

Determinants of the exit value in European venture capital-backed technology startups

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62

Abstract

Purpose – This study aims to analyze the impact of different exit alternatives, investor presence and founders' human capital on the exit value of European venture capital (VC)-backed high technology startups.

Design/methodology/approach – The empirical analysis is based on a sample of 107 European firms that obtained an exit through Merger&Acquisition (M&A) or an initial public offering (IPO) between 2010 and 2017, backed by VC investors.

Findings – This study provides empirical evidence on how different exit alternatives, investor heterogeneity and founders' human capital may affect the exit value of European VC-backed startups. Exiting through an IPO and retaining a larger equity stake are positively correlated with the exit value. The presence of business angels and non-governmental VC firms is associated with larger valuations. Founders' previous education was positively correlated with the exit value.

Originality/value – Exit strategies in technology startups are essential to capitalize investors' efforts and reinvest cash into new ventures, supporting the development of entrepreneurial ecosystems and countries' competitiveness. The results of this study provide interesting hints for policymakers and contribute to an in-depth understanding of the drivers of exit valuation for startups.

Keywords Exit, Entrepreneurial ecosystem, Startup, IPO, M&A

Paper type Research paper

1. Introduction

This study explores how the valuation obtained by venture capital (VC)-backed technology companies at the exit is correlated with specific factors such as exit strategic decisions, investor heterogeneity and founders' human capital. The exit phase is considered a relevant example of the concept of “entrepreneurial re-cycling,” which arguably has a profound impact on countries' competitiveness (Boeker and Wiltbank, 2005; Mason and Harrison, 2006; Wennberg *et al.*, 2010; Cavallo *et al.*, 2019a). Exits generate resources and cash that can be reinvested in new activities, triggering a “catalysis” for future self-perpetuating entrepreneurial development (Roundy *et al.*, 2018).

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The literature investigated the motivations that bring founders to plan an exit (van Praag, 2003) together with determinants affecting exit strategic choice (Cumming, 2008) and exit value (Bayar and Chemmanur, 2011). The first determinant handles founders' strategic decisions regarding choice of exit path (Bayar and Chemmanur, 2012) and ownership retention (McConnell Servaes and Lins, 2008). These decisions are often driven by entrepreneurs' social motivations, directly influencing entrepreneurs' desire for financial rewards and/or their propensity for autonomy. At the exit, entrepreneurs can either decide to leave the company through full exit, sell all their shares or remain with a smaller portion of stakes and lower control power, realizing a partial exit [1]. The determinant considers the presence, in a company's ownership, of external equity investors such as business angels (BAs) and VC investors, possibly affecting business innovation and internal efficiency (Politis, 2008; Drover *et al.*, 2017). The third determinant explores the effects of founders' human capital characteristics (e.g. gender, education and experience; Wennberg *et al.*, 2010; DeTienne and Cardon, 2012). To date, these topics have been considered only using a disjoint approach, but a more comprehensive overview is still lacking. This study provides two main contributions to the literature:

- (1) It aggregates in a single research the three determinants' clusters, according to DeTienne *et al.* (2015).
- (2) It provides insights into the determinants of a topic that is relatively less analyzed than the drivers of exit strategies.

The study is based on 107 European VC-backed high-tech startups that obtained an exit through Merger&Acquisition (M&A) or initial public offerings (IPOs) between 2010 and 2017.

The findings of our empirical analysis show that, regarding founders' strategic decisions, the IPO choice and the percentage of ownership retained at the exit are associated with a larger exit value. Meanwhile, the support of private VC investors and BAs is positively correlated with the exit valuation; the founders' educational background is relevant and positively correlated.

Our analysis is relevant owing to three main reasons. First, it casts light on startups' financial valuation at the exit, a topic that is relevant for practitioners. Founders' concerns about the issue are expressed in popular press, newspapers and blogs (Wennberg and DeTienne, 2014; DeTienne *et al.*, 2015), such as [tech.eu](#) or [techcrunch.com](#) (Pisoni and Onetti, 2018). Second, our results can provide important hints for policy-makers, considering their interest in securing new resources to support the development of entrepreneurial ecosystems. Finally, it adds to the existing literature by integrating contributions from additional literature streams concerning different and sometimes heterogeneous, explanatory factors.

The remainder of this paper is organized as follows. Section 2 presents the theoretical background and hypotheses. Section 3 presents the study's methodology. Section 4 summarizes the econometric analysis of the relation between the exit value and explanatory factors. Finally, Sections 5 and 6 discuss the results and conclude the study, respectively.

2. Theoretical background and hypothesis development

Exit determinants have three main clusters in the literature: exit strategic decisions, investors' presence and founders' characteristics. These topics have often been studied independently, but their empirical relevance in determining exit valuation suggests considering them jointly (DeTienne *et al.*, 2015).

2.1 Exit strategic decisions

Entrepreneurs, before and during the exit phase, take specific strategic decisions driven by their utility function, which have an impact on exit performance. Specifically, these decisions are:

- the choice of the best exit path according to the level of financial reward expected by the founders after the deal and the future strategic objectives; and
- the definition of the degree of control that they want to maintain in the company after the exit (i.e. ownership retention).

Most existing literature on exit focuses on M&A and IPO deals. Generally, IPO valuation multiples are larger than acquisition ones (Kim and Ritter, 1999; Poulsen and Stegemoller, 2008) because, on average, founders of private firms receive an acquisition payoff equal to only 78% of a comparable IPO. VC funds have historically achieved larger returns through IPOs (Ball *et al.*, 2011). The “valuation premium” associated to IPOs is due either to the “windows of opportunity” available when the stock market is bullish (Lerner, 1994) or to higher bargaining power and consequently larger extractions of value from insiders (Bayar and Chemmanur, 2011).

