Alma Mater Studiorum Università di Bologna
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Entrepreneurship: Economics and Policy

Lecture 7

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1

Debt

200

Credit rationing – Type 1

- Type **1 credit rationing** occurs when new entrepreneurs receive a smaller loan than they desire at the quoted interest rate. For several reasons:
  - Larger loan sizes may increase the temptation to 'take the money and run';
  - Being aware that high repayment rates may deter both entrepreneurs' effort and repayment rates, banks protect themselves against losses caused by moral hazard by restricting loan sizes;
  - Limited liability (for incorporated businesses, entrepreneurs whose company fail are liable only up to the value of the business assets) places a fixed lower bound on entrepreneurs' downside risk;
  - Available evidence consistent with Type 1 credit rationing:
    - In The Netherlands entrepreneurs obtain on average four-fifth of the starting capital they request (Parker and van Praag, 2006)

201

Credit rationing – Type 2, Redlining, Underinvestment

- **Type 2 credit rationing** occurs when some randomly selected new entrepreneurs are denied a loan despite being observationally identical to those who receive one;
- **Redlining** occurs when a bank refuses to lend to any loan applicant for a particular group of entrepreneurs because the bank (believes it) cannot obtain its required return from these borrowers at any rate.
- **Underinvestment** occurs when, due to lack of financial resources, some socially efficient ventures are not undertaken by entrepreneurs.

202

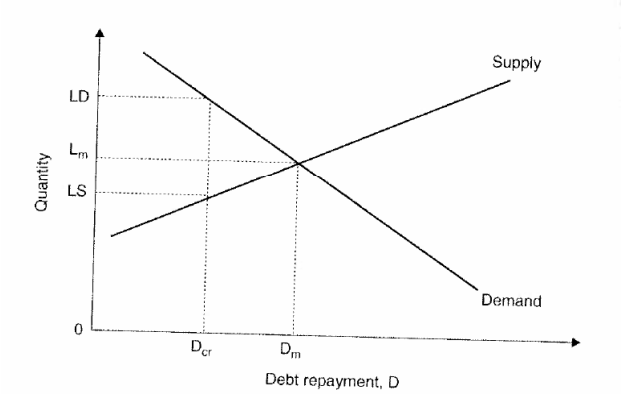
Credit rationing – Type 2, Redlining, underinvestment

- Stiglitz and Wiss (1981) (SW) develop a model **with asymmetric information** about the values of new ventures. Entrepreneurs are assumed to:
  - Be risk-neutral;
  - Have identical stocks of wealth;
  - Borrow a unit of capital form a competitive risk-neutral bank;
  - Operate one investment project with a given risk profile;
  - Know the risk of their project whereas banks do not:
    - And there is no credible way for entrepreneurs to convey their private information to bank.

203

Credit rationing – Supply and Demand of loans

- The interest repayment D_m would clear the market for credit, but the actual interest rates $D_{cr} < D_m$ determines an excess demand for funds of LD – LS. Thus:
  - With Type 1 rationing LS is the equilibrium loan size for an individual entrepreneur and LD is the desired loan size;
  - With Type 2 rationing LS is the number of entrepreneurs who obtain a loan, and LD is the number of loan applicants.



Credit rationing – Stiglitz-Weiss model

- 1) All ventures generate the same expected return:
  - Even though some entrepreneurs operate projects with greater risk than others;
- 2) Bank offer debt contracts:
  - Together with assumption of limited liability, this means that entrepreneurs have bounded downside risk;
- It follows that, although entrepreneurship becomes less attractive for all entrepreneurs as mandated interest repayments (D) increase, entrepreneurs operating the riskiest projects are the least affected and enjoy greater upside risk:
  - Hence, the first entrepreneurs to drop out of the market as D increases are those operating the safest projects:
    - But since these are the best customers from banks' perspective, one may conclude that there is adverse selection in the credit market.

205

Credit rationing – Stiglitz-Weiss model

- **Implication 1: Under-investment**
- Due to asymmetric information, the competitive loan rate reflects the *average* riskiness of loan applicants;
- As a consequence, low-risk entrepreneurs drop out of the market first:
  - Under-investment;
- With perfect information these entrepreneurs would face an interest rate which reflect their risk:
  - No under-investment, since low-risk entrepreneurs stay on the market;
- **Solution**: Subsidizing interest income, with a consequent increase in both equilibrium number of entrepreneurs and social efficiency

