Economics Ekonomika
Management Management
Innovation Inovace

EMI, Vol. 15, Issue 1, 2023
ISSN: 1804-1299 (Print), 1805-353X (Online)
www.emijournal.cz

IMPACT OF VENTURE CAPITAL FINANCING ON STARTUP INNOVATION IN ALGERIA. CASE: ALGERIAN STARTUP FUND

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Abstract:

This paper aims to study the impact of venture capital financing on startup innovation in Algeria, and more specifically the venture capital firm Algerian Startup Fund spa (ASF spa). To do so, we adopted a quantitative research approach, using a sample of 32 startups associated with ASF. We applied Pearson correlation and multiple regression analysis using IBM SPSS software. The results show that there is a strong positive significant relationship between venture capital funding and the profitability of innovative projects. In addition, a positive but weak correlation between increasing venture capital funding and the number of intellectual property filings. We also found an inverse negative relationship between venture capital financing and research and development costs. Therefore, venture capital has a role in innovation promotion for startups in Algeria.

Keywords: Venture capital, Innovation, Startup, Algeria***.***

JEL: G21, G32

1 Introduction

Venture capital is an essential form of small business financing that has gradually grown to become an important part of financiers' portfolios (Sarfaraz Javed, Baaeth AtAllah Elias Aldalaien and Uvesh Husain, 2019). A venture capital fund is a common financing vehicle that essentially invests third-party shareholder funds in companies that are generally too dangerous for mainstream financial firms.

Innovation is the main driver of economic development. With the intensification of globalization of the economic and industrial chain, the competition in the global market has shifted to the competition of global forces (Ashraf Elsafty, Dalia Abadir, Ashraf Shaarawy, 2020; Mahfud, T., Triyono, M. B., Sudira, P., and Mulyani, Y., 2020). Startups count to them are an indispensable driver of innovation, and obtaining venture capital is one of the important steps in their development path. (Duan Yongqian, Chen Jin, 2021)

Finally, the literature review, especially the Algerian literature, reveals the insufficiencies in the study of this impact. Therefore, we propose in this research, to analyze the extent to which the granting of venture capital financing has an impact on the innovation of startups (Ashraf Elsafty, Dalia Abadir, Ashraf Shaarawy, 2020)

Paper received: 11.10.2022 Paper revised 03.01.2023 Paper accepted: 14.02.2023

In order to achieve our research objectives, taking inspiration from (Sheng Xu, Danni Song, 2020) we state our problem as follows: **What is the impact of venture capital funding on startup innovation?**

Based on the work of Sheng Xu, Danni Song (2020); Jiang Cailou, Liu DeHai (2022); Chien-Chi Chu, Yong-Li Li, Shi-Jie Li, Yun Ji (2021); Stéphane KOFFEL, Jonathan LABBÉ (2020); Yannis Pierrakis, George Saridka (2017); Claude Bekolo (2009), we hypothesize the following:

H 01: Venture capital has a positive and significant impact on the innovation of startups.

H 1.1: Venture capital financing has a positive effect on innovation, measured by an increase in the level of R&D expenses.

H 1.2: Venture capital financing has a positive effect on innovation, measured by an increase in the number of patent filings or any type of intellectual property document.

H 1.3: Venture capital financing based on innovation-appropriate financing terms can contribute to the profitability of startups.

2 Literature review

Recent literature indicates that small and medium-sized enterprises (SMEs) and startups ensure economic development and contribute to national income, by creating wealth and added value; as much as they ensure social welfare, reduce unemployment and contribute to employment (Abdellah Kellouch, Hamid Hakem, 2021). On the other hand, their financing is a concern of policy-makers. It has proven to be an important topic, since it is part of the study on one of the sources of financing that complements bank financing, namely venture capital. (Mohammed Himrane; Mohammed Sahli, 2019)

According to Beztouh (2021) the particularity and originality of venture capital is that it commits illiquid investments to unlisted companies, which intervenes at the very beginning of the life of an SME or a startup. This is done to compensate for the lack of private funds (Latrech, 2020).

