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# Assessing Financing, Innovation and Growth Linkage: New Evidence for Policy

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Financing, innovation and growth linkage is a multi-stage process. First, access to finance has a leverage effect on innovation and secondly this additional innovation has an impact on growth. However, few authors have assessed the effect of these three components at the same time. Furthermore, the scientific literature usually focuses more on assessing only the effect of one type of source of financing, such as public support or venture capital, on innovation or firm growth. The aim of the present study is to go further and to assess the effect of eight different sources of financing (internal funds, bank loan, credit line, trade credit, grants, equity, leasing and factoring) on innovation and then on firm growth. Using data from the Survey on the Access to Finance of Enterprises and a three-step econometric approach, the study provides evidence that external sources of financing have a positive effect on innovation and then an additional effect on firm growth (turnover and employment). However, not all sources of external financing have the same impact.

Equity financing has a larger effect on the strategic

decision to innovate, and the highest output additionality on firm turnover growth, when compared to the effects of other sources of financing.

Grants registered a moderate effect on innovation and on output additionality on firm growth (both turnover and employment) and its effect does not appear to be statistically different from other financing instruments (excluding equity). Moreover, grants show higher employment growth than turnover. Furthermore, the number of financing instruments used together also seems to matter, revealing that a financing instrument used alone has no effect on innovation. Our findings suggest that state aid to promote R&D and innovation needs to rely on sounder public/private support integration for it to be successful. All these conclusions could be particularly useful for policy-makers since recommendations for a European Innovation Council point out that the use of existing funding instrument should be improved and the opportunity for blending grant and financial instruments could be further explored.

**Keywords:** Financing; Innovation; Firm growth; Europe



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# 1. Introduction

Joseph **Schumpeter** (1934) was the first scholar to support a positive relationship between innovation and growth, sustained by financial services and intermediaries. According to the Schumpeterian theory, through entrepreneurship and credit system intermediation, innovation can sustain economic growth, as successful innovation gives firms a competitive advantage in the market vis-à-vis competitors. The financing-innovation-growth linkage was also supported by **King and Levine** (1993). These authors show that a better financial system improves the probability of successful innovation, thus accelerating economic growth.

A main player in the financial market are banks, which lend money to firms under specific conditions, either for growth purposes, or for day-to-day business operation. Nevertheless, access to bank finance is subject to a selection process and a main determinant for the lender's decision is the firm and investment project's level of risk (**Savignac, 2007**). For these reason, innovative firms face more severe constraints and barriers to access external financing (**Lee et al., 2015; Santos and Cincera, 2017**), either for their higher uncertainty and riskier projects, and for fewer assets to be used as collateral (**Hall and Lerner, 2010**). Therefore, innovative firms need to find alternative channels when banks refuse to provide loans and when internal sources of financing are insufficient. Some available options, depending on the type of project to be financed, are: i) finding Private Equity (PE) funds, such as Business Angels and Venture Capitalists; ii) applying for a government grant or subsidy; iii) asking for trade credit from suppliers; iv) obtaining asset-based financing, such as leasing; v) selling the firm's invoices to a factoring company to obtain liquidity more quickly; or vi) trying to collect funds via the Internet using crowdfunding.

The article aims to explore the effect of eight sources of financing (internal funds, bank loan, credit line, trade credit, grants, equity, leasing and factoring) on innovation and then on firm growth. The database comes from the anonymous "Survey on the Access to Finance of Enterprises" (SAFE). The methodological approach is based on a three-step procedure. The first two steps are based on a Propensity Score Matching (PSM) and estimate the effect of financing on innovation. The third step takes the form of a regression estimation, considering the effect of innovation financing as an explanatory variable of firm growth.

The contribution and originality of the paper takes several forms. Firstly, since the seminal contributions of **Schumpeter** (1934) and **King and Levine** (1993), few studies have assessed simultaneously the relationship among these three components (finance, innovation and growth). In fact, most studies focused more on assessing the impact of innovation on firm growth or on the impact of financing on innovation. Secondly, the paper intends to assess the effect of eight different sources of financing at the same time, making their effect comparable. Usually the scientific literature focuses more on assessing only the effect of one source of financing (e.g. public support or venture capital) on innovation or firm growth. However, there is little comparison of the effect of different sources of finance. Third, we used a database that, as far as we know, has not previously been used to this end.

The paper is structured in five sections. After the introduction, section 2 provides a description of the background theory about the financing-innovation-growth linkage. Section 3 presents the framework, methodology and data used. Section 4 describes the results obtained. Section 5 concludes and gives some policy recommendations.

## 2. Innovation and sources of financing

The Financing-Innovation-Growth linkage is a multi-stage process. More specifically, access to finance has a first step leverage effect on innovation, and a second one linking additional innovation to growth. According to **Levine** (2005), innovation can only foster growth in the presence of a financial system, and this is also the pillar of Schumpeterian theory (**Schumpeter, 1934**). Nevertheless, innovative firms are typically more financially constrained (see e.g. **Hall, 2002; Lee et al., 2015; Santos and Cincera, 2017**). The main reason for this is the presence of asymmetric information (**OECD, 2012 and 2015a**). The asymmetric information problem refers to the information gap between entrepreneur/inventor and potential investors about the innovative content of an R&D project (**Hall, 2009**). Due to uncertainty and risk, traditional financial markets and financial institutions are reluctant to invest

in R&D projects compared to more traditional business projects (**Mazzucato, 2013**).

Public support (grants, subsidy or tax incentives) and equity investors or funds, such as Business Angels and Venture Capital (VC), are two alternatives to bank loans (**OECD, 2012; Cincera and Santos, 2015**), when firms are financially constrained due to market failures. Indeed, innovative firms are more likely to apply for VC financing (**Cosh et al., 2009**) and VC are also more likely to finance innovative firms than imitators (**Hellmann and Puri, 2000**). Similarly, innovative firms have a higher probability of receiving a grants or subsidy than non-innovative ones (**Czarnitzki and Lopes-Bento, 2014; Santos et al., 2016**). For these reasons the concept of 'financing of innovation' is mostly associated with grants and equity, which could also explain

why researchers have paid more attention to assessing the effectiveness of these two types of financing sources in enhancing innovation. Nevertheless, directly or indirectly, also other sources of financing can trigger innovation. For instance, trade credit can be an alternative source of short-term external finance for firms that are credit constrained, particularly innovative SMEs (Bönte and Nielsen, 2011). Indeed, firms with a high level of intangible assets are more likely to use trade credit (Tsuruta, 2008), and demand for, and supply for trade credit are also higher for innovative firms (Nielsen, 2016). Firms that are credit rationed usually ask for trade credit as a substitute for bank debt, leading to higher demand for such financing instrument (Nilsen, 2002). Besides, since suppliers have closer relationships with their customers, and consequently more information about their business, asymmetric information can be reduced (Petersen and Rajan, 1997), leading to a higher availability of trade credit for innovative firms (Nielsen, 2016). Leasing can also be a substitute for traditional bank debt for new firms lacking in collateral, since asset ownership remains with the lessor<sup>1</sup> and is not transferred to the customer (lessee), who has only the right to use it, during a specified period of time in exchange for regular payments (OECD, 2015b). Furthermore, firms choose to use leasing because this asset-based finance lets them manage their working capital better by allowing them to pay for the equipment over the life of the asset and not all at once at the beginning<sup>2</sup> (Oxford Economics, 2015). Similarly, factoring can also be used by firms as a financing source for working capital and as an instrument to improve

cash flow (Soufani, 2001). Factoring is revealed to be particularly useful for high-risk firms and for firms with high investments in intangible assets that cannot use other types of financing instruments (OECD, 2015b). Furthermore, non-bank financing could also be complementary instrument to alleviate financing constraints (Bönte and Nielsen, 2011; Kraemer-Eis and Lang, 2012; OECD, 2015b).