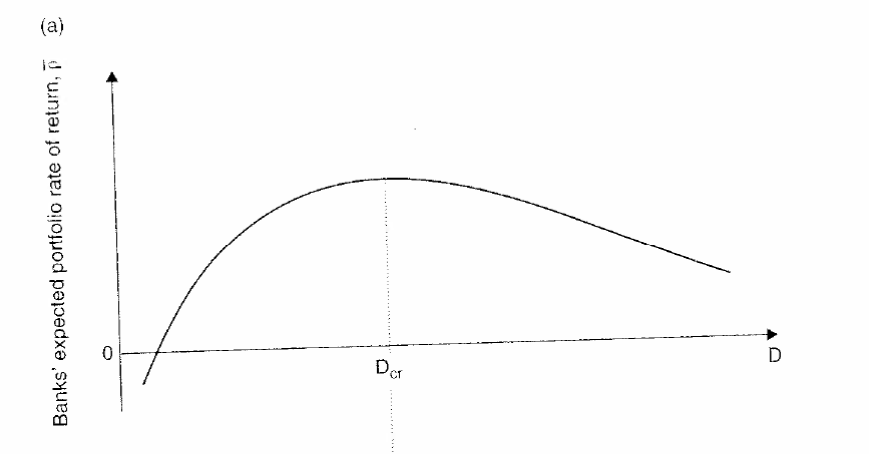
206

Credit rationing – Stiglitz-Weiss model

Implication 2: Type 2 credit rationing:

Let D_{cr} denote the "bank optimal" interest rate maximizing banks' expected profits;

In this case (Figure a) the supply of funds becomes a decreasing function of D above D_{cr}, since depositors receive the banks' returns and so supply fewer funds when banks' average portfolio rate of return $\overline{\rho}$ decreases



Credit rationing – Stiglitz-Weiss model

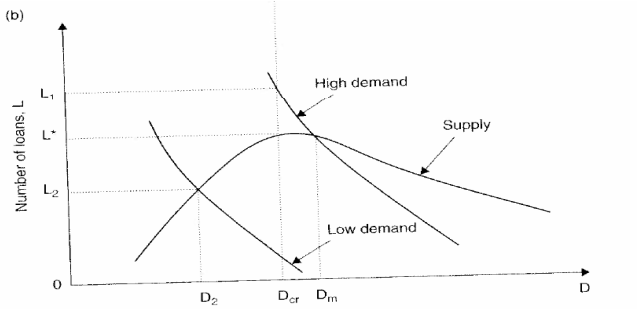
Implication 2: Type 2 credit rationing

Also the supply of funds becomes a decreasing function of D above D_{cr}, since depositors receive the banks' returns and so supply fewer funds when banks average portfolio rate of return decreases;

Figure (b) shows how credit rationing can occur if there is as high demand for funds and if $D_{cr} < D_{cm}$, with D_{cm} denoting the 'market-clearing' interest matching supply with demand;

Here banks deny credit to $L_1 - L^*$ randomly chosen entrepreneurs who are operationally undistinguishable from those who do receive loans.

Thus, credit rationing occurs because banks do not respond to an excess demand for funds by increasing the interest rate.



Venture capital and other sources

209

Venture capital and entrepreneurs

- Definition of venture capital:
  - Independently managed, dedicated pools of capital that focus on equity or equity-linked investments in privately held, **high growth** companies.
- Providers of venture capital:
  - Private independent venture funds, corporate subsidiaries, and special investment schemes;
- Typical venture cycle:
  - VCs raise a 'closed-end' (fixed term and fixed size) venture fund;
  - VCs screen, invest in, monitor and add value to the projects they select:
  - VCs exit successful deals and return capital to their investors;
  - VCs raise further.
- In return for providing infusion of capital, assistance, advice and expertise, VCs demand a share of entrepreneurs' profits (usually varying between 20 and 49.9%, depending on the prevailing technological and economic conditions) and an exit route that will generate a capital gain on their investment.

210

Venture capital and entrepreneurs

- Initial Public Offering (IPO): first sale of stock (shares) by a company to the public:
  - Preferred way for VCs to exit their investments and deploy their capital in new ventures;
  - For small firms, most IPOs take place in lightly-regulated "growth" stock markets (NASDAQ, etc.);
- As well as providing a natural exit route for venture capital investors, IPOs also offer valuation guidance to portfolio investors wanting to buy and sell companies;
- Easy access to public markets through IPOs is crucial for venture capital investment .

211

Venture capital and entrepreneurs

- Venture capital in practice:
  - **Early-stage capital**: Financing for companies before they initiate commercial manufacturing and sales or generate any profit. It includes:
    - **Seed capital**: Financing provided to study, assess and develop an initial concept. The seed phase precedes the:
  - **Start-up capital**: Provided to companies for product development and initial marketing. Firms may be in the process of being set up or may exist but have yet to sell their product or service commercially
  - **Expansion capital**: Financing provided for the growth of a firm, which may or may not break even or be profitable. Capital may be used to finance increased production capacity, market or product development, or to provide:
    - The liquid assets a firm has available to build its business.

212

Venture capital and entrepreneurs

- A matter of bargaining power?:
  - When valuable entrepreneurial opportunities are less common, bargaining power shifts to the VCs:
    - E.g. when risk higher in connection to technological uncertainty (high-tech industries):
      - In such cases, entrepreneurs and VCs negotiate also over control rights and other contract provisions, which include:
        - » Pre-determination of future rounds of financing;
        - » Pre-determination of release of shares to the entrepreneur;
        - » VCs right to take a seat on the board of directors;
        - » VCs ability to appoint managers and remove members of the entrepreneurial team: up to 80% of CEOs and managers in high-tech start-ups replaced after 7 years!
  - Good reasons for individuals with marked preferences for entrepreneurial activities (e.g. due to family tradition, culture, etc. ←) to be reluctant to enter into VC relationships?

