

The Financial Dynamics of University-Based Firms. The Effect of Different Financing Sources on the Firm Financial Performance

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Abstract

The research aims to investigate the financing sourcing of the university-based firms in the form of university spin-off (USOs), namely the in-house finance, the debt finance and equity finance, jointly with their impact on the financial performance of USOs. A panel sample of 621 Italian USOs was examined over the period 2004–2013. The results show a positive but low effect of in-house finance on the financial performance of USOs, while debt finance has positive and relevant impact on the financial performance of USOs. Taking into account the effect of equity finance, the evidence is comparable to those associated with the effect of debt finance. However, the most significant impact is exercised by the institutional investors in the form of venture capital and private equity. This evidence shows that, in the entrepreneurial university context, these dedicated investors have the most beneficial and central role in improving the financial development of university-based firms.

Keywords: university-based firms; USOs; firm finance; in-house finance, debt finance; equity finance, VC finance; PE finance; firm financial performance.

1. Introduction

In view of the evolving process of integration of markets and the globalization of economies, companies in well-developed countries find themselves facing various pressures, such as competition from new entrants and the obsolescence of their products and services, which lead to a contraction in demand and therefore, ultimately, negatively affect the economic growth (Buckley and Hashai, 2020; Petricevic and Teece, 2019). To counter this phenomenon, it is necessary that the economic system is able to innovate, that is, to create new companies with high added value, technological or scientific or that exploit innovative ideas (Soete, 2014; Alvarez et al., 2019).

However, innovation must be developed so as to find proper application in the economy and, therefore, it becomes essential to implement the so-called technology transfer process (Audretsch et al., 2014; Cho and Shenkoya, 2020) University spin-offs are one of the tools available to researchers and entrepreneurs to implement this transfer. In Italy, the university spin-off phenomenon is relatively new and has had a significant development since the 2000s. This has also happened thanks to the more relevant interventions of universities, with the creation and strengthening of assistance services for start-ups and actions to enhance and protect intellectual property. Furthermore, in some cases, universities have achieved more effective coordination with subjects such as incubators, investors, industrial partners and, finally, have issued ad hoc regulations, so as to provide a clearer regulatory framework.

Despite the importance of this tool, most of the studies on university spin-offs in Italy have focused on surveys of the phenomenon and descriptive analysis, with a focus on the internal and external determinants of the success of spin-offs.

Indeed, the previous literature, for example, instigates the growth (both as a change in turnover and as a number of employees) (Balderi and Piccaluga, 2010; Colombo and Grilli, 2010; Balderi et al., 2011), the productivity and the degree of innovativeness - measured for example by the number of patents - as well as income performance (Bolzani et al., 2014). However, it is necessary not only to understand how many research spin-offs are created and performed, but also to investigate the quality of the projects and the results achieved in terms of financing methods and choices over time.

The present work therefore aims to fill this gap in the literature by investigate the phenomenon of research spin-offs answering the following research question:

What are the impacts of the different financial sources (namely in-house finance, debt finance and equity finance – institutional finance) on the financial performance of the USOs?

To this end, we will focus on analyzing a sample of 621 spin-offs in the period between 2003 and 2014.

The work is organized as follows: the second paragraph presents a review of the main contributions of the literature. The third paragraph is dedicated to the description of the sample; then the results are presented and, finally, some conclusive considerations are developed.

2. Review of the literature

The theoretical perspective that better integrate the conceptual framework about the development of university spin-offs is the Resource Based View of the firm (RBV).

With reference to the first line, the RBV refers to the ability to acquire and organize the resources and skills that favor the success of businesses (Barney, 2001; Kull et al., 2016). Within this framework, there are numerous studies with specific insights into the context of research spin-offs.

In the case of spin-offs, the relevant resources identified in the literature are: (1) the technological resources, intended both as equipment for plants and laboratories either as the availability of patents or other intellectual property rights; (2) the quality of human resources, in terms of scientific skills, of entrepreneurial spirit and managerial skills; (3) the financial resources, in terms of the amount of capital raised and the network for the involvement of new shareholders; (4) the ability to attract new financial shareholders (venture capitalist and business angel) and / or industrial.

