high entrepreneurial opportunities will have an increased number and aggregate value of investments associated with them.

We expected to find that the factor for entrepreneurial opportunities would have a significant positive effect on private equity activity. In the literature review section 05 and 07, is was established that private equity firms search for investment opportunities in the form of companies that have a significant potential for value increase, wither due to internal process innovation or optimisation, or because the company is in a growth phase and require either professional investor knowledge and/or capital to sustain growth.

Based on this, we would expect there to be more private equity activity in markets that are characterised by a high level of entrepreneurial opportunities.

A purely visual inspection of figures A2.1 and A2.2 suggest that Entrepreneurial opportunities is linearly related to the number and size of private equity investments within a country. In addition to this the variable seems to be normally distributed which it confirmed with the Shapiro-Wilks normality test.

In regression 1, this factor is significant for 2015 a the 90% level, for 2016 at the 95% level, and for 2017 at the 99% level when dependent variable is count of deals. It is insignificant for the sum of deals.

In regression 2 with count of deals as the dependent variable, this factor is significant to the 95% for 2017, and at the 95% level for 2016. All coefficients are positive, as expected. With sum of deals in millions USD as the dependent variable, 2018 is significant to the 90% level.

In regression 3, all coefficients are positive and significant but 2017 when sum of deals is the dependent variable.

The results obtained are in support of hypothesis 6, that the structural factor entrepreneurial opportunities has a positive effect on private equity activity.

6.4 Extended analysis

In addition to the primary analysis of this thesis, we have added this section with some extended analysis we have conducted based on our findings in the main analysis. As mentioned previously, we will conduct an additional regression based on a panel model and investigate possible correlation between factors.

6.4.1 Panel models

Panel analysis of private equity activity enables some of the questions that are left unanswered by the prior model to be explained. The most important question that could not be accurately answered by the cross-sectional model is what effect do these factors

have on activity over time.

The results for the three panel models are shown in table 6.11. Namely these three models are the the Pooled OLS, Random effects, and Fixed effects, each of which has been explained thoroughly in the Methodology section previously.

Table 6.11: OLS: Logged number of deals 2014 - 2018

Variable	**POLS**	**Fixed effects**	**Random effects**
Intercept	-4.199***	-	-4.731***
Economic activity	-0.031***	0.003	-0.008**
Capital markets	-0.006	0.006	0.004
Taxation	0.007	0.003	0.009*
Investor protection and corporate governance	0.042***	0.008	0.033***
Human and social environment	0.015**	-0.001	0.013**
Entrepreneurial opportunities	0.029***	-0.018*	0.008
n	108	108	108
T	5	5	5
N	540	540	540
R^2	0.72	0.02	0.31

$***p < 0.01$,$**p < 0.05$, $*p < 0.1$

One can see from table 6.11 that the POLS produced the most significant results among the three choices of model.

Looking at the POLS coefficient for Entrepreneurial Opportunities, we can see that an index point increase resulted in 2.9% more deals per capita across the time period. This figure is slightly less than the average coefficient from the cross sectional version of the model at 3.2%. We again see that Economic activity is negative while Investor protection and the Human and social environment are positive coefficients. These results compare somewhat to the Random effects estimator other than the fact that Taxation is now significant while Entrepreneurial opportunities is insignificant.

The fixed effects estimator shows us that once we take into account each country's

mean then the significance of the factors is reduced and furthermore our causality for Entrepreneurial opportunities is reversed. One reason for this could be that the time period is too short to distinguish these changes and was a consideration previously about why panel analysis was not used within the core of the study.

Table 6.12: Breusch-Godfrey Lagrange multiplier test

	POLS	**Random effects**	**Fixed effects**
χ^2	212.020	2.213	73.975
df	5	5	5
p-value	2.2e-16	0.993	1.5e-14

Alternative hypothesis: serial correlation is present

The Breusch-Godfrey Lagrange multiplier test (Breusch, 1978; Godfrey, 1978) results are found within table 6.12. This model tests for serial correlation in the error term, which if found would imply that the POLS model and Random effects model are inefficient. Due to the small p-values presented within the table we must reject the null hypothesis of no serial correlation and accept the alternative. While this does not effect the unbiasedness nor the consistency of the estimators, it does mean that the model is inefficient. Thus, if there is an overestimated coefficient in one year then there is likely to lead to overestimates in succeeding years.

One solution in further testing would be to first difference the variables such that only the changes from one year to the next are carried through. This does have the implication of removing one year of data however, which for an already short panel, may be excessive.

Table 6.13: Hausman test: RE vs FE

	Value
χ^2	109.47
df	6
p-value	2.2e-16

Alternative hypothesis: one model is inconsistent

The authors additionally conducted a Hausman test (Hausman, 1978) to select between the Random or Fixed effects models. The null hypothesis of the test is that the preferred

model is random effects vs. the alternative the fixed effects. As can be seen within table 6.13, the p-value of the test is 2.2e-16 we can reject the null hypothesis in favour of the alternative and use the fixed effects model for analysis.

6.4.2 Correlation of factors

This section will present the extended analysis on the correlation between each of the index variables and the impact it has on the results of the study. While the Robustness of results section concluded that multicollinearity within the regressions did not reach a critical level, it did present evidence that the Entrepreneurial opportunities was high on the scale. Furthermore a number of results within the previous regressions that did not present with a coefficient sign that matched economic theory and previous literature. These factors in collaboration justified a deeper dive into if multicollinearity between factors has influenced the results.

