
The profile of venture capital investments: the European context

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Abstract: The aim of this paper is to deepen our understanding of the investment valuation process followed by venture capitalists (VCs) at the European level. Its contribution is two-fold. First, we shed light on the manner in which VCs estimate the investee company's value and operationalise the main variables involved in the practical application of the well-known discounted cash flow method. Second, we study whether the different degree of use of valuation methods across European countries may be explained by differences in institutional characteristics related to the underlying legal regime (i.e., English vs. German vs. French-based legal traditions). Using both univariate and multivariate analysis for a sample of 99 responses obtained from a survey addressed to VCs from the UK, France, Germany and Italy, we find that both legal systems and characteristics of VCs (i.e., experience, preferred investment stage, and main source of funds) do influence in the valuation methods used.

Keywords: venture capital; entrepreneurship; legal system; Europe; discounted cash flow method; valuation.

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1 Introduction

During recent years we have seen an increase in the number of actions undertaken by governments worldwide towards encouraging entrepreneurship in order to foster economic growth and job creation. A part of these efforts have been focused on the generation of an active venture capital (hereafter, VC) market. VC funding turns out to be a particularly interesting alternative to bank financing for small and medium-sized (SMEs) firms and entrepreneurs with innovative projects as the highest risk associated with these projects implies a greater difficulty in raising funds through the traditional forms of financing. Previous evidence (Hellmann and Puri, 2000; Li and Zahra, 2012) points out that VC has been traditionally characterised by its support and contribution to the development of new business projects and start-ups, promoting the development of some of the leading technology companies worldwide (e.g., Google, Apple and Intel). VC investment enables companies to raise additional capital through the venture capitalist's experience, expanded network of contacts, enhanced market credibility, and stronger financial position (Pintado et al., 2007; Ruhnka and Young, 1997). Moreover, VC has also been found to stimulate innovation, job creation, and economic growth (Global Insight, 2007; Kortum and Lerner, 2000; Li and Zahra, 2012).

In this context, understanding VC investment decision-making process can be particularly relevant for entrepreneurs who submit innovative proposals to venture capitalists (hereafter, VCs) in order to improve the likelihood of being successful in raising funds. This is particularly true for SMEs that are in early stages of development where information asymmetry problems are greater and financial constraints more acute and persistent (Sahlman, 1990). Furthermore, VC investment decision-making process is quite often regarded as opaque as we know relatively little about the inner workings of VC firms. Most existing evidence on how VCs behave is based on anecdotes, blogs and small-sample reports. This paper thus has the potential to fill a gap in the literature on VC investment decision processes.

Although the USA has the largest and most sophisticated VC market in the world, the VC industry has spread internationally, so that the total volume of VC funds flowing

through financial systems of most developed countries has increased significantly since the 90s, and especially since 1995 (Megginson, 2004). In Europe, its importance has been growing over the last twenty years and currently ranks second worldwide in attracting VC funds. In 2011, VC investments accounted for 0.34% of total European GDP (EVCA, 2012).

The study of international entrepreneurship is receiving a growing attention (McDougall and Oviatt, 2000, Wright et al., 2004), not only because of the increasing cross-border activities of entrepreneurial firms, but also because differences in the legal, institutional, cultural and corporate governance systems seem to significantly influence the access of these firms to finance worldwide (Bouncken et al., 2009; Hampden-Turner and Trompenaars, 1993; Hofstede, 1984; Manigart et al., 2000; Schwarz et al., 2009). As pointed out by Bruton et al. (2005), differences observed among countries may be driven by institutional characteristics related to the underlying legal regime (e.g., English vs. French vs. Germanic legal regimes), the development of stock markets or the economic growth. It is therefore of interest to deepen our understanding of the behaviour of VCs in different European countries, particularly in relation to the investment valuation criteria taken into consideration when evaluating new ventures. By doing so, this paper is aimed at filling the void in the literature on VCs' approaches to valuation and sources of information in different institutional environments.

In this regard, the aim of the present study is to contribute to a better understanding of the valuation process which follow VCs at the European level. Its contribution is two-fold. First, although there are well-known investment valuation guidelines in Europe (see International Private Equity and Venture Capital Valuation Guidelines – IPEVG, 2009), the manner in which VCs estimate the investee company's value is no uniform at all (Reverte and Sánchez-Hernández, 2012). Valuation methods based on discounted cash flow (DCF) analysis are recommended by standard finance textbooks (Brealey and Myers, 2000) and previous research has confirmed that DCF is indeed the most commonly used valuation method employed by VCs (Pintado et al., 2007; Sander and Koomägi, 2007). However, as outlined in the IPEVG (2009), in using the DCF methodology to estimate the fair value of an investment, the VC should derive the present value of the investment, using reasonable assumptions and estimations of expected future cash flows and the terminal value, and the appropriate risk-adjusted rate that quantifies the risk inherent to the investment. All the previous variables (i.e., cash flows, terminal value and discount rate) require substantial subjective judgements to be made. In the present study, we contribute to the literature by trying to shed first light on how European VCs operationalise the key inputs involved in the DCF method, and aspect not studied so far.

Second, the EU is seeking to unify the VC market in order to provide innovative small businesses with easier access to financing. To achieve this, the recent *Regulation 345/2013 of the European Parliament and of the Council on European venture capital funds* is aimed at facilitating the cross-border fundraising and investments by VC funds so that funds established in any Member State can invest freely throughout the EU. In this context, our research focuses on testing whether the different degree of use of valuation methods across European countries may be explained by differences in institutional characteristics related to the underlying legal regime (i.e., English vs. German vs. French-based legal traditions). We also control for the effect on the investment valuation methods used of several idiosyncratic characteristics of VCs that previous literature has

identified as potential determinants of their activities (such as experience, preferred investment stage, and public vs. private origin of funds).

Our empirical study includes the four European countries (UK, France, Germany and Italy) with a higher GDP and VC activity in terms of both funds raised and invested (EVCA, 2012). Furthermore, these countries differ in their legal, institutional, cultural and corporate governance systems (La Porta et al., 1998, 2000), which potentially leads to differences in the conduct of VCs and entrepreneurs across markets.

The rest of the paper is structured as follows. Next, we discuss previous empirical research on this field. In the third section we discuss the data and sample. Results are reported in the fourth section and finally we present our main conclusions.

2 Literature review and hypotheses development

2.1 Valuation methods used by VCs

Past evidence on the valuation methods employed by VCs is scarce¹. Based on a sample of 140 VCs in Great Britain, France, the USA and Canada, Barrow et al. (2001) find that, although the majority of experts surveyed prefer the multiples of comparable firms' method, DCF is the preferred method when there is no much information available to compare with. That is the reason why DCF is the method most widely used in young companies that have lower income and high growth expectations. For the German case, Dittmann et al. (2004) also find that the majority of German VC professionals use DCF techniques for their valuations, although when they went more into detail of the methods used they also found that only about one third of the VCs using the DCF method chose to use the textbook approach. Rather, the majority of the users of DCF use ad hoc adjustments applied on a subjective basis. For the Spanish case, Pintado et al. (2007) show that DCF is the most commonly used valuation method, followed by the use of price-earnings multiples based on predicted values.

Using a multi-country approach, Manigart et al. (2000) compare the valuation methods used in five countries (the USA, UK, France, Netherlands and Belgium). They find differences in the valuation methods used among these countries. Their results indicate that the most commonly used method in the UK is the historical price-earnings ratio (PER), while the earnings before interest and taxes (EBIT) multiple and the price of recent investment are most used in the USA. Also the price of a recent investment is used in France while in The Netherlands and Belgium are utilised more DCF-based methods.

