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

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Structure of the presentation



1. Objective
2. Background theory
3. Data
4. Methodology and conceptual framework
5. Results and discussion
6. Conclusion

1. Objective

OBJECTIVE

Financing



Innovation



Growth



1. Internal funds
2. Bank loan
3. Credit line
4. Trade credit
5. Grants
6. Equity
7. Leasing
8. Factoring

GEOGRAPHICAL SCOPE

Sample : 3,786 SMEs in EU28

Data source: SAFE (2014 — 2015)



2. Background theory

- **Financing of innovation** ▶ literature focused more on:
 - Equity financing (e.g. venture capital):
 - positive, negative or non-effect
 - Public support (e.g. grants, subsidies or R&D tax credit):
 - positive, negative or non-effect
- **Directly or indirectly other sources of financing can also have a leverage effect on innovation**

2. Background theory

Table 1. Main financing sources by type of expenditure

Instrument	Description	Main purpose		
		R&D activity	Fixed assets	Working capital
Bank loan	Long-term debt in exchange for its reimbursement and a financing cost (interest rate)		✓	
Credit line	Short-term loan which can be used fully or partially, at discretion, up to a pre-arranged limit	Could be if included in day-to-day expenditure e.g. to pay wages		✓
Private Equity	Equity financing obtained in exchange for a share of firm ownership	✓	✓	✓
Grants or Subsidy	Non-reimbursable funds or low-interest loan or interest-free loan provided by government	✓	✓	
Trade credit	To pay suppliers of goods, services or equipment at a later agreed date	Only if carried out outside the firm	✓	✓
Leasing	To make regular payments in exchange for the use of a fixed asset, without its immediate ownership		✓	
Factoring	To sell firm invoices to a factoring company in exchange for immediate cash, but at a lower amount than their value	Generate cash-flow for any purpose		

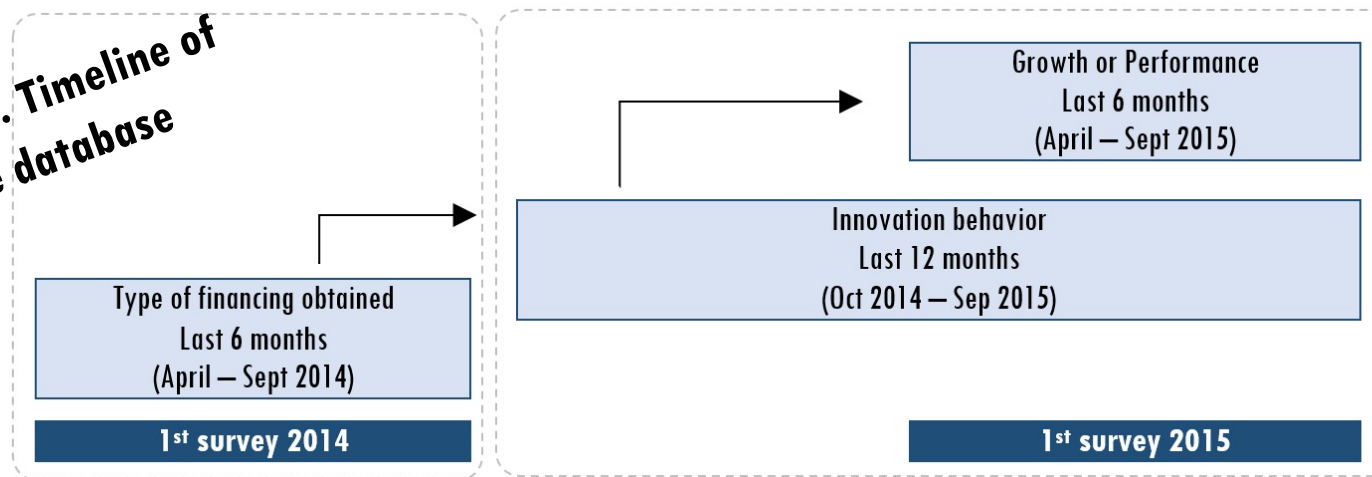
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Source: Authors' own elaboration. Description of financial instrument is based on SAFE questionnaire description.