Drawing on social identity theory, we argue that, among the basic social motivations of individual entrepreneurs, a dominant role is played by financial rewards and gains (“make money and build their own financial wealth”) that can be obtained through the exit (Fauchart and Gruber, 2011). This objective is enhanced by the presence of investors who have the deliberate goal of delivering higher returns (e.g. VC funds; Lin and Smith, 1997). Therefore, entrepreneurs opt for an IPO if they offer a larger valuation than other exit strategies. Following the path paved by all these authors who supported the existence of an IPO valuation premium, the following hypothesis can be advanced:

H1. Exit value is positively correlated with the choice to pursue an exit through an IPO.

Another important element worth considering when assessing exit characteristics is the percentage of shares sold by insiders at the exit. This element determines whether the exit is partial or full. Evidence of a positive correlation exists between the level of ownership retention, follow-up firm performance (McConnell and Servaes, 1995) and exit value (McConnell Servaes and Lins, 2008). Scholars consider insider ownership retention as a quality signal that consequently impacts a firm’s market value (Gompers and Lerner, 1999). Therefore, based on signaling theory, entrepreneurs’ desire to retain shares is proof of the project quality because founders have more information about their projects than external investors (Connelly *et al.*, 2011). Consequently, founders’ financial commitment is evidence of their optimism (Busenitz *et al.*, 2005), having a potential increase in exit value. Thus, they find it less expensive to maintain an ownership interest in a high-quality than in a low-quality firm (Leland and Pyle, 1977). Therefore, an insider may choose to retain higher ownership to sell the remaining shares at a value closer to the firm’s true worth. Therefore, the following hypothesis can be advanced:

H2. Exit value is negatively correlated with a higher percentage of shares sold at the exit.

2.2 Investor presence

During its life cycle, a firm can communicate with different types of investors, such as BAs and VCs, which provide two types of support, namely, cash and managerial effort (Baum and Silverman, 2004), speeding up the time-to-market and enhancing startup performance (Colombo and Grilli, 2010). This type of investor is fundamental to spur innovation and develop a financial harvest exit strategy (Drover *et al.*, 2017).

Among equity investors, BAs play an important and specific role in startup companies (Wetzel, 1987) with a twofold impact. However, they generate certification effects and high-quality signals, making a firm’s value perceived by the market increase (Drover *et al.*, 2017). BAs’ strong industry knowledge and experience provide guidance to foster venture

development (Politis, 2008), promote innovation and create collaborations with entrepreneurs, which are important in determining ventures' growth and consequently, a potential future successful exit (Burchardt *et al.*, 2016).

However, financial resources provided by BAs are generally limited (Cavallo *et al.*, 2019b). When new ventures validate their business model, they exhibit relevant growth metrics and find large rounds of investments approaching formal investors (Hellmann and Thiele, 2015). In particular, VC funds [2] can invest larger amounts compared to angels based on a more structured deal screening process (Hellmann and Thiele, 2015). The theoretical grounding of external investors signaling firms' quality, reducing the issues of information asymmetries and moral hazard and fostering new ventures' growth until a potential success, applies to BAs and VC funds (Elitzur and Gavius, 2003; Hellmann and Puri, 2002). This is especially true considering the recent professionalization and formalization phenomena of the BA market, leading angels to act and especially impact similar to VC funds (Carpentier and Suret, 2015; Drover *et al.*, 2017; Cavallo *et al.*, 2019b). Specifically, VC funds are managed by investment organizations with high incentives to exit in a relatively short time frame (Berglof, 1994), typically not over 10 years. Thus, they are prone to pursue a successful exit to enjoy higher returns (Dutta and Folta, 2016). Regarding the arguments regarding the role of external investors (BAs and VC funds), the following hypothesis can be proposed:

- H3.* Exit value is positively correlated with the number and types of external equity investors (BAs and VC funds) during a start-up lifecycle.

2.3 Human capital: founders' characteristics

Founders' characteristics are important factors influencing startup success as these actors are the top decision-makers and the reference point of an organization (Colombo and Grilli, 2005). Thus, they must be highly experienced to avoid inefficiencies in venture management (Stinchcombe, 1965).

Important factors that prepare entrepreneurs to perform properly during their entrepreneurial journey are education, work experience and learning by doing; elements that are more effective are inherent to the industry where entrepreneurs operate (Argote and Miron-Spektor, 2011; Sevilir, 2010). Past experience helps the founder muddle through different startup phases and cope with environmental changes, determining entrepreneurial success. The two fundamental elements of experience are:

- (1) Education, helping develop the know-how necessary to run a business and identify potential entrepreneurial opportunities owing to broader knowledge base (DeTienne and Cardon, 2012).
- (2) Working experience, for the creation of a network of contacts (Hellmann and Puri, 2002; Sevilir, 2010) and the possibility of learning from previous mistakes and replicating the best practices observed.

Further, experienced entrepreneurs are more likely to create growth potential, set more ambitious goals and obtain larger payouts in the exit phase (DeTienne and Cardon, 2012).

Experience and education can be related to IPOs or acquisition intentions (DeTienne and Cardon, 2012). Human capital characteristics are considered vital in creating and exploiting entrepreneurial opportunities (Alvarez and Barney, 2007; Bruns *et al.*, 2008). Therefore, based on human capital theory, we conceptualize founder characteristics of work experience and education as human capital assets to accumulate capabilities that can be transferred to

entrepreneurial tasks (Aldrich and Yang, 2014) and to finally predict entrepreneurial outcomes forms (e.g. new firm creation and other entrepreneurial success measures (Marvel *et al.*, 2016), including exit value). Thus, the following hypothesis was introduced:

- H4. Exit value is positively correlated with the characteristics of the founder: education and cumulative working experience during startup founding.

2.4 Human capital: diversity in the founding team

Recently, debate on human capital relevance in entrepreneurship has been enriched with the diversity construct of the founding team. Scholars suggest that diversity can improve a firm's performance because it enhances team creativity, knowledge and decision-making processes (Carter *et al.*, 2010). In this study, diversity was considered inside the entrepreneurial team in terms of gender balance.