Despite the fact that most studies point out that public support (see e.g. Busom, 2000; González et al., 2005; Cerulli and Poti, 2012; Huergo et al., 2016), VC investment (see e.g. Kortum and Lerner, 2000; Popov and Roosenboom, 2009; Amess et al., 2016) and bank debt (see e.g. Benfratello et al., 2008) have a positive effect on firm's innovation behavior, there is also evidence of an adverse effect. For example, public support can substitute or crowds out<sup>3</sup> private R&D expenditure (Dai and Cheng, 2015; Marino et al., 2016) or have no effect<sup>4</sup> on the development of new products (Hashi and Stojicic, 2010; Maffioli et al., 2012), and on the number of registered patents (Maffioli et al., 2012). On the other hand, it seems that innovation performance can also slow down (Capizzi et al., 2011) or even not improve after VC investment (Engel and Keilbach, 2007; Guo and Jiang, 2013).

With the present study, we intend to contribute to the scientific literature by providing additional evidence on the effect of public support, VC investment, bank and non-bank financing in innovation and then on firm's growth.

### 3. Data and methodology

The database comes from the anonymous<sup>5</sup> "Survey on the Access to Finance of Enterprises" (SAFE), conducted together by the European Central Bank and the European Commission since 2009. Data from the first surveys of 2014 and 2015 was used in order to build a panel leading to assessment of firms' growth evolution. These two surveys cover the period from April 2014 to September 2015 and after selecting only firms with valid answers to all the dimensions included in the analysis, our sample contains 3,786 Small and Medium-sized firms (SMEs) in EU28.

The main hypothesis in the timeline used in the study is that financing obtained (or used) in a period (t-1) could influence firms' capacity to introduce an innovation in the market (product or service) or their organization (process or marketing) in the next period (t). Information about

financing covers the 6-month period between April and September 2014 and concerns innovation in the next 12 months, i.e. between October 2014 and September 2015. A posteriori, as the result of innovation behavior, firms can grow in terms of turnover or employment level. This growth is expected to happen just after the innovation or even simultaneously. In fact, a long period of time is not necessary before recording at least turnover growth, for example, due to introducing a new product in the market. Firms' growth status covers a period of 6 months between April and September 2015, whereas innovation was introduced from October 2014.

To assess the impact of financing on innovation behavior and then on firm growth, we consider a conceptual framework similar to that used by Cerulli and Poti (2012)

<sup>1</sup> Lessor refers to the entity that leases the equipment or property to the lessee, who in turn makes use of it.

<sup>2</sup> For example, if a firm needs a new car, it can choose to pay the whole amount when it does the deal or to pay in 48 monthly installments through a leasing arrangement.

<sup>3</sup> Crowding-out happens when all or part of the subsidy is used to replace firms' own R&D expenditure and in the end, they invest less than they would have without the subsidy (Dimos and Pugh, 2016).

<sup>4</sup> No effect of public subsidy means that subsidized firms and non-subsidized ones reveal the same net innovation performance.

<sup>5</sup> Since the survey is anonymous, cross-answering with other databases is not possible.

based on a three-step approach. The first two steps are based on Propensity Score Matching (PSM), and estimate the effect of financing on innovation, taking into account the endogenous nature of using a specific source of finance. This endogeneity occurs because access to external financing is subject to a selection process (Busom, 2000). The third step takes the form of a regression estimation, considering the effect of innovation financing as an explanatory variable of firm growth.

PSM is a two-step approach which estimates the effect

$$p(x) = \text{prob}(w = 1|x) \quad (1)$$

This technique allows estimating the 'Average Treatment Effect on Treated' (ATET( $x_i$ )), as expressed in equation (2), where  $y_{1i}$  corresponds to the outcome of a treated firm and  $y_{0i}$  refers to the outcome in a situation in which a

$$ATET(x_i) = E(y_{1i} - y_{0i} | w_i = 1, x_i) = ATE_{(w_i=1)}(x_i) \quad (2)$$

In the present study, the outcome variable corresponds to firm innovation behavior in  $t$ , measured by the number of innovation types launched in the market or in the firm's organization. This accounts for the complementarity among different types of innovation as suggested by Mohnen and Hall (2013).<sup>6</sup> Firms can introduce jointly or separately four types of innovation: i) Product or service; ii) Production process or method; iii) Organization of management; or iv) Marketing (new way of selling goods or services). Additionally, the dichotomous variable (Yes or No) used to measure innovation is also included in the analysis as an outcome for a robustness test.

The treatment variable coincides with the status of receiving, obtaining or using jointly or separately a source of financing in period  $t-1$ , among the following: a) Internal funds; b) Bank loan; c) Credit line, bank overdraft or credit card overdraft; d) Trade credit; e) Equity capital; f) Grants or subsidized bank loan; g) Leasing or hire-purchase; h) Factoring. On average, firms included in the control group are those that did not obtain new financing in  $t-1$ , except for internal funds and leasing where the treated group have used them in  $t-1$ . For more details about financing sources see Table A1 in Appendix.

of a treatment (e.g. receiving a grant or obtaining another source of financing) using matching estimators. For each observation, matching estimators compare outcomes by finding individuals, included in both groups (treated and non-treated) with similar characteristics. The similarity between individuals is found using treatment probabilities also called the Propensity Score (PS). The PS can be described by equation (1), where  $w = \{0,1\}$  is the treatment indicator and  $x$  is the multidimensional vector of pre-treatment characteristics.

firm does not receive the treatment. The comparison group (also called control or non-treated group) is found by means of the PS. As the quantity to be estimated in equation (2) is specific to each firm, we will indicate it simply by ATETi.