3. Data

- Survey on the Access to Finance of SMEs in the euro area (SAFE)
- Conducted together by the European Central Bank and the European Commission
- Data from the first surveys of 2014 and 2015 → Sample = 3,786 SMEs

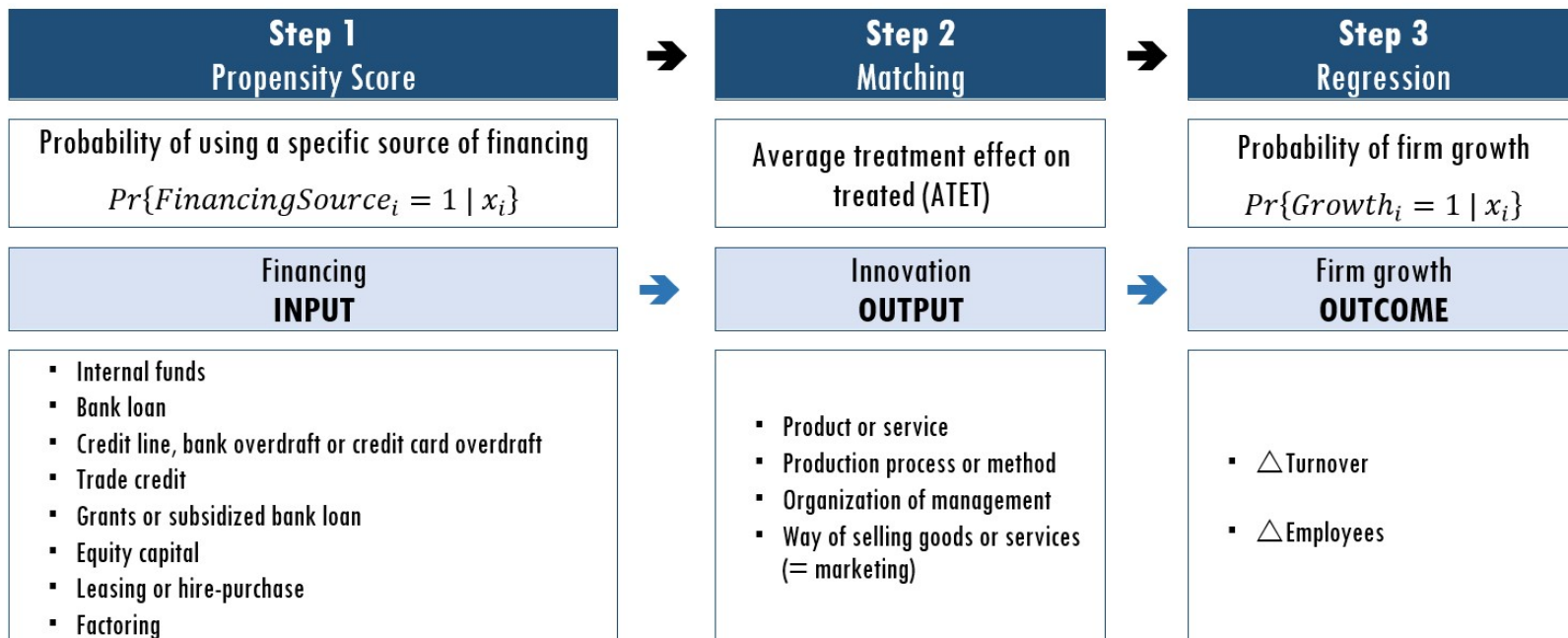
Figure 1. Timeline of the database



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

4. Methodology and conceptual framework

Figure 2. Steps of methodological approach



Source: Authors' own elaboration.

4. Methodology and conceptual framework

- $ATE = E(y_1|w = 1) - E(y_0|w = 1)$
- $p(x) = prob(w = 1|x)$
- Selection co-variantes takes into account the Common Mean Independence (CMI):
 $E(y_0|w = 1, x) = E(y_0|w = 0, x)$
measured before participation
- PSM with Abadie and Imbens (2016)
robust standard error

Co-variantes in propensity score model STEP 1

- Firm size (micro, small and medium)
- Firm age (young, mature, old)
- Firms' main ownership (private, public and others)
- Autonomous or belonging to a group
- Export intensity
- Firm performance (average growth performance in last 3 years)
- Activity sector
- Country