The impact of gender diversity in top-level positions on firm performance is debatable. Many scholars have found a positive relationship between hiring more women in the management team to achieve gender equality (DeTienne *et al.*, 2015) and the following evidence:

- Improvement of problem-solving ability and competitive advantage creation owing to a better understanding of marketplace and customer needs.
- Enhancement of a company's image and stock appreciation as the company demonstrates respect for an important social responsibility rule such as gender equality.
- Improvement of teams' dynamics as women are characterized by higher inclination to ask questions and sensitivity toward others.

Therefore, many countries have introduced regulations to incentivize women's presence in entrepreneurship, which is traditionally limited. Given the crucial role of diversity, the following hypotheses were developed:

- H5. Exit value is positively correlated with women's presence in the founding team.

3. Research design

The unit of analysis examined in this study refers to the single exit deal implemented by European startups between 2010 and 2017. A list of high-tech VC-backed startups was extracted from VICO 4.0, a proprietary database containing information on firms located in 27 European countries and Israel. VICO 4.0, provides detailed information on each external equity investment, referring to the type and the number of investors involved in a deal. It has been built to match secondary information sources, such as Zephyr, Crunchbase and Thomson One. Its accounting information of firms collected from Orbis has been enriched. Figures about the exit valuation and the percentage of shares sold at each deal were detailed in Zephyr. In this study, we focused on investment exit. In the case of follow-up rounds, we considered only the first deal for each firm in chronological order. We defined high technology companies according to the Eurostat NACE Rev. 2 code classification. In particular, high-technology manufacturing industries comprise NACE Rev. 2 codes 21 (manufacture of basic pharmaceutical products and pharmaceutical preparations), 26 (manufacture of computer, electronic and optical products) and 30.3 (manufacture of air and spacecraft and related machinery, NACE Rev. 2 code 30.3). Meanwhile, high-technology

knowledge-intensive services include NACE Rev. 2 codes 59 (motion picture, video and television program production, sound recording and music publishing activities), 60 (programming and broadcasting activities), 61 (telecommunications), 62 (computer programming, consultancy and related activities), 63 (information service activities) and 72 (scientific research and development). [Table 1](#) summarizes the final sample with 107 exits (69 (64.5%) IPOs and 38 (35.5%) M&As. [Table 2](#) presents some country-level statistics.

We collected information about the founders of every company inside the sample. According to [Nelson \(2003\)](#), the following criteria have been used in their identification:

- Either being declared “founder” in reliable sources (press news, research reports or a related firm’s official website).
- Being the owner of the company as reported on Crunchbase (section dedicated to the management team).

Data regarding education, working experience and gender were added using LinkedIn as the main source, integrated where applicable with information from CVs found online and founders’ profile in the companies’ websites.

Year	No. of exits	(%)	IPOs	M&A
2010	9	8.41	5	4
2011	7	6.54	5	2
2012	10	9.45	5	5
2013	15	14.02	10	5
2014	30	28.04	18	12
2015	22	20.56	13	9
2016	6	5.61	5	1
2017	8	7.48	8	–
Total	107	100	69 (64.5%)	38 (35.5%)

Table 1.
Composition of the
sample by year and
exit type

Country	Deals	IPO	M&A	Average exit valuation (€ million)	Average deal stake (%)	Average firm age
Austria	1	1	–	419	35.83	9.0
Belgium	4	2	2	239	37.64	7.3
Denmark	7	4	3	1,020	63.20	11.1
Finland	3	–	3	12	23.23	7.7
France	44	38	6	1,488	52.35	8.4
Germany	8	3	5	5,471	33.89	9.8
Israel	5	5	–	967	57.69	12.0
The Netherlands	1	–	1	2,060	100	15.0
Poland	1	–	1	7	39.29	4.0
Spain	5	1	4	1,501	29.91	12.4
UK	20	8	12	738	54.22	10.5
Total	107	69	38	1,219	52.35	9.3

Table 2.
Sample: country-level
statistics. The exit
valuation is defined
alternatively as the
IPO share price times
the number of shares
outstanding before
the IPO or the total
equity valuation
obtained at the
acquisition (M&A).
The deal stake is
defined as the
percentage of the
equity capital sold at
the exit

Our dependent variable is exit valuation (Table 2). Following Finkle (1998) and Bayar and Chemmanur (2011), exit value has been computed in two ways. In the case of an IPO, it is obtained by multiplying the IPO price of the shares by the total number of shares outstanding before the IPO. In the case of acquisition, the total equity capital valuation related to the acquisition price is considered. In both cases, a transformation to logarithm was performed to adjust for skewness, obtaining the *Exit_value* variable. The mean value is €1.219bn and the median value is €225m. Table 2 also reports the average stake of the company's equity capital sold at the exit and age at the exit (52.35%). A set of independent variables was introduced to test the hypotheses. Table 3 describes all the variables used in the study.

Variable	Description	Expected correlation with <i>Exit_value</i>
<i>Exit decision:</i>		
IPO	Dummy variable equal to 1 if the exit occurs through an IPO; 0 otherwise (M&A)	+
Deal_stake	Natural log of the percentage equity capital sold at the exit	-
<i>Investors:</i>		
BA	Dummy variable equal to 1 if BAs previously invested in a startup	+
N_investors	Total number of pre-deal investors	+
N_privateVC	Number of different independent and corporate VCs that invested in a startup	+
N_GVC	Number of different governmental VCs that invested in a startup	
<i>Team:</i>		
Avg_years_study	Average number of years of academic education held by founders	+
Avg_years_work	Average number of years of working experience held by founders	+
Women	Dummy variable equal to 1 if there is a woman among founders	
<i>Control variables:</i>		
Assets	Log of total company assets (year before the exit)	
Net_profit	Total company earnings (year before the exit)	
Firm_age	Natural log of (1+company age)	
Manufacturing	Dummy variable equal to 1 if a startup is active in a manufacturing industry (Eurostat classification)	
France	Dummy equal to 1 if the firm is based in France	
Germany	Dummy equal to 1 if the firm is based in Germany	
Northern_Europe	Dummy equal to 1 if the firm is based in Denmark or Finland	
Southern_Europe		
UK	Dummy equal to 1 if the firm is based in Spain or Portugal	
Benelux		
Other_country	Dummy equal to 1 if the firm is based in the UK	
	Dummy equal to 1 if the firm is based in Belgium, the Netherlands or Luxembourg	
	Dummy equal to 1 if the firm is based in other countries	
<i>Instrument:</i>		
IPO_momentum	Number of IPOs registered in the sample countries in the three-year time slot around the firm foundation year	
<i>Heckman model:</i>		
Prob_Exit	Inverse Mills' ratio of the probability to be acquired estimated by implementing a Heckman selection model	