In a similar vein, Wright et al. (2004) conduct a study with VCs located in Europe, America and Asia. With respect to the legal system, these authors find, contrary to expectations, that the DFC method is much more used in countries with German legal systems, followed by English-based countries. By contrast, in countries using the French legal system, it is much more used the historical book value. Their justification is argued based upon the lower investor protection provided by the French legal system (La Porta et al., 1998, 2000), making assets-in-place somewhat more important than in English legal systems as a form of protection for investors. They also obtain evidence of a greater use of multiples methods in systems based on the English model against the French and German systems, which is justified by the greater development of stock markets in common-law countries that ensures a sufficient number of comparable listed companies.

Other studies have been focused on the comparison of valuation methods used in emerging markets compared to developed markets. This is the case of studies such as Karsai et al. (1998), comparing Central and Eastern Europe (Hungary, Poland and Slovakia) with the UK, or Sander and Koomägi (2007) comparing the Estonian VC market with the Western European and American ones. Both studies find that DCF is the most widely used valuation method in emerging markets, while multiples are more applied in developed countries. Unlike emerging markets, in more developed markets there are a higher number of companies available to compare with, which explains why multiples-based techniques are so much applied. Vydrzel and Soukupová (2012), based on a sample of 45 VCs in the Czech Republic, also document that multiples are the most common valuation approach used in practice followed by the DCF. The most frequently used multiple is EBITDA, followed by price-to-sales and EBIT.

2.2 Idiosyncratic VC characteristics and institutional factors affecting VCs investment valuation decisions

Previous research has also analysed whether the different degree of use of valuation methods across European countries may be explained by the underlying legal regime (i.e., English vs. German vs. French-based legal traditions) or by several idiosyncratic characteristics of VCs such as experience, preferred investment stage, and main source of funds (i.e., public vs. private). Next, we briefly refer to each of them.

2.2.1 Legal system

Cumming et al. (2010) point out that differences in legal systems justify differences in the behaviour of VCs around the world. These authors apply to VC the well-known classification of legal regimes introduced by La Porta et al. (1998). On the one hand, the common-law regime that is characterised by a very strong protection to both shareholders and creditors because of the high enforcement power of contracts and the good quality of information. According to La Porta et al. (1998), the UK and the USA are pure common-law systems. On the other hand, the French civil-law regime that is characterised by offering a low degree of protection to external investors, a low enforcement power of contractual agreements and a low quality of information. Italy and Spain belong, like France, to French civil-law systems. The regimes of German and Scandinavian civil-law are intermediate.

Studies by Manigart et al. (2000) and Wright et al. (2005) show significant differences in valuation methods between VCs from the UK, the USA, Continental Europe and Asia. Countries with less developed capital markets are less likely to employ valuation techniques consistent with standard corporate finance theory developed in an advanced capital market context (e.g., prospective methods such as DCF or earnings discounting). Hence, as the UK has the most developed stock market in our sample, we expect that DCF will be less used for VCs in countries with French or German legal systems than in English legal systems.

As regards the use of comparators-based methods, they are more likely to be used in English legal systems where the greater development of stock markets ensures the existence of a sufficient number of comparable listed companies. Assets-based approaches (i.e., historical cost) valuation methods, on the contrary, are more likely to be adopted in countries based on the French legal system, which is due to lower shareholder

protection, which makes assets-in-place somewhat more important than in English legal systems as a form of protection for investors. Further, Sapienza et al. (1996) also note that in bank-based systems (such as France, Germany and Italy), many VC firms may be owned by banks. Given the importance of collateral in bank lending, VCs may be more likely to pay attention to the asset backing of investees.

Finally, as far as the liquidation value method is concerned, where there is a high risk of failure, the expected liquidation value of assets may be an important consideration in valuing potential investees (Wright et al., 2004). These valuations, as pointed out by Shleifer and Vishny (1992), may be more feasible in market-based systems, which tend to be associated with active takeover markets, especially for forced asset disposals. The UK has notably the most developed takeover bid market among the countries studied here. Hence, although the liquidation value method is expected to be less used than conventional methods (i.e., DCF and multiples), we expect it to be more used in UK than in France, Germany and Italy.

Therefore, our first four hypotheses (stated in their alternative form) are as follows:

- H₁ Prospective methods (i.e., DCF and discounted earnings) are likely to be significantly more used by VCs in countries with an English legal system than in countries with French and German legal systems.
- H₂ Comparators-based methods (i.e., multiples) are likely to be significantly more used by VCs in countries with an English legal system than in countries with French and German legal systems.
- H₃ Historical cost-based valuation methods are likely to be significantly more used by VCs in countries with French and German legal systems than in countries with an English legal system.
- H₄ Liquidation value-based valuation methods are likely to be significantly more used by VCs in countries with an English legal system than in countries with French and German legal systems.

In our regression model, the English-based legal system is chosen as the base system so that two dummies are included in the models: one for the German legal system, and other for French-based legal systems (i.e., France and Italy).

2.2.2 *Preferred investment stage*

The information asymmetries between VCs and the investees are higher in the initial stages (seed and start-up phases) because of the higher adverse selection problems. This is because early stages are characterised by highly technological and innovative projects where there is a lot of uncertainty regarding future payoffs (Van Auken, 2001). In order to compensate these higher information asymmetries, the rates of required return will be higher due to the higher exposure risk (Pintado et al., 2007). Valuation techniques developed in mainstream corporate finance are applicable in early-stage VC investments, but access to information may pose a particular problem (Wright and Robbie, 1998). Early stage investments require valuation approaches that can handle uncertain and/or rapidly growing future cash flows. In these cases, the analyst should handle with highly innovative companies, with little track record, lower levels of current earnings and cash flows but with high growth expectations. As there is no much information available to

compare with in these circumstances, DCF techniques are more preferred than multiples (Barrow et al., 2001).

Pintado et al. (2007) examine the investment decisions of 51 Spanish VC firms as a function of the investee's stage of development (early vs. late stages). They document that multiples (like the PER) are more used in late stages than in early stages whereas asset-based approaches (like book value) are more frequently used in early-stage firms. No significant differences are found in the use of DCF method in early vs. late stage firms.

We expect DCF to be more frequently used in early-stage firms that have a limited track record, little or no revenues, and no operating profits but rather high growth expectations. On the contrary, we expect multiples (such as the price-to-earnings or price-to-cash flows) to be more used in late stages where there are a higher number of companies to compare with and positive operating profits and cash flows are more common. So, our next hypotheses are stated as follows:

- H₅ DCF method is likely to be more significantly used by VCs that invest predominantly in early-stage firms rather than in late-stage firms.
- H₆ Comparators-based methods (i.e., multiples) are likely to be more significantly used by VCs that invest predominantly in late-stage firms rather than in early-stage firms.

To measure this variable, as in previous studies, we use a dummy variable that takes the value 1 if the VC firm invest predominantly in late stages (i.e., expansion and maturity stages) and 0 otherwise (early stages, i.e., when the VC firm invest predominantly in seed and start-up phases).