4. Methodology and conceptual framework

- $P\{y_i = 1|x_i\} = G(x_i, \beta)$

- Function $G(.)$:

$$G(x_i'\beta) = 1 - e^{-e^{x_i'\beta}}$$

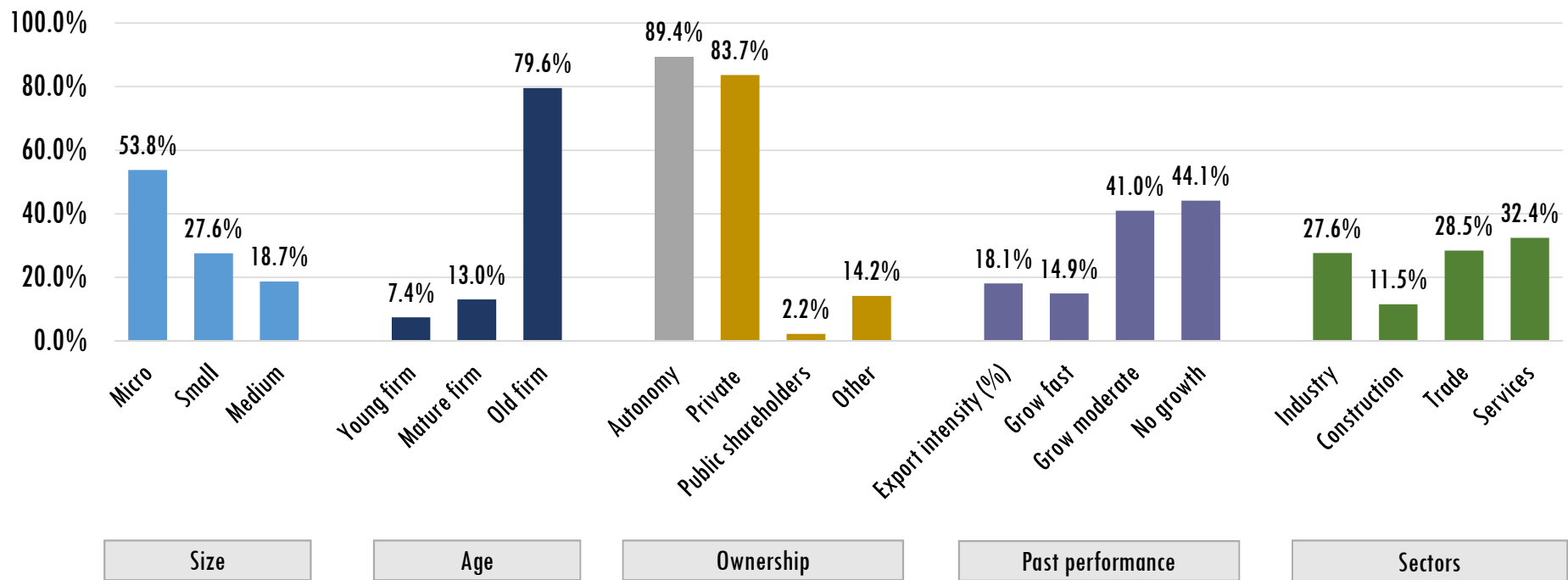
- Complementary log-log regression

Explanatory variables probability to growth STEP 3

- ATE: Effect of financing on innovation
- Past performance: ΔY
- Firm size (micro, small and medium)
- Firm age (young, mature, old)
- Activity sector
- Country