Table 3. Definition of the variables and expected correlations with the dependent variable (*exit_value*, namely, the natural log of the exit valuation)

To test *H1*, we introduced a dummy variable (*IPO*) equal to 1 in the case of exit through IPO and 0 in the case of M&A. To test *H2*, the ownership stake sold (*Deal_stake*) was measured as a percentage of the number of shares sold to acquirers or new shareholders and transformed to logarithm. This variable is correlated with ownership retention (Boeker and Wiltbank, 2005). To test *H3*, we introduce the total number of equity investors before the exit (*N_investors*); a dummy detecting BA presence among investors (*BA*) and the number of venture capitalists *N_privateVC* and *N_GVC*, respectively; the number of private (i.e. independent and corporate VCs) and governmental VCs (Drover et al., 2017). To test *H4a*, the founder's academic studies (*Avg_years_study*) were measured based on the number of years of academic education. When startups were created by a team of founders, this variable has been calculated as the average between the years of academic education held by each founder (Wennberg et al., 2010; DeTienne and Cardon, 2012; DeTienne et al., 2015). To test *H4b*, a variable measuring the years of working experience held by a founder until the moment the foundation of the startup is defined (*Avg_years_work*). When startups were created by a group of founders (instead of a single one), the variable was again defined as the average of the years of experience of each founder.

To verify *H5*, the presence of women was detected. A dummy variable (*Women*) equal to one if at least one woman is present among the founders has been modeled. Regarding the control variables, proxies of firm size, profitability and firm maturity have been introduced, as they model factors strictly related to firm value, reflecting growth opportunity (Wennberg et al., 2010), firm performance (Tian, 2012; Bayar and Chemmanur, 2012) and firm's attitude toward innovation (Wennberg et al., 2010; DeTienne and Cardon, 2012). The logarithm of total assets (*assets*) in the year before the exit was used as a proxy of firm size; *Net_profit* (the bottom-line earnings in the year before the exit) was introduced as an indicator of profitability and the logarithm of one plus the firm age (*Age*), computed as the difference between the exit and foundation years, was considered the maturity representative of the startup.

To control for the industries wherein the firms operate (manufacturing vs services), we adopted the criteria of the Eurostat indicators [3]: the dummy variable *Manufacturing* is equal to 1 if the firm belongs to a manufacturing industry and 0 otherwise. We classified the companies in geographical macro-areas identified on the basis of the density and development of the local VC market, in terms of the total number of VC deals. In particular, we introduced a set of dummy variables to identify companies operating in the *UK*, *France*, *Germany*, *NorthernEurope* (Denmark and Finland), *SouthernEurope* (Spain and Portugal), *Benelux* (comprehending firms operating in Belgium and The Netherlands) and other countries (*Other_country*).

Finally, we introduced the variable *Prob_Exit* as the inverse Mills' ratio estimated by implementing a Heckman selection model (Heckman, 1979) on the firms of our sample combined with a random sample of 107 entrepreneurial ventures that were neither acquired nor made public between 2010 and 2017, but were similar to the companies in our sample based on country dummies, industry dummies, age and size (for a similar methodology, see Colombo et al., 2019). We included this variable in our models to control for the probability of acquiring firms in our samples.

Table 4 introduces the basic statistics on the value of the selected variables, while the correlation matrix is reported in the Appendix.

The research hypotheses were tested using two multiple ordinary least squares regression models (equations 1 and 2) implemented through the Stata software. The decision to split the variables in distinct regressions depends on multicollinearity issues among some covariates.

Table 4.
Descriptive statistics

Variable	Obs.	Mean	SD	Min. value	Max. value
Exit_value	107	11.97	2.21	4.25	17.14
IPO	107	0.645	0.481	0	1
Deal_stake	107	-0.864	0.678	-2.624	0
BA	107	0.103	0.305	0	1
N_investors	107	7.112	8.794	1	52
N_privateVC	107	5.692	7.593	0	46
N_GVC	107	0.579	1.353	0	9
Avg_years_study	107	5.447	4.376	0	19
Avg_years_work	107	8.054	6.888	0	30
Women	107	0.047	0.212	0	1
Assets	107	9.431	1.857	4.676	15.501
Net_profit	107	-5,712.095	43,409.375	-208,276.19	358,313.5
Firm_age	107	2.102	0.532	0.693	3.258
Manufacturing	107	0.467	0.501	0	1
France	107	0.411	0.494	0	1
Germany	107	0.074	0.264	0	1
Northern_Europe	107	0.102	0.305	0	1
Southern_Europe	107	0.046	0.212	0	1
UK	107	0.186	0.391	0	1
Benelux	107	0.047	0.213	0	1
Other	107	0.130	0.338	0	1
IPO_momentum	107	1365.85	573.04	18	2190

$$\begin{aligned}
Exit_value_i = & \beta_0 + \beta_1 \cdot Assets_i + \beta_2 \cdot Net_profit_i + \beta_3 \cdot Age_i + \beta_4 \cdot IPO_i + \beta_5 \cdot BA_i \\
& + \beta_6 \cdot N_investors_i + \beta_7 \cdot Avg_years_study_i + \beta_8 \cdot Avg_years_work_i \\
& + \beta_9 \cdot Women_i + \beta_{10} \cdot France + \beta_{11} \cdot Germany + \beta_{12} \cdot Northern_Europe \\
& + \beta_{13} \cdot Other + \beta_{14} \cdot Southern_Europe + \beta_{15} \cdot UK_i + \beta_{16} \\
& \cdot Manufacturing_i
\end{aligned}
\tag{1}$$