Venture capital companies take part in the performance of startups by helping them in their management (Alvarez-Garrido, 2020). This assistance is in the form of value-added services, advice in specific areas, and suggestions on operations, marketing, strategic planning and investment management, that is, at different stages of development of the company (Han, 2021), in addition to administrative and technical support. (Latrech, 2020)

According to Sarfaraz Javed, Baaeth AtAllah Elias Aldalaien and Uvesh Husain (2019), since a study that adopted a quantitative approach that applied Pearson's correlation and multiple regression analysis, from 20 UK venture capital firms. Venture capital-backed firms improve and grow on average twice as fast as non-venture capital-backed firms. They add that there is a positive and significant relationship between total assets and net profit ($r = .920$, $p<.01$), generating a positive correlation between profit and firm performance.

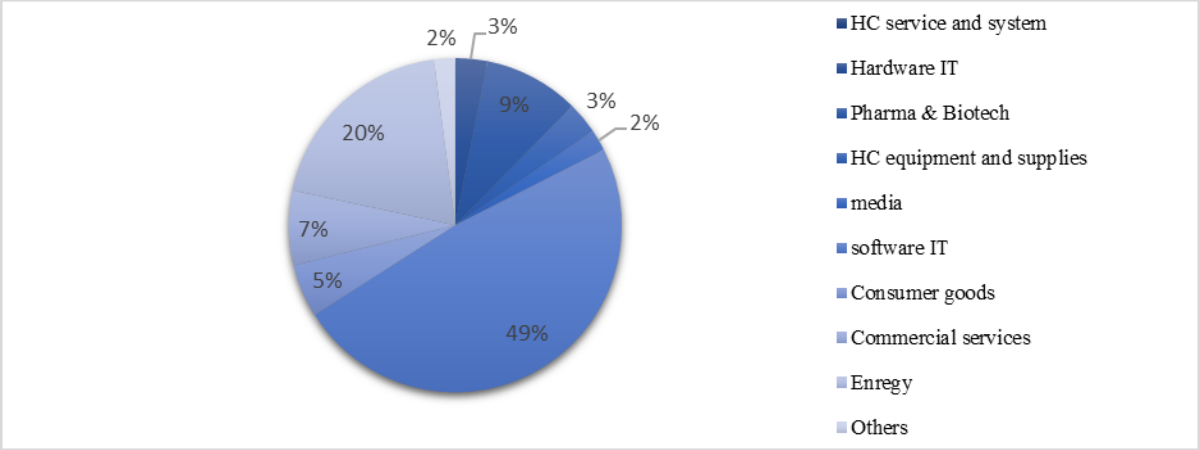
Increasing firms' total equity could improve their profit and also their performance. This shows that a higher level of equity has a positive impact on the performance of risk capital. In another study, where the Propensity Score Matching (PSM) model is used to analyze the innovation of venture capital intervention in companies, Han (2021) deduces that venture capital support has a positive and significant impact on the number of invention patent, and the number of utility model patent applications.

According to the article written by (Uliana Andrusiva, Iryna Kinasha, Anzhela Cherhatab & al, 2019), in the year of 2017, and at the level of the European Union countries, the companies that attract the large number of venture capitalists are IT companies "information technology" and pharmaceutical and biotechnology companies, on the pretext of a considerable demand for innovative methods. The following diagram illustrates the structure of venture capital in the overall financing of innovative industries in EU countries:

Paper received: 11.10.2022 Paper revised 03.01.2023 Paper accepted: 14.02.2023

EMI, Vol. 15, Issue 1, 2023
ISSN: 1804-1299 (Print), 1805-353X (Online)
www.emijournal.cz

Figure 01: The structure of venture capital in the overall financing of innovative industries in EU countries in 2017



Source: Uliana Andrusiva, Iryna Kinasha, Anzhela Cherchatab, Alla Polyanskaa, Oleh Dzobaa, Tatiana Tarasovaa, Halyna Lysakal. (2019, 11 16). Experience and prospects of innovation devopment venture capital financing. Management Science Letters, pp. 782-790.

Most of the reviews attribute these differential results to various factors existing in the relationship between venture capital and startups based on qualitative analysis only. Regarding the lack of theoretical support and quantitative evidence in previous research, Duan Yongqian, Chen Jin (2021) firstly integrates the bibliometric method into the literature review and explores the underlying mechanism behind the influence of venture capital on startups based on the evolution of applied theories and knowledge of topics in 692 related articles.

Duan Yongqian, Chen Jin (2021)'s paper shows how the previous literature reveals the relationship between venture capital and firm innovation from different perspectives of signal theory, RBV, institutional theory, and real options theory, and clarifies the differentiated research trends toward PVC (private venture capital), CVC (corporate venture capital), and GVR (government venture capital). The results reveal that PVC plays a dominant role in stimulating the degree of innovation and efficiency of enterprises, CVC is most favorable to high-quality innovation and exploratory innovation of enterprises, and CVR can merely serve as a stimulus in the venture capital industry but does not have a direct positive effect on startups.