The covariates to include in the propensity score model (equation 1) are those usually listed in the literature and common to all sources of financing: i) Firm size<sup>7</sup>; ii) Firm age<sup>8</sup>; iii) Firms' main ownership<sup>9</sup>; iv) Autonomous or belonging to a group; v) Export intensity<sup>10</sup>; vi) Firm performance (average growth performance in last 3 years<sup>11</sup>); vii) Activity sector<sup>12</sup>; viii) Country. Firm size, export intensity and firms' past performance refer to a period before the treatment. Since the answers provided in the survey about financing instruments refer to the period between April and September 2014, firm size, measured by turnover, and export intensity concern the year 2013. Firms' past performance reports average growth performance over the past 3 years (2011-2013). Firm age, ownership, autonomy (not belonging to a group), activity sector and country are characteristics of firms not affected by the treatment.<sup>13</sup>

After estimating the ATETi this parameter – conditional on all the covariates considered – can be used as an explanatory variable for firm growth. Therefore, the third and final step consists of assessing the effect of innovation additionality (ATETi) on firm growth using a regression analysis. In this

<sup>6</sup> According to Mohnen and Hall (2013), the complementarity between different types of innovation could justify why, when estimated together, conclusions about the effect of innovation financing are not unanimous. Indeed, the simultaneity of different types of innovation makes it difficult to isolate the individual effect of each one (Mohnen and Hall, 2013) and a way to mitigate this complementarity problem could be to combine the dichotomous measures of innovation type with the so-called "innovation strategies".

<sup>7</sup> Firm size was divided in three categories (Micro, Small and Medium) taking turnover into account, as reported in the Commission Recommendation 2003/361.

<sup>8</sup> Firm age was divided in three categories considering the criteria of Criscuolo et al. (2014): Young firm under 5 years old; Mature firm between 5 and 10 years old; Old firm more than 10 years old.

<sup>9</sup> Private (one owner only, family or entrepreneurs), Public shareholders and other (other enterprises; venture capital enterprises or business angels; with other business associates or others not previously listed).

<sup>10</sup> Export intensity corresponds to the percentage of turnover destined to international market.

<sup>11</sup> Grow fast (on average over 20% per year), Grow moderate (less than 20% per year) and No growth (not grown or become smaller).

<sup>12</sup> Industry, Trade, Services and Construction.

<sup>13</sup> Results of collinearity diagnostic are available on request.

last step, the dependent variable is a binary variable, which assumes the value of 1 if firms have positive growth in the past 6 months, and 0 otherwise.<sup>14</sup> The binary choice model

(3) explains essentially the probability of having  $growth_i=1$ , taking into account the set of explanatory variables  $z_i$ .

$$Pr\{Growth_{i,t} = 1 | z_i\} = G[\beta_0 + \beta_1 ATE_{i,t} + \beta_2 Growth_{i,t-1} + \beta Firms\ Characteristics_{i,t}] \quad (3)$$

Firms' growth is measured through their increase in turnover and number of employees over the last 6 months. In addition to the average treatment effect of financing on innovation (ATE<sub>Ti</sub>), the regression also included growth status reported in the similar period one year before, and firm characteristics, such as firm size and age, as well as

activity sector and the region<sup>15</sup> where firms are located. Only firms subject to the treatment are included in the regression, as we are only interested in estimating the effect of innovation financing on growth. Thus, we consider in the regression model only firms that received or used financing.

## 4. Results and discussion

### 4.1. Data description

The sample is composed of 3,786 firms located in EU28 (for geographical distribution of the sample, see Table A3 in Appendix) and operating in industry (27.6%), construction (11.5%), trade (28.5%) and services (32.4%) sectors. Micro-sized enterprises represent around 54%, small 27.6% and medium-sized 18.7% of the total. About 89% of the surveyed firms have been operating in the market for more than 10 years. Young firms (under 5 years old) represent 7.4% of the sample, while mature firms (between 5 and 10 years old) about 13%.

There are approximately 403 firms belonging to a group (10.6%). Around 83.7% are owned mainly by one person, family or group of entrepreneurs. Firms listed in the stock market account for only a small proportion of the sample (2.2% of the total).

As regards firms' past performance, 41% said their turnover growth was less than 20% per year, between 2011 and 2013. About 15% revealed an average sales growth of over 20% per year in the past three years. The rest of the sample (44%) registered no growth or even a fall during this period.

Export intensity in the year before treatment is on average 18.1%, with some firms exporting all their goods and services and others having no international behavior.

Firms introducing an innovation to the market or in their managerial organization represent about 60% of the sample, and some firms have implemented up to four different innovation types (product, service, process and marketing). About 42% of firms increased their turnover and around 25% their employees in the year following the use or receipt of financing.

Concerning the use of financing instruments (Table 1), about 27.7% of the sample (1,049 firms) indicated they had not used or obtained any kind of financial instrument. The remaining 2,737 firms (72.3%) used at least one source of financing solely or jointly with others. The financing instruments most frequently used are leasing (30%), internal funds (17.5%) and bank debt (long term loan – 15.7% – and credit line – 15.7%). Equity financing (3.4%) and factoring (7.7%) are the least used or obtained.

<sup>14</sup> AReference category refers to 'remain unchanged or decrease in terms of turnover or the number of employees'.

<sup>15</sup> Region refers to a group of geographically close countries. Due to the limited number of observations for each of the 28 EU member states after selecting only treated firms, it is not possible to implement a country fixed effect for all of them.

Table 1

## → Financing instruments by innovation behavior

Variable	All sample		Innovative Firm		Non-Innov Firm		Diff of means		Relative Diff. (a)
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.			
No use or request for financing	0.277	0.448	0.252	0.434	0.315	0.465	-0.063	***	-20%
All financing	0.723	0.448	0.748	0.434	0.685	0.465	0.063	***	9%
N.° instruments used	1.640	1.506	1.762	1.542	1.459	1.433	0.302	***	21%
Internal funds	0.175	0.380	0.194	0.395	0.147	0.354	0.047	***	32%
External financing	0.686	0.464	0.711	0.453	0.650	0.477	0.061	***	9%
<i>Bank loan</i>	0.157	0.364	0.167	0.373	0.144	0.351	0.023	*	16%
<i>Credit line</i>	0.157	0.364	0.168	0.374	0.142	0.349	0.026	**	18%
<i>Trade credit</i>	0.105	0.307	0.116	0.321	0.088	0.284	0.028	***	32%
<i>Equity</i>	0.034	0.180	0.042	0.201	0.021	0.143	0.021	***	101%
<i>Grants</i>	0.113	0.316	0.129	0.335	0.089	0.285	0.040	***	45%
<i>Leasing</i>	0.302	0.459	0.316	0.465	0.281	0.450	0.035	**	13%
<i>Factoring</i>	0.077	0.267	0.090	0.287	0.058	0.233	0.033	***	57%

Source: Authors' own elaboration.

Note: N° observations: all sample = 3,786; innovative firms = 2,258; non-innovative firms = 1,528. All variables are dummy with minimum equal 0 and maximum equal 1, except for the number of financing types used where the value is between 0 and 9. Number of financing instruments includes the 8 sources of financing under analysis plus a 9th category corresponding to all other sources of financing. (a) Relative difference = [(mean innovative firms / mean non-innovative firms) - 1]. Significance level: \*\*\* 1%; \*\* 5%; \* 10%.