213

Venture capital and entrepreneurs – Advantages 1

- 1) In addition to funding, VC provide assistance and advice:
  - 1.1 Monitoring:
    - VCs spend a lot of time monitoring and recruiting; on average, they visit their portfolios nineteen times a year and playa major role in shaping the top management teams of the companies in which they invest;
  - 1.2 Professionalization:
    - VCs provide a variety of support services to their companies, ranging from building their internal organization to HHRM policies, from recruitment of professional staff to the adoption of stock option plans;
  - 1.3 Certification:
    - The backing of a VCs signals quality and reputation, which can attract additional investors;

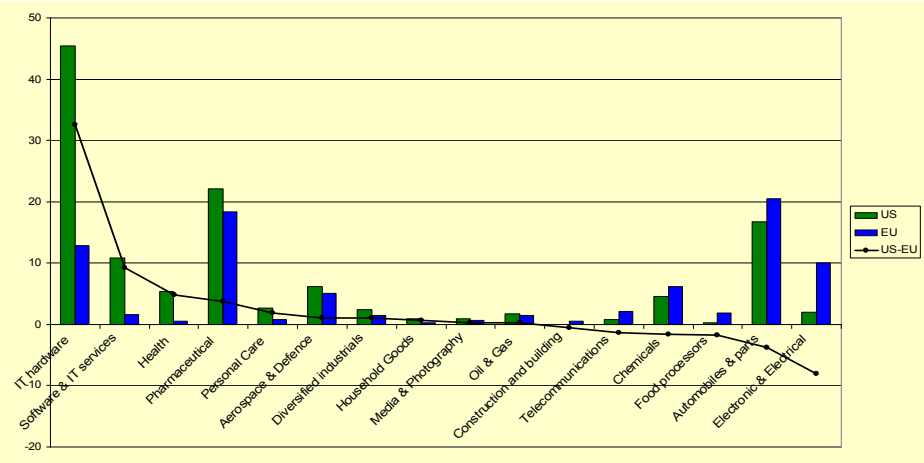
214

Venture capital and entrepreneurs – Advantages 2

- 2) Equity finance (EF) is the optimal financial contract for some entrepreneurs:
  - 2.1 EF is a substitute for debt finance (DF):
    - Projects receiving EF do not have the tangible assets which are requested as collateral for DF;
    - Projects receiving EF are highly concentrated in industries with the prospect of years without positive cash flows (in the US, during the 1990s, 75% of venture financing occurred in the IT and healthcare sectors;

215

Sectoral R&D gap in the 1990s - BERD (USA-UE)



216

Venture capital and entrepreneurs – Drawbacks

- Only a small minority of entrepreneurs choose to use venture capital. Several reasons can be adduced:
  - 1) Unwillingness to cede ownership and control rights:
    - Growth potential of new ventures not known in advance:
      - Should it be substantial entrepreneurs will find inconvenient to share ownership with someone else;
    - According to the pecking order theory, entrepreneurs seek funds in an order that minimizes external interference and ownership dilution. They prefer internal finance, followed by DF and EF;

217

Venture capital and entrepreneurs – Drawbacks

  - 2) Financing costs:
    - 2.1 – DF is usually tax favourerd with respect to EF;
    - 2.2 Remember that VCs are interested in IPOs. Thus, financing costs are fixed costs of issuing shares and listing on secondary markets where shares can be traded (e.g. NASDAQ):
      - Provided that most start-ups never grow to a size where these costs are warranted;
      - Provided that e.g. management buy-outs may generate greater and more reliable income for VCs.

218

Venture capital and entrepreneurs – Drawbacks

- 3) Agency costs:
  - Involvement of outside financiers may cause conflicts if interest with entrepreneurs, resulting in extra costs on all of the contracting parties;
- 4) Information costs:
  - Because entrepreneurs and outside financiers *must* co-operate closely, each side faces high costs for gathering information, which would ultimately result in an increase in the price fo funds beyond the willingness of entrepreneurs to pay:
    - Besides, full disclosure may encourage competitors to appear.

219

Equity 'gap' and Equity 'rationing'

- Equity gap denotes a mismatch between the fund sizes that interest entrepreneurs on the one side and VCs on the other, in the form of e.g.:
  - High fixed costs of screening which may VCs reluctant to supply the small sums usually required by entrepreneurs;
- Equity rationing occurs when there is a persistent excess demand for funds which even competitive VCs are unwilling to satisfy. This may occur in connection with:
  - As in SW model, if many low-risk entrepreneurs switch between debt and equity markets, competition induces lenders in both markets to reduce the price of funds below market clearing levels in order to attract them:
    - Rationing is then needed to break-even;

220

Equity 'gap' and Equity 'rationing'

- Since most VC funds are 'closed-end', which means that they have a predetermined scale and therefore 'shallow pockets', they:
  - Create competition for continuation finance (second-stage financing) between their portfolio entrepreneurs;
  - Give entrepreneurs an incentive to to select projects which not only have a Net Positive Value (PNV) at the refinancing stage, but also have returns that are higher than those of competing portfolio projects;
  - Cause an efficiency loss for society at large because some projects with a Net Positive Value will not be financed.