The 2017 cross-section of the logged count of deals was selected by the authors in order to conduct this deep dive due it prevalence within the results presented previously. Firstly a correlation matrix is shown and then each of the explanatory variables is regressed individually before being compared to the full model.

Table 6.14: Correlation matrix - 2017 cross section

	Economic activity	Capital markets	Taxation	Investor protection and corporate governance	Human and social environment	Entrepreneurial opportunities
Economic activity	1.000	0.641	0.208	0.325	0.366	0.569
Capital markets	0.641	1.000	0.417	0.649	0.561	0.821
Taxation	0.208	0.417	1.000	0.553	0.460	0.611
Investor protection and corporate governance	0.325	0.649	0.553	1.000	0.847	0.776
Human and social environment	0.366	0.561	0.460	0.847	1.000	0.749
Entrepreneurial opportunities	0.569	0.821	0.611	0.776	0.749	1.000

The correlation matrix in table 6.14 shows that there are large similarities between Entrepreneurial opportunities and all of the other variables. Most importantly, the three factors, Taxation, Investor protection and Corporate governance, and the Human and Social environment, that were not expected to have negative coefficients had correlations of 0.611, 0.776, and 0.749 respectively. Furthermore, the correlation between Investor protection and Corporate governance, and the Human and Social environment was found

to be 0.847 which was the highest within the matrix.

This point of correlation between factors is emphasised in table 6.15 below. Firstly, one is able to see that individually each of the variables tested other than Economic activity is significant when regressed independently on the logged number of deals. However, when all of the explanatory variables are included within the regression the number of significant variables drops to four and the Economic activity becomes significant and negative.

Table 6.15: OLS: Logged number of deals for the 2017 cross section

	(1)	(2)	(3)	(4)	(5)	(6)	(All)
Intercept	-2.198**	-2.662***	-5.949***	-5.751***	-4.108***	-4.493***	-4.150***
Economic activity	0.017	-	-	-	-	-	-0.040***
Capital markets	-	0.035***	-	-	-	-	-0.004
Taxation	-	-	0.053***	-	-	-	-0.009
Investor protection and corporate governance	-	-	-	0.073***	-	-	0.043***
Human and social environment	-	-	-	-	0.059***	-	0.015*
Entrepreneurial opportunities	-	-	-	-	-	0.061***	0.032**
N	108	108	108	108	108	108	108
R^2	0.02	0.28	0.34	0.66	0.54	0.49	0.76

$***p < 0.01$,$**p < 0.05$, $*p < 0.1$

Some solutions to the problem presented here are to remove co-integrating variables, or to use another estimator such as the Partial Least Squares (PLS) (Wold et al., 2001). Each has its drawbacks especially as when extending the model into a panel structure, differencing may occur which show more differences between the variables.

6.5 Summary of results and analysis

As mentioned previously, we put much more emphasis on the results of the third regression comparable to those of regression 1 and 2. This is because when the dependent variable is logged the distribution of the y variable is closer to a normal distribution and the regression thus has significantly more explanatory power. Based on all our results as discussed above, the conclusions to our hypotheses are summaries in the table below.

Table 6.16: Summary of results comparative to hypotheses

Hypothesis	Result
1. Countries characterised by high economic activity will have an increased aggregate deal value associated with them	Rejected
2. A more developed capital market will increase the number and size of private equity activity	Supported
3. A higher tax burden, shown by an increase in the Taxation variable will decrease the number of deals of a country	Rejected
4. A higher investor protection and corporate governance score will increase number and size of investments for the respective country	Accepted
5. A high human and social environment within a country will lead to an increased investment size	Supported
6. Countries characterised by high entrepreneurial opportunities will have an increased number and aggregate value of investments associated with them	Accepted

7 Discussion

This section will present a more high level examination of the findings than found in the Analysis section. Real world examples of how the findings can impact investor and government decision making as well as a country case study will be presented before suggestions to where further research can be conducted.

7.1 Denouement

Within the following sections the authors will deep dive into each of the factors to review why the previous analysis dismissed or supported each hypothesis, and the economic interpretation of these results.

7.1.1 Rejected

As discussed in the previous section, there are two hypothesis that we reject based on our analysis, namely those for the factors Economic Activity and Taxation.

One would expect these two factors to play a role in the determination of private equity activity. At the same time, from economic intuition these factors are both large and complex, and thus there may be components of these factors that contribute to determination of activity that are not captured in our analysis. Thus, while we reject our hypotheses related to these factors, we cannot outright state that policymakers and investors alike should disregard these factors when making their considerations.

It is worth mentioning that both these factors are highly structural and related to the financial infrastructure of countries. While Economic Activity captures components such as GDP, unemployment and economic growth, Taxation captures the disadvantages to companies by taxation and entrepreneurial incentives. More analysis on a more detailed level would be of interest to see if any of the components are independently more significant. As many countries offer tax incentives to entrepreneurs, it would be especially interesting to investigate further if these policy initiatives are effective in impacting private equity activity.

7.1.2 Supported

Two out of the six factors considered were only partially significant, and we therefore conclude that these factors are supported but the hypotheses are not fully accepted.

Proven multiple times over by Black and Gilson (1998) and subsequent studies, the impact that a strong capital market has on private equity activity is both positive and significant. We can see from the tables 6.5 and 6.6 that this factor has more impact on the size of deals than it does the number, but that is not unexpected when you consider that the largest deals will take place in markets with the ability and experience to cope with them. This is not likely a factor in which policy has an ability to significantly impact due to the nature of the underlying constructs. These level-2 constructs outlined previously often take a long time to develop and cluster within a region as seen by London, New York and Hong Kong.