Innovative firms used different sources of financing on average 9% more than non-innovative ones and they are also more likely to use financing (74.8%) than their non-innovative counterparts (68.5%). Greater differences between groups can be observed in equity financing, factoring and grants, where innovative firms show a relatively higher propensity to use or obtain them (between 10% and 45%) compared to non-innovative firms. Concerning the other types of financing sources, innovative firms also showed a tendency to use them, but with a lower relative difference (13% to 32%).

On average, firms used 1.6 financing instruments (Table 1) and only 496 firms used solely one type of the eight sources of financing under analysis here (Table A2 in Appendix). Credit line is the source of financing least used on its own (1.7%) and is mainly used with two (30%) or three (25.8%)

different instruments. On the other hand, internal funds, leasing and equity financing are those more frequently used on their own (20.8%, 15.9% and 13.4%, respectively), or in combination with only one more instrument (22.8%, 32% and 29.9%, respectively). Other financing instruments are more often combined with two or three different instruments.

Concerning the combination of only two financing instruments used together, Table A4 in Appendix shows that firms using internal funds seem to combine this mainly with leasing (45%), whereas grants are more associated with bank loans (45%). Furthermore, trade credit (31%) and equity financing (41%) are both more used in conjunction with internal funds (31% and 41%, respectively), whereas factoring is more associated with leasing (56%).

## 4.2. Impact of financing on innovation

Table 2 reports the results of the Propensity Score Matching, which corresponds to the effect of financing, measured through different sources, on firm innovation behavior, compared to a situation where firms did not obtain or use new financing in the previous year. The balancing

quality test, using the kernel density plots' distribution of the propensity score (Figure A1 in Appendix), shows that covariates are balanced as the distribution of the propensity score is very similar in both groups (financially supported firms and non-supported ones) after matching.

Table 2

### ➔ Effect of financing in period 't-1' on innovation behavior in period 't'

Source of financing	Treated (n° firms)	Being an innovative firm			N° of innovations Introduced		
		Yes/No			0 – 4		
Internal funds	663	0.049	(0.034)	+	0.057	(0.087)	
External sources	2,599	0.053	(0.024)	**	0.177	(0.055)	***
<i>Bank loan</i>	596	0.032	(0.039)		0.167	(0.101)	*
<i>Credit line</i>	596	0.039	(0.035)		0.141	(0.081)	*
<i>Trade credit</i>	398	0.103	(0.041)	**	0.202	(0.101)	**
<i>Equity</i>	127	0.177	(0.062)	***	0.625	(0.140)	***
<i>Grants</i>	427	0.083	(0.041)	**	0.185	(0.107)	*
<i>Leasing</i>	1,143	0.061	(0.034)	*	0.179	(0.081)	**
<i>Factoring</i>	292	0.078	(0.047)	*	0.277	(0.105)	***

Source: Authors' own elaboration based on PSM results.

Note: Table reports the Average Treatment Effect on Treated (ATET). Abadie and Imbens (2016) robust standard error is included in parenthesis. Significance level: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, + p<0.15. Firms can use each source of financing solely or jointly with others. Control group corresponds to firms did not obtain or no use new financing in the previous year. N° of firms in control group: 1,049.

In overall, Table 2 shows a positive and significant effect of external sources of financing on innovation. However, not all external sources of financing seem to have the same effect on innovation behavior. To assess statistical differences between coefficients we estimated a Z-test. The results (Table A5 in Appendix) show that grants are only significantly different when compared with equity financing. In turn, equity financing is significantly different when compared with any other financing instrument, using the count data innovation measure. This means that equity has a higher impact on innovation in comparison with the other financing sources and that grants do not have any different impact than any other financing instrument (excluding equity).

Furthermore, the results regarding equity financing (Table 2) do not confirm the hypothesis that the effect disappears in the short term, one year after VC investment as shown

by **Engel and Keilbach (2007)** and **Guo and Jiang (2013)**. Indeed, the results of the present study indicate that the effect is positive and significant one year after equity investment. One possible explanation for this divergence could lie in the use of different innovation measures and comparison groups. In the cited studies (**Engel and Keilbach, 2007; Guo and Jiang, 2013**), the authors used as innovation measure patent applications or R&D investment, whereas the present study used the **OECD (2005)** concept of innovation (product, process, organization and marketing), which usually takes place after patenting and R&D.

As a complementary analysis, we also assessed the effect of financing obtained between April and September 2014 (period t-1) on innovation introduced between October 2013 and September 2014 (period t-1). However, the main limitation of this analysis is that innovation could take place before financing, because the questions about

16 The Z-test was estimated based on Clogg et al. (1995), where H0: Differences between coefficients = 0 and the Z test is estimated by the following equation: 
$$\frac{\beta_1 - \beta_2}{\sqrt{(\text{Std.Error } \beta_1)^2 + (\text{Std.Error } \beta_2)^2}}$$

financing in SAFE are about the firm's situation in the last 6 months and innovation behavior in the last 12 months. Nevertheless, since there is a period of 6 months where financing could anticipate innovation and because in some cases an innovation could be introduced at the same

time as accessing finance, (e.g. with internal funds and credit line), we think that this analysis could complement the results obtained previously. Table 3 below reports the effect of different sources of financing on firm innovation behavior, measured in the same period of time t-1.

**Table 3**
**→ Effect of financing in period 't-1' on innovation behavior in period 't-1'**

Source of financing	N° of firms (Treated)	Being an innovative firm			N° of different types of innovation (0 – 4)		
			(Yes/No)				
Internal funds	663	0.117	(0.037)	***	0.204	(0.078)	***
External sources	2,599	0.097	(0.025)	***	0.219	(0.055)	***
<i>Bank loan</i>	596	0.127	(0.040)	***	0.269	(0.099)	***
<i>Credit line</i>	596	0.115	(0.033)	***	0.203	(0.086)	**
<i>Trade credit</i>	398	0.122	(0.048)	**	0.283	(0.112)	**
<i>Equity</i>	127	0.210	(0.062)	***	0.537	(0.132)	***
<i>Grants</i>	427	0.157	(0.044)	***	0.301	(0.110)	***
<i>Leasing</i>	1,143	0.108	(0.033)	***	0.240	(0.070)	***
<i>Factoring</i>	292	0.090	(0.056)	+	0.279	(0.112)	**

Source: Authors' own elaboration based on PSM results.

Note: Table reports the Average Treatment Effect on Treated (ATET). Abadie and Imbens (2016) robust standard error is included in parenthesis. Significance level: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, + p<0.15. Firms can use each source of financing solely or jointly with others. Control group corresponds to firms did not obtain or no use new financing in the previous year. N° of firms in control group: 1,049.

The results show that all sources of finance have a positive effect on the two innovation measures, including internal funds, credit line and bank loans for which some doubt existed in the previous analysis. However, as

we said previously, due to the possibility of innovation happening before financing, we choose to focus the output additionality on firm growth only based on results obtained for period t.

