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 POLITECNICO DI MILANO



**Financing Entrepreneurial  
Ventures in Europe**



## **The economic impact of venture capital investment in Europe**

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**financing  
entrepreneurial ventures  
in Europe**



**Evidence from:**

**"VICO - Financing Entrepreneurial Ventures  
in Europe: impact on innovation, employment  
growth, and competitiveness"**

**(Project funded under the 7th Framework Programme of the European  
Commission)**



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## KEY HIGHLIGHTS

1. The venture capital (VC) ecosystem in Europe has peculiarities:
  - independent VC (IVC) is the prevalent form of VC, but captive VC are more diffused than in the US;
  - Public VC (PVC) is more diffused and corporate VC is less diffused than in the US.
2. The investment patterns of different types of VC are very heterogeneous.
3. In Europe too IVC has VERY POSITIVE EFFECTS on the total factor productivity, sales and employment growth, and innovation performance of investee firms.
4. However, in Europe IVC tend NOT TO INVEST in:
  - Small & young firms;
  - Firms in seed stage;
  - Firms with long new product development cycles (biotech).



## KEY HIGHLIGHTS

5. European governments have tried to fill this investment gap through the launch of public VC funds, including university seed funds.
6. However, with few exceptions, the performance of PVC in Europe:
  - Has been poor;
  - Has been better when PVCs have entered a IVC- led syndacate;
  - The formation of this type of syndicate is quite rare.
7. VC has protected investee firms from the crisis, while promoting their adoption of aggressive product innovations strategies.
8. Key issue for European policy makers: how to attract SMART MONEY towards young, small firms with promising new technologies and interesting growht potential?



# Agenda

1. The VICO dataset
2. Patterns of VC investment of in Europe
3. Impact of VC on performance of investee firms
4. VC in times of crisis



# THE VICO DATASET



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# The VICO project

## Objective:

- Role of VC in financing entrepreneurial ventures in Europe;
- Impact of VC on innovation, employment growth, and competitiveness of European NTBFs;
- Focus on heterogeneity in VC in Europe.
- Attention to disentangling “selection” and “treatment” effects (Colombo et al. 2011, Research Policy)

## Consortium

- 9 partners in 7 countries

## Dataset :

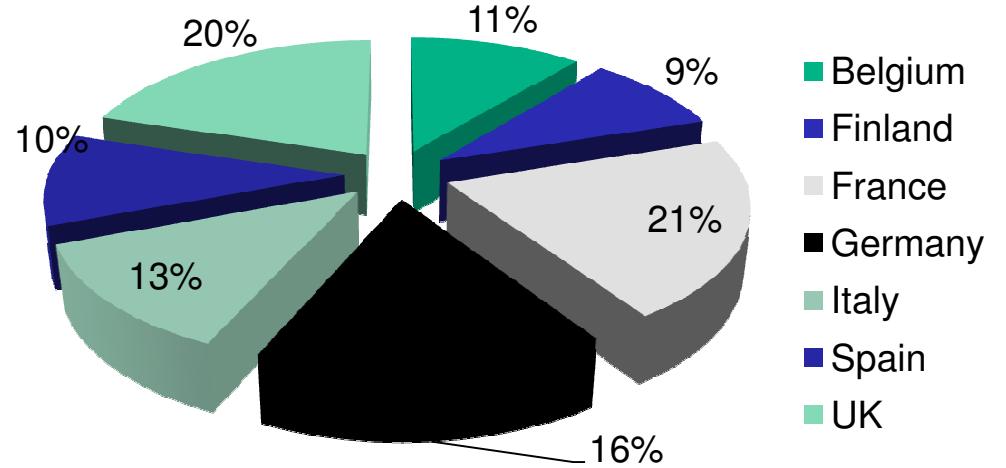
- 8,370 NTBFs, out of which 759 VC-backed;
- Accounting and VC investments data suitable for micro-economic quantitative analysis;
- [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1904297](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1904297)



