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# The Italian potential in the sectors of electronic components, computer hardware and telecommunication equipment

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**TABLE OF CONTENTS**

## LIST OF TABLES



## LIST OF FIGURES

# 1. INTRODUCTION

This chapter is aimed at providing a basis to assess the potentiality of high-tech start-ups in the sector of electronics with particular reference to the semiconductor, telecommunication hardware and computer fields.
As was explained in Modena et al (2001) we approach this problem from the point of view of potential entrepreneurs and their geographic concentration throughout Italy. In order to achieve this objective, (1) we have made use of the available literature (which was indeed very scarce), (2) we have elaborated data on the authors of patents in Italy and (3) we have gathered and analysed a series of interviews with start-up managers and potential entrepreneurs in two selected regions.

Section 2 presents a general description of the sectors mainly based on the literature, section 3 presents the identification of geographic areas active in the selected sectors resulting from the data, and section 4 illustrates the results of the field survey.

# 2. THE SECTOR: ELECTRONIC COMPONENTS, COMPUTER HARDWARE AND TELECOMMUNICATION EQUIPMENT

In order to briefly depict the Italian sectors of semiconductors, telecommunication equipment and computer hardware, we start from the studies of Bussolati et al. (1996) on the evolution of these sectors from the early fifties up to the mid-nineties. The most striking fact emerging from their analysis is that, until the mid-nineties, three big national companies have been so dominant, that their history can be considered to roughly coincide with the history of those sectors in Italy. These are ST Microelectronics for the semiconductors industry, Italtel for telecommunication equipment and Olivetti for computer hardware. As was already shown in Modena et al. (2001) entrepreneurship in Italy has always been limited to traditional sectors and high-tech activities have been left to big players.

The following sections are devoted to outline a brief history of the three big firms which dominated the three sectors and to provide some data on their recent evolution.

The last section describes the existing centres of research in terms of field of activity, size and location. In this instance, since no literature is available on the subject, information has been gathered by a phone survey.

## 2.1. ST Microelectronics and the electronic components sector

SGS was founded in 1957 basing its production activity on licences from General Electric (GE). In 1960 SGS abandoned GE technology, the most widespread at that time, for adopting Fairchild's technology, correctly forecasting the development of silicon technology. Fairchild acquired an equity share of the Italian SGS, who was owned by Olivetti and Telettra, in order to enter the European market. In 1966, SGS created its own R&D laboratory to adapt Fairchild technologies to the European market, which was mostly oriented to consumption electronics, but the adjustments of the technology were only incremental and no autonomous capabilities of technology development were acquired.

After breaking contacts with Fairchild in 1968, SGS went through a deep crisis until its control passed from Olivetti to STET. SGS-ATES was created in 1971, vertically integrating the production activity and upgrading the quality of its products. However, only in 1980, when Pasquale Pistorio became CEO of the group, has the company strategy changed towards seeking to become a world-wide level semiconductor supplier and towards more technologically advanced products. This was obtained also by enhancing the collaborations with Italtel (telecommunication equipment), Olivetti (computer hardware) and FIAT-Magneti Marelli (automotive).

In the eighties another important strategic decision needed to be taken: in a context of progressive consolidation of the oligopolistic core at global level, SGS decided for a differentiation of electronic products instead of targeting niche markets, and a strategic merge with the French semiconductor company Thomson was realised in 1987 giving birth to the actual STMicroelectronics.

Malerba and Pellegrini (1996) conclude their study on the development of ST noting that the early development of the company and the sector has been hampered by both public sector negligence and short-term policy. The company has started thriving in the early eighties when it has been able to exploit national and European support measures for microelectronics and has adopted a more research intensive and long term oriented policy.

STMicroelectronics is today the 4th largest semiconductor company in the world. Turnover of the group totalled 7,813M $ in year 2000[4]. It should be mentioned that the aggregate turnover of SGS and Thompson in 1985 was 624M$ and that at the time, the two companies together would rank only 12 (Malerba and Pellegrini, 1996). STMicroelectronics offers over 3,000 main types of products to more than 1,500

[4] http://eu.st.com/stonline/company/index.htm

customers. The group totals 42,000 employees, 12 advanced R&D units, 33 design and application centres, 19 manufacturing sites and 74 sales offices in 27 countries.

