
Venture capital financing and the growth of new technology-based firms

A longitudinal analysis on the role of the type of investor

**Fabio Bertoni, Massimo G. Colombo, Luca Grilli,
Politecnico di Milano**



Research questions (I)

- Focus on new technology based firms (NTBFs): key role for:
 - Employment growth (Acs 2004);
 - Static and dynamic efficiency (Audrestch 1995).
- Stylized facts:
 - NTBFs suffer from binding financial constraints (Carpenter and Petersen 2002): difficult to obtain access to bank loans;
 - Key role of personal capital;
 - Very few NTBFs get access to VC financing especially in bank-based countries like Italy (and other UE countries);
 - **VC-backed NTBFs grow faster than their non VC-backed counterparts.**



Research questions (II)

- Does VC financing spur the growth of NTBF?
- Or is the relation between VC financing and growth simply the result of unobserved heterogeneity/reverse causality problems?
- Are there any differences according to the nature of the investor (IVC vs. CVC)?



Objective of the paper

- Econometric analysis of the **causality relation** between:
 - VC financing;
 - NTBFs growth.
- Difference between:
 - Financing obtained by independent VC firms (**IVC**);
 - Financing obtained by non-financial firms (**CVC**).
- Hand-collected longitudinal dataset on 550 Italian NTBF observed in the 1994-2003 period.



Does VC financing spur NTBF growth? (I)

- **Scouting** (Chen 1983, Amit et al. 1998):
 - Specialized competencies in early stage financing in high-tech industries: cope effectively with adverse selection problems;
 - Provide promising NTBFs with necessary financing: “pick the winner” effect.

- **Monitoring & control** (Sahlman 1990, Gompers 1995, Lerner 1995, Kaplan & Stroemberg 2003, 2004):
 - Active investor (sit on the board);
 - Use of sophisticated contracts to incentivate firms’ management (e.g. staging).



Does VC financing spur growth? (II)

- **Coaching** (Gorman & Sahlman 1989, Sapienza 1992, Hellmann 2002, Hsu 2006):
 - Provide NTBFs with strategic advice, supplementing firm's competencies;
 - Provide NTBFs with business contacts.

- **Certification** (Megginson & Weiss 1991, Stuart et al. 1999, Hsu 2004):
 - Endorsement by VC makes it easier for NTBFs to establish business relations with third parties.



Does VC financing reduce growth?

➤ **Agency costs:**

- Strategic divergences between the external investor and the entrepreneur: absorption of entrepreneur's time and energy;

➤ **Appropriability hazards:**

- Risk of expropriation of technological knowledge (Yosha 1995, Ueda 2004).



IVC vs. CVC financing

➤ CVC investors:

- often pursue strategic objectives (technology window) in addition to financial objectives (Siegel et al. 1988, Chesbrough 2002, Ernst et al. 2005, Dushnitsky and Lenox 2005 a,b,c): greater likelihood of conflicts and greater appropriability hazards;
- generally have more limited investing experience (Gompers and Lerner 1998) and less skilled personnel (Block and Ornati 1987) than IVC firms;
- but possess unique resources and capabilities that are extremely useful to portfolio companies (Block and Macmillan 1993, Chesbrough 2000).



The empirical evidence

- Positive relation between VC financing and firms' growth:
 - Jain & Kini (1995), Manigart & Hyfte (1999), Engel & Keilbach (2002), Audretsch & Lehmann (2004):
 - Matched pair analysis or regression analysis;
 - Focus on IPO firms (J&K 1995, A&L 2004).
- Contrary evidence:
 - Buerghel et al. (2000): start-ups localized in Germany and UK;
 - Bottazzi & Da Rin (2002): European IPO firms.
- IVC financing has greater positive effect on NTBF success (and growth) than CVC financing?
 - weak and controversial evidence (Gompers & Lerner 1998, Gompers 2002, Engel 2002, Audrestch & Lehman 2004).



Methodological problems (I)

- Samples composed of IPO firms:
 - sample selection bias;
 - capture the moderating effect of VC financing on the relation between the IPO and firm growth.