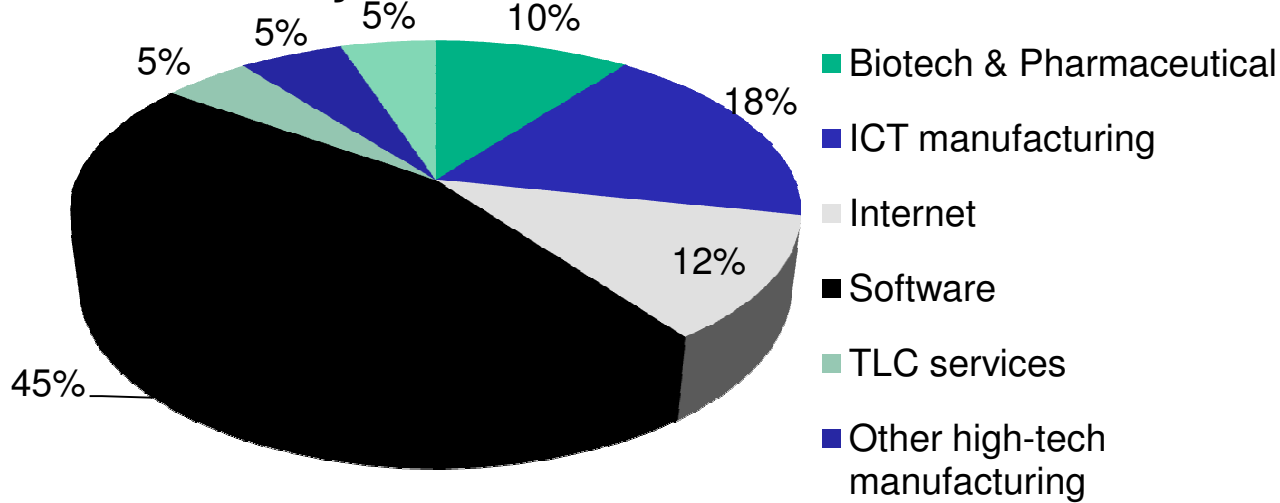
# VICO sample composition

8,370 NTBFs

## Geographic distribution



## Industry distribution





# PATTERNS OF VC INVESTMENT IN EUROPE



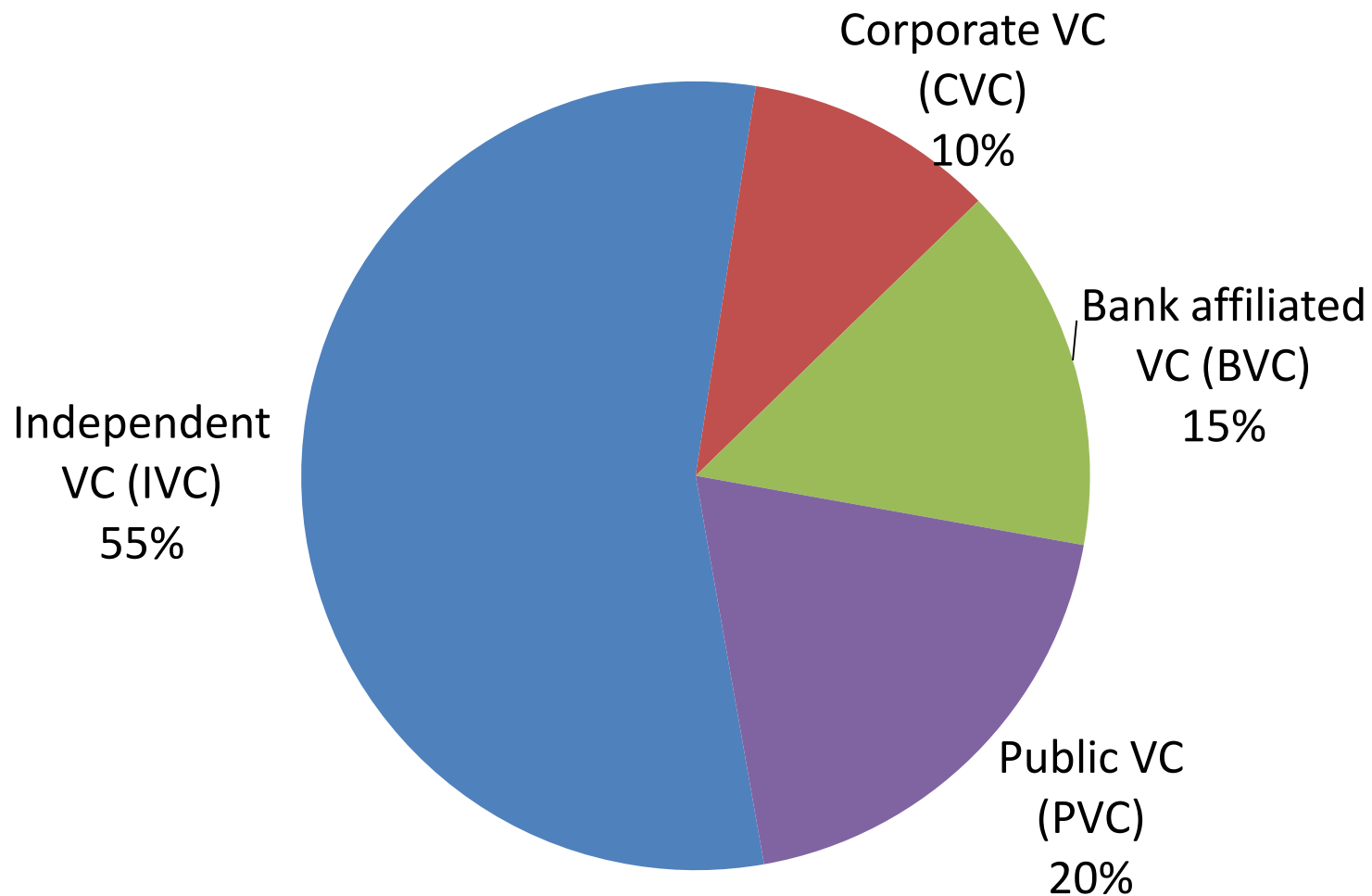
- VC investors differ along several dimensions:
  - Size
  - Investment experience
  - Cross-border investment activity
  - **Governance**
- 4 different investor types:
  - Independent VC (US style);
  - Corporate VC: affiliated to a (non-financial) corporation;
  - Bank-controlled VC: affiliated to a bank;
  - Public VC: government owned management company.
- Do the patterns of investment in Europe of these 4 types of VC investor differ?
  - Large scale evidence provided by the VICO database: new stylized facts on the ecology of the VC landscape in Europe;
  - Comparison with the US

- Pattern of investment:
  - Investee firm characteristics
    - Industry of investee firms
    - Age and size of investee firms
    - Stage of development of investee firms
    - Location of investee firm and distance between investee firm and investor
  - Investment characteristics
    - Syndication
    - Duration
    - Exit mode

- Data from the VICO micro-level dataset, composed of:
  - 2,104 VC investments
  - by 1,124 VC investors
  - in 759 European firms
    - Located in 7 European countries: Belgium, Finland, France, Germany, Italy, Spain, United Kingdom
    - Received first round of investment between 1994 and 2004.
- Focus on first investment by each VC investor in portfolio firms.
- Unit of analysis: the investment.



