Venture capital as a driver of startup innovation in Algeria : A survey of the Algerian, Tunisian and Moroccan contexts between 2016 and 2020

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Venture capital as a driver of startup innovation in Algeria : A survey of the Algerian, Tunisian and Moroccan contexts between 2016 and 2020

رأس المال المخاطر كمحرك لابداع المؤسسات الناشئة في الجزائر. دراسة استقصائية للسياق الجزائري، التونسي والمغربي ما بين الفترة 2016-2020

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Abstract: Companies are willing to be more innovative if they expect to receive funds. In this paper, we will emphasize the importance of venture capital as a motor for innovation and entrepreneurship in the Algerian context, by presenting a survey of other contexts such as the USA and Europe in a review of literature. We will also show the state of existing Algerian innovation and venture capital and compare it to the Moroccan and Tunisian contexts. Our main finding is that the Venture capital funds have a positive impact on innovation furthermore; the venture capital activity in Algeria is still very weak compared to our neighboring countries, which also has a negative impact on Algerian startup innovation.

Key words: startup; venture capital; innovation.
JEL classification: M130 ; G240 ; O31

الملخص: يلعب التمويل دورا اساسيا في تحفيز الشركات على الابتكار. في هذه الورقة، سوف نؤكد على أهمية رأس المال المخاطر كمحرك الابتكار ورواد الأعمال في السياق الجزائري، من خلال تقديم مسح للدراسات التي تمت في السياقات الأخرى مثل الولايات المتحدة الأمريكية وأوروبا في مراجعة الأدبيات. سنعرض أيضًا حالة الابتكار الجزائري ورأس المال المخاطر ومقارنة بالسياقات المغربية والتونسية. النتيجة الرئيسية التي توصلنا إليها ان الراس المال المخاطر يؤثر إيجابا على ابتكار الشركات الناشئة وأن نشاط رأس المال الاستثماري في الجزائر لا يزال ضعيفًا جدًا مقارنة بالبلدان المجاورة، والذي له أيضًا تأثير سلبي على ابتكار الشركات الناشئة الجزائرية.

الكلمات المفتاحية: الشركات الناشئة، رأس المال المخاطر، الابتكار

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INTRODUCTION

Entrepreneurial innovation is an important source of creative destruction and economic growth (Schumpeter, 2003). Scholars, practitioners and policy makers agree that technological innovation is critical to sustaining innovation activities, new job creation, and, in turn, economic growth. (Bozkaya & Van Pottelsberghe De La Potterie, 2008; Caviggioli et al., 2020; Ewens & Rhodes-Kropf, 2015). From this perspective, the efforts of Algerian authorities in encouraging startups through policies to organize and determine the startup status is evident, for instance with the creation of the ministry of SME , Startups and Digital Economy by the decret N 20-50 of February 2020 as an authority to organize and manage the ecosystem of the startup field.

Furthermore, the decret N 20-254 of September 2020 clarified the legal status of startup, innovative venture, and incubator. (Algerian Official Journal 09-2020).

However, the startup concept emphasizes the innovative activity as a main characteristic of startups--wherefore, to encourage startups and entrepreneurship as scholars and policy makers, we also have to define the startup issues in terms of growth and innovation.

One of the main barriers of startup innovation is funding and external finance (Hsu, 2006). Scholars, practitioners and policy makers agree that venture capital (VC) potentially has a crucial beneficial effect on startups, as it can alleviate the above mentioned problems. (Colombo et al., 2010) VC is also the most suitable financing form for startups. (Keilbach et al., 2007) .

Both academics and practitioners generally consider Venture capital (VC, henceforth) as the most suitable financing mode for entrepreneurial firms. (Croce et al., 2013).

A previous study, which explored Venture capital in the Algerian context, is the Himrane and Salhi (2019) paper .The authors studied SME financing by venture capital in Algeria and found a lack of VC in the Algerian context. (Himrane & Salhi, 2019).

Our research problem began with startup innovation in Algeria, which is very concerning in terms of the number of patents issued by startups.

Based on the above, our aim is to show the importance of venture capital in the startup ecosystem and its role in enhancing and encouraging startup innovation. We present evidence from other contexts as well as empirical data about Algerian startups, venture capital and innovation.