221

Informal equity funding: business angels

- Business angels are individuals who invest their own money, time, and expertise in start-up companies in which they have no family connections, in the hope of financial gain;
- They are usually interested in firms with potential for rapid growth operating in fields where they have experience, and usually prefer firms located fairly close to their home or office.
- As lenders to start-ups, they differ from friends and family members:
  - Their aim is not leveraging personal relationships, but making money;
  - They are typically 45-65 years old and well educated;
  - Most of them are successful cashed-out entrepreneurs.

222

Informal equity funding: business angels

- Business angels share similarities with VCs:
  - Reject most applications for funding (low quality);
  - Like VCs, they are valued by entrepreneurs for their value-adding activities
- Business angels are different from VCs:
  - (←) Locate geographically close to the entrepreneurs they finance;
  - Use few of the formal control mechanisms favored by VCs;
  - Are rarely involved in shaping top management teams;
  - Rarely demand board seats;

223

Other informal sources: family

- Families are among the most commonly used sources of business finance (←), used also by businesses who access bank credit:
  - Third after banks and other financial institutions in the US;
  - Second after banks in the UK
  - Start-ups in Canada: 60%: personal savings; 13%: family and friends; 12%: bank loans; 6%: trade credit;
  - Used also by businesses who access bank credit;

224

Other informal sources: trade credit

- Trade credit (TC) is a largely used substitute for formal finance, which denotes loans between firms and is typically used to purchase materials and intermediate goods:
  - Delaying payments is an important way to deal with cash-flow variations;
- Its duration is the time between invoicing and payment (30-60 days usually);
- TC in theory (IO):
  - If suppliers have market power, TC enable them to price discriminate covertly, hiding price cuts from other customers;
  - TC can serve as a warranty for product quality, since the delay in payment gives customers time for inspecting the merchandise;
  - Sometimes suppliers have to offer TC to cash-strapped customers if they want to make a sale.

225

Other informal sources: trade credit

- TC in theory (Informational asymmetries):
  - Suppliers engaged a long-term contractual relationships with entrepreneurial ventures have superior information about their creditworthiness than a bank does;
  - Suppliers can solve their incentive problems by threatening to withdraw access to future supplies:
    - Based on a day-to-day information flow they can easily evaluate their customers' abilities to pay;
  - Suppliers are well placed to resell their goods in the event that an entrepreneur defaults.

226

ENTREPRENEURSHIP (AND INNOVATION) POLICY IN PRACTICE

227

INNOVATION PREMIUM AND THE SURVIVAL OF ENTREPRENEURIAL FIRMS IN THE NETHERLANDS

E. Cefis – O. Marsili (2006) , in E. Santarelli (ed.), pp. 183-198

228

Aims and structure

- This study explores the effects of innovation on the survival of manufacturing firms in different technological environments in the Netherlands.
- It focuses on the role of innovation within the firm in shaping its survival probability,
- Different technological environments are considered, namely innovative and non-innovative firms in high- and low-tech industries.
- Besides, the Authors control for firm size and age, that is also a way to distinguish between entrepreneurial (young) and established firms in an industry.

229

Aims and structure

- The empirical analysis combines economic and demographic data from the Business Register of all firms active in the Netherlands with data on innovation derived from the second Community Innovation Survey (CIS-2). Total sample size is 3,275 firms.
- Main findings:
  - Entrepreneurial firms benefit relatively more than established firms from a technology rich environment, which in general favors their survival;
  - In low-tech industries entrepreneurial firms that innovate have significantly higher (58%) chances of survival than non-innovative firms:
    - Thus, the innovation premium for survival is highest for entrepreneurial firms in low-tech industries.

230

Technological determinants of firm survival

- Some studies have highlighted the role of technological conditions in an industry as a determinant of firm survival (Audretsch, 1991; 1995; Agarwal, 1998).
- There are two interpretations of the relationship between the level of technological intensity in a sector and the survival probability of firms active in that sector (Agarwal, 1996):
  - One argument maintains that a fast changing environment hampers firm survival:
    - it is the ability of new firms to learn about the environment and to adapt their strategies to changes in it, which ultimately determine their chances of survival.
  - Another argument sees the technological activities of a sector as being a source of opportunity for innovation for new entrants:
    - Highly innovative sectors may enable new firms to introduce new products and successfully compete with established firms. This increases the likelihood of survival of new firms.