# Distribution of investments by type of VC investor



## Methodology: relative specialisation of VC investors

$N_{i,j}$ : number of investments made by type  $i$  investor in category  $j$  investment

*Balassa Relative specialisation index (Balassa 1965):*

$$BI_{i,j} = \frac{N_{i,j}}{\sum_j N_{i,j}} \cdot \left( \frac{\sum_i N_{i,j}}{\sum_{i,j} N_{i,j}} \right)^{-1}$$

Neutral value=1  
Range:  $[0, +\infty)$   
Asymmetric  
Skewed

*Transformed Balassa Index (Dalum et al. 1998):*

$$TBI_{i,j} = \frac{BI_{i,j} - 1}{BI_{i,j} + 1}$$

Neutral value: 0  
Range:  $[-1, +1]$   
Symmetric

## Example

### *Specialization of PVC investors in firms invested at birth*

Overall PVC investors made 360 investments  
PVC investors made 107 investments in less than 1 year old firms (29.7%)

We know firm age at the time of the investment for 1,869 investments

In 377 cases (20.2%) the investee firms are *less than 1 year old*.

$$N_{PVC,0years\_old} = 107$$

$$\sum_j N_{PVC,j} = 360$$

$$\sum_{i,j} N_{i,j} = 1,869$$

$$\sum_i N_{i,0years\_old} = 377$$

$$BI_{PVC,0years\_old} = \frac{N_{PVC,0years\_old}}{\sum_j N_{PVC,j}} \cdot \left( \frac{\sum_i N_{i,0years\_old}}{\sum_{i,j} N_{i,j}} \right)^{-1} = \frac{107}{360} \cdot \left( \frac{377}{1,869} \right)^{-1} = \frac{29.7\%}{20.2\%} = 1.47$$

$$TBI_{PVC,0years\_old} = \frac{BI_{PVC,0years\_old} - 1}{BI_{PVC,0years\_old} + 1} = \frac{0.47}{2.47} = 0.19$$


$$TBI_{PVC,0\text{years old}} > 0$$

PVC investors are relatively **more** likely than the “average investor” to invest in firms less than 1 year old firms (i.e. they are **relatively more specialised** in this category of firms)

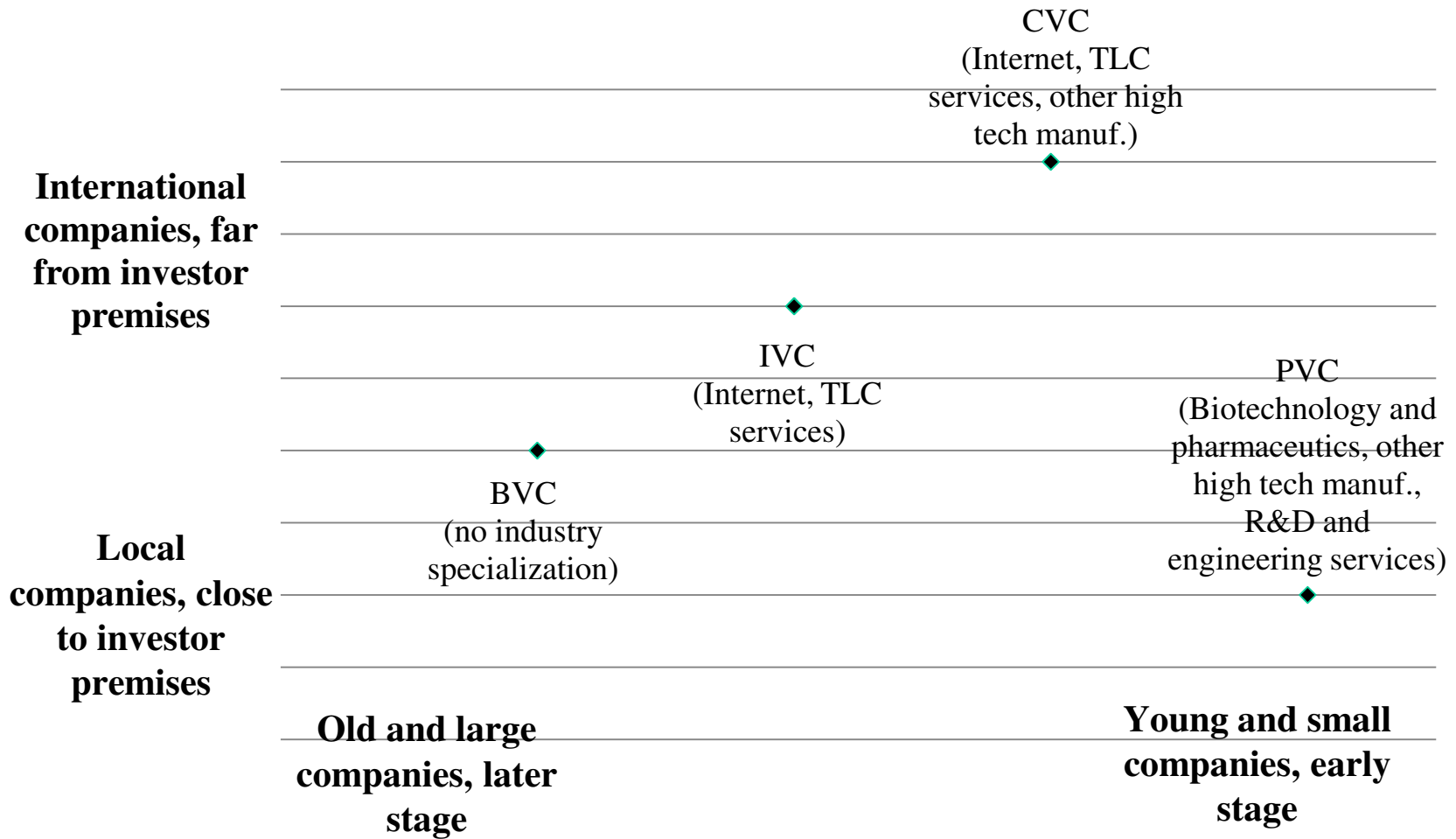
$$TBI_{IVC,0\text{years old}} < 0$$

IVC investors are relatively **less** likely than the “average investor” to invest in firms less than 1 year old (i.e. they are **relatively less specialised** in this category of firms)