With regard to financial resources, great attention is paid in the literature to the ability of spin-offs to attract venture capital to a sufficient extent to guarantee development (Heirman and Clarysse, 2004; Huynh et al., 2017), although it represents a necessary, but not a sufficient factor for growth (Moray and Clarysse, 2005). Risk capital allows, in fact, to create a competitive advantage, allowing the spin-off to make technological investments from the first years of life, as well as investments in management activities, and to cover the financial needs in the period in which the revenues are scarce and discontinuous or in the presence of economic difficulties (Minola et al., 2019).

The literature, however, frequently finds that the start-up capital of spin-offs is small, and this happens for two reasons. First, the needs spin-off financials may initially be lower than similar companies in the industrial world (Mathisen and Rasmussen, 2019; Yagüe-Perales and March-Chordà, 2012), thanks to the possibility for spin-offs to benefit from subsidies, financial aid and logistical support made available by the university or by the promoting body. Secondly, the founders' ability to contribute capital can be limited, as these are often natural persons who cannot access large amounts of personal assets to be contributed as capital in the spin-off (Rodríguez-Gulías et al., 2017).

The literature has highlighted, in particular, the difficulty in attracting risk capital, typical of companies with a high technological or scientific research content (Carpenter and Petersen, 2002; Fini et al., 2017) and the various implications related to the type of lenders. In the case of spin-offs, the difficulties are exacerbated by the fact that the contribution from universities is often limited and moreover, as already mentioned, individual shareholders generally prevail in the shareholder structure and this further hinders the ability to attract other types of shareholders who intervene in a purely financial logic.

The benefits deriving from the entry into the share capital of subjects other than individuals and universities or research institutes promoters are many and not only linked to the contribution of capital, but also of skills. For example, with explicit reference to the role of venture capital, international studies show how the contribution of adequate levels of capital is able to foster growth (Baum and Silverman, 2004; Heirman and Clarysse, 2004), while scouting and coaching carried out by venture capital operators makes it possible to support the most gifted companies, increasing their chances of success (Colombo and Grilli, 2010). Other research shows, however, that this relationship is not always valid (Guerrero and Urbano, 2012).

Although some empirical studies have shown that in some countries, university spin-offs attract venture capital funds more than start-up companies far from academia and industrial groups (Yagüe-Perales and March-Chordà, 2012), the participation of these entities in the capital of the spin-offs remains limited. The causes of the reduced participation of venture capitalists in the capital of spin-offs are, in fact, the strong information asymmetries and the reduced management capacity of entrepreneurs (Oskarsson and Schläpfer, 2008; Florio, 2019). On the other hand, the researchers themselves are sometimes prejudiced against venture capitalists for fear of income pressures and the possible loss of managerial autonomy (Guerrero et al., 2016).

Finally, looking at the other types of potential financiers, industrial companies show greater interest and willingness to enter the capital of university spin-offs than financial operators, but their links with these companies are not widespread in Italy anyway (Bolzani et al., 2014; Fini et al., 2018), perhaps due to a certain distance between the business and academic worlds, the result of prejudices that mutually distance the two parties. On the one hand, there is, in fact, the fear that academic entrepreneurs resist purely industrial logic and that they are bearers of priorities and cultures that are not completely permeable to those of industry; on the other side, the fear of excessive interference in management by the industrial shareholder remains (Lazzeri and Piccaluga, 2012).

Several empirical studies show, however, how the presence of industrial investors within the shareholder structure contributes to the success of the spin-off (Aggarwal et al., 2004; Prokop et al., 2019), both for the management support provided and for the commercial one.

3 Methodologies

3.1 Data

In order to test the research hypothesis above, data about USOs were drawn from Netval database that is part of the ‘Spin-off Italia’ project and run in collaboration with Netval, Università Politecnica delle Marche and Scuola Superiore Sant’Anna – Istituto di Management, which collects updated information about the complete population of active spin-offs in Italy. From the full dataset of the Netval database, we extracted only information related to the USOs, namely 1,275 firms. Since the Netval database does not contain financial information, we collected this latter by extracted data from Aida BdV database, an Italian subset of the ORBIS database, which contains financial, biographical and merchandise data of about 700,000 active Italian companies. Specifically, financial information is provided by Honyvem, which acquires and reprocesses all official accounts deposited with the Italian Chambers of Commerce. From the 1,275 USOs we eliminated those firms for which the data was not available in the Aida BdV database for the time period we are taking into account. Thus, the final panel sample consists of 621 Italian USOs, with data covering the period from 2003 to 2014 for an average of 1,640 firm-year observations.