1. The literature review

The literature review shows the importance of venture capital in startup growth and innovation, although the impact of venture capital on innovation is still under debate.

In order to clarify this impact, we would like to determine

The concept of VC

The impact of VC on innovation.

After that, we will analyze this impact in the research stream from different levels, such as industry level and firm level, and startup innovation before the VC investment and after the VC investment.

1.1 The VC concept

Venture capital investors are specialized financial intermediaries that provide funding for technological innovation, with the goal of realizing a capital gain within a few years.(Da Rin & Penas, 2017).

Venture capital firms are specialized investors that raise money from pension funds, endowments, and other institutional investors (Da Rin & Penas, 2017) to invest in high-growth, innovative enterprises. (Arque-Castells, 2018) . According to research, venture capitalists keep track of and provide value to the firms in which they invest. (Knockaert et al., 2006). Ueda (2004) shows that banks are less suitable than venture capital firms for financing high-risk entrepreneurial projects. (Ueda, 2004). Furthermore, both academics and practitioners agree that venture capital (VC) is the best financing option for emerging high-tech startups. (Bertoni et al., 2010; Colombo et al., 2010)

1.2 The Impact of VC on innovation.

Scholars analyze the impact of VC on innovation from different levels, such as industry level and firm level, and startup innovation before the VC investment (selection effect) and after the VC investment (treatment effect).

However, the findings in the research stream regarding the impact of venture capital on innovation are different, but all scholars use patent activities as an indicator for measuring startup innovation.

1.2.1. Industry level:

The work of Kortum and Lerner (2000) is probably the first study that analyses the impact of VC on innovation (Bertoni & Tykvová, 2015). The authors examined the influence of venture capital on patented inventions in the United States across twenty industries over three decades, from 1965 to 1992, and found the positive impact of venture capital on

patenting activity in an industry. (Kortum & Lerner, 2000).

Hirukawa and Ueda (2011) analyze the causality issue of VC and innovation in the US manufacturing industry using both total factor productivity growth and patent counts as measures of innovation. (Hirukawa & Ueda, 2011). Their finding is consistent with Kortum and Lerner's (2000) findings. (Hirukawa & Ueda, 2011).

Based on the above, the impact of VC on startup innovation remains unclear, as these previous studies only focused on the industry level by linking the total amount of VC investment with the total number of patents. Therefore, scholars further investigate this issue inside firms by using longitudinal data for startup patents before and after VC investment.

1.2.2. Firm Level:

Regarding the first round of VC investment in a startup, scholars distinguish two phases: before the VC investment and after the VC investment. The impact of VC investment on startup innovation has two effects; the selection effect, which is the impact of VC investment on startup innovation before the VC investment, and the treatment effect, which is the impact of VC investment on startup innovation after the VC investment.

1.2.2.1. Selection effect

The existing body of research on venture capital and startup innovation in the American and European contexts shows that startup innovation attracts VC investment by using patents as a signal to point to startups that are suitable for VC financing. (see eg (Haeussler et al., 2014) Furthermore, VCs invest in firms whose research efforts have already successfully crystallized into promising inventions. (Arque-Castells, 2018; Bertoni et al., 2010; Caselli et al., 2012; Chemmanur et al., 2011; Hellmann, 2000; Keilbach et al., 2007; Mann & Sager, 2007; Samila & Sorenson, 2010)

1.2.2.2. Treatment effect

So far, there has been little agreement on the positive impact of VC investment on startup innovation after the VC investment. There are two contradictory approaches: a positive one, led by Kortum and Lerner (2000), and a negative one, led by Engel and Keilbach (2007).

Though the Kortum and Lerner (2000) finding is related to the industry level, their study is the first paper that explored the impact of VC on innovation.

In the following Table (01), we will show the various studies in different

contexts.