2.2.3 *Experience*

With regard to the experience variable, there are studies supporting the fact that a greater experience of VCs leads to higher rates of return on investment (ROI) (Gompers et al., 2006). In addition, companies financed by more experienced VCs are more likely to be more successful than those funded by VCs with lower experience (Gompers et al., 2010; Hochberg et al., 2007; Kaplan and Schoar, 2005; Sorensen, 2007). Other surveys, however, state that the investments made by more experienced VCs obtain better yields because the selected companies are better (Sorensen, 2007). In any case, empirical evidence suggests that more experienced analysts perform more accurate assessment processes, which leads them to adopt the most appropriate investment decisions, and this translates into higher returns on their investments. In cross-border investments, the experience factor can be even more important than the legal system (Kaplan et al., 2007; Lerner and Tag, 2012). Many researchers have employed a learning (operationalised as investment management experience) perspective when studying the impact of learning on VC's selection behaviour (Shepherd et al., 2003; Yang et al., 2009), value adding behaviour (Knockaert et al., 2006), or valuation capability, defined as the capability to accurately evaluate the value of a potential portfolio company (Yang et al., 2009). With regard to valuation models, Wright et al. (2004) find that experience has no significant impact on the importance placed on particular valuation methods, although there is a weak significant positive association between experience and the use of price-earnings comparator valuation methods.

Although there is no a clear theoretical relationship studied so far between the use of valuation models and experience, we hypothesise that more experienced VCs will use to a greater extent valuation methods that require a higher expertise in their practical application (such as the DCF method) and will use to a lesser extent the asset-based approaches (i.e., net adjusted book value and liquidation value).

Our hypotheses are, thus, as follows:

H₇ The experience of the VC firm is positively related to the degree of use of the DCF method.

H₈ The experience of the VC firm is negatively related to the degree of use of asset-based valuation methods (i.e., net adjusted book value and liquidation value).

To measure experience, we include a question in the survey related to the number of years since the creation of the company.

2.2.4 Main source of funds

The relation to and dependence on fund providers can affect the behaviour of VC. Private independent VCs typically have investment return or financial objectives as their primary goal. However, public sector VCs might differ in their behaviour relative to their private counterparts for instance in that they are limited by statutory constraints (Leleux and Surlemont, 2003). The existence of higher long-term goals (i.e., fostering growth, industrial restructuring of some regions) beyond making business profits is a notable feature that separates all public sector VC companies from their private counterparts. Wright and Robbie (1996) find on UK data that private VCs use significantly more multiples (PER, EBIT) to value investments than public VCs. Hassan and Leece (2004) point out that the type of VC company influences on the valuation method used. In their research, they distinguish three types of categories used by the British Venture Capital Association (*captive venture capital firms – CVCF, semi-captive venture capital firms – SCVCF and independent venture capital firms – IVCF*). With respect to the valuation method used, the results suggest that the IVCF and the SCVCF use the DCF method to a greater extent, followed by other prospective methods, while the CVCF use preferably methods based on historical data, being the implementation of the DCF method rather residual. Cumming et al. (2014) examine the impact of government versus private independent VC backing on the exit performance of entrepreneurial firms and find that private independent VC-backed companies have better exit performance than government-backed companies. Baldock and Mason (2015) focus on two types of UK governmental VC schemes directed at young and potential high growth businesses operating in the sub-£2m equity finance gap such as the Enterprise Capital Funds (ECFs) and the Angel Co-Investment Fund (ACF) They find that these schemes are making attributable impacts on their portfolio businesses and the wider UK economy. Bertoni and Tykvová (2015) explore whether and how governmental venture capital investors (GVCs) spur invention and innovation in young biotech companies in Europe. They find that GVCs boost the impact of independent venture capital investors (IVCs) on both invention and innovation and that GVCs are an ineffective substitute, but an effective complement, of IVCs.

Based on the previous arguments, our next hypothesis is stated as follows:

- H₉ The main source of funds in the VC company affects the choice of the valuation method used.

To measure this variable, we use a dummy variable that takes the value 1 if the VC company is mainly privately owned and 0 otherwise.

3 Data

The empirical research is conducted through a questionnaire consisting of sixteen questions. Most of them use a Likert-based scale ranging from 1 ('not important') to 5 ('very important'). The design of the questionnaire is structured in three parts. The first part deals with general questions relating to the characteristics of the VC firm (such as experience, location, preferred investment stage, origin of funds, and volume of funds managed), the investment valuation methods used and the general aspects of the investee company considered to be more important. The second part explores the use of multiples methods and, finally, the third part (the largest one) is related to specific questions concerning the variables used in the practical implementation of the DCF method.

Questionnaires were sent to all registered members of the European Venture Capital Association (EVCA) in the UK, France, Germany and Italy. This resulted in an initial population of 221 VC for UK, 158 for Germany, 105 for France, 45 for Italy. The data collection period began in January 2012 and concluded in late December of that year. A total of 99 responses were received, representing an overall response rate of 18.71%. This rate is similar to that of many other studies on venture capital using hand-collected data (Bottazzi et al., 2009; Brau and Fawcett, 2006; Cumming, 2006; Kaplan and Strömberg, 2003; Kaplan et al., 2007; Schwienbacher, 2008). The overall response rate of nearly 19% is larger than for comparable surveys of industrial firms, as discussed by Graham and Harvey (2001, 2013)². The distribution of response rates by country is as follows: UK (16.29%), Germany (14.55%), Italy (46.67%) and France (18.09%).

The characteristics of the sample are shown in Table 1. It can be seen that 53.5% of respondents are experts with over ten years of experience in valuation. We note that in Germany and Italy the majority of respondents in our sample have fewer than ten years of experience (69.6% and 52.4%, respectively), while in the UK and France most of the VCs have more than ten years of experience. Regarding the financing structure, the vast majority of VCs are completely privately-owned (76.8%). The highest percentage of mixed public/private financing is found in France (31.6%) and Italy (23.8%). As far as the preferred investment stage, with the Italian exception, in all other countries VCs prefer to invest in companies in early stages (seed and start-up phases). According to the EVCA 2012 data regarding the investment by stage and regions, our sample can be regarded as representative of the population in each of the four countries under analysis.

Table 1 Sample characteristics by country

		<i>Percentage of firms</i>				
		<i>Total</i>	<i>UK</i>	<i>Germany</i>	<i>France</i>	<i>Italy</i>
Experience	Less than 10 years	46.5%	30.6%	69.6%	31.6%	52.4%
	More than 10 years	53.5%	69.4%	30.4%	68.4%	47.6%
Source of funds	Public financing	9.1%	9.1%	8.7%	0.0%	0.0%
	Mixed financing	14.1%	14.1%	4.3%	31.6%	23.8%
	Private financing	76.8%	76.8%	87.0%	68.4%	76.2%
Preferred investment stage	Start up/seed	37.2%	61.8%	52.2%	42.0%	14.3%
	Growth/expansion	24.7%	5.9%	17.4%	40.6%	38.1%
	Maturity	38.1%	32.3%	30.4%	17.4%	47.6%
Real GDP growth rate in 2012 ¹			0.1	0.7	0.0	-2.5
Market capitalisation of listed companies (as % of GDP) in 2012 ²			124.0	43.7	69.8	23.9

Source: ¹Eurostat, ²World Bank

We can also observe a substantial heterogeneity in both the development of stock markets across countries (proxied by the market capitalisation of listed companies/GDP ratio) and the GDP growth rate. Regarding the former, the UK market is, by large, the most developed one (124.0), followed by the French and German stock markets (69.8 and 43.7, respectively). As for the GDP growth, only two of the four countries under analysis have positive figures (Germany with 0.7%, followed by UK with 0.1%).