Interestingly, Precup (2015) found that deterministic structural factors of private equity activity for a European sample changed during the financial crisis, and showed that factors that had previously been insignificant became significant during the crisis, including factors for productivity and corruption. These factors would be included in our factor Human and Social Environment. It would be interesting to further study if and how structural factors change during a time of financial crisis, both for the understanding of private equity drivers, but perhaps more importantly for the understanding it would give investors and policy developers alike of these hypothetical changes. Theoretically it seems logical that factors such as corruption and productivity would be of greater importance during recessions, but it is very interesting that Precup (2015) found them to first become significant during the financial crisis, and that we for our larger country sample find Human and Social Environment to be a significant factor in years following the financial crisis.

A direct way for countries to incentivise this factor is to for instance introduce higher education programmes directly aimed at utilising talent for the sake of entrepreneurship, which is also related to hypothesis 6.

7.1.3 Accepted

We find consistent support for two of the hypotheses, namely those related to the factor for Investor Protection and that for Entrepreneurial Opportunities.

Is came to no surprise to the authors that the factor Entrepreneurial Opportunities was found to be accepted. Private equity firms operate by finding companies to invest in where there is significant scope for an increase in company value, therefore the venture capital and startup market is an attractive investment ground, and the factor for Entrepreneurial Opportunities would therefore intuitively be influential on private equity activity.

While there are numerous ways to incentivise entrepreneurial activity, such as tax schemes, structured advice organisations funded by the government, among others, it has been proved difficult to identify how this environment prospers and how successful startups, commonly referred to as "unicorns", are developed from the ground up.

More surprising is how significant the factor for Investor Protection is. Referring to the literature review, we know that private equity shareholders are exposed to a specialised risk profile, due to the high use of leverage, the longer holding periods, and other restrains put on shareholders. This specialised risk profile and the legal framework surrounding private equity firms might be a reason for private equity shareholders preferring countries where their investor rights are well protected.

The level-2 constructs of this factor are the quality of corporate governance, the security of property rights, and the quality of legal enforcement. Improving the legal systems within developing countries is one way in which private equity will develop as has been tested by Cumming et al. (2006, 2010) previously and now confirmed again within this study. This factor is much more difficult for established nations to improve and thus remains something in which the rest of the world can use to develop the market as a whole.

However, risk assessments and measures to reduce risk has been well developed since the financial crisis of 2008, and the industry and policy makers are still developing new measures to assess and limit risk, and establish mechanics that can support investors and institutions in recessions or during other financial distress. While the commonly implemented capital requirements of banks and insurance services would be difficult to

apply to the private equity industry without putting significant strain on their operations, shareholder interest could be protected in other ways.

7.2 Economic interpretation of statistical results

Here, we relate the discussion above of supported, partially supported and dismissed factors to the implications for economic policy and interpretation.

The following country case study derived from the analysis conducted above will provide a real world example of how Italy has developed its private equity market over the course of the sample, while general policy considerations will be presents afterwards along with a discussion on the economic interpretation of our findings.

7.2.1 Country case study

Following the primary analysis of this thesis - the factor effects on private equity activity - it is interesting to see if there are any countries included in the data set that have improved significantly within the given time frame. We look at how their improvement corresponds to our findings in the statistical analysis of factor effects on private equity activity, and to explore this further to see which measures the relevant countries have taken to increase private equity activity. We have therefore chosen to include a short case study for an example of a country in our sample that has improved significantly within our time frame.

We find that Italy has experienced an 175% increase in the number of deals that took place in 2018 with respect to the 2014 figure. The index over the time shows an increase in both the capital markets and taxation factors of 10 points, in addition to a 1.59 increase in the value of the entrepreneurial opportunities factor.

We have seen in our statistical analysis that especially the factor for Entrepreneurial Opportunities is significant in determining private equity activity. The other two factors that Italy has improved its score on, Capital Markets and Taxation, are found to be less significant but we would still expect that this has contributed to the overall change.

The Italian economy is complex and with its challenges, but it has nonetheless a noteworthy start-up culture, especially in the northern regions of Italy. Its economy is mostly composed of SMEs (small and medium-sized businesses) and thus Italy has tailored policy towards helping this segment grow. For example, in 2017 and the first quarter of 2018, Italy adopted 24 policy measures and formally announced two new measures directly aimed at lifting this segment of the economy. These measures addressed all 10 principles under the Small Business Act of the European Commission. The most significant changes in legislation was made in the key areas of entrepreneurship and skills & innovation.

According to the European Commission annual report on SMEs and the accompanying Small Business Act (SBA) fact sheet for Italy, (Commission, 2018), the country has implemented numerous policies in recent years to aid its SME segment in growing. Some policies that directly target the above-mentioned factors for which Italy has significantly improved its score, include measures to support R&D projects in twenty of the less developed regions towards South through the Enterprises and Competitiveness national programme.

The increase in private equity activity could also be a response to the increase in SME employment and performance since 2013-2014, when the segment of the Italian economy started to recover from the financial crisis. In addition to this, financial incentives to high-skilled workers returning to Italy for at least two years enables businesses to attract better quality individuals to spur growth.

Another notable policy recently implemented by Italy is a major reform of the legal rules surrounding corporate crisis and insolvency, which would be addressing the other factor than Entrepreneurial Opportunities that this analysis has found to be accepted, namely Investor Protection.