Around 10,000 of the ST workers are employed in Italy and they provide for 77% of the Italian employees in the 21 companies associated to the national association of electronic components producers. Table 2.1. gives recent data on domestic market, revenues, exports and imports of the associated firms.

Imports constantly exceed exports in the considered period (1998-2000) and while the percentage variation of the trade balance in the 1998-1999 period reached a positive 18.1% it has subsequently worsened with a negative change of -5.6%.

***Table 2.1: Electronic components sector***

| | **1998** | **1999** | **2000** | **99/98** | **00/99** |
|---|---|---|---|---|---|
| **domestic market** | 2,636 | 2,583 | 2,768 | -2.0% | 7.2% |
| **Turnover** | 2,117 | 2,159 | 2,319 | 2.0% | 7.4% |
| **exports** | 1,020 | 1,137 | 1,198 | 11.4% | 5.4% |
| **Imports** | 1,539 | 1,562 | 1,647 | 1.4% | 5.5% |
| **trade balance** | -519 | -425 | -449 | **18.1%** | **-5.6%** |

millions euro

Source: electronic components national association data - ANIE
Data refers to semiconductors, integrated circuits, hybrid circuits, cathode ray tubes, capacitors, resistors, inductors, connectors, switching systems, printed circuits, electronic card assemblers.

## 2.2. Olivetti and the computer hardware sector

The Italian history of the computer industry widely coincides with that of Olivetti.
Olivetti was founded in 1908 in Ivrea (Torino), and by the sixties it had reached a solid international position in office equipment. In 1959 it opened the department of electronics and timely started to produce electronic calculators, while maintaining a strong position in the sector of typing machines. In the late seventies definitively passed to electronics from electromechanics. At that time the introduction of personal computers marked the change in Olivetti strategy. Price competition became crucial and R&D expenses were lower than for mainframes or minicomputers. Marketing and customer service became more relevant and Olivetti could exploit the competitive advantage of being internationally known and having a good distribution and assistance network.

De Benedetti brothers acquired the majority of Olivetti when personal computers were becoming widespread in the USA (1978). Acquisition and collaboration agreements allowed a rapid recover of the delay of Olivetti, making of it a leader in Europe.

In the eighties there was another discontinuity and rapid change of the competition rules in the sector; the increase of the market share of PC and software compelled a restructuring of the major companies which had to give up their vertical integration. In Europe the only companies remaining in the computer market were: Siemens, Olivetti and Bull (Torrisi, 1996).

In the nineties, competition pressures, progressive fall of revenue margins, and weakness of the European and Italian market compelled Olivetti to start a restructuring of its activities[5]. Olivetti enters the telecommunication service sector founding, together with other international telecommunication operators, Omnitel a wireless telecommunication carrier. Following the same strategy for the wireline telecommunication, Infostrada is founded in 1995. In 1997 new alliances are created with the Mannesmann group and the activities related to personal computers, systems and services are sold. This date roughly marks the end of computer hardware production in Italy.

In 1999 Olivetti acquired 52% of Telecom Italia and sold its participation in Omnitel and Infostrada (as requested by antitrust laws) to Mannesmann.
Olivetti is today the holding company of a group with a turnover of 30.1 billions euro in the telecom business and more than 120,000 employees (year 2000)[6]. However, its activity in the computer hardware sector has ceased and it has become a holding for telecommunication carrier companies.

The national association of telecommunication equipment and computer hardware (which is part of ANIE national association of electronics) provides some data on domestic market, revenues, exports and imports. The number of associated companies is 55, reaching a total of 28,000 employees.

Table 2.2 shows data for the computer hardware sector. The worsening of the trade balance in the period 1998-2000 clearly emerges.

[5] http://www.olivetti.it/group/stori2.html
[6] http://www.olivetti.it/group/stori2.html

*Table 2.2: Computer hardware sector*

| | 1998 | 1999 | 2000 | 99/98 | 00/99 |
|---|---|---|---|---|---|
| **domestic market** | 4,733 | 5,206 | 5,934 | 10,0% | 14.0% |
| **turnover** | 3,712 | 3,935 | 4,328 | 6,0% | 10.0% |
| **exports** | 1,978 | 2,012 | 2,133 | 1,7% | 6.0% |
| **imports** | 2,999 | 3,285 | 3,739 | 9,4% | 13.9% |
| **trade balance** | -1,021 | -1,273 | -1,606 | **-24.7%** | **-26.1%** |

millions euro

Source: telecommunication and information technology national association data - ANIE
Data refers to computers, mini and personal computers, terminals, office automation machines, cash registers.