On the other hand, Sheng Xu, Danni Song (2020) examine the significant impact of venture capital on green technology innovation in each province in China and municipality in the context of the new era of "building a market-oriented green technology innovation system" and the exponential growth of venture capital to support green technology innovation. They used the amount of venture capital investment, the number of green patents, and other mediating variables, as well as regional heterogeneity variables for 30 provinces and cities from 2014 to 2017. The results of the empirical study show that venture capital, as a form of market-based capital provision, significantly improved the green technology innovation capacity of each region.

Using a sample of listed new energy enterprises in China (2010-2017), Jiang Cailou, Liu DeHai (2022) studied the impact of venture capital on the innovation of new energy (NE) enterprises by applying the propensity score matching (PSM) model and the Poisson model. The results indicate that venture capital has a positive and significant impact on the innovation of NE firms, among which the innovation incentive effect of government participation and joint venture capital is more significant. Compared to venture capital without government participation, single venture capital, and non-local investment, venture capital with government participation, joint venture capital, and local investment are more conducive to promoting the increase of patent applications of NE firms.

Paper received: 11.10.2022 Paper revised 03.01.2023 Paper accepted: 14.02.2023

In the case of Algeria, the activity of venture capital firms is very low, almost non-existent, full of constraints that requires following heavy administrative and bureaucratic procedures (Mohammed Himrane; Mohammed Sahli, 2019). The venture capital industry is considered an emerging industry, its legislative and legal framework has just been established and there is still a lot of work to do to advance this promising industry (Kellouch, Hakem, 2021).

Finally, venture capital financing appears to be a different alternative to other financing because it represents the ideal case for the financing problems that a startup faces (Abdellah Kellouch, Hamid Hakem, 2021).

3 Methodology

3.1 Method of analysis

In order to answer our problem and test our research hypotheses, our study is based on a quantitative study to measure the impact of venture capital financing on startup innovation by conducting a questionnaire survey. Our questionnaire was inspired by (Burnett, 2011; Han, 2021; Manuel d'Oslo, 2018; Sheng Xu, Danni Song, 2020; Yannis Pierrakis, George Saridka, 2017; Institute de recherche sur les PME; INSEE, 2010; INSEE, 2012; Canada statistics, 2019; Sarfaraz Javed, Baaeth AtAllah Elias Aldalaien and Uvesh Husain, 2019) (Ana Paula Faria, Natàlia Barbosa, 2014; Jiang Cailou, Liu DeHai, 2022; Claude Bekolo, 2009; Dagobert Ngongang , Annette Mostsoguem, 2017; Vanessa Chan, Chris Musso, Venkatesh Shankar, 2009) in order to justify all the asked quetions. The latter was developed using Google Forms (available in the appendix), and subsequently shared with targeted startups from the Algerian Startup Fund portfolio.

The data collected is statistically processed with the BIM SPSS program.

To test our hypotheses, two steps of statistical analysis are conducted. First, a descriptive analysis to identify the profiles of the respondents and the startups they belong to.

Second, an explanatory analysis using multiple regression and Pearson correlation to study the relationship between venture capital funding and startup innovation.

3.2 Data

In this study, we refer to firms that innovate in their field, either in production, in the development of a non-existent product or in a substantial qualitative improvement of a product (Kisse, 1992).

The parent population consists of N = 60 funded startups, we collected this database fom the ASF‘s internal document. Our sample will take the full number of startups, since the size of the population is less than 200. We obtained 32 complete and usable responses from the questionnaire, which means that we reached 53.33% of the target population.

3.3 Measurement variables

Taking into consideration the hypotheses formulated earlier, we distinguish a set of variables. A variable related to the innovation of startups with its sub-variables, and an independent variable that concerns venture capital financing.