231

Data

- The Business Register database consists of all firms registered in the Netherlands for fiscal purposes and reports no. of employees, sector of activity and month of entry and exit in the datasets.
  - For compatibility with the CIS-2, all manufacturing firms present in the Business Register at year 1996 were considered.
  - The number of firms in the Business Register at 1996, including firms with zero employees, that is self-employment, is 61,177.
- The CIS-2 firms (private, with at least 10 employees) were extracted from those present in the Business Register in order to constitute a stratified random sample, based on size class, region and industrial sector at the 2-digit Standard Industrial Classification (SIC) code level. The number of manufacturing sector respondents to CIS-2 was 3,299 firms, with a response rate of 71 percent.
- The variable of interest is the survival probability of a firm. To estimate this variable, the date of exit of a firm from the population of manufacturing firms in the Business Register was used.

232

Methodology

- A non-parametric approach based on Transition Probability Matrices to analyze the survival probabilities among different groups of firms is used. Survival probability is measured as the firm probability of remaining in the state in which the firm actually exists, while the probability of exiting the market is given by the probability to go from the state of existence to the one of non-existence

Table 1 - Descriptive statistics of the number of employees of manufacturing firms at 1996 by sample and industry group

	N	%	Mean	Std. Dev.	Skewness	Kurtosis	Median
ALL FIRMS IN BR							
Low-tech	49,119	80.8	14.2	105.4	53.1	5,205.9	2
High-Tech	11,673	19.2	27.3	395.2	82.6	7,880.3	2
ALL FIRMS IN BR WITH AT LEAST 10 EMPLOYEES							
Low-tech	9,161	74.7	66.4	237.0	24.4	1,067.4	21
High-Tech	3,099	25.3	96.7	762.8	43.0	2,124.3	27
ALL FIRMS IN CIS-2							
Low-tech	2,279	69.6	108.9	228.4	9.9	146.7	52
High-Tech	996	30.4	136.0	322.8	7.6	72.2	59
INNOVATORS IN CIS-2							
Low-tech	1,322	63.7	132.7	249.9	9.2	128.2	69
High-Tech	753	36.3	151.4	327.4	6.3	47.7	67
NON INNOVATORS IN CIS-2							
Low-tech	957	79.8	76.1	190.0	11.7	194.0	33
High-Tech	243	20.3	88.2	303.9	12.9	185.5	35

Source: Business Register (BR), Second Community Innovation Survey (CIS-2).

233

Methodology

- Among the firms that were in existence in 1996, at each point in time (after 1996) there is a cross-section distribution of firms that exist and firms that have ceased to exist:
  - The objective is to describe the evolution of this distribution over time, to enable the intra-distribution mobility of firms to be analyzed.
- To study the evolution of this distribution it is necessary to hypothesize a law of motion for the cross-section distribution within a more formal structure.
- Since the analysis focuses on the probability of firm survival, a state space is considered that is constituted by two states identified by the condition of existence of the firm.
  - State 0 defined as the non-existing state (state 0), in which firms are non-active in the market (they have in fact exited the market);
  - State 1 is defined as the existing state in which firms are actually present in the market.

234

Methodology

- The analysis was conducted dividing the sample into **entrepreneurial** and **established** firms, and according to whether they were categorized as high-tech or low-tech manufacturing.
- In order to test whether the differences between two estimated probabilities were statistically significant, a test for the null hypothesis that there is no difference between the survival probabilities of the populations was applied (H_0: $p_1 = p_2$).

235

Empirical results

- In general survival probability is **higher for established** than for entrepreneurial firms. Indeed, the percentage differences in survival probability between established and entrepreneurial firms increases from 3.1 in the first year to 22.2 in the last year. This shows that firm age and firm size have a positive effect on the survival probability. As Figure 1 shows, survival probability is **higher in high-tech** than in low-tech industries.

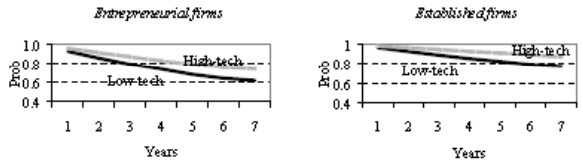


FIGURE 1 - SURVIVAL PROBABILITIES IN HIGH- AND LOW-TECH INDUSTRIES

236

Empirical results

- Figure 2 depicts the effects of the technology on the survival probabilities of innovators and non-innovators.
  - Among the entrepreneurial firms, innovators do not seem to be affected by sectoral differences in their survival probability, while non-innovators in high-tech sectors have better survival probability than those in low-tech sectors.
  - For established firms, those firms in high-tech sectors have higher chances of survival regardless of whether they are innovators or non-innovators.

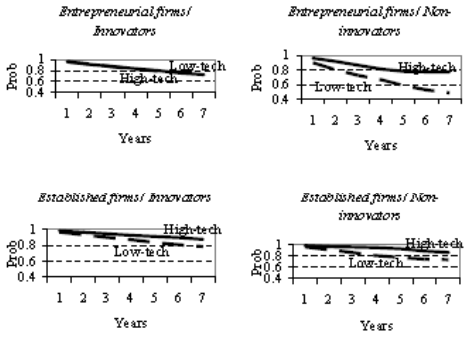


FIGURE 2 - SURVIVAL PROBABILITIES OF ESTABLISHED AND ENTREPRENEURIAL FIRMS BY INNOVATION.