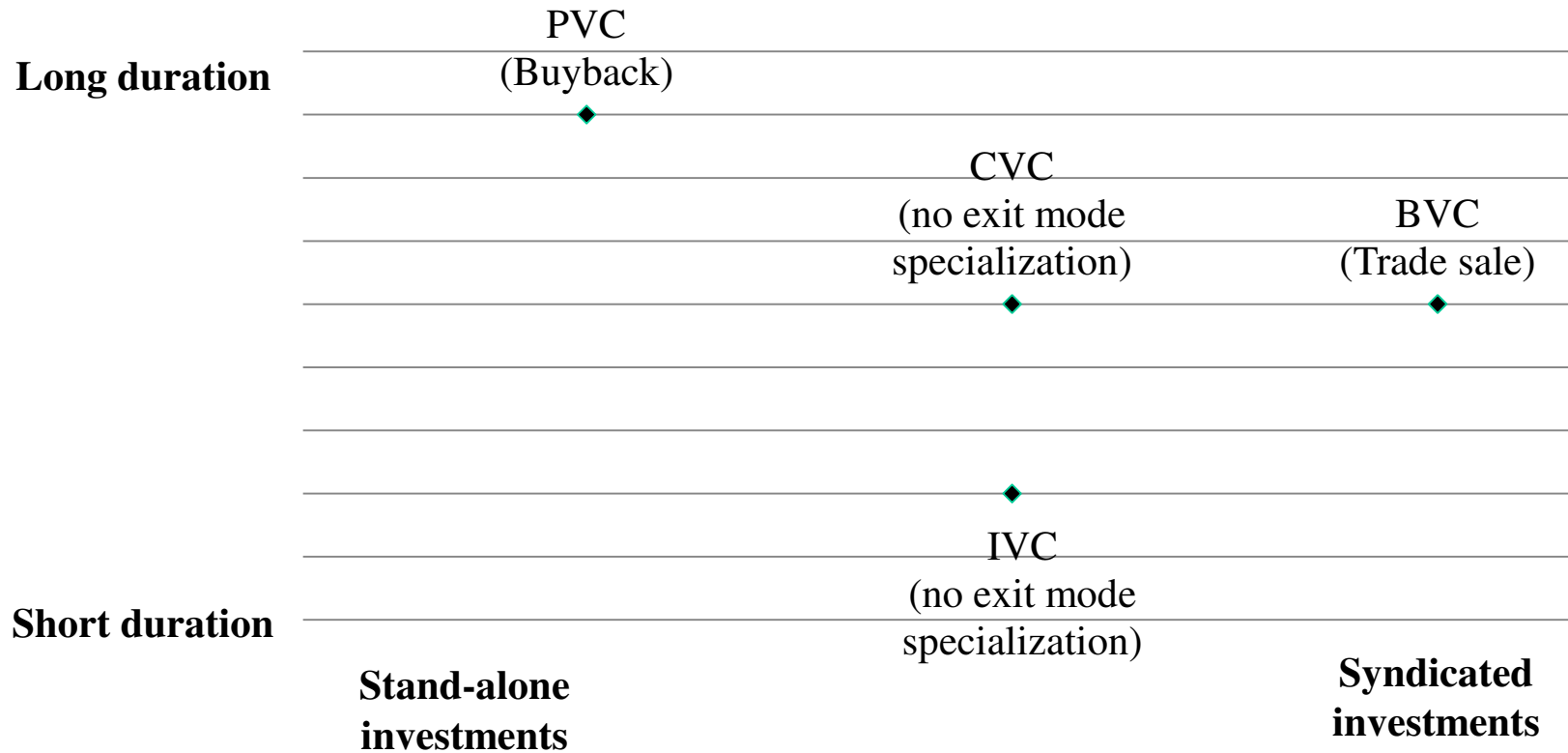
As it is possible to calculate the variance of the TBI, tests of hypothesis can be performed.

*For each category, only groups covering at least 5% of the observations are included.*





# Investment characteristics



## Correlation between the investment patterns of different VC types

	IVC	CVC	BVC	PVC
IVC	1.00			
CVC	-0.29	1.00		
BVC	-0.02	0.12	1.00	
PVC	-0.68***	-0.04	-0.59***	1

Higher values indicate similar investment behavior

Spearman rank correlation coefficients significant at the 10% (\*), 5% (\*\*) and 1% (\*\*\*) confidence levels

Number of observations: 33

# THE “TREATMENT” EFFECT OF VC ON FIRM PERFORMANCE



- Evidence on the effect of VC on the efficiency (i.e. TFP growth) of European high-tech entrepreneurial ventures.
- Sample of 4,911 high-tech entrepreneurial ventures in 1995-2008 period:
  - 236 IVC-lead backed;
  - 62 CVC-lead backed.
- Focus on:
  - differential impact of IVC and CVC;
  - channels through which IVC and CVC investors improve the efficiency of portfolio firms (i.e. revenue growth vs. cost saving).

# TFP growth before and after obtaining IVC and CVC

VC type	Pre-investment	Post investment	Difference
IVC	2.9322 (0.1158)	3.3707 (0.0458)	0.4385*** (0.1246)
CVC	3.5734 (0.1501)	3.5200 (0.0791)	-0.0534 (0.1696)



# Impact of IVC and CVC on Portfolio Firm's TFP Growth

Type of VC investor	% increase of TFP growth	% increase of sales growth	% increase of CAPEX growth	% increase of payroll growth
<b>Independent venture capital</b>	+25%	+29%	Negligible	+15%
<b>Corporate venture capital</b>	Negligible	Negligible	Negligible	+32%



- Best results in terms of TFP and sales growth are achieved when:
  - IVC investors syndicate with other IVC investors or with non-CVC captive investors;
  - IVC investors go alone;
  - when CVC investors are member of the syndicate led by IVC investors impact on TFP and sales growth is negligible.



- Evidence on the effect of VC on the growth (i.e. sales and employees) of European high-tech entrepreneurial ventures.
- Sample of 7,401 high-tech entrepreneurial ventures:
  - 522 private VC (PRVC)-backed;
  - 216 public VC (PUVC)- backed:
    - 194 governmental VC (GVC)-backed;
    - 33 university VC (UVC)-backed.
- Focus on:
  - differential impact of PRVC and PUVC;
  - differential impact of GVC and UVC
  - role of firm's age at the reception of the first round of financing

- Governmental VCs have:
  - A positive but small treatment effect on the growth of employees and sales of early stage firms;
  - No impact on growth of mature firms.
- University seed funds have no positive treatment effect on growth of employees and sales.
- Little perceived value added of public VC to portfolio firms in comparison with private VC.