3.3.1 Dependent variable “Innovation”

The dependent variable is the company's level of innovation, the definition and measurement of this innovation are major challenges in the relevant research fields concerned. (Chien-Chi Chu, Yong-Li Li, Shi-Jie Li, Yun Ji, 2021)

First, we used two indicators of innovation. Research and development expenditures, denoted as R&D, as well as the number of patents, and intellectual property documents filed. And we hypothesize

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EMI, Vol. 15, Issue 1, 2023
ISSN: 1804-1299 (Print), 1805-353X (Online)
www.emijournal.cz

that these two innovation indicators are positively influenced by VC funding (Stéphane KOFFEL, Jonathan LABBÉ, 2020)

These data were obtained by cross-referencing data from the Zéphyr and Orbis databases:

- **Zéphyr:** This database contains a wide range of financing deals, including VC financing deals.
- **Orbis:** This database allows us to access different characteristics of companies, including financial data such as the amount of research and development costs. (Stéphane KOFFEL, Jonathan LABBÉ, 2020)

Second, we studied the profitability of innovative projects financed by the VC (Claude Bekolo, 2009), to prove the efficiency and impact of innovation financing on startups.

3.3.2 Independent Variable "Venture Capital Financing"

The main independent variable is the involvement or not of venture capital financing, According to the literature of (Chien-Chi Chu, Yong-Li Li, Shi-Jie Li, Yun Ji, 2021). Venture capital is a dummy variable, as long as all selected startups are funded (Han, 2021).

4 Results and discussion

4.1 Results of the unidimensional analysis

4.1.1 Respondent profiles

Table N°01 represents the statistics of the respondents' profile of our questionnaire, in the horizontal axis we find the frequency and the percentage of the answers, however, in the vertical axis, we find our variables.

The sample obtained is generally composed of men with a percentage of 75%. For the age category, the majority of the respondents answered between 26 and 35 years (34.4%), and the respondents with an average age between 36 and 45 years are in the second position with a slight difference in the percentage of 31.3%.

The majority of the study sample resides in the wilaya of Algiers, with a percentage of 68.8%.

Table 01: Respondent profiles

	Variable	Frequency	Percentage (%)
Gender	Men	24	75,0
	Women	8	25,0
Age	Less than 25 years old	3	9,4
	26 - 35 years old	11	34,4
	36 -45 years old	10	31,3
	46 - 55 years old	7	21,9
	Over 55 years old	1	3,1
Wilaya of residency	Laghouat	2	6,3
	Batna	1	3,1
	Bejaïa	1	3,1
	Biskra	1	3,1
	Tlemcen	1	3,1
	Algeirs	22	68,8
	Constantine	1	3,1
	Medea	1	3,1
	Mascara	1	3,1
	Bordj Bou Arreridj	1	3,1

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Figures N° 02 and N° 03 expose the number of years of management of the company by the respondent, and his experience in the sector of the activity calculated by years.
We can see from these two bar graphs that the respondents have been running their companies for 2 to 4 years with 9 respondents each. On the other hand, they accumulate experience from one year to 26 years. The most remarkable values are 5, 10 and 12 years, with 5, 4, 4 responses out of 32 responses respectively.

Figure 02: Number of years in management of the Company

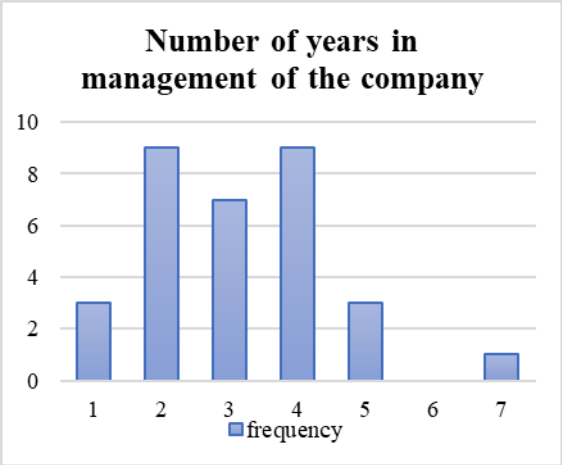
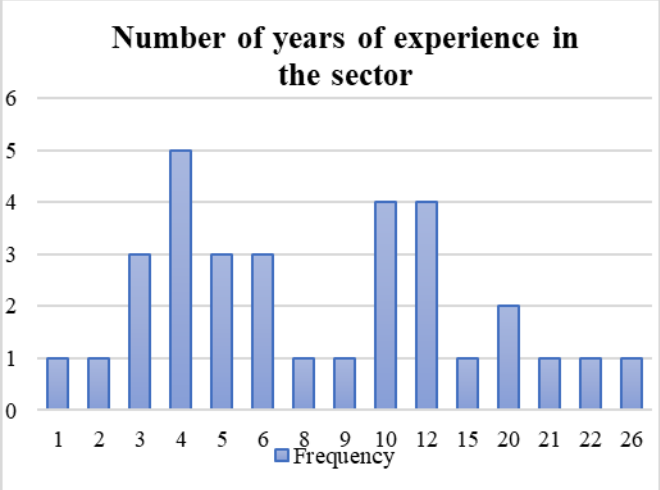


Figure 03: Number of years of experience in the sector



According to the results of figures No. 04 and No. 05, all the respondents have participated in the creation of their present startups, and they are the leaders of the startups.