237

Empirical results

- In high-tech sectors, the survival probabilities of innovators and non-innovators are barely distinguishable, either for established or entrepreneurial firms. Figure 3 depicts the two curves of the differences in the levels of probabilities fluctuating around zero, meaning that the innovation premium is very small in the case of both an entrepreneurial and an established firm.
- As Figure 3 shows, over 6 and 7 years, in high-tech sectors non-innovators have higher chances of survival than innovators.

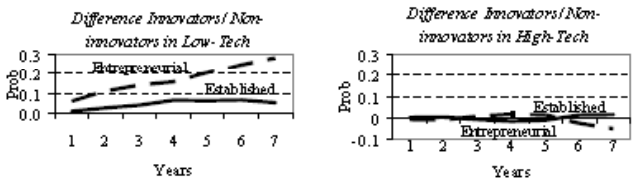


FIGURE 3 - INNOVATION PREMIUM OF ESTABLISHED AND ENTREPRENEURIAL FIRMS.

238

Empirical results

- However, the differences in the levels of probabilities are not statistically significant, except for the longest transition period (84 months) in which the difference is negative and significant at 1 percent (see Table 3). In fact, the innovation premium for entrepreneurial firms becomes negative in the 'long run'.

Table 3 - Differences in survival probability between innovators and non-innovators (z-values in parentheses)

	Number of months						
	12	24	36	48	60	72	84
HIGH-TECH							
Entrepreneurial firm	-0.008	-0.010	0.008	0.017	0.014	-0.026	**-0.051**
	(-0.36)	(-0.44)	(0.35)	(0.78)	(0.64)	(-1.25)	(-2.62)
Established firm	0.002	0.003	-0.008	-0.016	-0.011	0.013	0.015
	(0.13)	(0.24)	(-0.62)	(-1.28)	(-0.94)	(1.04)	(1.25)
LOW-TECH							
Entrepreneurial firm	**0.060**	**0.112**	**0.141**	**0.157**	**0.205**	**0.247**	**0.282**
	(3.08)	(5.93)	(7.91)	(9.39)	(12.86)	(16.53)	(20.11)
Established firm	0.010	**0.027**	**0.042**	**0.066**	**0.063**	**0.067**	**0.053**
	(1.06)	(2.89)	(4.62)	(7.52)	(7.49)	(8.19)	(6.72)

|z| > 2.58 statistically significant at 1 percent; |z| > 1.96 statistically significant at 5 percent; |z| > 1.64 statistically significant at 10 percent. Differences significant at 10 percent are in bold

239

Conclusions

- Among the group of established firms, firms with the highest survival probabilities are those active in technology intensive environments, regardless of whether they are innovators or non-innovators.
- On the other hand, in low-tech sectors being an innovator is a decisive factor in firm survival, increasing survival probability by 7.2 percent.
- For entrepreneurial firms it is crucial to either be an innovator or at least to be active in a high-tech sector; in a low-tech sector, innovative activity is a "matter of life or death". Indeed, innovation increases the survival probability of entrepreneurial firms in low-tech sectors by 58 percent compared to non-innovative firms. This is the highest innovation premium amongst all the categories of firms and sectors studied.

240

WHAT IS THE BEST POLICY FOR INNOVATIVE ENTREPRENEURSHIP?

241

Aims and structure

- Innovation and entrepreneurship are the interrelated forces which shape the paths of economic development and represent a major goal of any policy aimed at improving a country's competitiveness.
- Entrepreneurial firms are important because of their impact in terms of innovative and competitive power, in particular when they possess the right human capital endowment and an educated workforce able to implement new technologies.
- The three keywords **innovation**, **entrepreneurship**, and **human capital** can be used as reference concepts around which to sharpen our understanding of the crucial features of the productive system.

242

Innovation

- The innovative capability of entrepreneurial firms is a crucial dimension of competitiveness, resulting in:
  - Either new products being brought to the marketplace or in higher productivity levels being reached through the adoption of improved machinery and capital equipment with embodied technological change.
- In this regard, the widespread presence of high-technology entrepreneurial start-ups in recent years has produced accelerated rates of technological change in high-tech countries such as the United States and the Netherlands.
- Conversely, in medium-technology countries such as Italy, the weakness of the innovation system is associated to a scant presence of high-technology entrepreneurial start-ups.

243

Innovation

- Italy's R&D intensity in high-tech industries is about half that in the other large industrialized countries, whereas in the medium-low and the low tech ones all countries, and not just Italy, do not invest greatly in R&D.