4 Empirical results

4.1 Univariate analysis

First, we present the results of the univariate analysis related to the first objective of our study, that is, to shed first light on how European VCs operationalise the key variables involved in the DCF method. The data are initially summarised by the use of univariate statistics (means and/or frequencies) for each survey item. Then, the Kruskal-Wallis test is used to determine if there are statistically significant differences across the four countries under analysis. Contingency tables were also used for categorical variables.

Regarding the criteria considered to analyse the potential investee company at the pre-investment stage, results for each country are shown in Table 2. As it can be observed, the most important factor of the potential investee considered by VCs is the qualification and experience of the management team (4.343), in line with, among others, MacMillan et al. (1985), Hill and Power (2001), Payne et al. (2009), Sander and Koomägi (2007) and Ramadani (2014). After that factor, the next ones in importance are the business plan and growth potential (4.284), ROI (4.085), growth phase (3.968), activity sector (3.646) and level of risk assumed (3.634).

Table 2 Criteria considered in the investment valuation process

	<i>Total</i>	<i>UK</i>	<i>Germany</i>	<i>France</i>	<i>Italy</i>
Stage of development**	3.968	3.735	3.682	4.471	4.238
ROI	4.085	4.294	4.136	4.235	3.571
Skills and experience of the management team	4.343	4.306	4.348	4.105	4.619
Business plan and growth potential**	4.284	4.206	4.000	4.294	4.714
Level of risk assumed	3.634	3.765	3.762	3.235	3.619
Financial situation	3.382	3.387	3.400	3.235	3.476
Ownership structure**	2.979	3.306	2.857	2.529	2.905
Size and age of the investee***	2.583	2.412	2.500	2.105	3.381
Sector of activity	3.646	3.472	3.682	3.765	3.810

Notes: Responses are based on a Likert scale (from 1 = not important to 5 = very important). The table provides the means of the responses. The significance of the differences across the four countries is tested using the non-parametric Kruskal-Wallis test. Significance levels: *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$.

Significant differences among countries are found in factors such as the growth phase of the investee company and the business plan and growth potential, being more important in countries with French-based legal system (i.e., France and Italy). These differences could be explained because VCs in French-based legal systems are, in many cases, owned by banks that have a higher propensity to invest in late-stage investments in order to minimise risk. We also note significant differences in relation to the ownership structure, which is more rated by UK companies. As pointed out by Abdesselam et al. (2009), the different degree of shareholder protection between common-law vs. civil-law countries impacts on the way VCs enter in the firm as minority or majority shareholders. In countries with a lower shareholder protection (i.e., Italy and France) VCs usually remain as minority shareholders whereas in countries with a higher shareholder protection (i.e., the UK) they tend to remain as majority shareholders.

As far as the valuation methods used by VCs, Table 3 reports data by country. In line with Barrow et al. (2001), it can be seen that multiples are the most used valuation methods in all countries (4.010), followed by the DCF method (3.478). As expected, multiples methods are more frequently used in countries with more developed stock markets, such as the UK, where there are a higher number of comparable firms. It can also be observed that discounted earnings is significantly more used in UK than in the rest of countries.

Although less frequently used, the liquidation value method is more used in UK than in the rest of countries. This is often justified by the fact that these valuations are more feasible in market-based systems, which tend to be associated with active takeover markets, especially for forced asset disposals (Shleifer and Vishny, 1992). The UK has notably the most developed takeover bid market among the countries studied here. Accounting-based methods are hardly used, specially the liquidation value (1.500) and adjusted net book value (1.911). Specifically for the adjusted net book value, the results show that is significantly more used in France than in the UK, coinciding with Wright et al. (2004). The lower protection to investors in French-based legal systems makes assets-in-place somewhat more important than in English legal systems as a form

of protection for investors. Further, Sapienza et al. (1996) also note that in bank-based systems (such as France and Italy), many VC firms may be owned by banks. Given the importance of collateral in bank lending, VCs may be more likely to pay attention to the asset backing of investees.

Table 3 Valuation methods used by VCs

	<i>Total</i>	<i>UK</i>	<i>Germany</i>	<i>France</i>	<i>Italy</i>
Discounted cash flow method	3.478	3.688	3.000	3.529	3.619
Discounted earnings***	1.709	2.161	1.762	1.200	1.316
Adjusted net book value**	1.911	1.893	1.353	2.600	1.895
Liquidation value method*	1.500	1.742	1.300	1.417	1.381
Multiples**	4.010	4.457	3.682	3.737	3.857
Others	0.878	1.028	0.695	0.421	1.238

Notes: Responses are based on a Likert scale (from 1 = not important to 5 = very important). The table provides the means of the responses. The significance of the differences across the four countries is tested using the non-parametric Kruskal–Wallis test.
Significance levels: *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$.

Under the heading ‘others’ some minority respondents choose other alternative methods, such as LBO valuation, the ‘venture capital method’ and the potential exit discounted value. It is quite surprising that only one respondent has chosen the fair value of other investments from independent third parties.

Given the importance of multiples methods in practice, respondents were asked about their use of these techniques. The results indicate that almost all of the VCs in the sample (98%) use this methodology. While 28.6% use it in isolation, most VCs (69.4%) combine their use with other valuation methods. Among the multiples most used (Table 4), EBITDA (4.18) is the preferred one. In addition, its use is significantly more prevalent in France and Italy than in the rest of countries. EBIT is the second preferred option (3.73), although no significant differences among countries were found. A widely used method in the UK is the PER, with a higher significant use than in Germany, France and Italy, where its use is less widespread. Our results support in part the conclusions drawn by Manigart et al. (2000) and Wright et al. (2004), noting that countries with an English common-law system are more likely to use this ratio than those with a German or French legal system. The same applies to the ratio of price-to-sales that is more widely used in the UK than in the rest of countries. It is also observed that the market-to-book ratio is significantly more used in France than in the other countries, which is consistent with the increased focus on accounting-based approaches by the French VCs.

Standard finance textbooks recommend valuation methods based on DCF analysis (Brealey and Myers, 2000) and previous research have shown that this is the preferred method used by VCs (Pintado et al., 2007; Sander and Koomägi, 2007). However, as outlined in the IPEVG (2009), in using the DCF methodology to estimate the fair value of an investment, the inputs of the model require substantial subjective judgements to be made regarding the assumptions and estimations of expected future cash flows and the terminal value, and the appropriate risk-adjusted rate that quantifies the risk inherent to the investment. In this regard, the next questions of the survey deal with the way European VCs operationalise the key variables involved in the DCF method.

Table 4 Multiples methods more used in investment valuation

	<i>Total</i>	<i>UK</i>	<i>Germany</i>	<i>France</i>	<i>Italy</i>
Market-to-book ratio**	1.728	1.548	1.467	2.706	1.333
PER***	2.543	3.226	2.400	2.294	1.722
EBIT	3.730	3.581	4.105	3.632	3.700
EBITDA***	4.180	3.581	4.000	4.632	4.850
Price-to-sales***	2.517	3.152	2.412	2.316	1.667
Price-to-cash flow	2.753	2.548	2.733	3.053	2.800

Notes: Responses are based on a Likert scale (from 1 = not important to 5 = very important). The table provides the means of the responses. The significance of the differences across the four countries is tested using the non-parametric Kruskal-Wallis test. Significance levels: *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$.