7.2.2 Policy implications

The above case-study shows that it is indeed possible to increase private equity activity through policy changes. This section will consider how the results obtained in this analysis can be used when developing and implementing economic policy, and present a wider discussion on the understanding of structural factor effects on private equity activity from

an economic perspective.

A point to notice is that Italy, prior to its improvement on attracting private equity activity as discussed above, already had a large base of SMEs and an active entrepreneurial environment.

We cannot outright propose that all countries focus on improving their investor protection and increasing entrepreneurial opportunities alone if they aspire to increase private equity activity for the sake of facilitating economic growth. These factors are both difficult to improve on, and considering the wider economy such a focus may pose negative externalities.

Despite this, the results of our analysis could provide valuable input for consideration to policy makers. If countries assess their relative attractiveness for private equity activity, they could assess whether it would be possible to implement policies that aid their access to these markets.

Although Italy, as mentioned, already had a good foundation to increase their standing on this point, there are alternative methods for incentivising entrepreneurial activity for a range of starting points. Many countries have specific public organs or organisations specifically for this purpose, with specified and detailed policy plans and a significant amount of resources being dedicated to the cause.

It is perhaps surprising that the factor for investor protection is so significant, especially compared to some of the other factors considered that would perhaps intuitively seem more significant, such as depth of capital markets or economic activity. However, this result is very interesting and definitely something that policymakers, investors and private equity funds alike could take into consideration.

7.3 Limitations of this thesis, and cases for future research

7.3.1 Limitations

One of the limitations to the analysis presented in this thesis is the fact that the more recent time period, in which private equity has flourished, has been characterised by an unusual low-yield economic environment. As mentioned earlier, this low yield environment has let institutional investors such as pension funds, who are cautious taking risk, to invest in private equity in order to reap positive returns. The question therefore is if this low-yield economic environment has had an impact on the private equity market, and what happens when interest rates inevitably rise at some points, and investors can again find other investment opportunities giving a positive return with a lower or different risk profile.

As mentioned previously a lack of sample data was the key limitation to this study. One improvement in this regard would be to obtain access to the venture capital module from Preqin. This would give the authors more observations around early stage investments that are more likely in lower income countries and would expands data set by 180,000 deals. This is likely to also have an significant effect on some of the variables. For example taxation would likely become more significant with earlier stage deals due to the reduced reliance of debt financing that has a positive effect on the variable. Furthermore one is likely to see added influence given to the human and social environment factor due to the added safety net given to individuals in these economies when becoming entrepreneurs.

7.3.2 Panel models

The extended analysis section, introduced the concept of analysing the factors over time to better draw conclusions to which factors to focus on in future research and policy. While the approach taken by the authors was through and consisted of a comparison between the three more well known models for panel analysis other routes could have been taken that may lead to more powerful results.

A more reliable and extensive approach would have been to use the Extreme-bounds analysis (EBA) proposed by Sala-i Martin (1997) which we advise for further research. The EBA approach requires one to estimate a large set of model specifications in order to check how sensitive each coefficient is to adding more explanatory variables (Bernoth and Colavecchio, 2014). One is then able select the explanatory variables that are best suited for the model. This is especially useful in the case of small samples such as this, where the number of explanatory variables is limited by the need to conserve degrees of freedom. Furthermore due to the likelihood of serial correlation, which was proven in the previous robustness tests, a first difference should also be considered.

7.3.3 Cases for future research

Through the process of writing this thesis, the authors have had numerous ideas for further research, unanswered questions, and detours of interest that had to be left unvoiced.

The most notable question is how our results would compare if the factors were more detailed instead of aggregated categories. Of course, there are limitations to the data available and a discussion around which variables from the 200 that make up the index would be most suitable, especially when considering the econometric limitations of a small sample.

Nonetheless, more detailed results would likely provide more points for consideration when developing policies and furthermore a direct link between variable and policy rather than an overarching factor.

Another detour that is outside the scope of this thesis would be to look further into our results and develop more country case studies. Looking country by country at factor effects and the economic structures of these countries would provide a better understanding of the connection between policy structures and factor effects on private equity activity.

Last but not least, it would be uncommonly interesting to have more available data for a longer time period, to see if there are significant changes over time, to study the impact of policy implementation, and to see if the factor effects change during a time of financial crisis.

8 Conclusion

This thesis investigates the explanatory power of country-specific structural factor effects on private equity activity. The research question was *"To what extent does structural factor effects explain cross-country differences in private equity activity?"*, and the aim was to better the understanding of how structural factors affect private equity activity, and to what extent this explains cross-country differences in private equity activity.

In the literature review, we showcased some of the papers that have formed the foundation of modern private equity research, while giving an account of the current debate. Concluding that private equity activity can be a driver of economic growth, we highlighted the need for a better understanding of why the industry is geographically dispersed and seem to cluster. Our opinion was that this could be done by looking at the structural factors that affect private equity activity against country levels of private equity activity.

The analysis was conducted by using data on the six factors established by Groh et al. (2018) from The Venture Capital and Private Equity Country Attractiveness Index in combination with a data set on deal count and deal size from Preqin, we ended up with a sample of 108 countries for a 5-year period from 2014-2018. The dependent variables were additionally scaled by the population of each country through use of the World Bank development indicators database. This enabled better comparisons between countries and conclusions that are dependent on the size of the country in question. Population was selected for scaling due the standard scalar GDP being present within the calculation of the Economic activity variable that was being regressed upon.