3.2 Variables

3.2.1 Dependent variable

With the purpose of determining the financial performance of the USOs sampled, the log of sales was used, (FINANCIAL PERFORMANCE). This form of measurement is usually recognized in research analyzing the SME’ financial performance dynamics.

3.2.2 Independent variables

In order to determine the proxies for the USO’ internal funding resource the ROA index was used (Gaud et al., 2007; Lappalainen and Niskanen, 2012), measured as the ratio of earnings before interest, taxes, depreciation and amortization (EBITDA) to total assets (IN-HOUSE FINANCE).

With the aim to determine the access to debt financing of USO, the leverage index was used (DEBT FINANCE), measured as a company’s debt ratio, i.e., financial debt to total assets (Vanacker and Manigart, 2010).

Further, with the purpose to determine the external equity finance of USOs, the share of external industrial firms/individual owners in the firm was used (EQUITY FINANCE) (Vanacker et al., 2014). The share of Private Equity and Venture Capital investors were used too (INSTITUTIONAL FINANCE).

3.2.3 Control variables

First, the relation between firm age and financial growth reveals that start-ups firms are expected to develop quicker. However, literature show an inverse relation between firm age and growth (Davidsson et al., 2002). Hence, we controlled for firm age (AGE).

Second, we controlled for firm size, measured as the number of the annual firm’ employees (SIZE).

Third, dummy variables were used to control for industry specific fixed effects on the base of NACE rev 2 classification.

3.3. Analytical approach

With the aim to test the developed research question a linear regression estimation was used. In line detail, the following firm’ financial growth function was defined, and it allows for time and firm fixed effects:

$$FINANCIALPERFORMANCE_{it} = f(\beta_0 + \beta_1 IN - HOUSEFINANCE_{it} + \beta_2 DEBTFINANCE_{it} + \beta_3 EQUITYFINANCE_{it} + \beta_4 INSTITUTIONALFINANCE_{it} + \beta_5 AGE_{it} + \beta_6 SIZE_{it} + \beta_7 INDUSTRYEFFECTS_{it} + \delta_t + \epsilon_{it})$$

Where i indexes USO and t indexes years. In addition, δ_t is the time effect and ϵ_{it} is the error term.

4. Findings

4.1. Descriptive statistics

Table 1 shows the descriptive statistics of variables used in the study. The results show that sampled firms show an average of financial performance of 5.1526, with a medium-low dispersion in the sample (S.D. = 0.8702), and remarks that the financial performance, measured term sales, are limited for the USOs sample, an issue shared by other typology of technology and knowledge-based firms.

With regard to the financial sources of USOs, the results show that the internal finance, measured by ROA, reports a mean of 2.3924, remarking that USOs are quite constrained in the formation of in-house financial resources to invest in the technology transfer process. However, this result shows a high dispersion in the sample (S.D. = 27.3834), highlighting the significant heterogeneity in the internal financial structure of the USOs. With reference to the debt finance, measured by the leverage ratio, the results show a mean of 1.5913, indicating that the USOs make an operational use of the debt financing. Nevertheless, taking into account that this information shows a significant dispersion in the sample (S.D. = 15.8276), this denotes a larger variability in the capital structure of the USOs sampled.

Concerning the access to external equity finance, the results show a pretty low mean of the share of external firms/individual owners (mean of 0.3545), with a moderate dispersion in the sample (S. D. = 4.783448), indicating that the involvement of external shareholders in the USOs ownership structure varies in a considerably manner between the sampled firms. Nevertheless, the share of institutional investors, in the form of private equity and venture capital investors, shows a higher mean higher of 0.0202. Also, the result shows a medium-low heterogeneity in the sample (S.D.= 0.10160).