### 4.3. Assessing output additionality on firm growth

As regards output additionality on firm growth as the result of financing, Table 4 summarizes the marginal effect of innovation financing on the probability of increasing turnover or the number of employees. On average, using an external source of financing has an additional effect on firm growth; however, as in the previous analysis, not all external sources of financing have an effect or the same effect on increased turnover and employment.

The output additionality on turnover growth is found to be the highest in firms that have issued equity financing and the lowest when linked with leasing, and these conclusions are observed for both innovation measures. Grants, credit lines and bank loans also showed significant output additionality on turnover growth, but only when the number of different innovation types is used as an output indicator. With regards to the size of these effects, they are more modest than the equity financing effect.

As for output additionality on employment growth, grants and leasing are the only financing instruments with a significant positive effect for the two innovation measures. In both cases, the size of the effect is greater when grants are used by firms, but only when compared to leasing. The robust and positive effect of grants makes sense because the probability of receiving them is generally associated with job creation (Santos et al., 2016), creating an incentive for employment growth. Additionally, when leasing is associated with investment in fixed assets, additional new equipment for innovation purposes can lead to increased production, which in turn could explain the positive effect of output additionality on employment growth and on turnover growth (although of a lower relative size). Furthermore, bank loans and credit lines also showed a significant output additionality on employment growth, but as with turnover growth, only when the number of innovation types is used. Regarding the size of their effects, they are slightly greater than for grants.

Table 4

**→ Complementary log-log regression results: average marginal effect of output additionality on firm growth by source of financing**

Variables	N° of firms	Increase turnover			Increase employment		
<b>ATE = being an innovative firm (Yes/No)</b>							
External financing	2,599	0.054	(0.014)	***	0.035	(0.013)	***
<i>Trade credit</i>	398	0.035	(0.036)		0.030	(0.034)	
<i>Equity</i>	127	0.156	(0.061)	***	-0.055	(0.054)	
<i>Grants</i>	427	0.051	(0.032)	+	0.082	(0.032)	**
<i>Leasing</i>	1,143	0.037	(0.021)	*	0.039	(0.019)	**
<i>Factoring</i>	292	0.044	(0.041)		-0.015	(0.038)	
<b>ATE = n° of innovations</b>							
External financing	2,599	0.023	(0.006)	***	0.025	(0.005)	***
<i>Bank loan</i>	596	0.024	(0.012)	**	0.033	(0.011)	***
<i>Trade credit</i>	398	0.020	(0.015)		0.013	(0.015)	
<i>Credit line</i>	596	0.029	(0.012)	**	0.032	(0.010)	***
<i>Equity</i>	127	0.054	(0.025)	**	-0.022	(0.023)	
<i>Grants</i>	427	0.031	(0.013)	**	0.029	(0.012)	**
<i>Leasing</i>	1,143	0.021	(0.009)	**	0.023	(0.009)	***
<i>Factoring</i>	292	0.027	(0.017)	+	0.023	(0.017)	

Source: Authors' own elaboration based on Cloglog results reported in Appendix (Tables A7, A8, A9 and A10).

Note: Regressions included firms' characteristics (size and age and ownership) in period 't', sector and country/region fixed effect, as well as growth indicators in period 't - 1'. Only those using the source of finance assessed are included in each regression. Only sources of finance for which ATET is shown to be significant have been assessed. Significance level: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, + p<0.15.

Finally, equity financing seems to have no additional effect on employment. One possible explanation for this finding could be related to the main goal of equity investors: maximization of financial returns. One way to achieve this could be through greater efficiency of the existing labor force, without hiring new employees. Indeed, as

mentioned by **Paglia and Harjoto** (2014), the impact of equity is not long-lasting and tends to disappear one year after investment. Together, these justifications could explain why equity financing shows no additional effect on employment growth.

## 4.4. Complementarity analysis

As a complementary analysis and because firms can use each source of finance on its own or jointly with others, the effect of using one or more than one source of financing was assessed. Unfortunately, the high number of combinations and limited number of observations for

each source do not allow a disaggregated analysis. Thus, a variable indicating to what extent each firm used a source of finance was created. Table 5 shows the results of PSM for different number of combinations.<sup>17</sup>

Table 5

### → Effect of different financing sources in period 't-1' on innovation behavior in period 't'

N° of financing sources	N° of firms		Being an innovative firm			N° of innovations Introduced		
	Treated	Control	Yes/No			0 – 4		
Source of financing = 1	978	1,049	-0.011	(0.028)		-0.001	(0.068)	
Source of financing = 2	788	1,049	0.073	(0.033)	**	0.153	(0.080)	*
Source of financing = 3	492	1,049	0.127	(0.037)	***	0.292	(0.092)	***
Source of financing = 4	291	1,049	0.118	(0.048)	**	0.184	(0.102)	*
Source of financing ≥ 5	188	1,049	0.054	(0.063)		0.283	(0.140)	**

Source: Authors' own elaboration based on PSM results.

Note: Table reports the Average Treatment Effect on Treated (ATET). Abadie and Imbens (2016) robust standard error is included in parenthesis. Significance level: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Control group corresponds to firms did not obtain or no use new financing in the previous year. N° of firms in control group: 1,049.

As seen in Table 5, no significant difference between using one source and no use of new financing emerges, whereas to use more than one source of financing has a positive and significant impact on innovation. Furthermore, the results of Z-test regarding differences between coefficients (available under request) don't reveal to be statistically significant. These conclusions can suggest that financing

instruments are complementary to one another rather than substitutes.

Finally, we also estimated the effect of different combinations of financing instruments and the results of PSM are reported in Table 6.

Table 6

### → Effect of different financing combinations in period 't-1' on innovation behavior in 't'

Source of financing	N° of firms		Being an innovative firm			N° of different types of innovation		
	Treated	Control	Yes/No			0 – 4		
Bank loans and grants	822	1,049	0.044	(0.032)		0.159	(0.081)	**
Bank loans and equity	702	1,049	0.068	(0.035)	*	0.262	(0.080)	***
Internal funds and grants	984	1,049	0.058	(0.035)	*	0.137	(0.087)	+
Internal funds and equity	755	1,049	0.120	(0.035)	***	0.270	(0.080)	***
Internal funds and leasing	1,541	1,049	0.048	(0.025)	*	0.050	(0.069)	
Leasing and grants	1,408	1,049	0.058	(0.031)	*	0.153	(0.078)	*
Leasing and equity	1,221	1,049	0.077	(0.028)	***	0.177	(0.080)	**
Credit line and grants	899	1,049	0.063	(0.032)	**	0.168	(0.075)	**
Credit line and equity	701	1,049	0.138	(0.033)	***	0.345	(0.075)	***

Source: Authors' own elaboration based on PSM results.