Table 01: Survey of the available evidence on the positive and negative impact of VC on startup innovation.

level	The impact	The study	The context
Industry level	Positive impact	Kortum and Lerner (2000) Hirukawa and Ueda (2011)	Twenty U.S. manufacturing industries between 1965 and 1992 US manufacturing industry
Firm level	Positive impact	(Alvarez-Garrido & Dushnitsky, 2016) (Arqué-castells, 2012) (Bertoni et al., 2010) (Da Rin & Penas, 2017) (Samila & Sorenson, 2010) (Kelly & Kim, 2018)	The sample consists of 545 U.S. biotechnology ventures founded between 1990 and 2003 and backed by independent venture capitalists (VCs) or corporate VCs (CVC). 233 VC-backed firms and a large set of controls operating in Spain. 351 Italian NTBFs operating in high-tech manufacturing industries and software, 33 of which are VC-backed 10,000 innovative Dutch companies Using panel data on metropolitan areas in the United States, from 1993 to 2002 544 Canadian firms
	Negative impact	(Keilbach et al., 2007) (Lahr & Mina, 2016) (Arvanitis & Stucki, 2014)	German firms founded between 1995 and 1998 for 142 funded ventures. Leading to a total sample of 1540 U.S. firms and 2129 U.K. firms in 2005 All firms *7,112 firms *founded in Switzerland in 1996/97, until 2006 the sample became 857 firms

Source: Adapted from Arqué-Castells (2012)

Based on the above all researchers agree that the fact of VC existence, the startup innovation is very active because one of the main funding criteria from the VC is the startup innovation and invention. Furthermore, there is an approach, which is led by Kortum and Lerner (2000), that confirms

the positive impact of VC on innovation even after the VC fund. From this perspective, VC can be a real motor to enhance startup innovation.

2. The empirical study:

In order to study the Algerian context, we would like to overview:
The legal context of startups and venture capital.
Analyze and compare startup innovation in Algeria, Tunisia, and Morocco by putting the following hypothesis to the test:

Ha_0: There is no difference in the means of startup innovation between Algeria, Morocco, and Tunisia.
Ha_1: There is a difference in the means of startup innovation between Algeria, Morocco, and Tunisia.

Analyse the existence of VC in Algeria and the availability of VC for startups and compare it with other contexts.

Hb_0: There is no difference in the means of venture capital deals between Algeria, Morocco, and Tunisia.
Hb_1: There is a difference in the means of venture capital deals between Algeria, Morocco, and Tunisia.

The reason for choosing the Tunisian and Moroccan contexts is geographical, and the main reason is that all of these contexts have the same policies concerning the startup status.

Data and Methods:

In order to analyse the startup innovation in Algeria, we checked all the patents published by the European Patent Office (EPO) between 2016 until 2020 as shown in Table (02). We could not find any granted patents for a startup.

Furthermore, we made a survey about the Moroccan, Tunisian, and Algerian granted patents in which the inventors and the demanders of patents are from the same country--to avoid foreign patent applications--from 2016 until 2020. (As we know by the definition of a startup that is related to information and technology, see (Tarillon, C., 2015). That means every startup has at least a visibility or presence on the internet through a website or the affiliation of their team members). This survey is an online survey by searching for the name of the company or the person who demanded the patent ; for double check, we also tried to confirm the company profile with the content of the patents). The results are shown in the table (02).

We also tried to get information from the Algerian National Institute of Industrial Property (INAPI) database (http://e-services.inapi.org/wopublish-search/public/patents;jsessionid=3769C1ACDE3EA0A5A898F132E45B1742?0&query=*:*#), but we found that the last granted patent was in 2012, which led us to check the European Patent Office (EPO) database.

In the Table (02), we refer the no startup to the Universities, the research centers and the companies that have more than 10 years of existence, and also the patent type that doesn't belong to the IT and Biotechnology industry.

Table (02): Patent grants in Algeria, Morocco, and Tunisia (number of patents by startups)

Country	Algeria		Morocco		Tunisia	
	no startup	startup	no startup	startup	no startup	startup
2016	5	0	16	2	22	5
2017	5	0	11	1	39	6
2018	8	0	7	4	28	7
2019	7	0	12	2	33	12
2020	10	0	12	2	22	14
Means	7	0	11,6	2,2	28,8	8,8

Source: Patents are from several sources by using a specific request for every context; and for defending the patent demander as a startup or other, we made an online survey. *https://worldwide.espacenet.com/patent/search?f=publications.pd%3Ain%3D20160101-20211231%7Cpublications.in_country%3Ain%3Ddz&q=a*

https://worldwide.espacenet.com/patent/search?f=publications.pd%3Ain%3D20160101-20211231%7Cpublications.pa_country%3Ain%3Dma%7Cpublications.in_country%3Ain%3Dma&q=a

https://worldwide.espacenet.com/patent/search?f=publications.pd%3Ain%3D20160101-20211231%7Cpublications.cc%3Ain%3Dtn%7Cpublications.in_country%3Ain%3Dtn%7Cpa_full%3Aex