## 2.3. Italtel and the telecommunication equipment industry in Italy

The Italian telecommunication equipment industry has started with a strong delay in the fifties as compared, for instance, to the U.K. and the U.S., as these countries enjoyed major development of this sector during the war. Italtel is the first Italian firm for telecommunication equipment. It starts as a branch of the German Siemens, but becomes fully Italian owned by 1950. The three decades up to the 80ies are characterised by efforts to produce state-of-the art switching systems, but a slow public policy and a mismatch between public demand and technological supply lead to a series of failures (Cozzi and Zanfei, 1996).

Today Italtel is a communication network designer strongly linked with Cisco systems which owns close to 20% of the company. Italtel's majority shareholder, controlling 49.1% of equity, is Clayton Dubilier & Rice, a private U.S. investment firm which manages closed-end funds for institutional investors. (Telecom Italia owns 19.5% and Cisco Systems 18.5%).

It has about 3,600 employees, of whom 43% work in leading-edge ICT research areas: broadband networks, voice/data integration and advanced network management systems. Revenues in 2000 totalled about 908m euro; key markets are Italy, Spain, Russia and Latin America (Argentina, Brazil, Chile, Columbia)[7].

While telecomm carriers have blossomed in the 90s due to the privatisation of the sector, producers of telecom equipment are very few. It should be mentioned that a number of foreign multinational companies have research centres in Italy e.g. Ericsson,

[7] http://www.italtel.it/webitaltel/brief/brief.html

Alcatel and Siemens. Some basic information over the research activity of these groups today is provided in the next section.
From data provided by the national association of telecommunication and information technology (table 2.3), it emerges that the telecommunication sector in year 2000 shows a strongly increased dependence on imports.

***Table 2.3: Telecommunication equipment sector***

| | **1998** | **1999** | **2000** | **99/98** | **00/99** |
|---|---|---|---|---|---|
| **domestic market** | 8,971 | 9,554 | 10,897 | 6.5% | 14.1% |
| **Turnover** | 10,716 | 11,290 | 12,627 | 5.3% | 11.8% |
| **exports** | 2,789 | 2,846 | 2,918 | 2.0% | 2.5% |
| **Imports** | 3,202 | 3,424 | 3,951 | 6.9% | 15.4% |
| **trade balance** | -413 | -578 | -1,033 | **-39.9%** | **-78.7%** |

millions euro

Source: telecommunication and information technology national association data - ANIE
Data refers to: telecommunication equipment; wireless and wireline systems and networks, and related installation activities; end-user systems; control, analysis and simulation equipment

## 2.4. Major companies' research centres today

In order to identify the fields of research in the Italian industry today we have conducted a survey among the biggest firms in the field of telecommunication and electronic components, which are present on the Italian territory. Table 2.4 summarises the results of such survey. Although the following list of companies is not exhaustive, a first glance at the fields of expertise of each research centre shows that there is not one single field in which competencies are concentrated. Indeed, in the field of semiconductor components only STMicroelectronics is present, in the field of fibre optics only ALCATEL and PIRELLI with 1100 researchers, the rest operates in various subsectors of the telecom equipment sector.

It is also very clear that research centres are concentrated in the Milan area. They provide a reservoir of highly skilled manpower and represent a source of potential entrepreneurs.

Next chapter will present further details about the identification of geographic areas especially active in the selected sectors, according to different indicators.