Note: Table reports the Average Treatment Effect on Treated (ATET). Abadie and Imbens (2016) robust standard error is included in parenthesis. Significance level: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, + p<0.15. Firms can use each source of financing solely or jointly with others. Control group corresponds to firms did not obtain or no use new financing in the previous year. N° of firms in control group: 1,049.

<sup>17</sup> Results of balancing tests are available under request.



Almost all combinations reveal a positive effect on innovation. Regarding comparison between the size of the effect, the results of Z-test (Table A6 in Appendix) show that credit line and equity, which registered the highest ATET, are statistically different from any other combination between grants and any other financing instrument. However, when we assess differences between credit line

and equity with equity used solely or with another financing instrument, using the count data innovation measure, we see that the ATET of equity financing used solely or with any other financing instrument is higher than the ATET of credit line and equity. This can lead to the conclusion that the perfect combination does not exist.

## 5. Conclusion and policy recommendations

The present paper assessed the financing-innovation-growth linkage using a three-step approach. The first two steps were based on Propensity Score Matching, aiming at assessing the effect of eight different sources of financing on innovation. The last step involved a regression estimation, using a complementary log-log model, aiming at quantifying the effect of innovation financing, estimated in the first steps, on the probability of firm growth.

The results demonstrate the importance of financing for promoting innovation, by showing that some sources of external financing used in one year seem to be more effective than others in stimulating innovation in the subsequent year. Equity financing has a larger effect on the strategic decision to innovate, and the highest output additionality on firm turnover growth, when compared to the effects of other sources of financing. Grants registered a moderate effect on innovation and on output additionality on firm growth (both turnover and employment). Furthermore, grants appear increasing more employment than turnover. Nevertheless, the number of financing instruments used together also seems to matter, and the present study reveals that a financing instrument used alone has no effect on innovation.

As for policy recommendations, if we hold public subsidies (grants or similar measures) not to be the most effective way to leverage innovation and growth, traditional state aid orientation for promoting R&D and innovation should be revised, with newer forms of support put forward. For example, since this study shows that a financing instrument is more effective when used in combination with others, public subsidies should be accompanied with other sources of financing, such as a credit line and bank loan. This might be achieved by promoting wider agreement/cooperation between the government agency and the bank system. Furthermore, as this study has found that equity financing is the most effective policy instrument to support innovation, the development of European venture capital funds, funded by the contribution of all EU member states, should be highly encouraged and possibly accompanied with an active monitoring on the proper use of public money.

Further research should focus on understanding why subsidies are less effective, namely analyzing the effectiveness of the selection procedure for public support and on evaluation of subsidized firms' fulfilment of the financial objectives foreseen on the application form.



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## Appendix

**Table A1**
**→ Description of source of financing**

Variable name	Description
Internal funds	Firm has retained earnings or sold assets in the past 6 months (question 4A in SAFE questionnaire)
Bank loan	Firm has obtained finance through a bank loan over the past 6 months. Obtained means to apply for finance and received everything requested, most of it or a limited part (question 7B in SAFE questionnaire)
Trade credit	Firm has obtained finance through a trade credit over the past 6 months. Obtained means to apply for finance and received everything requested, most of it or a limited part (question 7B in SAFE questionnaire)
Credit line	Firm has obtained finance through a credit line, bank overdraft or credit card overdraft over the past 6 months (question 7B in SAFE questionnaire)
Grants	Firm has obtained new grants or subsidized bank loan in the past 6 months (question 4A in SAFE questionnaire)
Equity	Firm has issued equity capital, including venture capital and business angels, in the past 6 months (question 4A in SAFE questionnaire)
Leasing	Firm has used leasing or hire-purchase in the past 6 months (question 4A in SAFE questionnaire)
Factoring	Firm has issued factoring in the past 6 months (question 4A in SAFE questionnaire)
No-financing	Firm has not used, issued or obtained any sources of external financing, among those listed above, in the past 6 months (question 4A and 7B in SAFE questionnaire)

Source: Authors' own elaboration based on SAFE Survey template.

**Table A2**
**→ Financing instruments: used alone or in combination with other(s)**

Instruments	N° Firms	Only		1 + 1		1 + 2		1 + 3		1 + more than 3	
Internal funds	663	138	20.8%	151	22.8%	151	22.8%	110	16.6%	113	17.0%
Bank loan	596	50	8.4%	107	18.0%	151	25.3%	151	25.3%	137	23.0%
Credit line	596	10	1.7%	115	19.3%	180	30.2%	154	25.8%	137	23.0%
Trade credit	398	41	10.3%	62	15.6%	94	23.6%	97	24.4%	104	26.1%
Equity	127	17	13.4%	38	29.9%	27	21.3%	26	20.5%	19	15.0%
Grants	427	36	8.4%	89	20.8%	99	23.2%	99	23.2%	104	24.4%
Leasing	1,143	182	15.9%	366	32.0%	276	24.1%	181	15.8%	138	12.1%
Factoring	292	22	7.5%	58	19.9%	68	23.3%	69	23.6%	75	25.7%

Source: Authors' own elaboration.

Note: 496 firms use only one type of the eight financing instruments. The combination of the eight financing instruments with others also included the category of all other sources of financing.

Table A3

## → Characteristics of the sample (% of observations)

Variables	%	Variables	%
Size: Micro	0.5378	Country: Cyprus	0.0048
Size: Small	0.2755	Country: Czech Republic	0.0248
Size: Medium	0.1867	Country: Germany	0.0724
Age: Young firm	0.0742	Country: Denmark	0.0225
Age: Mature firm	0.1302	Country: Estonia	0.0034
Age: Old firm	0.7956	Country: Spain	0.0927
Ownership: Autonomy	0.8936	Country: Finland	0.0357
Ownership: Private	0.8365	Country: France	0.1054
Ownership: Public shareholders	0.0217	Country: Greece	0.0386
Ownership: Other	0.1418	Country: Croatia	0.0116
Past performance: Export intensity (%)	0.1811	Country: Hungary	0.0275
Past performance: Grow fast	0.1492	Country: Ireland	0.0283
Past performance: Grow moderate	0.4099	Country: Italy	0.1305
Past performance: No growth	0.4408	Country: Lithuania	0.0114
Output: Being an innovative firm	0.5964	Country: Luxembourg	0.0055
Output: N° of different innovations	1.0800	Country: Latvia	0.0079
Outcome: Increasing turnover	0.4229	Country: Malta	0.0055
Outcome: Increasing employment	0.2520	Country: Netherlands	0.0523
Activity: Industry	0.2763	Country: Poland	0.0663
Activity: Construction	0.1149	Country: Portugal	0.0320
Activity: Trade	0.2845	Country: Romania	0.0225
Activity: Services	0.3244	Country: Sweden	0.0225
Country: Austria	0.0304	Country: Slovenia	0.0082
Country: Belgium	0.0277	Country: Slovakia	0.0235
Country: Bulgaria	0.0306	Country: United Kingdom	0.0557

Source: Authors' own elaboration.  
 Note: Number of observations = 3,786.