- Endogenous nature of VC financing;
 - Biased estimates due to lack of control for unobservables: spurious correlation between VC financing and growth.
 - Reverse causality problems: growth may spur VC financing.



Dealing with methodological problems

- Engel (2002), Colombo & Grilli (2005):
 - Econometric techniques typical of the “endogenous treatment effect” literature (Heckman 1990, Vella & Verbeek 1999):
 - large “average treatment effect” of VC financing (especially IVC financing);
 - Evidence of promising firms self-selecting out of the VC market or of ineffective screening by VC investors.
- Limited evidence from estimates of panel data models:
 - Davila et al. (2004), Alemany & Marti (2005): positive effect of VC on NTBF growth (before and after the investment).
- IVC vs. CVC:
 - No estimates of panel data models.

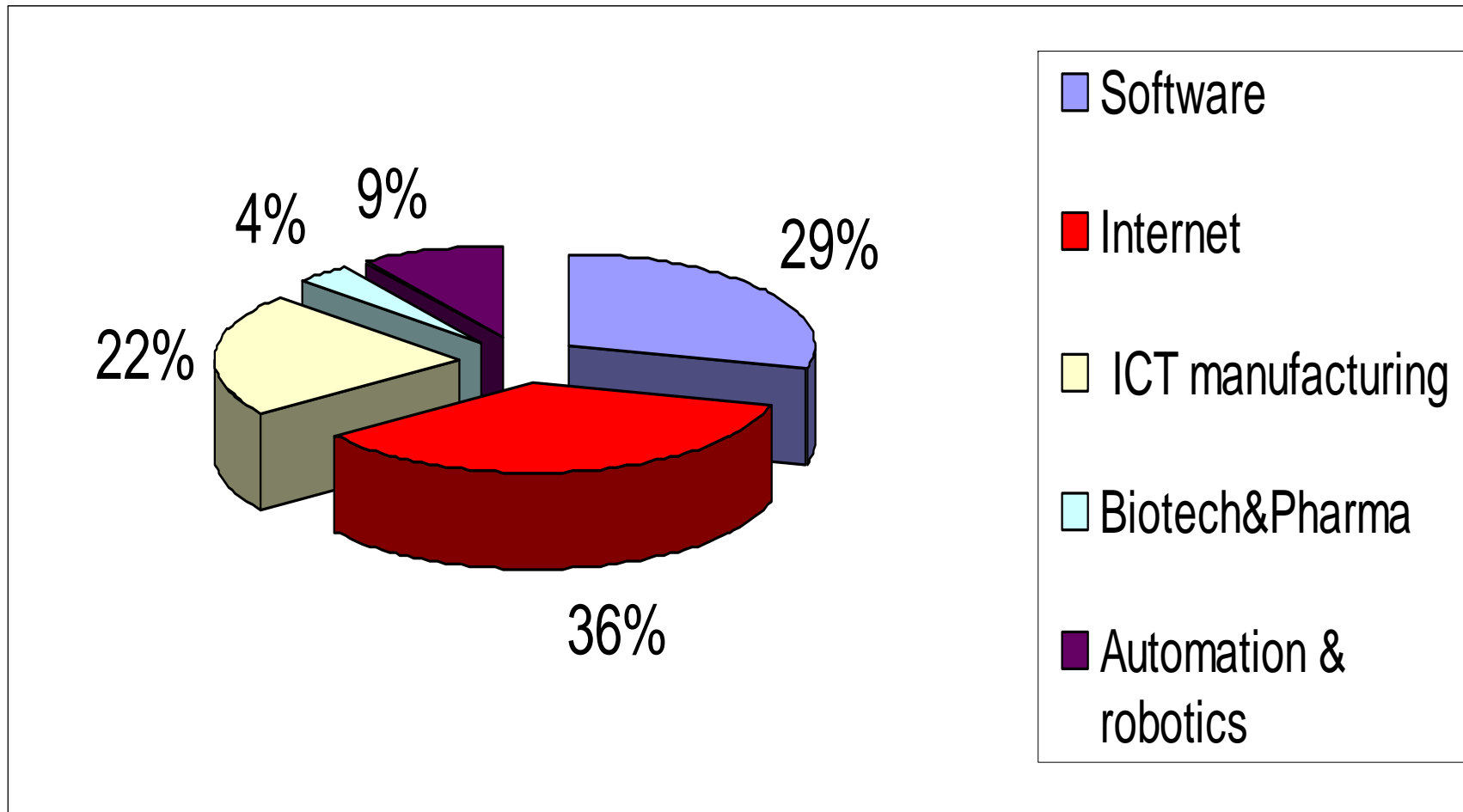


The sample

- 550 Italian NTBFs:
 - Established in 1980 or later;
 - Independent;
 - Having survived as independent firms up to the end of 2003;
 - In high-tech industries in manufacturing and services;
 - Representative of a population of 1974 firms (RITA Directory).
- Hand-collected longitudinal dataset:
 - Firm-specific data relating to the 1994-2003 period: firm size (number of employees, sales);
 - Data on VC financing: dates of investment rounds, type of investor (IVC, CVC);
 - Data on firm-specific controls.



Firms of the RITA sample, distribution by industry



Source: RITA database

Methodology of the econometric analysis

- Effect of VC financing on firm's growth (yearly growth of the number of employees and sales):
 - Augmented Gibrat's law specification;
 - Panel data models: Fixed effects & GMM-system;
 - Distributed lags for VC financing.
- Effect of VC financing on firm's growth by type of investor:
 - IVC vs. CVC.
- Control for firm-specific characteristics:
 - patent activity,
 - access to public subsidies,
 - presence of a salaried manager.



Effects of VC financing on NTBF growth

		<i>Number of employees</i>	<i>Sales</i>
β_1	<i>LSize (-1)</i>	0.8873 (0.0383) ***	0.8969 (0.0524) ***
β_2	<i>LAge</i>	0.0217 (0.0325)	-0.1799 (0.0786)**
β_3	<i>VC (-1)</i>	0.5708 (0.0838) ***	0.7339 (0.3791) *
β_4	<i>VC (-2)</i>	0.3387 (0.074) ***	0.0219 (0.1678)
β_5	<i>VC (-3)</i>	0.2352 (0.0736) ***	0.3221 (0.1547) **
	<i>Long-run Effect of VC</i>	21.67 ***	6.39 **