First, respondents were asked about the specific cash flows that they discount under the DCF method. Table 5 shows that in all countries VCs discount the well-known 'free cash flow' (66.3%). We find statistically significant differences among countries, with a higher use in France and Italy relative to the UK. 90.4% of the Italian VCs use 'free cash flow' to perform their assessments, while in France it is used in 73.7% of cases. By contrast, in the UK the 'free cash flow' is used in slightly more than 50% of cases, while they are also used other options such as cash flows available to equity holders, net income before interests and after taxes and net income for the year plus depreciation (with a frequency of 14.3% in all cases). Dividends, however, are not used in practice in any country.

A crucial aspect that exerts a significant influence on valuation is the choice of an appropriate discount rate intended to capture the riskiness of the future stream of projected cash flows of the investee. Overall, as shown in Table 6, the weighted average cost of capital (WACC) is the preferred discount rate (3.877) for the VCs to value their investments (Groh, 2002), although its use is more widespread in Italy, France and Germany versus the UK. This more prevalent use of WACC is logical since it is regarded to be the suitable discount rate to be used when 'free cash flows' are discounted. The cost of equity capital is the second alternative to discount (2.935), being used significantly more in Italy and the UK than in France and Germany. Other alternatives, such as the average cost of debt of the company and the cost of the bank's financing, are less used in all countries.

One of the most problematic issues referred to in the application of the DCF method is that concerning to the estimation of the cost of equity. Finance textbooks as well as practitioners generally tend to use the CAPM model (Graham and Harvey, 2001; Rojo and Garcia, 2006; Welch, 2000), which considers that the cost of equity capital is the sum of a risk-free rate and a risk premium. As shown in Table 6, VCs of all countries usually consider the interest rate from long-term treasury debt (62.2%) as a proxy for the risk-free rate. Less used options are a weighted-average treasury debt (21.10%), and a short-term treasury debt (8.90%). As regards the risk premium, this is one of the most controversial points in valuation. The preferred options are to estimate risk premium based on the well-established CAPM's market beta (32.3%) and the use of specific risk indices based on experience (32.3%). Other less frequently used options are those based on the variability of stock market profitability (16.7% and much more used in Italy), and through fundamental analysis (15.6%).

Finally, regarding the residual or terminal value (Table 5), the most common practice is to capitalise in perpetuity the latter forecasted cash flow (3.290), except in the UK where liquidation value is preferred. The option of not considering any residual value (1.778) is the only one with statistically significant differences, because in Germany it is quite common to apply this option, unlike other countries where is rarely used.

Table 5 Value components in applying the DCF method

		<i>Total</i>	<i>UK</i>	<i>Germany</i>	<i>France</i>	<i>Italy</i>
Flow discounted	Cash flows available to equity holders**	11.2%	14.3%	0.0%	26.3%	4.8%
	Free economic cash flows (FCF)**	66.3%	51.4%	60.9%	73.7%	90.4%
	Dividends	0.0%	0.0%	0.0%	0.0%	0.0%
	Net income before interests and taxes**	5.1%	14.3%	0.0%	0.0%	0.0%
	Net income before interests and after taxes	5.1%	5.7%	8.7%	0.0%	4.8%
	Net income plus depreciation	7.1%	14.3%	8.7%	0.0%	0.0%
	Others	5.1%	0.0%	21.7%	0.0%	0.0%
Discount rate	The cost of equity capital**	2.935	3.250	2.733	1.786	3.450
	The cost of the bank's financing	1.747	1.643	1.800	1.571	2.000
	The weighted average cost of capital (WACC)*	3.877	3.250	4.176	4.059	4.368
	The average cost of debt of the company	2.068	2.269	2.333	1.714	1.833
Residual value	Equivalent to the liquidation value	2.530	3.087	2.400	2.412	1.938
	No existence of residual value***	1.778	1.476	3.500	1.500	1.389
	As a multiple of some accounting variable	2.367	2.143	3.111	2.071	2.500
	Capitalise in perpetuity the latter forecasted cash flow	3.290	2.762	3.889	3.857	3.167
	Capitalise in perpetuity the latter forecasted earnings	2.068	1.895	2.800	2.214	1.688

Notes: For the 'flows discounted' variable, we use the chi-square test of significance.

For the other two Likert-based variables (scaling from 1 = not important to 5 = very important), we use the non-parametric Kruskal-Wallis test.

Significance levels: *** $p \leq 0.01$, ** $p \leq 0.05$, * $p \leq 0.1$.

Table 6 Components of risk applied in DCF method

		<i>Total</i>	<i>UK</i>	<i>Germany</i>	<i>France</i>	<i>Italy</i>
Risk-free rate	A weighted average treasury debt	21.1%	17.7%	20.0%	27.8%	11.1%
	Long term treasury debt	62.2%	64.7%	55.0%	61.1%	66.7%
	Short term treasury debt	8.9%	5.8%	15.0%	0.0%	16.7%
	Others	7.8%	11.8%	0.0%	11.1%	5.6%
Risk premium	From stock market profitability**	16.7%	9.1%	9.0%	15.8%	38.1%
	Through fundamental analysis	15.6%	18.2%	13.0%	15.8%	14.3%
	Through specific risk indices based on experience	32.3%	36.4%	39.1%	26.3%	23.8%
	Through market beta	32.3%	27.2%	39.1%	42.1%	23.8%

Note: Contingency table: chi-square test of significance: * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.

4.2 Multivariate analysis

The previous univariate analysis has evidenced differences across countries in the investment valuation criteria used by VCs. However, these differences may be driven by broader institutional characteristics related to the development of stock markets, the underlying legal regime or the economic growth. Moreover, they can also be driven by several idiosyncratic characteristics of VCs that previous literature has identified as potential determinants of their activities (such as experience, preferred investment stage, and main origin of funds). Hence, in order to examine the effect of all these factors on the investment valuation methods employed by VCs in our sample, we next estimate a series of ordered logistic regressions as the dependent variable (*VAL_MODEL_USE*) takes five possible values in an ordinal Likert-based scale (ranging from 1 ‘not used’ to 5 ‘most used’). These regressions are estimated separately for each of the five valuation methods considered (i.e., DCF, discounted earnings, adjusted net book value, multiples and liquidation value).

The general form of the model is as follows:

$$VAL_MODEL_USE_i = f(GERMAN_LEGAL_SYS, FRENCH_LEGAL_SYS, \\ EXPER, SOURCE, VOLUME, \\ STAGE, GDP_GROWTH, MKTCAP_ \%GDP)$$

where

- *GERMAN_LEGAL_SYS* = 1 for German-based legal system and 0 otherwise
- *FRENCH_LEGAL_SYS* = 1 for French-based legal systems and 0 otherwise
- *EXPER*: experience (i.e., number of years since its foundation) of the VC firm
- *STAGE* = 1 when the VC firm invests predominantly in late stages and 0 otherwise

- *SOURCE* = 1 when the VC firm is mainly privately-owned and 0 otherwise
- *VOLUME*: volume of funds managed by the VC company
- *GDP_GROWTH*: gross domestic product growth
- *MKTCAP_%GDP*: market capitalisation as a percentage of GDP.

The variables *VOLUME*, *GDP_GROWTH* and *MKTCAP_%GDP* are included in the regressions as control variables based on the following arguments.

4.2.1 *Volume of funds managed*

Under the so-called ‘limited attention hypothesis’, when fund size increases, while the size of management team does not increase at the same scale, due to the limited attention, VCs’ attention allocated to each of their portfolio companies will be diluted (Keuschnigg and Nielsen, 2008). Cumming’s (2008) results provide evidence in support of the ‘limited attention hypothesis’ by revealing a strong positive relation between fund size and pre-money valuations.