5. Results | Descriptive Statistics

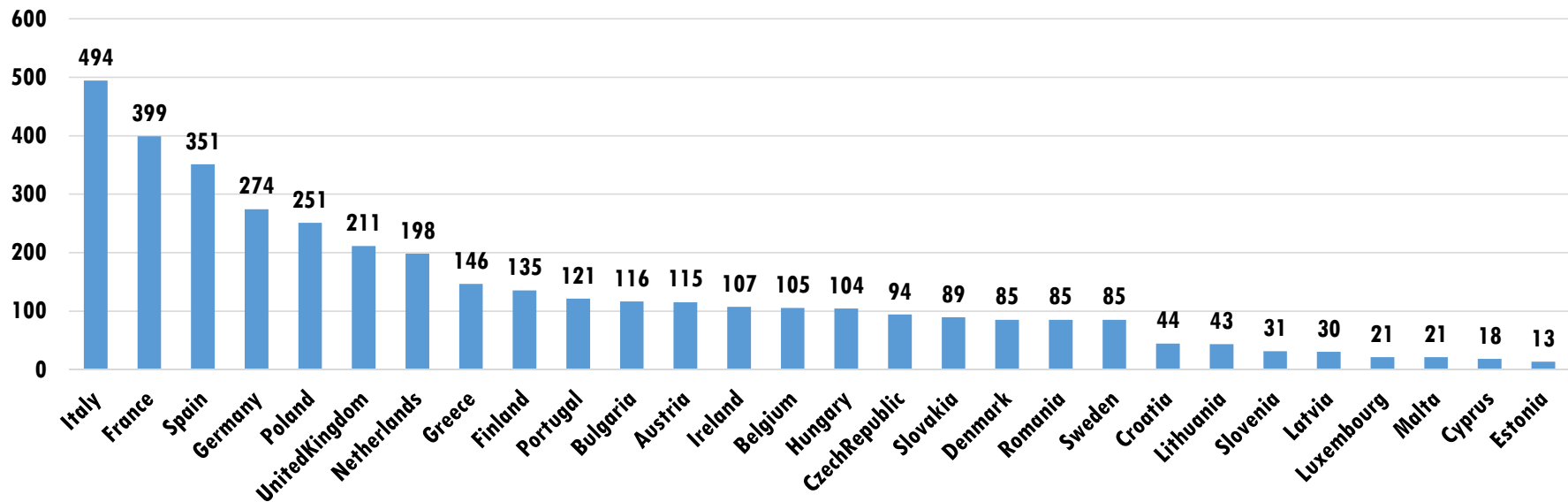
Figure 3. Characteristics of the sample



Source: Authors' own elaboration. Note: total 3,786 firms.

5. Results | Descriptive Statistics

Figure 4. Geographical distribution of the sample



Source: Authors' own elaboration. Note: total 3,786 firms.

5. Results | Descriptive Statistics

Table 2. Financing instruments by innovation behavior: Difference of means

	Innovative Firm	Non-Innovative Firm	Diff of means	Relative Diff. (a)
No use/request for financing	0.252	0.315	-0.063***	-20%
All financing	0.748	0.685	0.063***	9%
N.° instruments used	1.762	1.459	0.302***	21%
Internal funds	0.194	0.147	0.047***	32%
Bank loan	0.167	0.144	0.023*	16%
Credit line	0.168	0.142	0.026**	18%
Trade credit	0.116	0.088	0.028***	32%
Equity	0.042	0.021	0.021***	101%
Grants	0.129	0.089	0.040***	45%
Leasing	0.316	0.281	0.035**	13%
Factoring	0.090	0.058	0.033***	57%

Main conclusions:

- Innovative firms: 59.6% of the sample
- Innovative firms are also more likely to use financing and to use a higher number of different sources
- Leasing is the financing instruments most used by both groups
- Greater differences between groups can be observed in equity financing, factoring and grants

Source: Authors' own elaboration. Significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

N° observations: all sample 3,786 | innovative firms 2,258 | non-innovative firms 1,528.

(a) Relative difference = [(mean innovative firms / mean non-innovative firms) - 1]

5. Results | The effect of Financing on Innovation

Figure 5. Effect of different types of financing on the number of different types of innovation