$$\begin{aligned}
Exit_value_i = & \beta_0 + \beta_1 \cdot Assets_i + \beta_2 \cdot Net_profit_i + \beta_3 \cdot Age_i + \beta_4 \cdot Deal_stake_i + \beta_5 \\
& \cdot N_privateVC_i + \beta_6 \cdot N_GVC_i + \beta_7 \cdot Avg_years_study_i + \beta_8 \\
& \cdot Avg_years_work_i + \beta_9 \cdot Women_i + \beta_{10} \cdot \beta_{10} \cdot France + \beta_{11} \cdot Germany \\
& + \beta_{12} \cdot Northern_Europe + \beta_{13} \cdot Other + \beta_{14} \cdot Southern_Europe + \beta_{15} \cdot UK_i \\
& + \beta_{16} \cdot Manufacturing_i
\end{aligned}
\tag{2}$$

Adopting two different models, no problems related to multicollinearity are detected, as the value inflation factor is equal to 2.46 for both the models, much less than the cutoff value set to 5. Regarding homoskedasticity, the Koenker test (Koenker, 1981) was performed. Results indicate that the models are not heteroskedastic because *H0* (homoskedasticity) is accepted with a *p*-value of 0.3670 for the first regression and equal to 0.1649 for the second regression,

both higher than the cutoff set at 0.05. Multiple checks of normality of residuals were performed, starting with graphical methods (kernel normality graph and box plot) that suggest normality with a slight right skewness and kurtosis for both models. The quantitative Shapiro-Wilk test (Shapiro and Wilk, 1965) was used. Normality is accepted in both tests, with p -values equal to 0.05916 and 0.06678, respectively [4].

To address the endogeneity issue of the dummy *IPO* [5], we introduced *IPO_momentum* as an instrumental variable and used a two-stage least squares (2SLS) instrumental variable approach (Wooldridge, 2010). The instrument is computed as the number of IPOs registered in the sample countries in the three-year time slot around the foundation year of a firm. For all the observations included in our final sample, this variable measures the sentiment of the IPO market in the founding year of a firm and before and after the founding year. Evidence exists that entrepreneurs can plan an exit strategy when founding a startup or accepting VC investment (DeTienne, 2010). Starting from this assumption, we expect that, if the firm is founded when the IPO market is favorable, then the founders may stick to the idea of exiting through an IPO. This implies that, for this type of firm, the probability of exiting through an IPO in the future could be higher.

Second, to control for the selection bias associated with that variable, the firms that exited through an IPO were matched through the coarsened exact matching (CEM) algorithm (Iacus *et al.*, 2012) with comparable companies that exited through M&A, controlling for a set of pre-treatment variables including the size (in terms of total assets, choosing the median of the distribution as threshold) and the age of companies before the acquisition year (always using the median of the distribution as a threshold), geographical location and the industry of belonging (through the dummy variables described before), identified through the NACE Rev. 2 two-digit classification. After applying the CEM algorithm, we discarded six non-matched observations.

4. Empirical results

The regression results are presented in Table 5, including the coefficients, p -values and general statistics related to each model's fit.

Combining the results obtained from the OLS regressions, the relationship between *IPO* and *Exit_value* is positive and significant, validating *H1*. Moreover, the estimation reveals a positive and significant association of *BA* with the exit value, even if the same cannot be said for *N_investors* because of insufficient significance. Therefore, *H3* was verified in terms of BAs. Regarding human capital, *H4a* is confirmed. Nevertheless, conclusions concerning the correlation between *Avg_years_work* and the exit value cannot be drawn because its coefficient is not significant. Therefore, *H4b* could not be confirmed or rejected. Furthermore, the first model does not reveal a significant association between the *Women* variable and the dependent variable. Hence, *H5* could not be confirmed also.

In the analysis of the second alternative model, the relationship between *Deal_stake* and *Exit_value* is negative and significant. Therefore, *H2* was confirmed. The coefficient related to the variable *N_privateVC* is positively and significantly correlated with the exit value, while the same cannot be said for *N_GVC*. Consequently, according to this model, *H3* is verified, but not for government-affiliated investors. *H4a* is confirmed again because the coefficient of the variable *Avg_years_study* is positively and significantly correlated with the output variable. The variable *Avg_years_work* exhibits a negative but slightly significant coefficient, in line with the results of the previous regression. Similarly, *H5* cannot be fully confirmed as *Women* positively but weakly correlated with the dependent variable.

Firm size does not always show a positive and significant correlation with the exit value, consistent with previous studies (Davila *et al.*, 2003; Wennberg *et al.*, 2010; Boeker and

Wiltbank, 2005; Bayar and Chemmanur, 2012), while age is negatively correlated (we may imagine that younger companies are characterized by larger growth opportunities discounted in the evaluation). Regarding profitability, no effect emerged in line with other published papers (Bayar and Chemmanur, 2012; Tian, 2012). The coefficients of the variables related to geographical location are never significant. However, we found a negative and significant coefficient for the variable *Manufacturing* in the second regression.

Both regressions have a good fit as the value of the first R^2 coefficient is 79.15% and the adjusted R^2 is 75.17% in the first analysis. In the second regression, the coefficients are equal to 81.94% and 78.49%, respectively. Tables 6 and 7 present the models, respectively, considering the instrumental variables (2SLS regression) and after applying the CEM methodology.

Table 8 presents the auxiliary regression of the first-stage Heckman selection model. This regression was performed using a probit model, with the final aim of computing the inverse Mills' ratio, *Prob_Exit*, included as a variable in all the models and the robustness check confirms the results presented in Table 5.