Checked in 31/05/2021

Furthermore, to analyse the existence of VC in Algeria and the availability of VC for startups, and compare it with the other contexts, we used the indexes relating to venture capital in the Algerian context, even though all scholars and practitioners agree that innovation requires a suitable

ecosystem on one hand. But on the other hand--returning to our evidence that we started this paper--entrepreneurial innovation is an important source of creative destruction (Schumpeter, 2003), which means entrepreneurial innovation can lead to a suitable ecosystem for innovation. The Venture Capital Deals Index can help us show the availability of funds for startups. Table (03) contains the relevant information.

Table (03): Algeria, Morocco, and Tunisia Venture Capital Deal Indicator Comparison

Country	Indicator	2016	2017	2018	2019	2020	**Means**
Algeria	Venture Capital deals	81	81	81	81	81	81
Morocco	Venture Capital deals	46	50	49	52	81	55,6
Tunisia	Venture Capital deals	41	32	20	28	61	36,4

Source: https://knoema.com/GII2018Aug/global-innovation-index?country=1000020-algeria
Checked in 31/05/2021

The one way ANOVA* test for panel data was carried out to examine whether the means of groups (Algeria, Morocco and Tunisia) were equal or unequal as illustrated in the $H_{a(0,1)}$, and $H_{b(0,1)}$.

2.1. The Algerian startup:

The efforts of Algerian authorities in encouraging startups through policies to organize and determine the startup status is evident, for instance with the creation of the ministry of SME , Startups and Digital Economy by the decret N 20-50 of February 2020 as an authority to organize and manage the ecosystem of the startup field.

Furthermore, the decret N 20-254 of September 2020 clarified the legal status of startup, innovative venture, and incubator. (Algerian Official Journal 09-2020).

Each company under Algerian law that meets the following criteria is considered a "Start-up":

- The company must not have existed for more than eight (8) years.
- The company's business model must be based on products, services, business models or any other innovative concepts.

* Following to Hae-Young Kim (2014) *"For a comparison of more than two group means the one-way analysis of variance (ANOVA) is the appropriate method."* (Kim, 2014)In our study, the ANOVA test address to compare between means of the Algerian, Moroccan and Tunisian context.

- The annual turnover must not exceed the amount set by the national committee.
- At least 50% of the share capital must be held by individuals, approved investment funds or other companies with the "Start-up" label.
- The company's growth potential must be sufficiently great
- The company must not have more than 250 employees. (Algerian Official Journal 09-2020)

Tunisian context

Each company under Tunisian law that meets the following criteria is considered a "Start-up":

- Less than 8 years of existence;
- A turnover and a balance sheet total lower than 30 MDT and a staff of less than 100 employees;
- An independent capital structure, more than 2/3 owned by individuals, investment funds and foreign startups;
- An innovative business model and an important growth potential.

(http://www.tunisie-societe.com/index.php/fr/constitution-societe-en-tunisie/solutions/cr%C3%A9ation-startup-en-tunisie).

For the Moroccan legal context, we could not find the startup status but we found that the startup is similar to LLC(limited liability company). *https://www.start-up.ma/articles-et-conseils/quelle-forme-juridique-pour-sa-startup/*

Innovation in the Algerian startup context:

We tested the null hypothesis Ha0 in order to analyze Algerian startup innovation, and we discovered that the difference in the means of granted patents in Algeria, Morocco, and Tunisia is significant.

In Table (05), we compared the startup innovation in Algeria, Tunisia, and Morocco after testing the null hypothesis, Ha0 in Table (04).

We found that the p-value is less than the significance level of 0.05. We rejected the null hypothesis Ha0 and accepted Ha1.We can say that Tunisian startups are more innovative than Moroccan startups, while Algerian startups don't have any granted patents. On the other hand, the results in Table (05) can confirm our findings, which reflect the mean ranking of Tunisia in first level in the global innovation index and patent Application by origin indicator, higher than Morocco and Algeria.