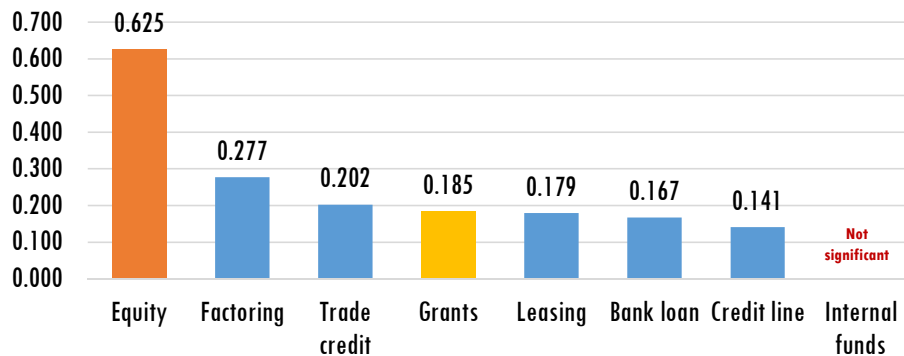
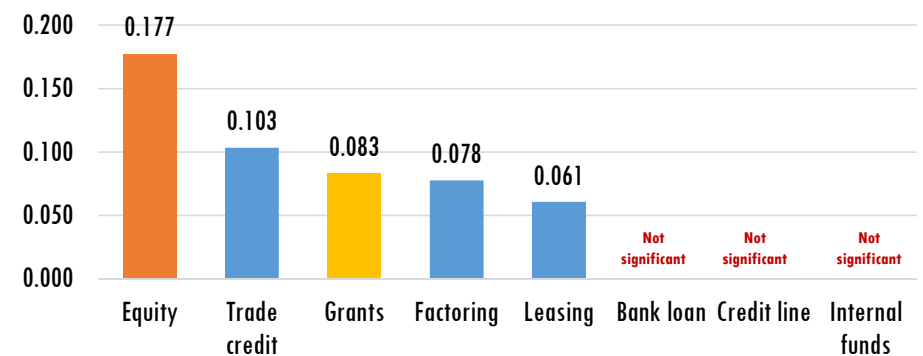


Figure 6. Effect of different types of financing on innovation (Yes/No)



Source: Authors' own elaboration. Note: Results report the Average Treatment Effect on Treated (ATET). Control group corresponds to no use of financing

Main conclusions:

- Firms that have issued equity financing one year before show the higher positive effect on innovation
- Grants show a more moderate positive effect on innovation

5. Results | Balancing quality

Figure 7. 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.

5. Results | The effect of output additionality (ATE) on Growth

Figure 8. Average marginal effect of output additionality on firm growth (TURNOVER) by source of financing

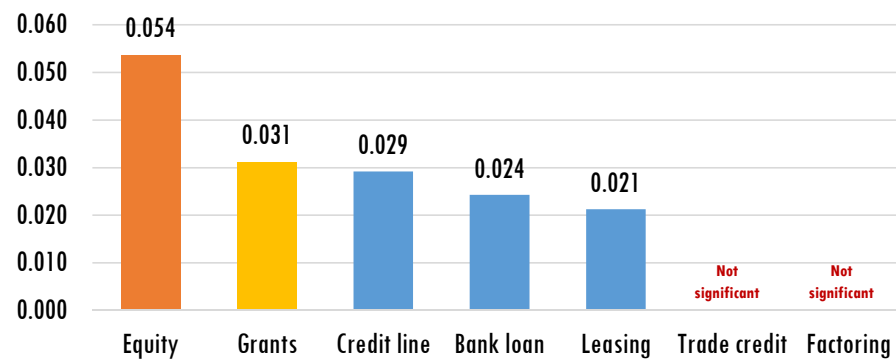
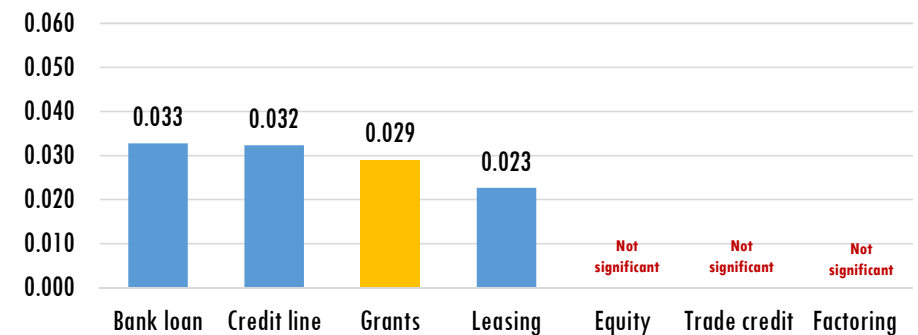


Figure 9. Average marginal effect of output additionality on firm growth (EMPLOYMENT) by source of financing



Source: Authors' own elaboration based on Complementary log-log regression results. Note: output additionality refers to ATET for number of different types of innovation.