By use of both descriptive and statistical analysis, this thesis analysed the effects of these 6 factors on private equity activity, represented by deal count and deal volume. We formulated an hypothesis for each of the 6 factors, and tested these by running an OLS regression with both normal and logarithmic data, and a POLS to investigate correlation between factors. Our results showed that the factors Investor protection and corporate governance along with Entrepreneurial opportunities were significant across the cross-sections at 99% and 95% confidence level respectively.

The two hypotheses regarding the factor for Economic Activity and Taxation were rejected.

We found some evidence in support of significance for the factors Depth of Capital Market, and Human and Social Environment. Two of the hypotheses we found strong support for, regarding the factors Investor protection and Entrepreneurial opportunities.

The discussion looked at the economic interpretation of the results, and featured a small case study of Italy as an example of a country within the sample that has improved significantly over the course of the considered time period. Each factor improvement was highlighted and assessed to show how the country developed through implementation of policies such as the Enterprises and Competitiveness national programme which enabled R&D projects throughout the south of Italy to support its growing number of SMEs.

Though the analysis we have observed the factors do in fact play a significant role and can explain 76% of the variations in the number of deals between countries along with 70% of the variations in the aggregate deal value. The factors play different roles with Economic activity reducing the amount of deals and the other factors improving the activity of private equity markets within a country.

Thus, we can conclude that structural factor effects have explanatory power on country-specific differences in private equity activity.

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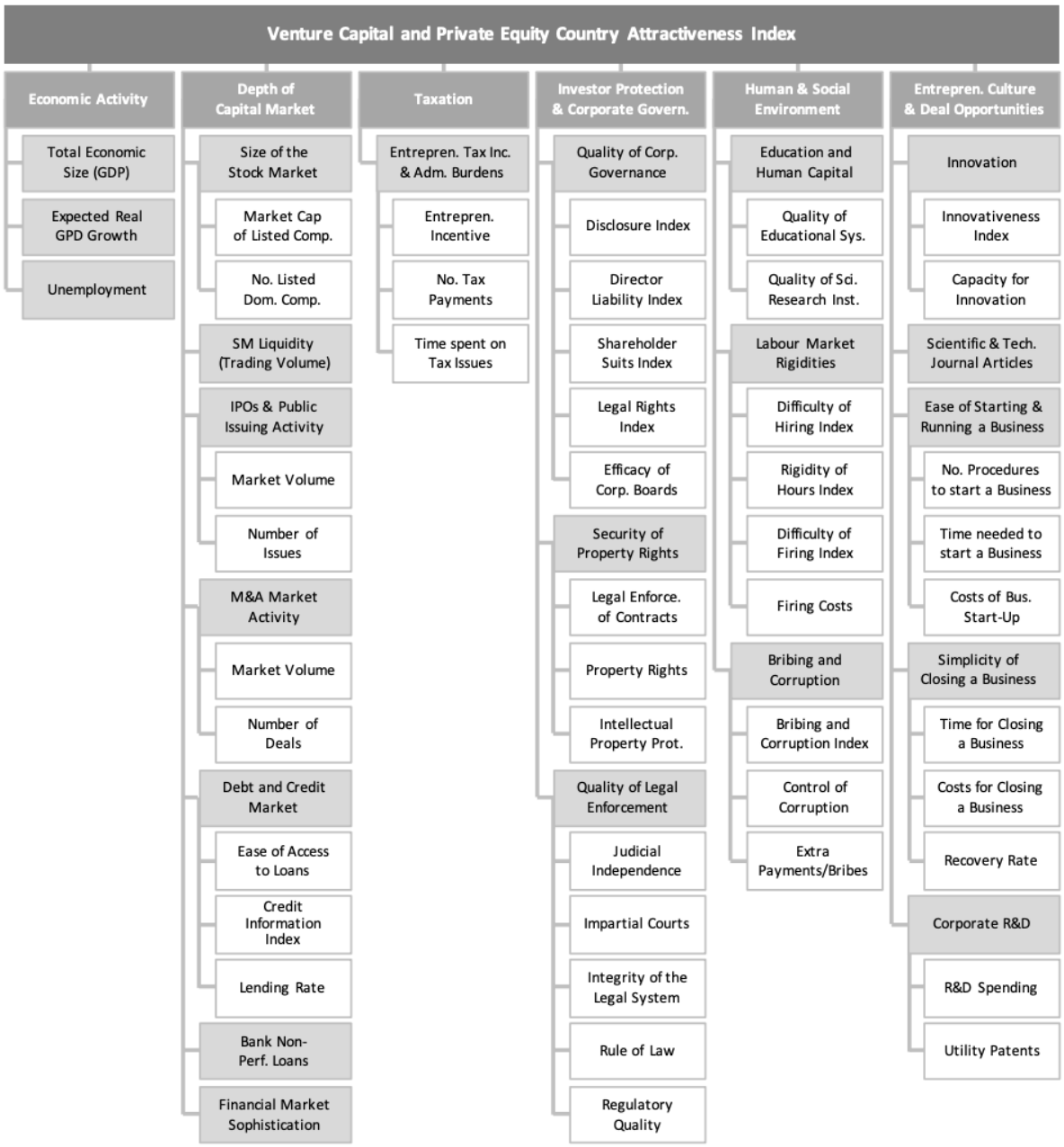
Appendix