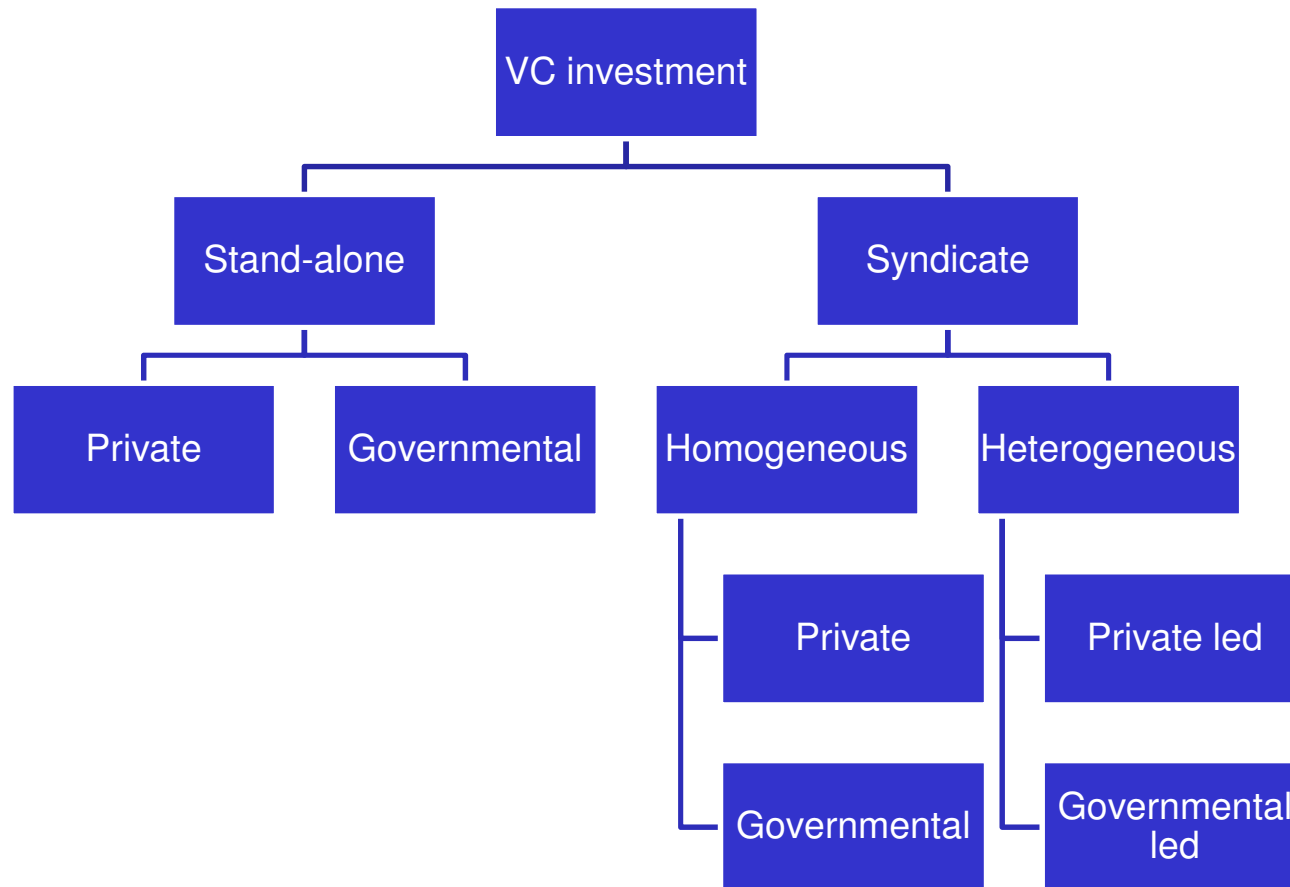
## Analysis of the treatment effect of VC on firms' innovativeness

- Evidence on the effect of VC on the patenting behavior of European biotech & pharmaceutical entrepreneurial ventures.
- Sample of 870 young biotech and pharmaceutical entrepreneurial ventures:
  - 159 VC backed;
  - 711 non-VC-backed.
- Matched sample based on propensity score technique: control for observable factors which drive selection.
- Focus on:
  - Identity of the VC investor: IVC vs. GVC;
  - Syndication.