Table A4

→ Combination of two financing instruments

Source of financing	Internal funds		Bank loan		Trade credit		Credit line		Equity		Grants		Leasing		Factoring	
	N°	% TT	N°	% TT	N°	% TT	N°	% TT	N°	% TT	N°	% TT	N°	% TT	N°	% TT
Internal funds			14	20.6%	12	31.6%	1	16.7%	9	40.9%	8	16.3%	38	37.3%	2	7.4%
Bank loan	14	16.7%			9	23.7%	2	33.3%	0	0.0%	22	44.9%	20	19.6%	1	3.7%
Trade credit	12	14.3%	9	13.2%			0	0.0%	3	13.6%	1	2.0%	8	7.8%	5	18.5%
Credit line	1	1.2%	2	2.9%	0	0.0%			1	4.5%	0	0.0%	2	2.0%	0	0.0%
Equity	9	10.7%	0	0.0%	3	7.9%	1	16.7%			2	4.1%	5	4.9%	2	7.4%
Grants	8	9.5%	22	32.4%	1	2.6%	0	0.0%	2	9.1%			14	13.7%	2	7.4%
Leasing	38	45.2%	20	29.4%	8	21.1%	2	33.3%	5	22.7%	14	28.6%			15	55.6%
Factoring	2	2.4%	1	1.5%	5	13.2%	0	0.0%	2	9.1%	2	4.1%	15	14.7%		
TOTAL	84	100%	68	100%	38	100%	6	100%	22	100%	49	100%	102	100%	27	100%

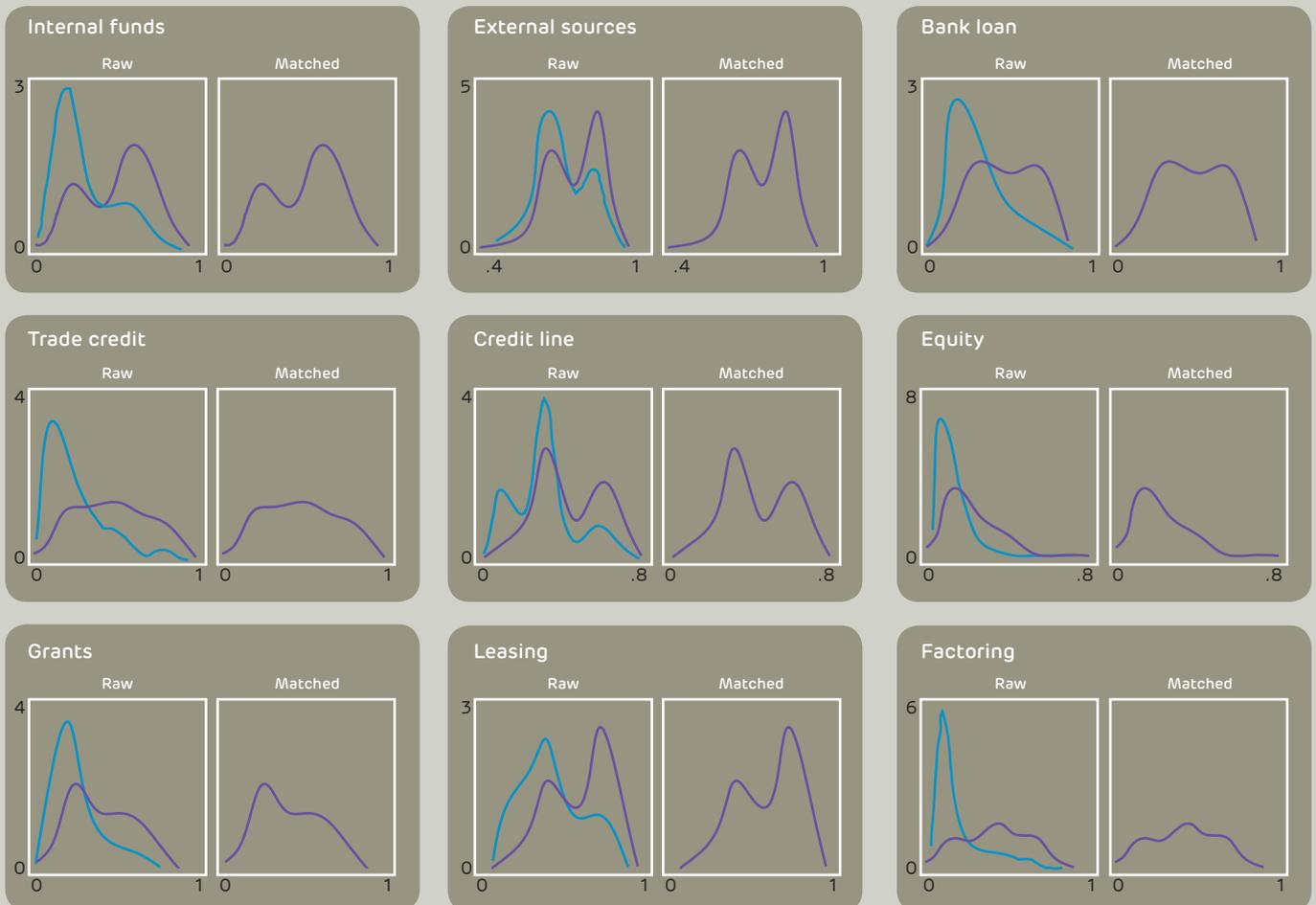
Source: Authors' own elaboration.

Note: Firms using only two types of the eight financing instruments assessed in the study.

Figure A1

Propensity Score vs Density — Control — Treated

→ Distribution of treated and non-treated firms according to the covariates by source of financing



Source: Authors' own elaboration based on results of kernel density plots of treated and control group, before and after matching

Table A5

→ Results Z-test differences between coefficients (ATET): financing in 't-1' in innovation 't'

H0: Differences between coefficients = 0		Being an innovative firm (Yes/No)		N° of different innovations type (0 – 4)		
		Z	p-value	Z	p-value	
Grants	Internal funds	0.638	0.523	-	-	
Grants	Bank loan	-	-	0.122	0.903	
Grants	Credit line	-	-	0.328	0.743	
Grants	Trade credit	0.345	0.730	0.116	0.908	
Grants	Equity	1.265	0.206	2.497	0.013	**
Grants	Leasing	0.413	0.680	0.045	0.964	
Grants	Factoring	0.080	0.936	0.614	0.540	
Equity	Internal funds	1.810	0.071	-	-	*
Equity	Bank loan	-	-	2.653	0.008	***
Equity	Credit line	-	-	2.992	0.003	***
Equity	Trade credit	0.996	0.320	2.450	0.014	**
Equity	Leasing	1.640	0.101	2.757	0.006	***
Equity	Factoring	1.272	0.203	1.989	0.047	**

Source: Authors' own elaboration based on PSM results. Note: Significance level: \*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1.