A1 Misc

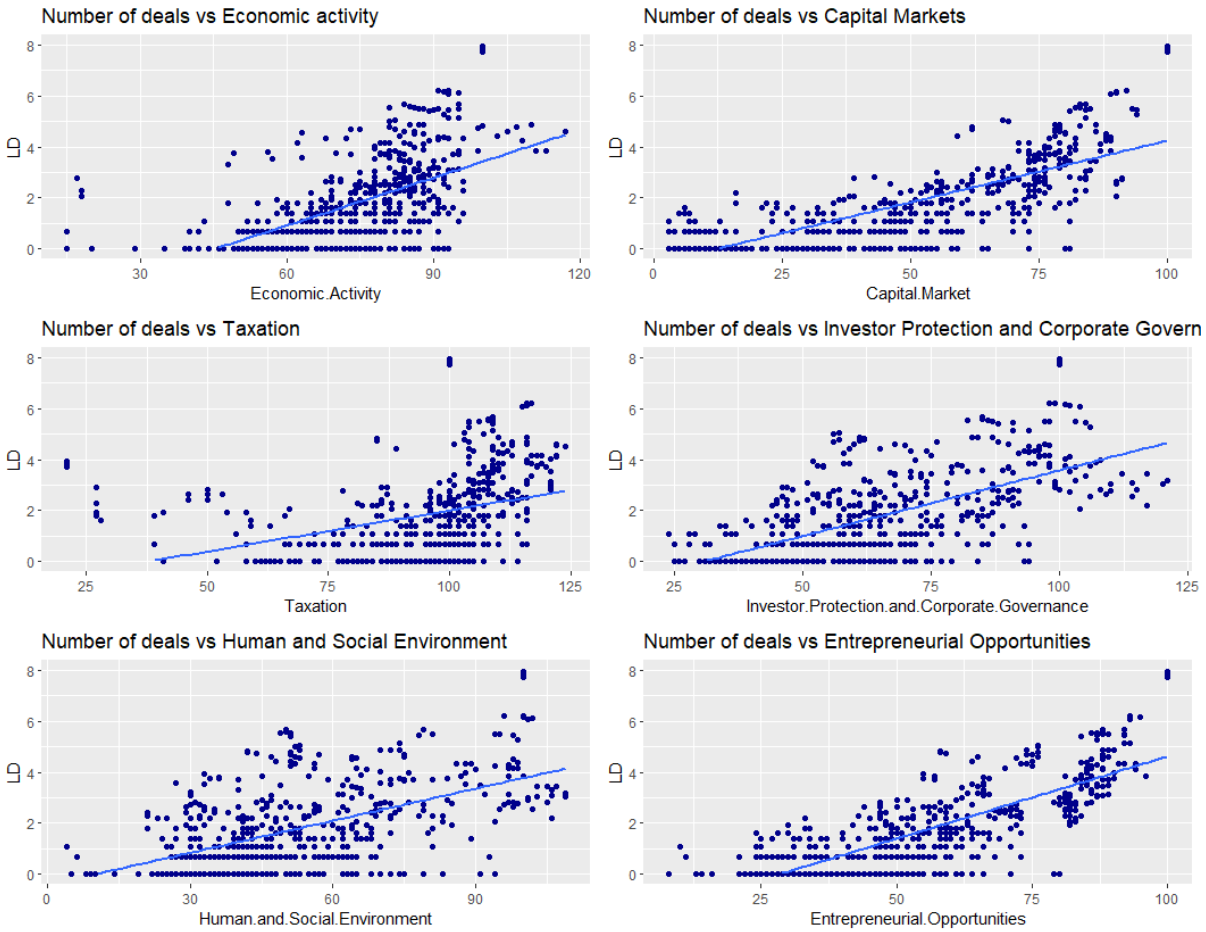
Figure A1.1: The Venture Capital and Private Equity Country Attractiveness Index - Structural Factor Components



This figure illustrates the factors of which The Venture Capital and Private Equity Country Attractiveness Index is comprised of, and the level-2 and level-3 compositions of these factors. The source of this table is Groh et al. (2018)