Table 1 - Descriptive statistics

	N	Min.	Max.	Mean	S. D.
FINANCIAL PERFORMANCE	2,981	0	7.994004	5.152642	.8702202
IN-HOUSE FINANCE	3,395	-636.96	88.25	2.392489	27.38346
DEBT FINANCE	2,957	-114.82	660.55	1.591356	15.82762
EQUITY FINANCE	7,116	0	100	.3545702	4.783448
INSTITUTIONAL FINANCE	7,440	0	1	.0202385	.1016048
SIZE	2,941	0	316	5.15879	21.95097
AGE	7,452	2	78	8.594203	6.519793

Table 2 shows the correlation matrix for all the variables used in the empirical study. The absence of high and significant correlation between the independent variables permit to reject problems linked to the effects of the nonsense correlation (Cohen et al., 2013).

Table 2 – Correlations

	1	2	3	4	5	6	7
1 FINANCIAL PERFORMANCE	1.0000						
2 IN-HOUSE FINANCE	0.1524*	1.0000					
3 DEBT FINANCE	0.0766*	-0.0012	1.0000				
4 EQUITY FINANCE	0.0984*	0.0003	0.0121	1.0000			
5 INSTITUTIONAL FINANCE	0.1323*	-0.0571*	0.0065	-0.0028	1.0000		
6 SIZE	0.0459*	0.0114	0.0619*	-0.0146	-0.0295	1.0000	
7 AGE	0.0508*	0.0214	-0.0332	-0.0147	-0.0253*	0.1995*	1.0000

Notes: ** p < 0.01; * p < 0.05 (all two-tailed tests).

4.2. Regression model estimation

Table 3 shows the results of the linear regression models estimating of the impact of internal finance, debt finance and external equity finance on the financial performance of USOs. The regression analyses are performed in a step-wise manner. Model (1) includes all the control variables, while Model (2), (3), (4) and (5) refer to the principal effects, entered one by one.

In the Model (2), the estimated coefficient on IN-HOUSE FINANCE is slightly positive (almost irrelevant in practical term) statistically significant (coeff. = 0.0070, p < 0.001), revealing that the internal financial resources generated by USOs have a marginal effect on the financial performance of the firm. In the Model (3), the estimated

coefficient on DEBT FINANCE is positive and statistically significant (coeff. = .0152399, $p < 0.001$), showing that debt financing contributes to improve the financial development of USOs, although not a in a relevant manner. In the Model (4), the estimated coefficient on EQUITY FINANCE is positive and statistically significant (coeff. = .0155837, $p < 0.001$); denoting a similar result with the debt financing. Hence, debt and external equity financing, from industrial firm and individual owner, are useful form of external finance for USOs, although not enough to resilient rise their financial performance.

Finally, the Model (5), the estimated coefficient on INSTITUTIONAL FINANCE is positive and statistically significant (coeff. = .9335841, $p < 0.001$). The higher value of this estimate compared with those obtained by debt and external equity finance, indicates that institutional financing in the form of venture capital and private equity constitutes the most adequate form of finance for the effective financial development of USOs.

Table 3 - Linear regression estimates of the impact of internal funding, debt finance and external equity finance on the financial performance of the USOs