4.2.2 *GDP growth*

We use this variable to control for differences in the macroeconomic conditions of the countries under study. Previous studies have found GDP growth to be positively correlated with the degree of VC activity (Bonini and Alkan, 2012; Gompers and Lerner, 1998; Romain and van Pottelsberghe de la Potterie, 2004) because, if an economy is growing, there may be more opportunities to start new firms, which will increase the demand for VC funds. To measure this variable, we use the real growth rate in GDP with respect to the previous year extracted from Eurostat.

4.2.3 *Market capitalisation (as % of GDP)*

We use this variable to control for differences in the stock market development across the four countries under study. Black and Gilson (1998) find a relationship between the degree of development of a country’s stock market and the overall volume of VC investments. This variable is defined as the ratio of market capitalisation of listed domestic companies of a particular country at the end of the year over the GDP of that country and year. This ratio is extracted from World Bank.

Table 7 reports the results from the ordered logistic regressions³. With regard to the impact of the legal system on the degree of use of prospective valuation methods (i.e., DCF and discounted earnings), Table 7 shows differences between legal systems in the use of the DCF method, as German VCs are less likely to use the DCF method than UK VCs, although at a 10% significance level (coef. = -2.261 ; p-value = 0.059). However, there are no significant differences in the use of the DCF method between French-based legal systems and English-based ones. On the other hand, for the

discounted earnings method, we find that it is less likely to be used in French-based legal systems than in English-based legal systems (coef. = -4.753 ; p-value = 0.046). However, there are no significant differences in the use of the discounted earnings method between German and UK VCs. Overall, these results do provide mixed evidence in support of H_1 .

Table 7 Degree of use of valuation methods as a function of VCs' characteristics, legal systems and macroeconomic variables

<i>Independent variables</i>	<i>Regression coefficients</i>	<i>Wald</i>	<i>p-value</i>
<i>Panel A: discounted cash flow method</i>			
EXPER	0.723	2.670	0.102
STAGE	-2.614	17.156	0.000
VOLUME	2.241	9.178	0.002
SOURCE	1.166	4.635	0.031
GERMAN_LEGAL_SYS	-2.261	3.571	0.059
FRENCH_LEGAL_SYS	1.047	1.962	0.161
GDP_GROWTH	0.301	0.539	0.463
MKTCAP_%GDP	-0.018	1.962	0.161
<i>Model fit</i>			
2 Log likelihood = 148.138 (chi-square = 34.437)			0.000
Cox and Snell $R^2 = 0.340$			
Nagelkerke $R^2 = 0.358$; McFadden $R^2 = 0.140$			

Notes: This table reports ordinal logistic regressions in order to test the impact of the legal system and other variables related to VCs characteristics and macroeconomic variables on the degree of use of valuation methods. The dependent variable (*VAL_MODEL_USE*) takes five possible values in an ordinal Likert-based scale (ranging from 1 'not used' to 5 'most used'). The general form of the model is as follows:

$$VAL_MODEL_USE_i = f(GERMAN_LEGAL_SYS, FRENCH_LEGAL_SYS, EXPER, SOURCE, VOLUME, STAGE, GDP_GROWTH, MKTCAP_%GDP)$$

These ordinal logistic regressions are estimated separately for each of the five valuation methods considered (*VAL_MODEL_USE_i* where $i =$ DCF, discounted earnings, adjusted net book value, multiples and liquidation value methods).

LEGAL SYSTEM: English-based legal system is the base system.

GERMAN_LEGAL_SYS = 1 for German-based legal system and 0 otherwise;

FRENCH_LEGAL_SYS = 1 for French-based legal systems and 0 otherwise.

EXPER: experience of the VC firm.

STAGE: 1 = where VC firm invests predominantly in late stages and 0 otherwise.

VOLUME: volume of funds under management by the VC company.

SOURCE: 1 where VC firm is mainly privately-owned and 0 otherwise.

GDP_GROWTH: real GDP growth (in %) with respect to the previous year (source: Eurostat).

MKTCAP_%GDP: ratio of market capitalisation of domestic listed companies of a particular country over the gross domestic product of that country (source: World Bank).

Table 7 Degree of use of valuation methods as a function of VCs' characteristics, legal systems and macroeconomic variables (continued)

<i>Independent variables</i>	<i>Regression coefficients</i>	<i>Wald</i>	<i>p-value</i>
<i>Panel B: discounted earnings</i>			
EXPER	-1.517	7.306	0.007
STAGE	-0.882	2.049	0.152
VOLUME	0.289	0.156	0.693
SOURCE	-1.499	5.522	0.019
GERMAN_LEGAL_SYS	-0.882	1.955	0.162
FRENCH_LEGAL_SYS	-4.753	3.997	0.046
GDP_GROWTH	-1.271	1.457	0.227
MKTCAP_%GDP	0.052	7.710	0.005
<i>Model fit</i>			
2 Log likelihood = 102.27 (chi-square = 24.261)			0.001
Cox and Snell R ² = 0.270			
Nagelkerke R ² = 0.305; McFadden R ² = 0.144			

Notes: This table reports ordinal logistic regressions in order to test the impact of the legal system and other variables related to VCs characteristics and macroeconomic variables on the degree of use of valuation methods. The dependent variable (*VAL_MODEL_USE*) takes five possible values in an ordinal Likert-based scale (ranging from 1 'not used' to 5 'most used'). The general form of the model is as follows:

$$VAL_MODEL_USE_i = f(GERMAN_LEGAL_SYS, FRENCH_LEGAL_SYS, EXPER, SOURCE, VOLUME, STAGE, GDP_GROWTH, MKTCAP_%GDP)$$

These ordinal logistic regressions are estimated separately for each of the five valuation methods considered (*VAL_MODEL_USE_i* where *i* = DCF, discounted earnings, adjusted net book value, multiples and liquidation value methods).

LEGAL SYSTEM: English-based legal system is the base system.

GERMAN_LEGAL_SYS = 1 for German-based legal system and 0 otherwise;

FRENCH_LEGAL_SYS = 1 for French-based legal systems and 0 otherwise.

EXPER: experience of the VC firm.

STAGE: 1 = where VC firm invests predominantly in late stages and 0 otherwise.

VOLUME: volume of funds under management by the VC company.

SOURCE: 1 where VC firm is mainly privately-owned and 0 otherwise.

GDP_GROWTH: real GDP growth (in %) with respect to the previous year (source: Eurostat).

MKTCAP_%GDP: ratio of market capitalisation of domestic listed companies of a particular country over the gross domestic product of that country (source: World Bank).

Table 7 Degree of use of valuation methods as a function of VCs' characteristics, legal systems and macroeconomic variables (continued)

<i>Independent variables</i>	<i>Regression coefficients</i>	<i>Wald</i>	<i>p-value</i>
<i>Panel C: adjusted net book value</i>			
EXPER	-1.242	5.618	0.018
STAGE	0.741	1.071	0.301
VOLUME	20.380	0.835	0.359
SOURCE	1.714	5.643	0.018
GERMAN_LEGAL_SYS	-2.145	6.447	0.011
FRENCH_LEGAL_SYS	0.914	1.205	0.272
GDP_GROWTH	0.883	3.486	0.062
MKTCAP_%GDP	-0.016	1.205	0.272
<i>Model fit</i>			
2 Log likelihood = 99.406 (chi-square = 34.503)			0.000
Cox and Snell R ² = 0.389			
Nagelkerke R ² = 0.424; McFadden R ² = 0.197			

Notes: This table reports ordinal logistic regressions in order to test the impact of the legal system and other variables related to VCs characteristics and macroeconomic variables on the degree of use of valuation methods. The dependent variable (*VAL_MODEL_USE*) takes five possible values in an ordinal Likert-based scale (ranging from 1 'not used' to 5 'most used'). The general form of the model is as follows:

$$VAL_MODEL_USE_i = f(GERMAN_LEGAL_SYS, FRENCH_LEGAL_SYS, EXPER, SOURCE, VOLUME, STAGE, GDP_GROWTH, MKTCAP_%GDP)$$

These ordinal logistic regressions are estimated separately for each of the five valuation methods considered (*VAL_MODEL_USE_i* where *i* = DCF, discounted earnings, adjusted net book value, multiples and liquidation value methods).