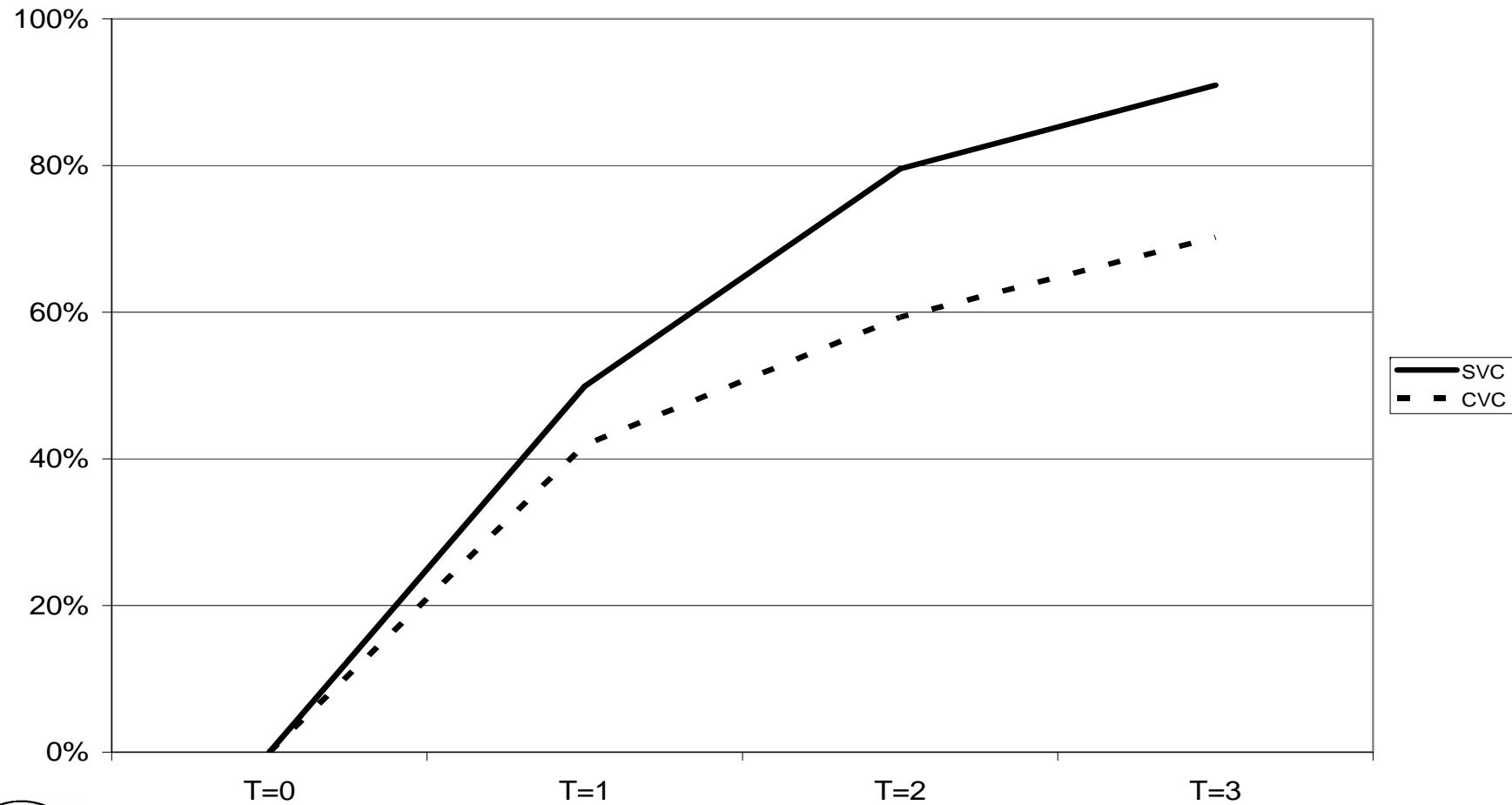


Effects of IVC and CVC financing on NTBF growth

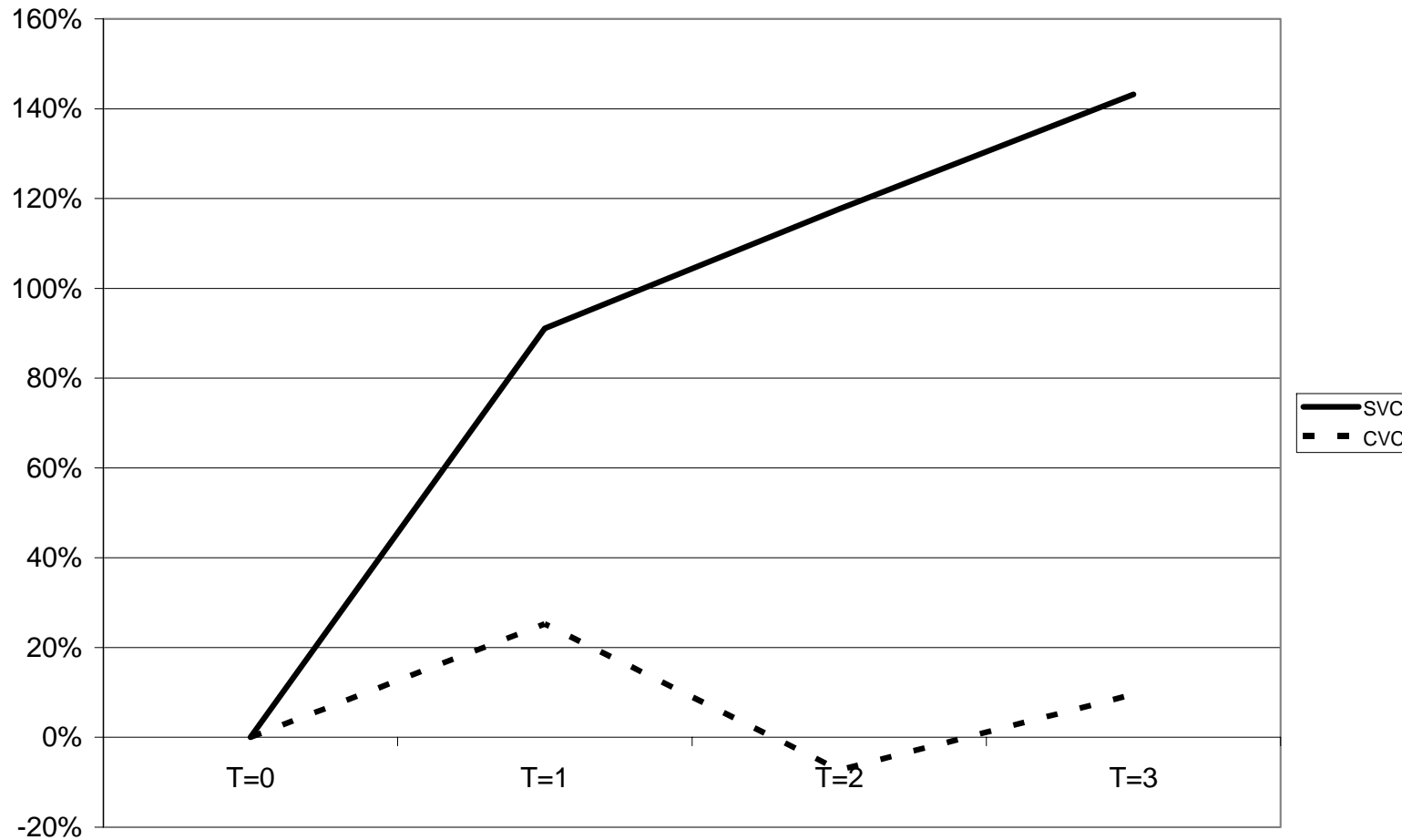
		<i>N. of employees</i>	<i>Sales</i>
B_1	<i>LSize (-1)</i>	0.8816 (0.0316) ***	0.8927 (0.0524) ***
B_2	<i>LAge</i>	0.03 (0.0248)	-0.1687 (0.783)**
B_3	<i>IVC (-1)</i>	0.4990 (0.1000) ***	0.9109 (0.5120) *
B_4	<i>IVC (-2)</i>	0.3557 (0.0633) ***	0.3636 (0.1806)**
B_5	<i>IVC (-3)</i>	0.2083 (0.0824) **	0.3814 (0.1775) **
B_6	<i>CVC (-1)</i>	0.4189 (0.1264) ***	0.2524 (0.8384)
B_7	<i>CVC (-2)</i>	0.2238 (0.0850) ***	-0.2988 (0.2700)
B_8	<i>CVC (-3)</i>	0.1793 (0.0933) *	0.1606 (0.1948)
	<i>Long-run effect of IVC</i>	24.15 ***	3.16 *
	<i>Long-run effect of CVC</i>	11.37 ***	0.01
	<i>ΔLong-run effect (IVC-CVC)</i>	25.06 ***	4.48 *



Percentage increase in the number of employees: IVC vs. CVC-backed NTBFs



Percentage increase in sales: IVC vs. CVC-backed NTBFs



Concluding remarks (I)

- Analysis of the effect of VC-financing on NTBF growth.
- Analysis of differences according to the type of investor (IVC vs. CVC).
- Use of a long longitudinal dataset on Italian NTBFs: effective control of unobserved heterogeneity and reverse causality problems.



Concluding remarks (II)

- Key results:
 - VC financing spurs the growth of NTBFs, measured by both number of employees and sales.
 - IVC investments have greater positive effects on growth than CVC investments, especially as regards sales.
- Development of the VC industry crucial for supporting the growth of the NTBF sector also in bank-based countries: key target of technology policy.
- The characteristics of different investors require careful consideration: who is investing matters for firm's growth.