Dependent variable: financial performance					
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)
<i>Main effects</i>					
IN-HOUSE FINANCE		.0070071*** (.0009389)			
DEBT FINANCE			.0152399*** (.0042843)		
EQUITY FINANCE				.0155837*** (.0039768)	
INSTITUTIONAL FINANCE					.9335841*** (.1652526)
<i>Control variables</i>					
AGE	.000565 (.0037134)	.0009605 (.0036608)	.0030992 (.0040474)	.0018294 (.0037811)	.0009928 (.0036832)
SIZE	-.0000377 (.000879)	-.0000533 (.0008663)	-.0001026 (.0008927)	-.0001999 (.0008759)	.0000938 (.0008719)
MANUFACTURING	1.790678*** (.3748518)	1.791778*** (.3694165)	1.830136*** (.3929674)	1.815179*** (.3730693)	1.543322*** (.374293)
ELECTRICITY GAS STEAM AND AIR CONDITIONING SUPPLY	.8562837 (.9682356)	.8283825 (.9541618)	.8486431 (.9707172)	.8524904 (.9629377)	.8550001 (.96015479)
CONSTRUCTION	.9142237 (.8745739)	.884283 (.8618649)	.9239743 (.8774842)	.9031731 (.8698161)	.9100255 (.867275)
WHOLESALE AND RETAIL TRADE REPAIR OF MOTOR VEHICLES AND MOTORCYCLE	1.320654 (.8795651)	1.262635 (.8668104)	1.257828 (.8842783)	1.33514 (.875156)	1.313569 (.8722251)
TRANSPORTATION AND STORAGE	1.93711** (.9041502)	1.842869** (.8911012)	1.842736** (.9082475)	1.894489** (.8996596)	1.918875** (.89661)
INFORMATION AND COMMUNICATION	1.537331*** (.3673553)	1.533545*** (.3620134)	1.611662*** (.3846413)	1.554877*** (.3653729)	1.306484*** (.366574)
REAL ESTATE ACTIVITIES	1.137513 (.8962487)	1.136198 (.8832153)	1.027462 (.9048876)	1.110431 (.8914372)	1.13081 (.8887694)
PROFESSIONAL SCIENTIFIC AND TECHNICAL ACTIVITIES	1.568231*** (.3710876)	1.570741*** (.365691)	1.630536*** (.3884738)	1.574657*** (.3691542)	1.303306*** (.3709664)
ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES	1.004286 (.8775371)	.9898692 (.8647776)	.8890518 (.8818928)	.9944739 (.8727584)	.9915319 (.8702161)
EDUCATION	1.624998* (.918834)	1.659532* (.9054829)	2.460909** (.9709228)	1.612118* (.9138209)	1.620939* (.9111657)
HUMAN HEALTH AND SOCIAL WORK ACTIVITIES	1.211946 (.8921151)	1.209644 (.8791416)	1.129208 (.8977428)	1.197816 (.8872809)	1.206222 (.8846701)

ARTS ENTERTAINMENT AND RECREATION	1.524974* (.919212)	1.499145* (.9058512)	1.496437 (.9216916)	1.497901 (.9142257)	1.509582* (.9115443)
OTHER SERVICE ACTIVITIES	.507276 (.9424769)	.5083627 (.9287703)	.6059756 (.9511381)	.5217586 (.9374004)	.2850599 (.9354383)
Number of obs	1,845	1,844	1,640	1,808	1,845
F	5.00***	8.33***	5.63***	5.74***	6.76***
R-squared	0.0394	0.0680	0.0526	0.0488	0.0559
Adj R-squared	0.0315	0.0598	0.0432	0.0403	0.0476
Root MSE	.86596	.85337	.86817	.86122	.85873

Notes: values in the parentheses are standard errors. *** p < 0.001; ** p < 0.01; * p < 0.10; (all two-tailed tests).^b This parameter is set to zero because it is redundant.

5. Conclusions

The research aimed to investigate the financing sourcing of the USOs, i.e., the in-house finance, the debt finance and equity finance, and their impact on the financial performance of the USOs. Some key conclusions emerging from the analyses conducted. First, the results highlight a positive but low effect of in-house finance on the USOs' financial performance, hence its impact is too weak to increment the financial development of the firm. This result remarks that the financial performance of university-based firms is not fully explained by internal sources of funding.

With regard to the effect of debt finance, the results show a positive impact on the financial performance of USOs, which is higher compared to the in-house finance. This evidence points out that debt constitute a key financial instrument to the economic development of USOs, remaking the bank-based influence of a country such as Italy.

Taking into account the effect of equity finance on the financial performance of the USOs, the evidence is comparable to those associated with the effect of debt finance. This means a significant role of the equity-based finance in improving the performance dynamics of the university-based firms.

However, the most significant impact on the financial performance of the USOs is exercised by the institutional investors in the form of venture capital and private equity. This evidence shows that, in the entrepreneurial university context, these dedicated investors have the most beneficial and central role in improving the financial development of university-based firms.

Hence, the USOs analyzed seems not be affected by the information asymmetry issues that usually affect innovative start-ups and new technology-based firms, such as the USOs, between the firm and investor. In this emerging setting, the institutional investor is the most prominent financial provider for the full development of the USOs, contributing to support the growth and financial strategy of the firm and providing organizational and managerial expertise too.

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