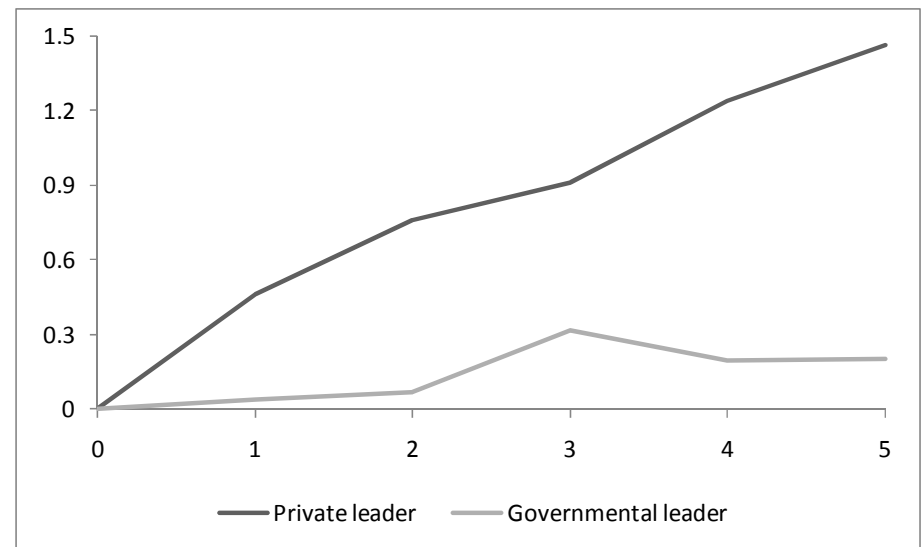
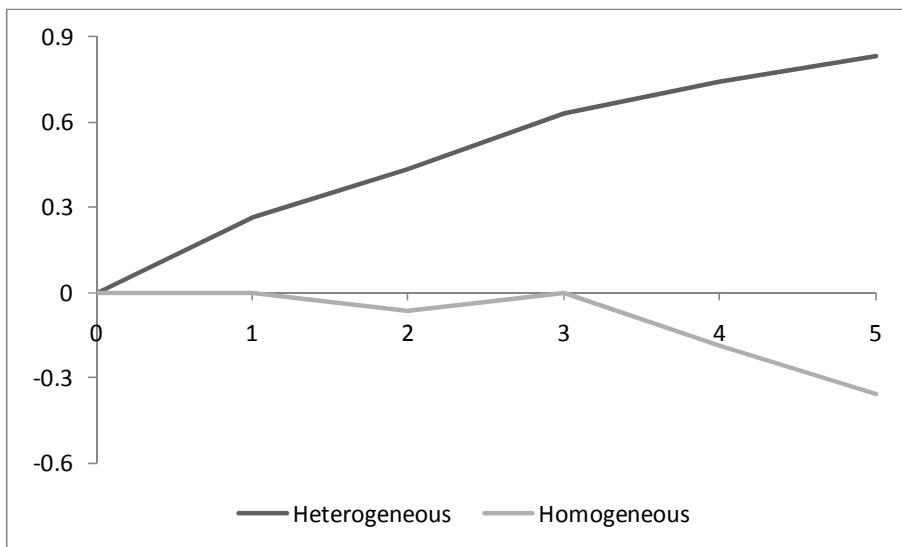
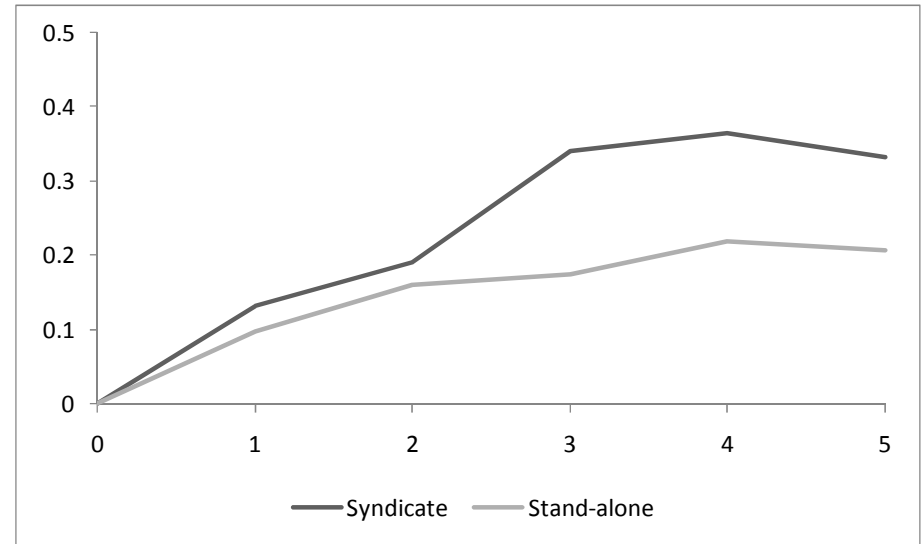
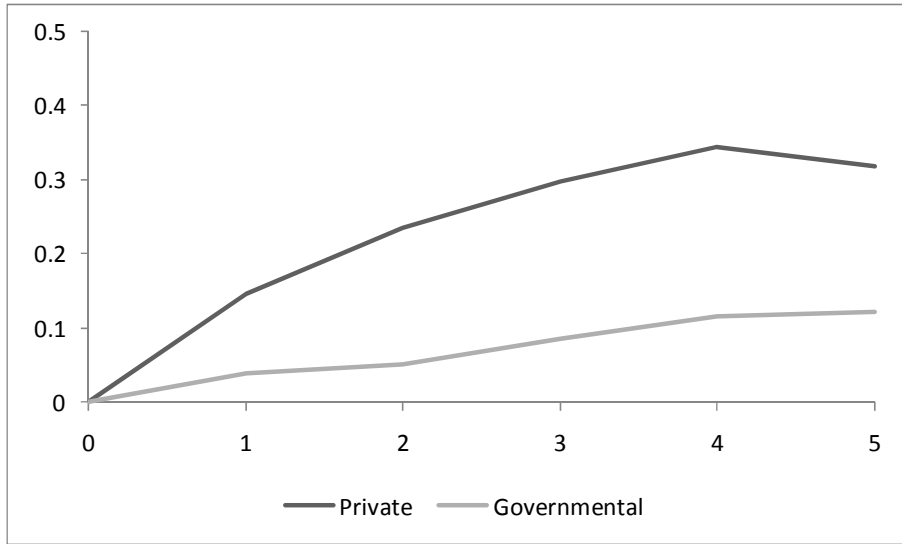


# Forms of venture capital

- Syndicates are characterized by:
  - Who is in the syndicate → homogeneous vs. heterogeneous
  - Who leads the syndicate → private vs. governmental leadership
- This gives rise to 6 potentially different forms of VC investment



# Difference across forms of VC



Dependent variable: Log (1+patent stock) three years after the VC's involvement

VC-backed companies vs. matched sample

	Model 1	Model 2	Model 3	Model 4	Model 5
VC dummy	<b>0.080**</b>				
Private lead		<b>0.120***</b>			0.080
Governmental lead		0.011			
Syndicate			<b>0.170***</b>		
Stand-alone			0.046	0.046	-0.001
Heterogeneous synd				<b>0.268***</b>	0.078
Homogenous synd				0.050	-0.019
(Heterog)x(Private lead)					<b>0.283**</b>