LEGAL SYSTEM: English-based legal system is the base system.

GERMAN_LEGAL_SYS = 1 for German-based legal system and 0 otherwise;

FRENCH_LEGAL_SYS = 1 for French-based legal systems and 0 otherwise.

EXPER: experience of the VC firm.

STAGE: 1 = where VC firm invests predominantly in late stages and 0 otherwise.

VOLUME: volume of funds under management by the VC company.

SOURCE: 1 where VC firm is mainly privately-owned and 0 otherwise.

GDP_GROWTH: real GDP growth (in %) with respect to the previous year (source: Eurostat).

MKTCAP_%GDP: ratio of market capitalisation of domestic listed companies of a particular country over the gross domestic product of that country (source: World Bank).

Table 7 Degree of use of valuation methods as a function of VCs' characteristics, legal systems and macroeconomic variables (continued)

<i>Independent variables</i>	<i>Regression coefficients</i>	<i>Wald</i>	<i>p-value</i>
<i>Panel D: liquidation value</i>			
EXPER	-1.632	6.047	0.014
STAGE	-1.207	3.103	0.078
VOLUME	0.242	0.056	0.812
SOURCE	0.319	0.194	0.660
GERMAN_LEGAL_SYS	-1.206	2.376	0.123
FRENCH_LEGAL_SYS	0.602	0.363	0.547
GDP_GROWTH	0.013	2.376	0.123
MKTCAP_%GDP	0.077	0.041	0.840
<i>Model fit</i>			
2 Log likelihood = 85,493 (chi-square = 10,093)			0.183
Cox and Snell R ² = 0,126			
Nagelkerke R ² = 0.153; McFadden R ² = 0.078			

Notes: This table reports ordinal logistic regressions in order to test the impact of the legal system and other variables related to VCs characteristics and macroeconomic variables on the degree of use of valuation methods. The dependent variable (*VAL_MODEL_USE*) takes five possible values in an ordinal Likert-based scale (ranging from 1 'not used' to 5 'most used'). The general form of the model is as follows:

$$VAL_MODEL_USE_i = f(GERMAN_LEGAL_SYS, FRENCH_LEGAL_SYS, EXPER, SOURCE, VOLUME, STAGE, GDP_GROWTH, MKTCAP_%GDP)$$

These ordinal logistic regressions are estimated separately for each of the five valuation methods considered (*VAL_MODEL_USE_i* where *i* = DCF, discounted earnings, adjusted net book value, multiples and liquidation value methods).

LEGAL SYSTEM: English-based legal system is the base system.

GERMAN_LEGAL_SYS = 1 for German-based legal system and 0 otherwise;

FRENCH_LEGAL_SYS = 1 for French-based legal systems and 0 otherwise.

EXPER: experience of the VC firm.

STAGE: 1 = where VC firm invests predominantly in late stages and 0 otherwise.

VOLUME: volume of funds under management by the VC company.

SOURCE: 1 where VC firm is mainly privately-owned and 0 otherwise.

GDP_GROWTH: real GDP growth (in %) with respect to the previous year (source: Eurostat).

MKTCAP_%GDP: ratio of market capitalisation of domestic listed companies of a particular country over the gross domestic product of that country (source: World Bank).

Table 7 Degree of use of valuation methods as a function of VCs' characteristics, legal systems and macroeconomic variables (continued)

<i>Independent variables</i>	<i>Regression coefficients</i>	<i>Wald</i>	<i>p-value</i>
<i>Panel E: multiples methods</i>			
EXPER	0.101	0.055	0.814
STAGE	1.228	4.095	0.043
VOLUME	-0.634	0.785	0.376
SOURCE	0.589	1.395	0.238
GERMAN_LEGAL_SYS	-1.511	5.223	0.022
FRENCH_LEGAL_SYS	-1.248	2.730	0.098
GDP_GROWTH	-0.336	1.677	0.195
MKTCAP_%GDP	0.016	5.223	0.022
<i>Model fit</i>			
2 Log likelihood = 151.25 (chi-square = 14.854)			0.038
Cox and Snell R ² = 0.155			
Nagelkerke R ² = 0.167; McFadden R ² = 0.064			

Notes: This table reports ordinal logistic regressions in order to test the impact of the legal system and other variables related to VCs characteristics and macroeconomic variables on the degree of use of valuation methods. The dependent variable (*VAL_MODEL_USE*) takes five possible values in an ordinal Likert-based scale (ranging from 1 'not used' to 5 'most used'). The general form of the model is as follows:

$$VAL_MODEL_USE_i = f(GERMAN_LEGAL_SYS, FRENCH_LEGAL_SYS, EXPER, SOURCE, VOLUME, STAGE, GDP_GROWTH, MKTCAP_%GDP)$$

These ordinal logistic regressions are estimated separately for each of the five valuation methods considered (*VAL_MODEL_USE_i* where *i* = DCF, discounted earnings, adjusted net book value, multiples and liquidation value methods).

LEGAL SYSTEM: English-based legal system is the base system.

GERMAN_LEGAL_SYS = 1 for German-based legal system and 0 otherwise;

FRENCH_LEGAL_SYS = 1 for French-based legal systems and 0 otherwise.

EXPER: experience of the VC firm.

STAGE: 1 = where VC firm invests predominantly in late stages and 0 otherwise.

VOLUME: volume of funds under management by the VC company.

SOURCE: 1 where VC firm is mainly privately-owned and 0 otherwise.

GDP_GROWTH: real GDP growth (in %) with respect to the previous year (source: Eurostat).

MKTCAP_%GDP: ratio of market capitalisation of domestic listed companies of a particular country over the gross domestic product of that country (source: World Bank).

In relation to comparators-based methods (i.e., multiples), our results show that these are likely to be significantly more used by VCs in countries with an English-based legal system than in countries with French-based (coef. = -1.248 ; p-value = 0.098) and German-based legal systems (coef. = -1.511 ; p-value = 0.022), thereby supporting H_2 . This is justified because the more developed UK stock market ensures the existence of a sufficient number of comparable listed companies to apply the multiples methodology in a more reliable way.

Regarding the use of adjusted net book value, we find that German VCs are significantly less likely to use this method as compared to UK VCs (coef. = -2.145 ; p-value = 0.011). However, no significant differences are found between French-based legal systems and English-based ones. As for the liquidation value, our results find no significant differences in the degree of use of this method based on the legal systems. Hence, our results do not provide evidence in support of H_3 and H_4 .