Table A6

## → Results Z-test differences between coefficients (ATET): combination of financing instruments

H0: Differences between coefficients = 0		Being an innovative Firm (Yes/No)			N° of different Innovations type (0 – 4)		
		Z	p-value		Z	p-value	
Bank loans and grants	Bank loans and equity	0.495	0.6204		0.914	0.3610	
Internal funds and grants	Internal funds and equity	1.253	0.2104		1.124	0.2611	
Leasing and grants	Leasing and equity	0.458	0.6468		0.222	0.8240	
Credit line and grants	Credit line and equity	1.626	0.1042	+	1.662	0.0968	*
Credit line and equity	Bank loans and grants	2.036	0.0420	**	1.690	0.0914	*
Credit line and equity	Internal funds and grants	1.662	0.0968	*	1.805	0.0713	*
Credit line and equity	Leasing and grants	1.756	0.0793	*	1.771	0.0768	*
Credit line and equity	Bank loans and equity	1.465	0.1433	+	0.757	0.4492	
Credit line and equity	Internal funds and equity	0.376	0.7070		0.677	0.4987	
Credit line and equity	Leasing and equity	1.394	0.1637		1.524	0.1279	+
Bank loans and equity	Internal funds and grants	0.192	0.8476		1.059	0.2899	
Bank loans and equity	Leasing and grants	0.200	0.8412		0.981	0.3269	
Bank loans and equity	Credit line and grants	0.097	0.9231		0.858	0.3912	
Internal funds and grants	Bank loans and grants	0.296	0.7676		0.180	0.8568	
Internal funds and grants	Leasing and grants	0.002	0.9980		0.132	0.8949	
Internal funds and grants	Credit line and grants	0.103	0.9177		0.270	0.7873	
Credit line and grants	Bank loans and grants	0.416	0.6772		0.087	0.9304	
Credit line and grants	Leasing and grants	0.107	0.9148		0.144	0.8858	
Bank loans and grants	Leasing and grants	0.316	0.7521		0.053	0.9578	
Equity	Credit line and equity	0.555	0.5788		1.762	0.0783	*

Source: Authors' own elaboration based on PSM results.  
 Note: Significance level: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ , +  $p < 0.15$

Table A7

## → Probability of increasing turnover with dummy innovation measure

Variables	External financing		Trade credit		Equity		Grants		Leasing		Factoring	
	(1)		(2)		(3)		(4)		(5)		(6)	
ATE: Effect of financing on innovation	0.177	***	0.109		0.549	**	0.172	+	0.116	*	0.140	
	(0.0466)		(0.113)		(0.232)		(0.111)		(0.0653)		(0.131)	
Past performance (Y), Size and Age	YES		YES		YES		YES		YES		YES	
Sector and country-region fixed effect	YES		YES		YES		YES		YES		YES	
Constant	YES		YES		YES		YES		YES		YES	
N.° observations	2,599		398		127		427		1,143		292	
Log pseudo-likelihood	-1661.20		-253.92		-73.27		-254.13		-743.89		-185.79	
Wald test (H0: All coefficient = 0)	235.5	***	41.72	***	25.8	**	85.87	***	88.25	***	32.14	***

Source: Authors' own elaboration.

Note: Robust standard errors are reported in parenthesis. Significance level: \*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1, + p&lt;0.15

Table A8

## → Probability of increasing employment with dummy innovation measure

Variables	External financing		Trade credit		Equity		Grants		Leasing		Factoring	
	(1)		(2)		(3)		(4)		(5)		(6)	
ATE: Effect of financing on innovation	0.162	***	0.127		-0.247		0.331	**	0.165	**	-0.0695	
	(0.060)		(0.142)		(0.245)		(0.132)		(0.0793)		(0.180)	
Past performance (Y), Size and Age	YES		YES		YES		YES		YES		YES	
Sector and country-region fixed effect	YES		YES		YES		YES		YES		YES	
Constant	YES		YES		YES		YES		YES		YES	
N.° observations	2,599		398		127		427		1,143		292	
Log pseudo-likelihood	-1,374.88		-220.24		-68.08		-243.16		-645.77		-150.58	
Wald test (H0: All coefficient = 0)	303.58	***	71.54	***	21.00	+	62.96	***	135.95	***	42.57	***

Source: Authors' own elaboration.

Note: Robust standard errors are reported in parenthesis. Significance level: \*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1, + p&lt;0.15

Table A9

## → Probability of increasing turnover with count data innovation measure

Variables	External financing (1)		Bank Loan (2)		Trade credit (3)		Credit line (4)		Equity (5)		Grants (6)		Leasing (7)		Factoring (8)	
ATE: Effect of financing on innovation	0.0773	***	0.0839	**	0.0618		0.0966	**	0.186	**	0.106	**	0.0674	**	0.0879	
	(0.0194)		(0.0405)		(0.0473)		(0.0397)		(0.0912)		(0.0457)		(0.0287)		(0.0556)	
Past performance (Y), Size and Age	YES		YES		YES		YES		YES		YES		YES		YES	
Sector and country-region fixed effect	YES		YES		YES		YES		YES		YES		YES		YES	
Constant	YES		YES		YES		YES		YES		YES		YES		YES	
N.° observations	2599		596		398		596		127		427		1143		292	
Log pseudo-likelihood	-1,660.36		-359.06		-253.49		-378.08		-74.08		-252.56		-742.66		-185.09	
Wald test (H0: All coefficient = 0)	237.41	***	100.53	***	42.09	***	60.24	***	24.5	**	86.81	***	90.62	***	33.64	***

Source: Authors' own elaboration.

Note: Robust standard errors are reported in parenthesis. Significance level: \*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1;

Table A10

## → Probability of increasing employment with count data innovation measure

Variables	External financing (1)		Bank Loan (2)		Trade credit (3)		Credit line (4)		Equity (5)		Grants (6)		Leasing (7)		Factoring (8)	
ATE: Effect of financing on innovation	0.119	***	0.145	***	0.0544		0.158	***	-0.0993		0.116	**	0.0948	***	0.111	
	(0.0249)		(0.0485)		(0.0626)		(0.0508)		(0.107)		(0.0504)		(0.0362)		(0.0797)	
Past performance (Y), Size and Age	YES		YES		YES		YES		YES		YES		YES		YES	
Sector and country-region fixed effect	YES		YES		YES		YES		YES		YES		YES		YES	
Constant	YES		YES		YES		YES		YES		YES		YES		YES	
N.° observations	2599		596		398		596		127		427		1143		292	
Log pseudo-likelihood	-1366.72		-323.47		-220.22		-303.85		-68.11		-243.75		-644.22		-149.59	
Wald test (H0: All coefficient = 0)	317.76	***	82.24	***	71.82	***	89.37	***	20.98	+	66.57	***	138.35	***	42.57	***

Source: Authors' own elaboration.

Note: Robust standard errors are reported in parenthesis. Significance level: \*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1, + p&lt;0.15