Plus controls: age, initial patent stock, country dummies, year dummies



# VC IN TIMES OF CRISIS



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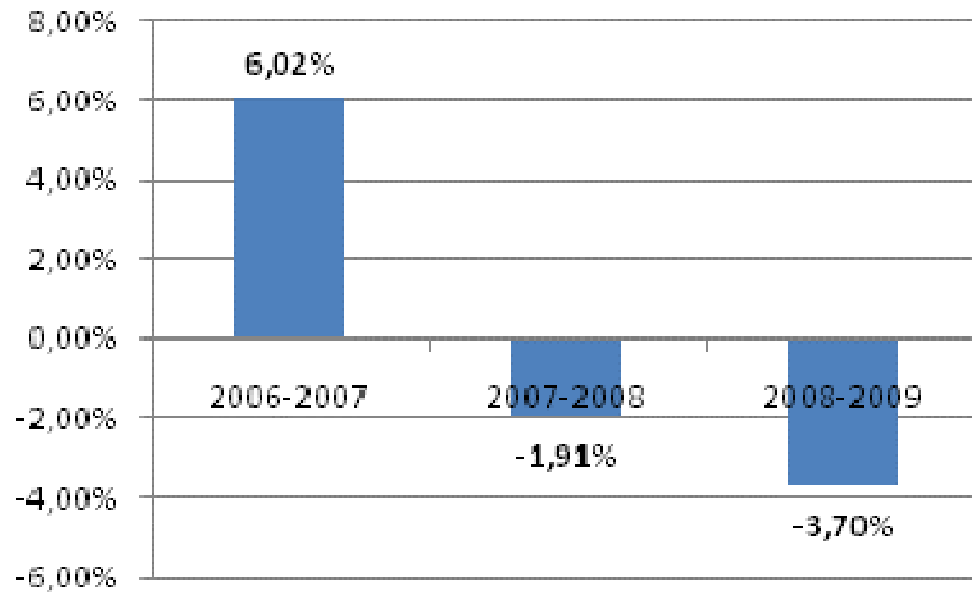


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- Evidence on the effect of the crisis on European high-tech entrepreneurial ventures:
  - focus on growth (or decrease) of employment and sales;
  - comparison of VC-backed and non-VC-backed firms.
- 5,434 European high-tech entrepreneurial ventures in existence and independent at the end of 2009.
- Available data for the period 2006-2009:
  - Data on sales: 3,263 firms,
  - Data on employment: 2,517 firms.