Table (04): result of one way Anova test for $H_{a(0,1)}$

Analysis of Variance

Source	SS	df	MS	F	Prob > F
Between groups	209.733333	2	104.866667	18.62	0.0002
Within groups	67.6	12	5.63333333		
Total	277.333333	14	19.8095238		

Table (05): Ranking of Algeria, Tunisia and Morocco by innovation indicators

Country	Indicator	2016	2017	2018	2019	2020	**Means**
Algeria	Global innovation index	113	108	110	113	121	113
	Patent Application by origin	94	101	100	91	95	96,2
Morocco	Global innovation index	72	72	76	74	75	73,8
	Patent Application by origin	58	67	70	74	79	69,6
Tunisia	Global innovation index	77	74	66	70	65	70,4
	Patent Application by origin	61	57	49	56	60	56,6

Source: https://knoema.com/GII2018Aug/global-innovation-index?country=1000020-algeria checked in 31/05/2021

2.2. The VC in Algeria:

2.2.1. Venture Capital policies:

The VC is defined in Algerian law n° 06-11 June 24, 2006, relating to the capital investment company. (...Art. 4. The modalities of intervention of the company in capital investment are: venture capital, which covers…). (Algerian Official Journal 06-2006)

Article 46 of the supplementary finance act for 2020 authorizes capital investment companies to hold shares or social shares representing no more than 49% of the capital, thus allowing startups to have an additional financing lever.https://pwcalgerie.pwc.fr/fr/files/pdf/2020/06/fr-algerie-pwc-lfc-2020.pdf

2.3.2. The Venture Capital investments

To grasp the innovative nature of VC investment in Algeria, we

checked the VC investment as summarized in Table (06)[*].

Our finding is that venture capital in Algeria does not focus on startups and innovation projects. This finding shows that the mission of VC is to invest in innovative firms and VC practice as shown in their investment is different.

Table (06): The Algerian VC and The rate of startups in the VC investment

The VC	The rate of startups in the VC investment
ASICOM	0%
EL DJAZAIR ISTITHMAR	No information
SOFINANCE	0%
FINALEP[†]	46% / 0 %
Algerian startup fund	Created in 09-2020

In order to analyse the existing state of Algerian VC compared with the Moroccan and Tunisian contexts, we tested the null hypothesis Hb0,

Table (07) shows the one way Anova test, to examine whether the means of the VC Deals Index in Algeria, Morocco, and Tunisia were equal or unequal.

Table (07): result of one way Anova test for $H_{b(0,1)}$

Analysis of Variance

Source	SS	df	MS	F	Prob > F
Between groups	5004.93333	2	2502.46667	16.59	0.0004
Within groups	1810.4	12	150.866667		
Total	6815.33333	14	486.809524		

We found that p-value is less than the significance level 0.05, we rejected the null hypothesis H_{b0} and we accepted the H_{b1}, and the deference between the index of VC deal in Algeria, Morocco and Tunisia are significant.

Furthermore, the Algerian context is in the last ranking when compared to Morocco and Tunisia, which explains the difficulties of gaining funds from VC for Algerian startups; this can be a good indicator

[*] The venture capitalists that are mentioned in the table (06) are from the study of Himrane and Salhi (2019). We conducted a survey but we could not find other VCs except for the Algerian startup fund.

[†] For FINALEP, they mention in the website that 46% of their investments are startups, but when we checked the portfolio of FINALEP, we couldn't find any startups.

on one hand, to increase the competition between startups to be more innovative.

However, the patent application index and the granted patent in Table (05) show that the Algerian context, including Algerian startups, are less innovative compared with the other contexts. This indicator can explain the lack of VC in Algeria and the difficulties for startups to be funded.

3. CONCLUSION

Venture capital is a very important factor in entrepreneurship and the innovation ecosystem. The existence of VC and the availability to get funds from VC are very important criterias to encourage startup innovation.

Our findings argue that venture capital activity in Algeria is still very weak compared with the Tunisian and Moroccan contexts, which may have an impact on startup innovation.

This weakness is related to the stock market in Algeria because the essence of venture capital activity is the stock market.

In addition, the weakness of the legal infrastructure to clarify the policies in case of conflict between stakeholders and the absence of an investment culture in the Algerian context, even in the financial establishment, are apparent in the portfolios of the Algerian VC. The dominant logic of VC activity is creditor debtor, not investor partnership.