Table 1 – R&D intensity (R&D expenditures as a share of value added) and share of value added to GDP by technological category

Type of technology	France	Germany	Italy	U.K.	Japan	U.S.
R&D INTENSITY						
High	0.26	0.23	0.12	0.21	0.24	0.18
Medium-high	0.10	0.11	0.03	0.08	0.12	0.07
Total high and medium-high	0.35	0.34	0.16	0.29	0.36	0.25
Medium-low	0.03	0.02	0.01	0.02	0.04	0.02
Low	0.01	0.01	0.00	0.01	0.02	0.01
Total medium-low and low	0.04	0.03	0.01	0.02	0.05	0.03
Manufacturing	0.40	0.37	0.17	0.31	0.41	0.27
VALUE ADDED IN PERCENTAGE OF GDP (X100)						
High	2.50	2.40	2.00	3.20	3.70	5.00
Medium-high	4.30	8.70	5.40	4.20	6.80	6.10
Total high and medium-high	6.80	11.10	7.40	7.40	10.50	11.10
Medium-low	3.40	4.80	5.80	3.90	4.50	4.50
Low	4.90	4.60	6.90	6.40	5.60	6.30
Total medium-low and low	8.30	9.48	12.69	10.28	10.16	10.83
Manufacturing	15.10	20.60	20.10	17.70	20.70	21.90

Source: own calculations on the OECD Science and Technology Indicators.

244

Innovation

- Inspection of the lower frame of Table 1 shows that, in terms of share of value added to GDP, Italy is more specialized in medium-low and low tech manufacturing than the other five countries.
- This overview of the ability of Italian firms to invest in R&D points to two preliminary conclusions:
  - The first concerns the innovative effort put forward by firms in high-tech industries: although Italy's productive capacity in this aggregate is only slightly lower than that of the other countries considered, Italian firms experience significant difficulties in undertaking R&D activities.
  - The second concerns the outcome of innovative activities (Table 2): inspection of the long-term trend in patenting shows that Italy has the smallest share. Although reflecting the specialization of the country in low-tech industries, also this evidence is indicative of the weakness of Italian firms in high-tech ones.

245

Innovation

- The third column of Table 2 shows that Italy lags behind the other countries also in terms of growth rate of the number of patents.
  - This backwardness is particularly evident with respect to Germany and the U.K.
- Hence, in general, although the innovative capability of Italy reflects the productive specialization of the country, it appears to be sluggish when compared with that of the other most advanced countries in the world.

Table 2 – Total patents (USPTO): across-country comparison (1963-2001)

Country	Patents	%	Growth rate of the number of patents (1996-2001)	Patents/resident population (x1,000)
Italy	35,856	1.2	7.3	0.6
France	93,258	3.2	7.7	1.6
Germany	242,590	8.3	10.6	2.8
U.K.	105,644	3.6	10.1	1.7
Japan	485,961	16.6	7.6	3.6
U.S.	1,957,669	67.0	7.5	7.7
Total	2,920,978	100.0	7.8	4.4

Source: own elaborations from the USPTO database.

246

Innovation

- Focusing on a narrower subset of high-technology industries – that comprising the Information and Communication Technology (ICT) aggregate and biotechnologies – furnishes the geographical picture arising for Italy (Figure 1):
  - Most noteworthy in the biotechnology industry are firms with their headquarters in Lombardia, followed by those in Lazio and Toscana; while firms headquartered in the remaining seventeen regions display a scant capacity to develop new innovations.
- Nor does the picture change substantially if we examine the ICT aggregate (Figure 2):
  - there is still a very promising situation in Lombardia and, to some extent, Piemonte, whereas all the other regions are backward.

247

Innovation

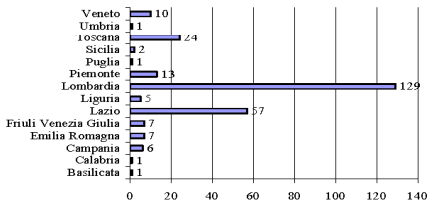


FIGURE 1 - REGIONAL DISTRIBUTION OF BIOTECH PATENTS (USPTO)

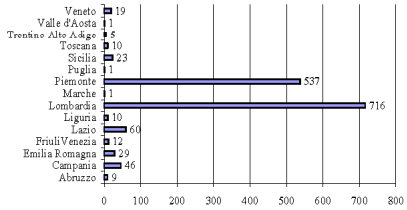


FIGURE 2 - REGIONAL DISTRIBUTION OF ICT PATENTS (USPTO)

248

Entrepreneurship

- It is widely believed in the E.U. that higher entry rates denote a larger availability of entrepreneurial forces with which to foster economic growth and structural change.
- However, one should consider the importance of "entry mistakes" (as defined by Cabral, 1997), since in every period and every industry more firms enter the market than it is able to sustain. Such mistakes are due to:
  - Lags in observation of rivals' entry decisions;
  - Merely the fact that entry investments take time;
  - They result in the inefficient allocation of resources to subjects unable to contribute to the competitiveness of a country, region, or industry.
- This theory is consistent with the "revolving door" metaphor put forward by Audretsch (1995), according to which if a large number of new firms enter into the market their exit rates will get higher as well.