Figure 04: Participation in the creation of the company

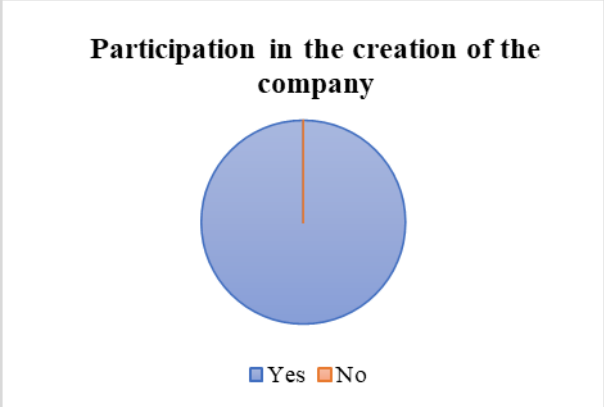


Figure 05: The owner is also the manager of the company

Paper received: 11.10.2022 Paper revised 03.01.2023 Paper accepted: 14.02.2023

EMI, Vol. 15, Issue 1, 2023
ISSN: 1804-1299 (Print), 1805-353X (Online)
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4.1.2 Company profiles

Table 02 presents a description of the profiles of the companies in the sample. This description is done by the following variables: company stature, sector of activity and the phases of creation of the company.

The ultimate majority of the startups have a legal status of SARL, limited liability company, with a high percentage of 96.1%. This result indicates that all startups are associated with the ASF. Having a fundraiser by a VC company also means the entry of the company into the status of funded startups.

In addition, the most exploitable business sector is e-service with 15.6% of positive responses out of 17 other business sectors. The latter responded mainly in the slow growth phase (43.8%), which is logical as VC firms mainly fund companies in the early stage (startups).

The research sample shows that the average number of employees in startups is 1-9, i.e. SMEs.

Table 02: Company profiles

	Variable	Frequency	Percentage	Mode
Company status	SARL	31	96,9	SARL
	EURL	1	3,1	
Business sector	E-service	5	15,6	E-service
	E-commerce	4	12,5	
	E-learning	2	6,3	
	Fintech	3	9,4	
	Greentech	1	3,1	
	Pharmaceutics	2	6,3	
	Cloud/SAAS	2	6,3	
	Transport and logistics	1	3,1	
	Games and leisure	1	3,1	
	BTP	1	3,1	
	Electronics and components	1	3,1	
	Industry	3	9,4	
	Robotics	1	3,1	
	Geomatisation and digitalisation	1	3,1	
	AI	2	6,3	
	Biotech	1	3,1	
	Marketing	1	3,1	
Busines start-up phase	Creation	4	12,5	Slow growth
	Startup	9	28,1	
	Slow growth	14	43,8	
	Fast growth	5	15,6	
Number of employees	1- 9 employees	20	62,5	1 – 9 emloyees
	10- 49 employees	12	37,5	

According to Table 03 below, the date of creation of startups with greater percentage and from 2019 to 2021 (25%). The majority of them obtained the startup label in 2021 (78.12%), and were funded by the ASF in 2021 (62.5%), the latter's recent creation (2020)

In order to study the innovation of the startups in our sample, we asked the startups about their type of innovation and the ones they are evaluating.

Paper received: 11.10.2022 Paper revised 03.01.2023 Paper accepted: 14.02.2023

Table 03: Key years for companies

	Frequency	Percentage (%)
Year of creation of the startup		
2016	1	3,1
2017	3	9,4
2018	2	6,3
2019	8	25,0
2020	7	21,9
2021	8	25,0
2022	3	9,4
Year of obtaining the Startup Label		
2020	6	18,8
2021	25	78,12
2022	1	3,1
Year of funding by the ASF		
2020	6	18,8
2021	20	62,5
2022	6	18,8

The results in Table 04 show that the majority of all startups innovate in the company's processes with 71.9%, and the production method with 53.1%. No startup answered "none", which attests that all the selected startups in our sample are innovative.