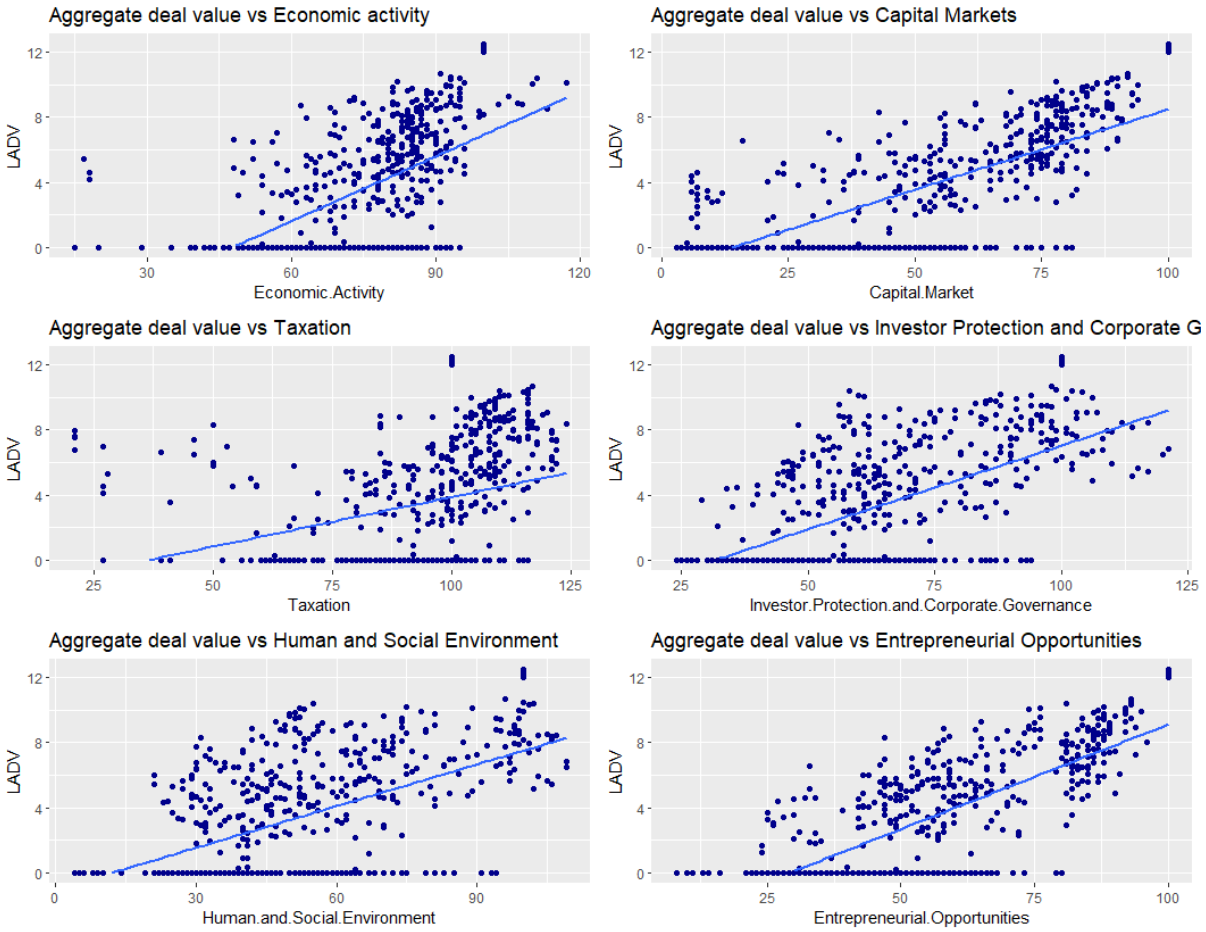
A2 Descriptive statistics

Figure A2.1: Scatter plots for the log number of deals



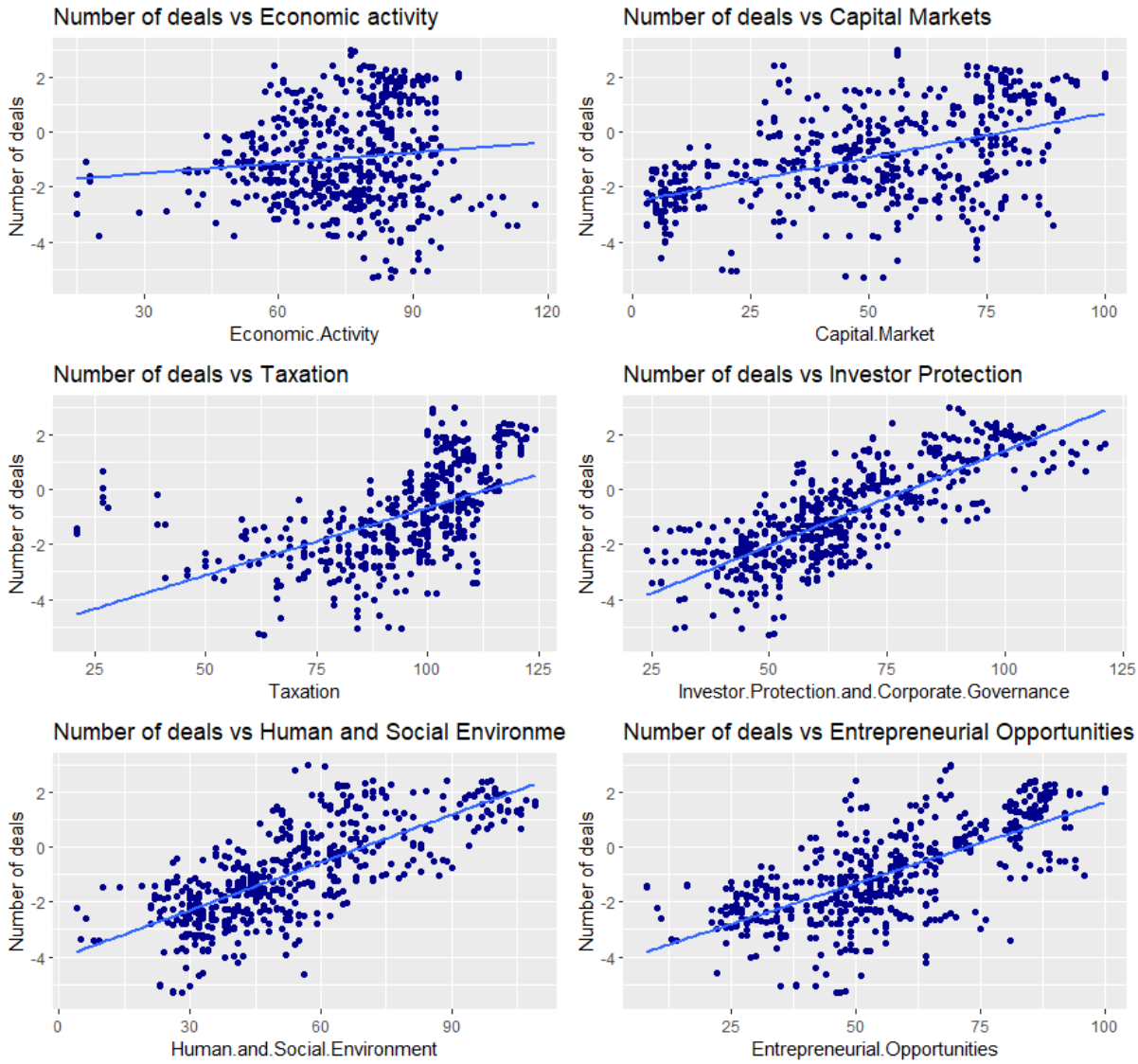
Theses figures show scatter plots for the logged number of deals related to the factors independently, with trend lines. Data sourced from Prequin and The Venture Capital and Private Equity Country Attractiveness Index. Graphs made by the authors.