The rest of hypotheses to be tested deal with the impact of specific characteristics of VCs on the use of valuation methods. With respect to the preferred investment stage, as predicted in H_5 , we find that the DCF method is significantly more used in VCs that invest preferably in early-stages (coef. = -2.614 ; p-value = 0.000). This is consistent with the results obtained by Barrow et al. (2001) for a sample of 140 VCs in Great Britain, France, the USA and Canada. Similar result is found for the liquidation value method (coef. = -1.207 ; p-value = 0.078), although only at a 10% significance level. For the adjusted net book value, no significant differences were found. On the other hand, as predicted in H_6 , VCs investing in late-stages make a higher significant use of multiples methods. This is because early stage investments are often highly innovative companies, with little track record, lower levels of current earnings and cash flows but with high growth expectations. Moreover, in early stage companies, there is no usually much information available to compare with and, as a result, DCF techniques are more preferred than multiples.

As regards the impact of experience, we find, as predicted in H_8 , that it is negatively related to the degree of use of the liquidation value (coef. = -1.632 ; p-value = 0.014) and adjusted net book value (coef. = -1.242 ; p-value = 0.018). However, we do not find significant differences in the use of the DCF method based on experience (H_7).

Finally, concerning the influence of the main source of funds of the VC company (private vs. public), our results show that private VCs make greater use of the DCF (coef. = 1.166 ; p-value = 0.031) and the adjusted net book value (coef. = 1.714 ; p-value = 0.018) than public ones. On the contrary, private VCs make lower use of the discounted earnings method (coef. = -1.499 ; p-value = 0.019). Therefore, although for the rest of methods no significant differences were found, these results lead us to conclude that the main source of funds of the VC company (private vs. public) do influence the choice of the valuation method, thereby supporting H_9 .

5 Conclusions

The goal of this paper is to analyse the investment valuation decisions by European VCs with particular reference to the variables used in applying the DCF method. Our empirical study includes the four European countries (UK, France, Germany, Italy and Spain) with a higher GDP and VC activity in terms of both funds raised and invested (EVCA, 2006). Furthermore, these countries differ in their legal, institutional, cultural

and corporate governance systems (La Porta et al., 1998), which potentially leads to differences in the conduct of VCs across markets.

Based on a questionnaire sent to VCs from these four European countries, we find that, when selecting an investment project, the qualification and experience of the management team is the most important factor considered, followed by the investee's business plan and growth potential and ROI. Multiples based on comparable firms and the DCF models are the most popular valuation methods among European VCs. Our paper also provides first evidence that some differences across countries still remain in the way VCs operationalise the key subjective variables in the DCF method, such as the discount rate, the risk premium and the terminal value.

We further provide evidence on the impact of the legal system and several characteristics of VCs (experience, preferred investment stage, and main source of funds) on the investment valuation methods used. After controlling for differences in GDP growth and stock market development (proxied by market capitalisation as a percentage of GDP) across countries, we find that both legal systems and characteristics of VCs do influence in the valuation methods used.

Specifically, we find that German VCs are less likely to use the DCF method than UK VCs. On the other hand, for the discounted earnings method, we find that it is less likely to be used in French-based legal systems than in English-based legal systems. We also document that comparators-based methods (i.e., multiples) are likely to be significantly more used by VCs in countries with an English-based legal system than in countries with French-based and German-based legal systems. This is justified because the more developed UK stock market ensures the existence of a sufficient number of comparable listed companies to apply the multiples methodology in a more reliable way. Regarding the use of the adjusted net book value, we find that German-based legal systems are significantly less likely to use these methods as compared to English-based legal systems. For the liquidation value, our results find no significant differences in the degree of use of this methods based on the legal systems.

As for the impact of specific characteristics of VCs on the use of valuation methods, we find that the VC's experience is negatively related to the degree of use of the liquidation and adjusted net book value methods. Concerning the influence of the main source of funds of the VC company (private vs. public), our results show that private VCs make greater use of the DCF and the adjusted net book value than public ones. On the contrary, private VCs make lower use of the discounted earnings method. Finally, with respect to the preferred investment stage, we find that the DCF method is significantly more used in VCs that invest preferably in early-stages. On the other hand, VCs investing in late-stages make a higher significant use of multiples methods. This is because early stage investments are often highly innovative companies, with little track record, lower levels of current earnings and cash flows but with high growth expectations. Moreover, in early stage companies, there is no usually much information available to compare with and, as a result, DCF techniques are more preferred than multiples.

The results of this study have important implications. First, in the current situation of financial constraints due to the problems faced by the banking sector in some European countries, VC funding is a particularly interesting alternative to bank financing for SMEs firms and entrepreneurs with innovative projects as the highest risk associated with these projects implies a greater difficulty in raising funds through the traditional forms of financing. Previous evidence has documented that VC has been traditionally characterised by its support and contribution to the development of new business projects

and start-ups, promoting the development of some of the leading technology companies worldwide. Moreover, previous literature has also shown that VC also stimulates innovation, job creation, and economic growth. In this context, understanding VC investment decision-making process can be particularly relevant for entrepreneurs who submit innovative proposals to VCs in order to improve the likelihood of being successful in raising funds. This is particularly true for SMEs that are in early stages of development where information asymmetry problems are greater and financial constraints more acute and persistent.

Second, the EU is seeking to unify the VC market in order to provide innovative small businesses with easier access to financing. To achieve this, the recent *Regulation 345/2013 of the European Parliament and of the Council on European venture capital funds* is aimed at facilitating the cross-border fundraising and investments by VC funds so that funds established in any member state can invest freely throughout the EU. In this context, our research evidences that the different degree of use of valuation methods across European countries may be explained by differences in institutional characteristics related to the development of stock markets, the underlying legal regime (i.e., English vs. German vs. French-based legal traditions) or the economic growth, which may pose some further problems to the creation of a single European VC market.

The main limitation of our study is the small response rate, which is quite common in the studies focused on VC using hand-collected data, thereby potentially limiting the generalisability of our results. As mentioned before, this response rate is rather similar to that of many other studies on VC (Bottazzi et al., 2009; Brau and Fawcett, 2006; Cumming, 2006; Kaplan and Strömberg, 2003; Kaplan et al., 2007; Schwienbacher, 2008) and is indeed larger than for comparable surveys of industrial firms (Graham and Harvey, 2001, 2013).

Future extensions of this work could explore the impact of additional explanatory variables that could potentially help to shed more light on the underlying mechanisms behind why VCs use different evaluation criteria, such as the background of the partners working at the VC firm (i.e., background in finance, entrepreneurship and/or industry), previous syndication deals with reputable silicon valley VCs, and other aspects such as VC partners' gender and age as well as the degree of internationalisation of the VCs related to their proportion of cross-border investments.

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Notes

- 1 A much more developed line of research beyond the scope of this study deals with the factors taken into consideration by VCs when they evaluate venture proposals (Fried and Hisrich, 1994; Hill and Power, 2001; MacMillan et al., 1985; Mason and Stark, 2004; Tyebjee and Bruno, 1984).
- 2 The typical response rate for such surveys is about 9% (Graham and Harvey, 2001). According to Graham and Harvey (2013), a response rate in the range 15%–20% is a good response rate. They find usual response rates in the range 5%–8% for these types of surveys and provide several reasons why we do not have to be overly concerned about the potential non-response bias and its effect on the results.
- 3 The same logistic analysis has been performed with the qualitative characteristics reported on Table 2. Specifically, we have also examined the impact of the legal system and the variables related to both VCs characteristics and macroeconomic variables on the degree of importance attached to those qualitative characteristics. Due to length restrictions, results are not reported but are available from the authors upon request.