However, the responses to the highest-rated innovations are in the production method and the service with 53.1% and 40.6% in order.

Table 04: Type of business innovation

	Product	Processes	Production method	Service	Business model	Raw material	none
Type of business innovation							
Frequency	9	23	17	2	2	14	0
Percentage	28,1	71,9	53,1	6,3	6,3	43,8	0
Type of innovation being evaluated							
Frequency	9	7	17	13	3	1	2
Percentage	28,1	21,9	53,1	40,6	9,4	3,1	6,3

4.2 Results of the multivariate analysis

4.2.1 Venture capital financing as an increase in the level of R&D expenses

Table N°05 presents the correlation between the value of VC funding and the percentage of R&D expenditure attributable to the development or launch of each type of innovation.

It consists of four columns, the value of funding allocated by the ASF, the percentage of R&D expenditure before the ASF funding and after the funding, and the last column calculate the difference between these two percentages.

Paper received: 11.10.2022 Paper revised 31.10.2022 Paper accepted: 21.11.2022

EMI, Vol. 15, Issue 1, 2023
ISSN: 1804-1299 (Print), 1805-353X (Online)
www.emijournal.cz

Table 05: Correlation between funding and percentage allocated to innovation

Funding values	% Before funding	% After funding	The diffrence between %
15000000	20	30	10
7000000	0	0	0
11000000	0	0	0
6600000	35	50	15
10000000	10	25	15
10000000	0	0	0
13000000	42	56	14
3000000	0	0	0
20000000	0	0	0
10000000	20	20	0
9000000	30	40	10
8000000	50	50	0
8700000	0	0	0
1000000	60	80	20
7000000	10	20	10
1000000	10	20	10
10000000	25	35	10
12000000	0	0	0
8500000	35	50	15
6000000	10	0	-10
6300000	25	37	12
8500000	0	12	12
7000000	0	7	7
8500000	0	0	0
20000000	30	30	0
6000000	20	80	60
5000000	30	45	15
5800000	0	0	0
16000000	0	30	30
6000000	5	20	15
15000000	0	7	7
3000000	33	45	12
30528125	**The average**		9,031
10000000	**The mode**		0
8500000	**The median**		10
Correlation			**-0,141**

We notice from the previous table that the highest value of funding allocated is 20.000.000,00 DZD[1], however, the lowest is estimated at 1.000.000,00 DZD, for an average of 8.871.875,00 DZD.

Furthermore, there is a remarkable difference in the percentages of the amounts attributed to R&D, in order to develop and/or launch an innovation, after and before the financing by the ASF. The highest value is an increase of 60%, and the lowest value is a decrease of 10%. With a positive mean of 9.031%.

We applied Pearson's correlation to distinguish the relationship between the value of funding and the difference between the two percentages. The results show that the correlation coefficient is negative

[1] DZD is the alphabetic code which represents the national currency of Algeria "Algerian Dinar"

Paper received: 11.10.2022 Paper revised 03.01.2023 Paper accepted: 14.02.2023

(r =-0.141), which means that the two variables vary in opposite directions from each other, which rejects hypothesis 1.1.

In the existing work on the subject, since R&D investment is a basic condition for innovation in the firm, we expect that firms with venture capital participation will have higher levels of R&D investment, which in turn will significantly influence innovation in the firm.

The results of Stéphane Koffel, Jonathan Labbé (2020) also show a negative effect on the level of R&D spending. The extent of innovation would not only be due to the level of R&D spending but also to the efficiency of the latter. The intervention of the VCs could respond to this search for efficiency, which could explain this negative effect.

However, the regression results of Chien-Chi Chu, Yong-Li Li, Shi-Jie Li, Yun Ji (2021) show that VC involvement significantly improves firms' R&D investment levels. With innovation as the dependent variable, venture capital is not included in the dependent variables and R&D investment has a significant influence on innovation.