Figure A2.2: Scatter plots for the log aggregate deal value



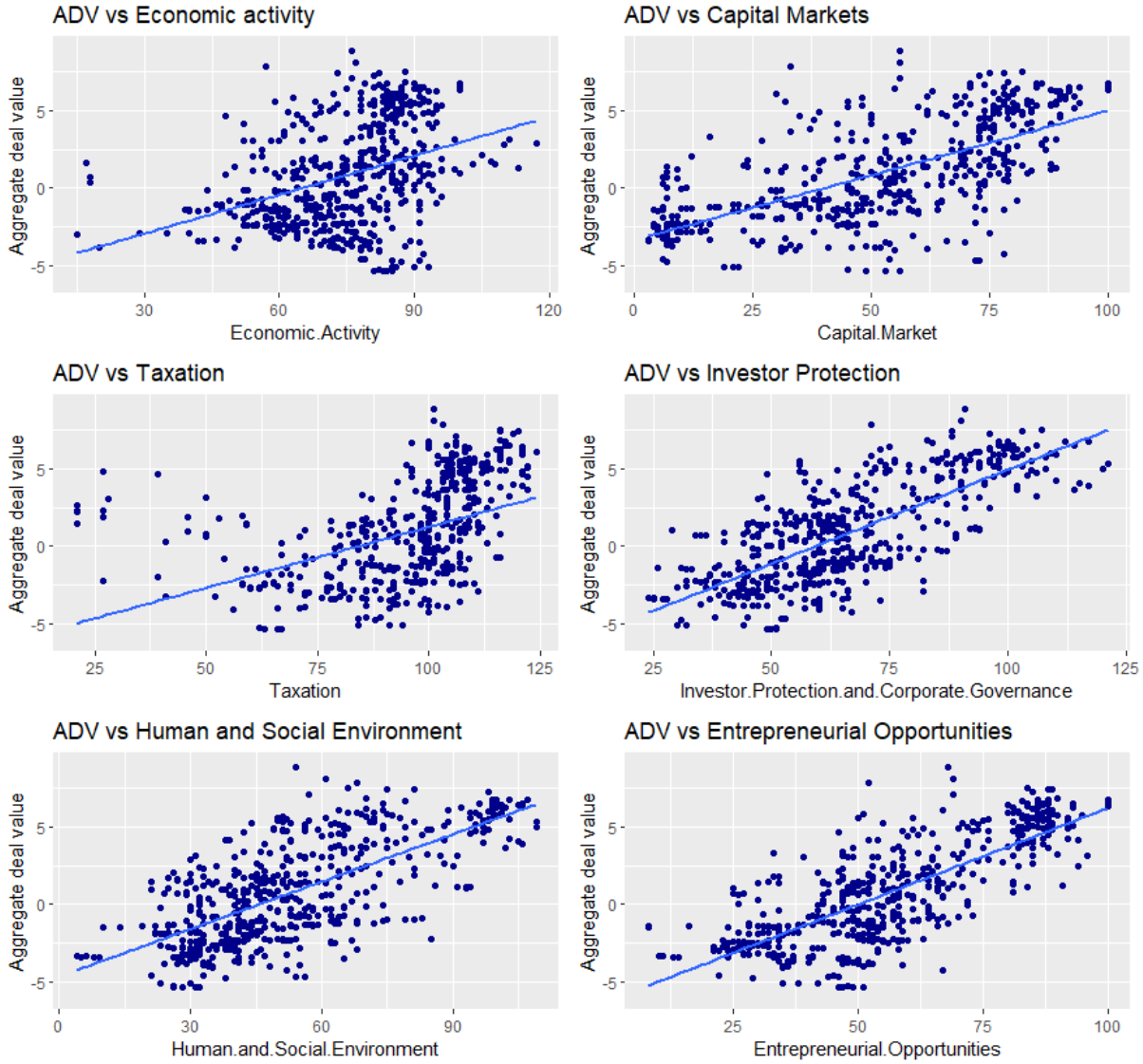
Theses figures show scatter plots for the logged aggregate deal volume related to the factors independently, with trend lines. Data sourced from Prequin and The Venture Capital and Private Equity Country Attractiveness Index. Graphs made by the authors.

Figure A2.3: Scatter plots for the log number of deals scaled by population (million)



Theses figures show scatter plots for the logged number of deals scaled by population in millions related to the factors independently, with trend lines. Data sourced from Prequin and The Venture Capital and Private Equity Country Attractiveness Index. Graphs made by the authors.

Figure A2.4: Scatter plots for log the aggregate deal value scaled by population (million)



Theses figures show scatter plots for the logged aggregate deal value scaled by population in millions related to the factors independently, with trend lines. Data sourced from Prequin and The Venture Capital and Private Equity Country Attractiveness Index. Graphs made by the authors.