Main conclusions:

- Equity financing: highest impact on turnover growth and non-significant effect on employment growth
- Grants: moderate effect of output additionality
- Bank debt and leasing: also important financing instruments for growth

6. Conclusion

- Some sources of external financing are more effective than others
- Equity financing
 - Greater effect on innovation and on firm turnover growth
 - No effect on firm employment growth
- Grants and subsidy
 - Positive effect on innovation and growth (turnover and employment)
 - Size of the effects are more moderate

6. Conclusion

- **Trade credit**
 - Second highest impact on innovation
 - No additional effect was found on firm growth
- **Leasing**
 - Only source of financing with a positive effect on both innovation measures and with a positive effect on both indicators of firm growth
- **Bank debt (loan and credit line)**
 - More relevant for growth than innovation behaviour

6. Conclusion | Policy recommendations

- If a subsidy is not the most effective way to leverage innovation and growth, state aid for R&D and innovation needs to be reviewed and new forms of support should be considered
 - To complement grants with others sources of financing: easier access to credit line
 - More financing provided by equity funds

Thank you for your attention

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Investigating the Impact
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EXTRA INFORMATION



2. Background theory

- **Effect on equity on innovation:**
 - Positive effect on innovation (Popov and Roosenboom, 2009; Amess et al., 2016)
 - No additional effect after VC entry (Engel and Keilbach, 2007; Capizzi et al., 2011; and Guo and Jiang, 2013)

- **Positive effect of public support on innovation:**
 - Private R&D effort (Busom, 2000; Cincera et al., 2011; Cerulli and Poti, 2012; Huergo et al., 2016)
 - Number of patent applications (Bronzini and Piselli, 2016)
 - Likelihood of introducing a new product or process (Batterink et al., 2006; Foreman-Peck, 2013)

5. Results | Descriptive Statistics

Table 1A. Mean, Standard Deviation, Minimum and Maximum

Variables	Mean	Std. Dev.	Min	Max
Size: Micro	0.5378	0.4986	0	1
Size: Small	0.2755	0.4468	0	1
Size: Medium	0.1867	0.3898	0	1
Age: Young firm	0.0742	0.2622	0	1
Age: Mature firm	0.1302	0.3366	0	1
Age: Old firm	0.7956	0.4033	0	1
Ownership: Autonomy	0.8936	0.3084	0	1
Ownership: Private	0.8365	0.3699	0	1
Ownership: Public shareholders	0.0217	0.1456	0	1
Ownership: Other	0.1418	0.3489	0	1
Past performance: Export intensity (%)	0.1811	0.2931	0	1
Past performance: Grow fast	0.1492	0.3564	0	1
Past performance: Grow moderate	0.4099	0.4919	0	1
Past performance: No growth	0.4408	0.4966	0	1

Variables	Mean	Std. Dev.	Min	Max
Output: Being an innovative firm	0.5964	0.4907	0	1
Output: N° of different innovation	1.0800	1.2201	0	4
Outcome: Increasing turnover	0.4229	0.4941	0	1
Outcome: Increasing employment	0.2520	0.4342	0	1
Activity: Industry	0.2763	0.4472	0	1
Activity: Construction	0.1149	0.3189	0	1
Activity: Trade	0.2845	0.4512	0	1
Activity: Services	0.3244	0.4682	0	1

Source: Authors' own elaboration.

5. Results | Descriptive Statistics

Table 2A. Financing instruments: used alone or in combination with other(s)

Instruments	Only	1 + '1'	1 + '2'	1 + '3'	1 + '> 3'
Internal funds	21%	23%	23%	17%	17%
Bank loan	8%	18%	25%	25%	23%
Credit line	2%	19%	30%	26%	23%
Trade credit	10%	16%	24%	24%	26%
Equity	13%	30%	21%	21%	15%
Grants	8%	21%	23%	23%	24%
Leasing	16%	32%	24%	16%	12%
Factoring	8%	20%	23%	24%	26%

Main conclusions:

- Credit line is the source of financing least used on its own (2%) and is mainly used with two (30%) or three (26%) different instruments
- Internal funds, leasing and equity financing are those more frequently used on their own or in combination with only one more instrument
- Other financing instruments are more often combined with two or three different instruments

Source: Authors' own elaboration.