Besides, it can be easily seen that after controlling for the effects of R&D investment, the coefficient on venture capital decreases to a magnitude of 0.203-0.127 = 0.076, almost equivalent to the mediating effects of R&D investment, i.e. 0.097*0.794 = 0.077. We can therefore conclude that R&D investment partially mediates the promotion effects of venture capital on innovation. The involvement of venture capital can facilitate the increase of firms' R&D investments, while the latter improves the firm's innovation levels. (Chien-Chi Chu, Yong-Li Li, Shi-Jie Li, Yun Ji, 2021)

4.2.2 Venture Capital Financing as an Increase in Intellectual Property Filings

Table 06 below shows the relationship between the value of VC funding and the number of filings of IP documents after funding, including registered trademarks, patents, registered industrial designs, trade secrets and non-disclosure agreements.

Table 06: Pearson correlation showing the relationship between VC funding and the number of intellectual property filings

Correlations						
		Registered trademark	**Patent**	**Registered industrial design**	**Trade secret**	**Non-disclosure agreement**
Funding value	Pearson correlation	,136	,110	,067	,126	,133
	Sig. (Bilateral)	,457	,550	,714	,490	,468
****. The correlation is significant at the 0.01 level (Bilateral)**						

It shows that the number of IP document filings is positively related to the funding value per VC (r = 0.136; 0.110; 0.067; 0.126; 0.133). The increase in the latter could imply an increase in innovation.

We note that the correlation is not significant (p> 0.01), and is weak because it is close to 0. Therefore, hypothesis 1.2 is partially rejected because the outcome of the results is weakly supporting hypothesis 1.2.

These results are consistent with the findings of Ana Paula Faria, Natàlia Barbosa (2014), explicitly addressing the potential endogenous relationship between venture capital and innovation and controlling for persistence in the patent series; the results show that patent applications are in fact influenced by venture capital. These results give policymakers a clear picture of the real impact of venture capital on innovation and what they can and cannot expect from venture capital regarding its role in supporting innovation.

They show a strong degree of persistence in patent applications, as expected, and a non-significant coefficient on venture capital investments (Ana Paula Faria, Natàlia Barbosa, 2014)

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In reverse, a positive and statistically significant relationship between venture capital investments and patent applications in the model of (Sunny Li Sun, Victor Z. Chen, Sanwar A. Sunny, Jie Chen, 2019). In terms of economic significance, all else being equal, a 1% increase in the number of venture capital investments would lead to a 3.70% increase in the number of patent applications ($p < 0.001$).

For Stéphane KOFFEL, Jonathan LABBÉ (2020), the Capital investment * the amount is positively correlated with Patents. They observed a positive effect, but it was not significant; and did not allow them to confirm their hypotheses.

4.2.3 VC funding and rates of return on innovative projects

Tables (07) (08) (09) present the results of a multiple linear regression between the independent variable, which is venture capital funding, and the dependent variables, which are the debt-to-salesio of the startups and their financial situation after financing by the ASF.

Table 07: Overview of models

Overview of models										
Model	**R**	**R-two**	**R- two adjusted**	**Standard error of the estimate**	**Editing statistics**					**Durbin-Watson**
					Variation of R-two	**Variation of F**	**ddl1**	**ddl2**	**Sig. Variation of F**	
1	,183[a]	,033	-,033	124274075 ,73728	,033	,500	2	29	,612	2,004
a. Predictors: (Constant), Your company's debt to sales ratio, Your company's financial situation										
b. Dependent variable: financing value										

Table 08: ANOVA VC and Rate of Return

ANOVA[a]						
	Model	**Sum of squares**	**Ddl**	**Medium square**	**F**	**Sig.**
1	**Regression**	15445073577231424,000	2	7722536788615712,000	,500	,612[b]
	De Student	447877331110268350,000	29	15444045900354082,000		
	Total	463322404687499780,000	31			
a. Dependent variable: funding value						
b. Predictors: (Constant), Your company's debt to sales ratio, Your company's financial situation						

Table 09: VC coefficients and rates of return

Coefficients[a]							
Model	**Non-standardised coefficients**		**Standardised coefficients**	**t**	**Sig.**	**Co-linearity statistics**	
	B	**Standard error**	**Bêta**			**Tolerance**	**VIF**
(Constante)	97961146,014	150251594,109		,652	,520		
The financial situation of start-ups	8949111,785	34993564,646	,049	,256	,800	,909	1,100
The debt to sales ratio of start-ups	-27223288,562	27253615,782	-,191	-,999	,326	,909	1,100
a. Dependent variable: funding value							

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After the analysis, we deduce the following results:

The correlation coefficient is significant but low which is close to 0, (r = 0.183), (sig =0.612)

R-two = 0.33, this explains that 33% of the variance of the financial situation and that of the debt/sales ratio is explained by the research model taken by the questionnaire answers, which is rather low.