5. Discussion

In this section, the results of previous analyses are discussed. As assumed by *H1*, a positive relationship between the choice of exiting through an IPO and the valuation attributed to the firm are obtained. This outcome can be interpreted by building on previous works

Table 5.
OLS Regressions.
The dependent
variable is
 $\ln(\text{exit_value})$, that is,
the logarithm of the
IPO price of the
shares multiplied by
the total number of
shares outstanding
before the IPO or, in
case of M&A, the
logarithm of total
equity Capital
valuation related to
the price of the
acquisition

Variables	Model (1)		Model (2)	
	Coefficient	<i>p</i> -value	Coefficient	<i>p</i> -value
IPO	1.74	0.000***	–	–
Deal_stake	–	–	–1.605	0.000***
BA	1.093	0.008**	–	–
N_investors	0.001	0.943	–	–
N_privateVC	–	–	0.029	0.064*
N_GVC	–	–	–0.065	0.421
Avg_years_study	0.102	0.000***	0.086	0.001***
Avg_years_work	–0.028	0.114	–0.033	0.051*
Women	0.710	0.192	1.031	0.074*
Assets	0.894	0.000***	0.821	0.000***
Net_profit	1.99e ^{–06}	0.496	1.26e ^{–06}	0.640
Firm_age	–0.601	0.016**	–0.497	0.033**
France	0.049	0.929	–0.421	0.408
Germany	–0.914	0.161	–1.113	0.070*
Northern_Europe	–0.787	0.218	–0.935	0.115
Other	1.041	0.107	0.576	0.329
Southern_Europe	–0.920	0.210	–0.875	0.200
UK	0.350	0.551	0.287	0.601
Manufacturing	–0.265	0.264	–0.468	0.036**
Prob_Exit	–0.052	0.932	0.412	0.481
Constant	3.340	0.052*	3.712	0.019**
Observations	107		107	
R^2	79.15%		81.94%	
R^2 (adjusted)	75.17%		78.49%	
<i>F</i> -test	19.88	0.000***	23.75	0.000***

Notes: **p*-value < 10%, ***p*-value < 5%, ****p*-value < 1%

Table 6.

2SLS Regression to control for the endogeneity of the *IPO* variable. The dependent variable is *exit_value*. Only the second stage of the regressions is reported. *IPO_momentum* has been used as instrumental variable for IPO

Variables	Coefficient	(1)	<i>p</i> -value
IPO	2.19		0.005***
BA	1.08		0.009**
N_investors	0.006		0.674
Avg_years_study	0.101		0.001***
Avg_years_work	-0.030		0.073*
Women	0.834		0.158
Assets	0.917		0.000***
Net_profit	4.59e ⁻⁰⁹		0.999
Firm_age	-0.587		0.031**
France	-0.098		0.860
Germany	-0.635		0.368
Northern_Europe	-0.786		0.195
Other	1.02		0.096*
Southern_Europe	-0.800		0.273
UK	0.444		0.458
Manufacturing	-0.332		0.172
Prob_Exit	0.288		0.688
Constant	2.595		0.178
Observations	99		
<i>R</i> ²	77.90%		
<i>R</i> ² (adjusted)	-		
<i>F</i> -test	-		0.000***

Notes: **p*-value < 10%, ***p*-value < 5%, ****p*-value < 1%

supporting the existence of an IPO premium (Kim and Ritter, 1999; Bayar and Chemmanur, 2012). Some authors have identified the presence of a 15%–30% discount in M&As compared to IPOs, despite small differences in pre-transaction performance (Poulsen and Stegemoller, 2008). Nevertheless, others debated that, if an IPO premium exists, every rational insider would always choose to exit through IPO (Bayar and Chemmanur, 2011), but this is not the case in reality as evidence shows a decreasing trend of IPOs (Gao *et al.*, 2013; Signori and Vismara, 2018). When comparing firms considering similarities regarding industry, time of transaction and other intrinsic firm characteristics, IPO premiums may diminish (Bayar and Chemmanur, 2011, 2012). Despite the positive results obtained, further investigating the correlation between IPO choice and higher valuation is an advantage.

To analyze *H2*, a negative relationship between the level of ownership sold and the valuation at exit is supported, confirming this hypothesis. This conclusion is consistent with prior findings. Using the social motivation theoretical lens, a lower fraction of ownership sold could be linked to an entrepreneur's high desire for control and to their inclination to remain inside a company as a form of emotional reward, even renouncing personal financial benefits (DeTienne *et al.*, 2015). However, a higher portion of ownership sold is negatively correlated with a firm's performance (McConnell and Servaes, 1995) and exit value (McConnell *et al.*, 2008). Thus, ownership retention is a quality signal of business activity and a proof of an entrepreneur's commitment (Gompers and Lerner, 1999; McConnell *et al.*, 2008). This study provides further support for this second view.

H3 finds support regarding specific types of investors, specifically the presence of BAs and venture capitalists not affiliated with the government. This result aligns with previous works highlighting the role of VC in enhancing firms' performance, productivity (Croce *et al.*, 2013)

Variables	(1)		(2)	
	Coefficient	<i>p</i> -value	Coefficient	<i>p</i> -value
IPO	1.491	0.000***	–	–
Deal_stake	–	–	–1.378	0.040**
BA	1.181	0.003***	–	–
N_investors	0.001	0.884	–	–
N_privateVC	–	–	0.024	0.089*
N_GVC	–	–	–0.043	0.549
Avg_years_study	0.095	0.000***	0.073	0.002***
Avg_years_work	–0.032	0.073*	–0.034	0.082*
Women	0.296	0.557	0.641	0.182
Assets	0.817	0.000***	0.728	0.000***
Net_profit	3.23e ^{–06}	0.197	2.03e ^{–06}	0.387
Firm_age	–0.525	0.018**	–0.430	0.040**
France	–0.053	0.917	–0.617	0.196
Germany	–1.066	0.101	–1.090	0.082*
Northern_Europe	–1.173	0.062*	–1.493	0.011**
Other	0.419	0.495	0.009	0.986
Southern_Europe	–0.905	0.155	–1.010	0.091*
UK	0.083	0.877	–0.124	0.806
Manufacturing	–0.075	0.730	–0.272	0.192
Prob_Exit	–0.612	0.251	–0.166	0.746
Constant	4.637	0.004***	5.364	0.000**
Observations	100		100	
<i>R</i> ²	81.47%		83.48%	
<i>R</i> ² (adjusted)	77.62%		80.06%	
<i>F</i> -test	21.20	0.000***	24.38	0.000***