249

Entrepreneurship

- Besides:
  - in most E.U. (e.g. Italy) countries the rate of new firm formation is (amazingly) high, resulting in a huge number of active firms;

Table 3 – Firms registered by sector of economic activity (1998-2004)

Sector	1998		2004		
	Registered	%	Registered	%	Growth rate 1998-2004
Distributive trades	1,506,295	27.3	1,581,818	26.4	5.0
Agriculture	1,092,525	19.8	972,940	16.2	-10.9
Construction	621,180	11.3	771,432	12.9	24.2
Manufacturing	740,492	13.4	752,188	12.5	1.6
Real estate, computer services, etc.	460,949	8.4	581,272	9.7	26.1
Hotels and restaurants	256,180	4.6	285,118	4.8	11.3
Other services	220,995	4.0	240,039	4.0	8.6
Transports and communication	201,630	3.7	212,943	3.6	5.6
Monetary and financial intermediation	90,589	1.6	108,008	1.8	19.2
Health, etc.	19,844	0.4	25,213	0.4	27.1
Education	13,848	0.3	18,939	0.3	36.8
Other (non classified)	292,056	5.3	447,840	7.5	53.3
Total	5,516,983	100.0	5,997,749	100.0	8.7

Source: Unioncamere (2005)

250

Human capital

- We already know that new firm formation rates are positively related to the level of human capital, and more educated people are more likely to acquire useful knowledge spillovers from others who are involved in research activities.
- There is evidence in regard to human capital that some significant improvements are taking place also in Italy. The Unioncamere data set out in Table 6 below signal that demand by Italian firms for more skilled labor has slightly increased in the most recent period. The share of highly skilled workers in total employment, although still low in absolute terms, has grown markedly in the recent period, whereas the share of blue collars and low-skilled workers has decreased.

251

Human capital

- This is an encouraging result, and it is consistent with the long-term trend of the last two decades in the skill-bias, not only in Italy but also in the other developed countries (Piva, Santarelli and Vivarelli, 2005).

Table 6 – Evolution of the skill structure of Italian firms (% of employed workers)

	31.12.2001	31.12.2002	31.12.2003
Managers and executives	1.2	1.3	1.3
Highly-skilled workers (including researchers)	4.4	4.3	5.7
Technical personnel	19.2	19.2	20.7
Clerical workers	11.9	11.4	11.6
Sales and marketing personnel	14.2	14.4	14.7
Skilled manual workers	23.5	23.2	22.2
Manual workers	16.2	16.4	15.3
Other unskilled personnel	9.3	9.7	8.6
TOTAL	100.0	100.0	100.0

Source: Unioncamere (2005)

252

Conclusions and policy suggestions

- Italy exhibits elements of endemic weakness in relation to the ability of its firms to implement innovation strategies:
  - There is a low propensity to invest in R&D, in particular in those industries in which this would be worthwhile, and regional imbalances emerge in terms of innovative capability;
  - Entrepreneurial talents are certainly widespread, but they are mostly defensive in nature and do not appear to be utilized for the pursuit of growth strategies;
  - By contrast, as far as human capital in concerned, a positive evolution in demand for more skilled labor is indicative that something is moving in a promising direction.

253

Conclusions and policy suggestions

- These results can be taken as reference points for some policy suggestions.
- After nearly twenty years during which entrepreneurship has been seen as an intermediate target for employment policies, subsidies to new firm formation in general have made their time.
- The moment has now come to use entrepreneurship policies as an instrument of an industrial policy explicitly aimed at promoting structural change:
  - In this sense, entrepreneurship policies cannot be implemented independently of innovation policies.

254

Conclusions and policy suggestions

- In this sense, they cannot be implemented independently of innovation policies: taking inspiration from what has been achieved in the U.S. and in some Asian "tigers" (see Mathews and Cho, 2000) - with the role played in fostering innovative entrepreneurship on the one side by venture capitalists and business angels, and on the other by the state as a 'collective entrepreneur' able to mobilize scarce but scattered resources for the development of strategic industries - it would be better to focus selectively on entrepreneurship and to target only those start-ups based on innovative projects and with good prospects of survival and growth.

255

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256

Conclusions and policy suggestions

- The favorable dynamics of demand for highly skilled human capital, in particular with an adequate endowment of general knowledge, social and communication skills, and 'learn how to learn' capabilities is a highly positive factor. The experience of other countries tells us that this kind of human capital achieves the best performance once it reaches the labor market.
- Unfortunately, and paradoxically, over the last ten years or so the Italian (and the European) system of secondary and tertiary education have instead been reformed in order to achieve an opposite result.

257

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- Unfortunately, and paradoxically, over the last ten years or so the Italian (and the European) system of secondary and tertiary education have instead been reformed in order to achieve an opposite result.

258

Conclusions and policy suggestions

- In the widespread unawareness that skill-specific education works well, as it actually did in the 1960s and 1970s, only when available technologies change slowly, but is useless when new technology emerge at a more rapid pace, as during the information age of the 1980s and 1990s, education policies in Italy (and Europe) have continued to target specialized education.
- To counteract this dangerous tendency, it is greatly to be recommended that both the secondary and tertiary education levels refocus their goals and become more closely involved in the creation of general and adaptable skills rather than specific competencies.
- In particular, the universities should engage more vigorously in top-quality research and transfer its results to the 'product' that they really bring to the market: that is, their graduates.

259