Standardized beta coefficients: the value of financing contributes positively to the financial situation of the startups (coef = 0.49), however, it contributes negatively to the debt-to-sales ratio of the startups (coef = -0.191).

Regarding table N°10 in the appendix, it communicates the results of the Pearson correlation between the value of financing per VC and:

- Sales growth attributable to new products or services;
- The percentage of sales attributable to new products or services over a given period;
- The number of new products or services introduced to the market;
- The return on investment (ROI) of new products or services;
- Profit growth attributable to new products or services;
- The potential of the entire portfolio of new products or services to meet growth targets;
- The change in market share attributable to the new products or services;
- The net present value of the entire portfolio of new products or services.

In general, we observe that there is a high positive and significant correlation (sig = 0.00) between all variables.

In detail, the correlation between the growth of the turnover after the financing by the ASF attributable to the new products or services and:

- The number of new products or services brought to market after financing is (r = 0.707)
- The return on investment (ROI) of new products or services is (r = 0.843)
- The profit growth attributable to new products or services is (r = 0.804)
- The potential of the entire portfolio of new products or services to meet growth targets is (r = 0.848)

In addition, the correlation between the percentage of sales attributable to new products or services over a given period after ASF funding and:

- The return on investment (ROI) of new products or services is (r = 0.478);
- The growth in profits attributable to the new products or services is (r = 0.445);
- The change in market share attributable to the new products or services is (r = 0.735);
- The net present value (NPV) of the entire portfolio of new products or services is (r = 0.364).

There are also other strong positive and significant correlations, such as the relationship between the number of new products or services brought to market and the number of new products or services brought to market with a coefficient of (r = 0.729). And the relationship Net Present Value (NPV) of the entire portfolio of new products or services and the change in market share attributable to new products or services (r = 0.588).

We deduce that after obtaining the ASF funding; the NPV, ROI and market share of the startups saw a remarkable increase. Our hypothesis 1.3 receives a strong validation.

According to Jiang Cailou, Liu DeHai (2022), large companies tend to have abundant financial and innovation resources; and have a greater ability to bear the risks of innovation.

The results of Han (2021) reported that venture capital investments have a positive and significant impact on small businesses and startups based on financial performance as well as business growth.

Paper received: 11.10.2022 Paper revised 31.10.2022 Paper accepted: 21.11.2022

EMI, Vol. 15, Issue 1, 2023
ISSN: 1804-1299 (Print), 1805-353X (Online)
www.emijournal.cz

Effect of total assets on performance is significantly positively related to net income ($r = 0.920$, $p<0.01$), which concretely means that the funds allowed to the company's performance affect positively the net income.

4.2.4 Venture capital has a positive and significant impact on startup innovation

On the basis of the results of the three sub-hypotheses, we deduce that venture capital has a positive and significant impact on firm innovation, and hypothesis H1 is established.

Venture capital focuses on long-term returns and can guide firm innovation by injecting capital into the firm and providing value-added management services. (Jiang Cailou, Liu DeHai, 2022)

5 Conclusion

This paper studies the impact of venture capital financing on startup innovation in Algeria. We have chosen the Algerian Startup Fund and its associated startups as the research sample.

Venture capital financing is the most appropriate for this type of company, with high risks, not listed on the stock exchange, and without any guarantee of projected financial profitability. It is a special type of financing intended mainly for young innovative companies, which need capital to finance the development of their product and their growth and which must, by the nature of their activity, obtain this capital largely in the form of equity capital. This counters the contribution of bank credit, which does not support startups.

In contrast to the catalytic role played by VCs in developed markets, VCs play a more proactive role as ecosystem engineers in creating and transforming the variation-selection-retention dynamics of the innovation ecosystem in an emerging market context, where supporting institutions and professional intermediaries are relatively absent and the innovation ecosystem is inefficient.

Interestingly, the estimates show that only late-stage venture capital has a significant impact on innovation. This result suggests that venture capitalists are more willing to support innovation only after overcoming the initial and more uncertain phase of technology development.

The most relevant result we obtained, which validates hypothesis 1.3, is that there is a positive and significant relationship between VC funding from the ASF and the profitability of innovative projects.

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Paper received: 11.10.2022 Paper revised 31.10.2022 Paper accepted: 21.11.2022