Notes: **p*-value < 10%, ***p*-value < 5%, ****p*-value < 1%

Table 7.
Regressions with
CEM. the dependent
variable is *exit_value*

Table 8.
Auxiliary regression:
Heckman selection
model. The model
reported in this table
is the first-stage
regression in the
Heckman selection
model used to
estimate the inverse
mills' ratio
(*prob_exit*)

Variables	Coefficient	<i>p</i> -value
Assets	1.00e ^{–05}	0.000***
Net_profit	–0.0000442	0.000***
Firm_age	0.027	0.117
Constant	–0.570	0.002***
Observations	214	
Pseudo R2	13.27%	

Notes: **p*-value < 10%, ***p*-value < 5%, ****p*-value < 1%

and growth rate due to their network and organizational support (Tykvova, 2018). Unlike other VC funds, government-affiliated funds invest in new ventures that tend to be, in earlier stages, smaller and located in underdeveloped regions (Bertoni and Tykvová, 2015; Kovner and Lerner, 2015; Bertoni *et al.*, 2019). Few studies have analyzed their specific impact on exit compared to other private VC funds – both independent and corporate. Our study supports the

extant (and limited) research evidence (Cumming *et al.*, 2017) by showing that the impact of governmental VC is less relevant to startup exit compared to private VC.

With regard to BAs, our results contribute to the contrasting debates presented in the literature. Some evidence exists that BAs may fail to seek and directly incentivize exit because they think that exit opportunities will come naturally if the firm performs well (Landström, 1993; Maxwell *et al.*, 2011); however, a large body of literature supports the notion that BAs foster venture innovation and commercialization, thus increasing firm value (Bruton *et al.*, 2010; Drover *et al.*, 2017; Politis, 2008). Our empirical analysis supports this argument.

H4a was also confirmed. This outcome is in line with the broader literature stream that proves the relevance of founder experience for enhancing a firm's performance (Aldrich and Yang, 2014), as experienced entrepreneurs are more likely to set high firm goals and obtain high exit payouts (DeTienne and Cardon, 2012). Conversely, *H4b* does not find support in this study because of its low significance. This conclusion may be a sign of the prior controversial findings. People with a more solid job track are less willing to stick to unprofitable firms, accepting to exit even without pursuing high valuations, to become re-employed as soon as possible in more rewarding activities. Overall, from these contentious arguments regarding founders' intrinsic characteristics, especially regarding working experience, further investigating their correlation with the exit value would be beneficial.

H5 does not provide adequate support. As country singularities, culture and regulations play an important role in supporting gender diversity, most extant studies focus only on a country directly. In the USA, gender diversity in top-level positions enhances firm performance (Lückerath-Rovers, 2013). Similar results have been identified in Denmark (Opstrup and Villadsen, 2014) and Spain (Martin and Minguez-Vera, 2014). This study adds insights to this topic, especially because it considers a broader geographical area. Nevertheless, the weakness of the correlation could be caused by geographical heterogeneity inside the sample.

6. Conclusions

This study explored how exit strategic decisions, investor heterogeneity and founders' human capital are correlated with the exit value of European VC-backed startups, analyzing a data sample of European high-tech companies that exited through an IPO or M&A between 2010 and 2017. The findings provide partial support to our research hypotheses, adding novelty to the existing literature because the three variable groups are considered simultaneously in the model.

This study had some limitations. First, some sample representativeness issues cannot be overlooked; despite working on a database characterized by an inclusive exit valuations range, some deals had to be excluded due to data unavailability or because they did not fall within the temporal horizon considered. Enlarging the dataset from a timeline perspective may be useful. Second, some selection bias could not be fixed due to data unavailability, especially regarding human capital characteristics. Future development includes the collection of more data to create a control sample to mainly eliminate the selection bias caused by the fact that the current model does not consider the probability that a startup has to perform a successful exit. Third, the exit alternatives considered in the creation of the database were only IPO and M&A. Nevertheless, considering a larger spectrum of exit strategies, including family succession or employees/management buyout, allows us to complement this study with research aimed at determining which variables bring to select a certain exit route over the others, changing the dependent variable, considering exit choice

rather than exit valuation. Fourth, a limitation and a proposal for future development is related to the use of only one instrumental variable. Other instrumental variables can be used to address the endogeneity problem to better measure the probability of startups to conclude an IPO.

Future studies should consider such limitations and investigate other explanatory variables. For instance, the debate over the role of serial entrepreneurs is still in its infancy (Hyytinen and Ilmakunnas, 2007). Similarly, we need more studies that link exit value to other organizations typically supporting startups such as incubators (Sansone *et al.*, 2020; Cavallo *et al.*, 2020; Colombo and Delmastro, 2002). Entrepreneurship is becoming an increasingly collective process (Nambisan, 2017), where an ecosystem of actors can impact potential exit success. Scholars should consider this to advance our current knowledge on entrepreneurial exits.

Our study leverages different theoretical perspectives to explain the exits. This can also be observed in other studies. For instance, DeTienne (2010) and DeTienne *et al.* (2015) point out how goal theory (Locke and Latham, 1990), causation theory (Sarasvathy, 2001), social identity theory (Fauchart and Gruber, 2011) and threshold theory (Gimeno *et al.*, 1997) can play a role in explaining exits. We believe that future research should attempt to integrate how we explain exit value under a single theoretical frame, which is a limitation of the present study.