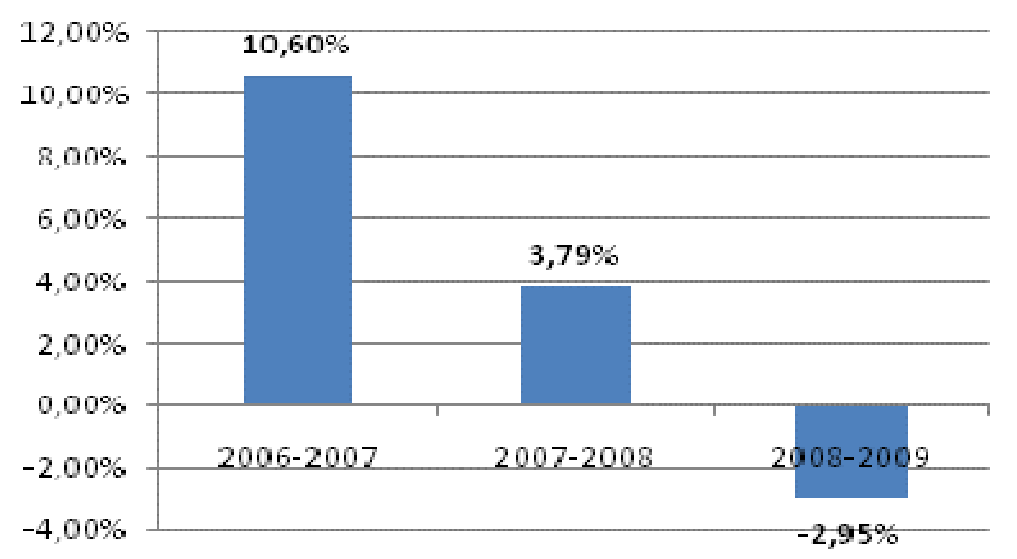


# Growth rates of sales and employment between 2006 and 2009



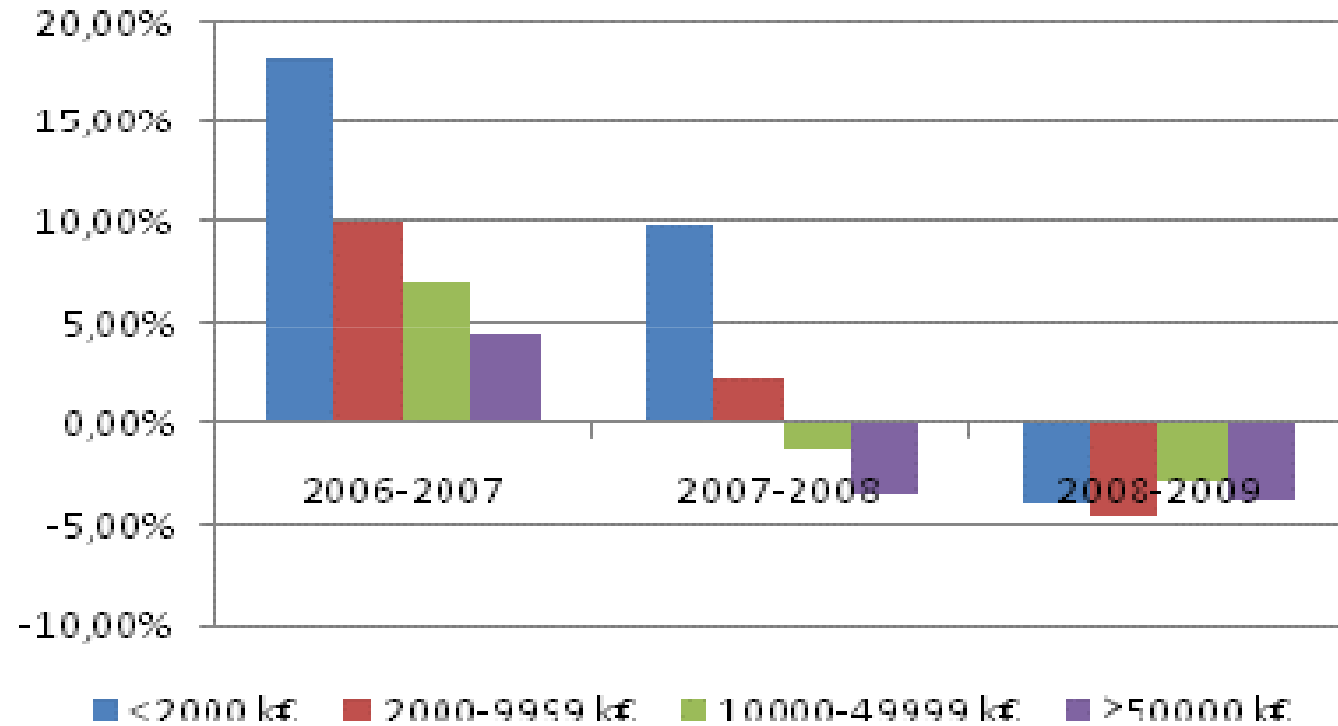
Sales growth rates

Employment growth rate



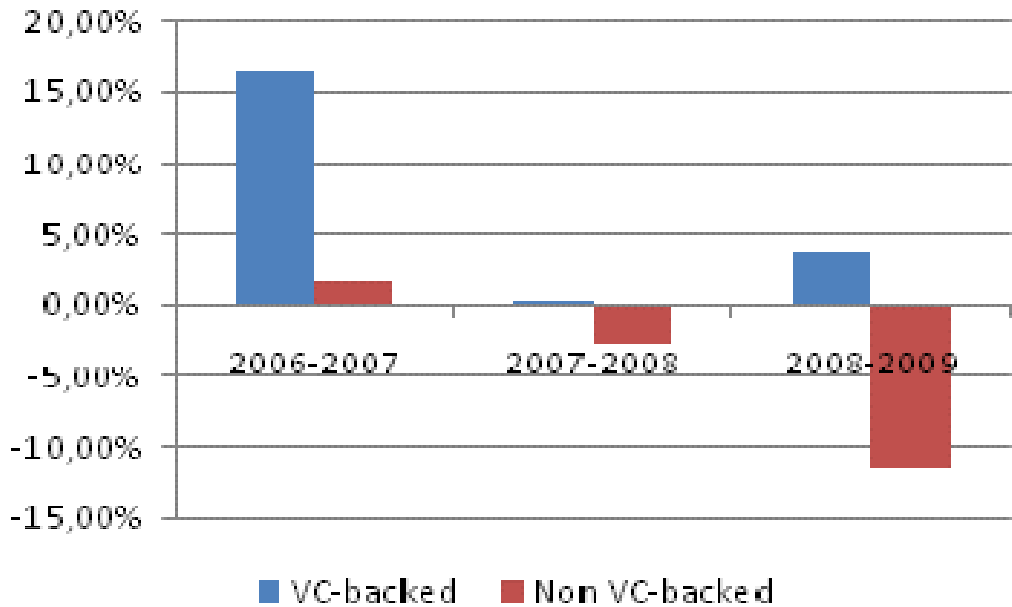
# Growth rates by size class (sales in 2006)

## Sales growth rates



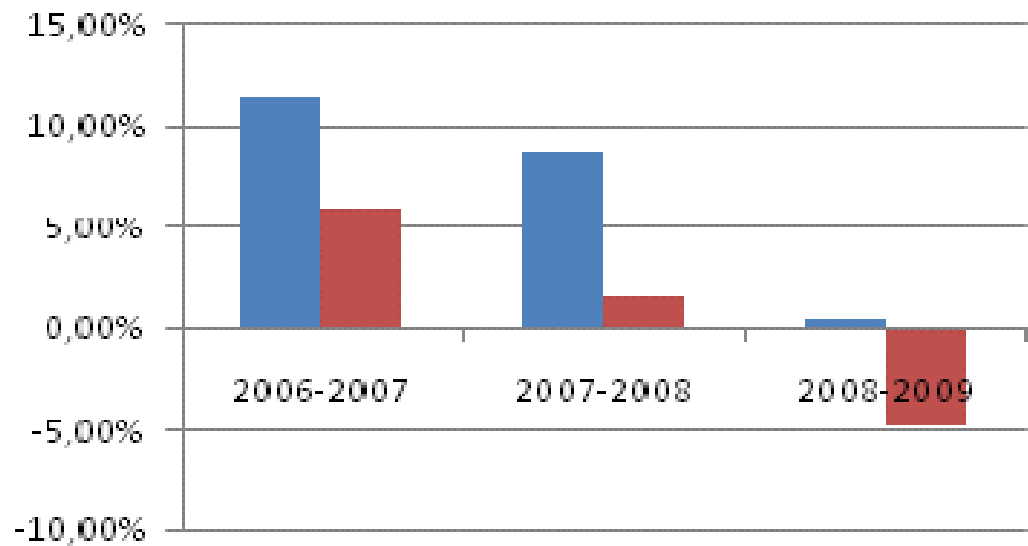
- Additional data collected through a web survey administered at the beginning of 2010 to firms included in the VICO dataset that were still in existence and independent:
  - 637 respondent firms;
  - Data on VC-backed status and sales for the period 2006-2009: 450 firms;
  - Data on VC-backed status and employment for the period 2006-2009: 366 firms.
- Moderating effect of VC on sales and employment growth.

# Growth rates of VC-backed firms vs. non-VC-backed



Sales growth rates

## Employment growth rates





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## Firm performance during the crisis: Role of resource configuration processes

- Survey to Italian owner-managers
  - Evidence on a sample of 114 Italian high-tech entrepreneurial ventures.

Key insight: the global crisis forged an extreme high-velocity environment, thus the pre-crisis resource configuration unlikely fits the abruptly changed contingencies.

- Increase of investments in new product development:
  - Very strong positive effect on firm growth: estimated “average treatment effect”:
    - +31% sales growth rate;
    - +23% employment growth rate.
- VC helps increase new product development effort.