Based on the above, startups in Algeria suffer from funding issues. This issue may demotivate the startups' innovation and also prevent them from growth.

Our study may suffer from various limitations, such as, the lack of data to compare between the Algerian, Moroccan, and Tunisian contexts, which prevents us from studying the correlation between the startup patents and the venture capital deals indicator, because the endogeneity of variables can bias our results.

For this reason, our study focuses on the Algerian context compared with the Moroccan and Tunisian contexts.

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Appendix

3.1.1. The Algerian VC

- **ASICOM**

The Algerian Saudi Investment Company (ASICOM) was created in 2008 by a signed agreement between the Kingdom of Saudi Arabia and Algeria. Its head office is in Algiers, Algeria. The declared capital is eight billion Algerian dinars (8 000 000 000 DZD - that is 75 000 000 USD) held equally and paid fully.
ASICOM intervenes in the promotion and the financing of projects in all kinds of sectors. Its activities consist of:

- Taking part in active or newly set up companies;
- Financing combined current accounts.

Underway Projects
Rusica Park (touristic village) located in Skikda and realised by 'Société d'Infrastructures Aqua - Hôtelières d'Algérie' (abréviatif as SIAHA Spa).
City Mall (shopping mall) located in Constantine and realized by CITY MALL company.

Azemmour Hotel located in Bejaia and operated by SHIFABE company.
Operating Projects
City Center (shopping mall) located in Algiers and owned by OCEANO CENTER company.

A Hypermarket located in Algiers and operated by "Hyper Distribution of Algeria" (HDA) under the Carrefour banner.
A company of Steel manufacturing for construction located in Blida and operated by "Armatures Techniques Algérie" (ATA).
A Brick factory located in Khenchela and operated by Enterprise des Produits Rouges des Aurès" (EPRA).
MST BAT " W2S" (construction works enterprise) located in Algiers.
El Djazair Idjar (leasing company) located in Algiers.

Ceded Projects
Three buildings (Offices) located in Algiers with a total area of more than 9000 m².
An equity in ROTO ALGERIE (Industrial Printing) located in Algiers.****

When we analyse the ASICOM portfolio, we don't find any innovative project or startup.

- **EL DJAZAIR ISTITHMAR**

The company " El Djazair Istithmar. Spa" is a capital investment company with a legal status of joint stock company, governed by the law N° 06-11 of June 24, 2006 relating to the capital investment company. It was created on December 28, 2009 and has been operational since July 7, 2010.

El djazair Istithmar.Spa is a subsidiary of two public banks, namely BADR and CNEP Bank.

The Ministry of Finance has approved it since 11.05.2010, with a share capital of one billion (1,000,000,000) dinars fully paid up and distributed as follows:

shareholders	Capital	Parts of vote
B A D R	700.000.000 DA	70%
C N E P- Banque	300.000.000 DA	30%
TOTAL	1.000.000.000 DA	100%

- **SOFINANCE**
- **FINALEP**

Financière Algérienne de Participation - FINALEP Spa (formerly Financière Algéro-Européenne de Participation) was created on June 30, 1991 in the wake of the reforms undertaken in the Algerian banking and financial system in order to promote Private Equity.

Its capital is currently held by the BDL (Banque de Développement Local) and the CPA (Crédit Populaire d'Algérie); it has undergone several successive increases and reorganizations to reach the level of 1.200.000.000 DA.

FINALEP Spa intervenes throughout the national territory and contributes to the development of the Small and Medium Enterprise (SME), in particular that having an industrial character.

The new policy of strategic reorientation of FINALEP Spa and its redeployment in the sphere of the economic and financial landscape results from its strong will of positioning and reinforcement of its collaboration with its relations and its partners.

The new strategy of FINALEP Spa is also translated by its will to singularize its perception and its distinction on an economic relief more and more demanding, and on which it reinforces exponentially the deployment of its commercial action, thus translating the evolution of its last quantified performances.

FINALEP Spa, a capital investment company, has as its object the participation, on its own behalf or on behalf of third parties and with a view to its retrocession, in the reinforcement of the equity capital of small and medium-sized companies.

Portfolio made up of start-ups

FINALEP Spa's portfolio is made up of a large proportion (46%) of participations at the seed stage (start-up), with the financing of certain singular projects