The research value of this study is linked to interesting policy cues that can be developed to support the exit phenomenon, which is a fundamental process in stimulating industrialization, ecosystem transformation, innovation and economic growth. Larger valuations generate more cash available for re-investments into new business concepts and startups, granting tax incentives and reliefs for SMEs going public, favoring the co-investment of BAs with VC funds and access to academic education for talented entrepreneurs. Further, teaching programs supporting talented university students in becoming entrepreneurs could be policy objectives aimed at easing the valuation of startups in the exit phase.

Notes

1. A full exit for an IPO involves a sale of all the principal holdings within one year of the IPO and a partial exit requires sale of only a part of the owned shares within the same period of time. Conversely, a full acquisition exit involves the sale of the entire firm for cash; in a partial acquisition exit, the founder receives illiquid shares instead of cash (McConnell Servaes and Lins, 2008).
2. VC funds can be private (independent/corporate) or public. Independent VC funds are a private investment vehicle managed by independent general partners, which raise funds from limited partners (typically: pension funds, banks and government funds), providing them a return by investing in high-growth and innovative companies (Gompers and Lerner, 2001). Further, corporate VC funds (CVC) are private vehicle but differ from traditional VC, as are typically sponsored by a company (Gompers and Lerner, 2001). Governmental VC (GVC) funds are structured similar to a private VC funds, but are government-owned (Bertoni *et al.*, 2019).
3. https://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an3.pdf
4. Estimations are available upon request to the authors.
5. To decide whether using an instrumental variable (i.e. whether the estimates obtained by OLS were consistent) was necessary, we performed the Davidson and MacKinnon (1993) augmented regression test (Durbin-Wu-Hausman test), confirming the endogeneity of the *IPO* variable (p -value 0.0098).

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Further reading

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Table A1.
Correlation matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(11)	(12)	(13)
(1) Exit_Value	1.00											
(2) IPO_momentum	0.22*	1.00										
(3) Assets	0.72*	0.18	1.00									
(4) Net_profit	-0.01	0.10	0.05	1.00								
(5) Firm_age	0.02	-0.08	0.19	-0.01	1.00							
(6) IPO	0.52*	0.07	0.17	-0.06	-0.09	1.00						
(7) BA	0.05	-0.16	-0.13	-0.2*	-0.03	-0.06	1.00					
(8) N_investors	0.28*	-0.09	0.23*	-0.34*	0.06	-0.86*	0.17	1.00				
(9) Deal_stake	-0.61*	-0.1	-0.22*	0.06	0.08	-0.86*	0.01	-0.13	1.00			
(10) N_privateVC	0.27*	-0.09	0.23*	-0.33*	0.04	0.17	0.15	0.98*	-0.12	1.00		
(11) N_GVC	0.08	-0.16	0.09	-0.07	0.03	0.10	-0.15	0.45*	-0.06	0.06	1.00	
(12) Avg_years_study	-0.06	0.23*	-0.2*	0.06	0.03	-0.14	-0.03	-0.08	0.07	-0.01	1.00	
(13) Avg_years_work	-0.01	0.05	-0.05	0.01	-0.31*	0.06	0.011	-0.03	-0.09	-0.01	0.24*	1.00
(14) Women	0.06	-0.11	0.14	0.03	0.15	-0.11	-0.08	-0.1	0.19	-0.03	-0.14	-0.03
(15) France	0.18	-0.07	0.08	-0.03	-0.17	0.38*	-0.22*	0.12	-0.38*	0.12	-0.01	0.12
(16) Germany	0.08	0.21*	0.30*	0.18	0.04	-0.16	0.02	0.05	0.14	-0.1	0.00	-0.1
(17) Northern_Europe	-0.36*	0.02	-0.28*	0.04	-0.11	-0.07	-0.01	-0.09	0.14	-0.05	0.03	0.08
(18) Other	0.10	-0.03	-0.1	-0.14	0.16	0.06	-0.04	0.16	-0.09	0.16	0.02	-0.13
(19) Southern_Europe	-0.00	0.11	0.20*	0.001	0.15	-0.21*	-0.08	-0.11	0.23*	0.00	0.09	-0.14
(20) UK	0.10	-0.03	-0.1	-0.144	0.16	0.06	-0.04	0.16	-0.09	0.16	0.02	-0.13
(21) Benelux	0.09	0.22*	0.11	0.04	0.01	-0.02	0.07	-0.11	0.02	0.00	0.04	-0.05
(22) Manufacturing	-0.18	-0.03	-0.20*	-0.03	0.14	0.03	-0.07	-0.05	-0.08	-0.03	0.12	-0.1
(23) Prob_Exit	-0.59*	-0.05	-0.68*	0.26*	-0.34*	-0.27*	-0.03	-0.36*	0.35*	-0.13	0.23*	0.05

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

(continued)

Variables	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
(1) Exit_Value										
(2) IPO_momentum										
(3) Assets										
(4) Net_profit										
(5) Firm_age										
(6) IPO										
(7) BA										
(8) N_investors										
(9) Deal_stake										
(10) N_privateVC										
(11) N_GVC										
(12) Avg_years_study										
(13) Avg_years_work										
(14) Women	1.00									
(15) France	-0.09	1.00								
(16) Germany	0.11	-0.24*	1.00							
(17) Northern_Europe	-0.07	-0.28*	-0.1	1.00						
(18) Other	-0.09	-0.32*	-0.11	-0.13	1.00					
(19) Southern_Europe	0.16	-0.18	-0.06	-0.08	-0.09	1.00				
(20) UK	-0.09	-0.32*	-0.11	-0.13	1.00*	-0.09	1.00			
(21) Benelux	-0.05	-0.19	-0.06	-0.08	-0.09	-0.05	-0.09	1.00		
(22) Manufacturing	-0.12	0.06	-0.12	0.12	0.03	-0.21*	0.03	-0.03	1.00	
(23) Prob_Exit	-0.07	-0.03	-0.08	0.30*	-0.24*	-0.05	-0.24*	0.02	0.17	1.00

Table A1.

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