***Table 2.4: R&D sites of the ICT major companies.***

| **COMPANY** | **R&D employees** | **SITES** | **TYPE OF RESEARCH** |
|---|---|---|---|
| STMICROELECTRONICS | 3,000 | 2 **Milano** area<br>1 Catania | semiconductor physics and devices |
| ALCATEL | 1,000 | 2 **Milano** area | optical fibre and optical communication devices |
| BULL | 900 | 2 **Milano** area | general purpose systems, software (new generation mainframe, system integration projects, billing systems) |
| TELECOMITALIA LABS | 850 | mainly in Torino | mobile internet, multimedia systems, broadband networks, voice technology |
| ERICSSON | 800 | 1 **Milano** area,<br>1 Roma ,<br>1 Bologna,<br>1 Salerno | wireless broadband access, high capacity radio, WCDMA (wideband code division multiple access) |
| SIEMENS | 800 | 1 **Milano** area | second and third generation mobile networks |
| AGILENT | 120 | 1 Torino<br>1 Brescia | optoelectronic and photonic devices and components for high speed optic fibre transmission |
| INFOSTRADA | 110 | **Milano** area | interactive video and streaming, communication protocols, ADSL technology and last mile |
| PIRELLI | 100 | **Milano** | optical fibres and material, nanotechnologies for optical transmission |
| LUCENT | 50 | 1 **Milano**<br>1 **Roma** | software development for intelligent networks |
| ALBACOM | 50 | 1 **Milano** | design of voice and data networks |
| PHILIPS | 25 | 1 **Milano area** | video signal processing, digital radio transmission, systems for broadband transmission, video networks and systems |

## 3. GEOGRAPHIC AREAS ACTIVE IN THE SECTOR

The identification of the geographic areas active in the electronic components sector and in the computer and telecommunication equipment sectors has been carried out analysing the geographical concentrations of the number of production units and employees (according to Istat classification of activities) together with the number of inventors and patents in the relevant technology classes.

Analysing in more detail the information on these sectors provided in Modena et al. (2001), it emerges again the importance of Milano for both computer hardware, semiconductor devices and electronic components, and consumption electronics and telecommunication hardware.

***Table 3.1: inventors, weighted inventors, production units and employees per local labour system***

| Sectors | **Region** | **Local Labour System[1]** | **Inventors per LLS and % on total investors of the sector. years 1995-99[2]** | **Weighted Inventors per LLS and % on total patents of the sector. years 1995-99[2]** | **Production units per LLS and % on total production units of the sector. census 1996[3]** | **Employees per LLS and % on total employees of the sector. census 1996[3]** |
|---|---|---|---|---|---|---|
| | | | | | | |
| **Computer hardware, semiconductor devices and electronic components** | Lombardia | Milano | 186 **(28.4%)** | 228 (35.4%) | 260 (13.4%) | 12,966 (25.9%) |
| | Sicilia | Catania | 39 **(11.2%)** | 50 (7.8%) | 13 (0,7%) | 1,969 (3.9%) |
| | All | ***Total in the sector*** | ***655 (100%)*** | ***644 (100%)*** | ***1,943 (100%)*** | ***49,984 (100%)*** |
| | | | | | | |
| **Consumption Electronics and Telecomm. (hardware)** | Lombardia | Milano | 145 **(25,3%)** | 104 **(28,0%)** | 331 **(15,1%)** | 14,253 **(26,1%)** |
| | Piemonte | Torino | 62 | 30 | 103 | 1,872 |
| | | Ivrea | 15 | 6 | 8 | 129 |
| | | Total | 77 (13.4%) | 36 (9.7%) | 111 (5,1%) | 2,001 (3,7%) |
| | Lazio | Roma | 48 (8.4%) | 35 (9.4%) | 173 (7,9%) | 5,802 (10,6%) |
| | All | ***Total in the sector*** | ***573 (100%)*** | ***371 (100%)*** | ***2,198 (100%)*** | ***54,618 (100%)*** |
| | | | | | | |

[1] *Source: ISTAT, 1997, I Sistemi Locali del Lavoro.*

[2] *Source: University of Pavia, elaboration on European Patent Office data.*

[3] *Source: ISTAT, census 1996.*

Table 3.1 summarises the geographical distribution of the following variables: number of inventors, inventors weighted by shares of patents filed, production units and employees, per each high-tech class[8]. Data specified in the table refer to the main concentrations identified on the basis of the number of inventors, showing also the region where local systems are located[9].
Milano, as already mentioned, is the most important concentration area for both classes of activity, with more than one fourth of inventors and employees, around 15% of production units, and one third of weighted inventors.

Computer hardware, semiconductor devices and electronic components show Catania as the second concentration area. Consumption electronics and telecommunication hardware sees Milano followed by Torino area.

The first of these two cases is of particular interest in our research, being Catania the only concentration of patent activity in high-tech classes in the south of the country. The following maps show the geographical distribution of production units and employees per local labour system of computer hardware, semiconductor devices and electronic

[8] For more details on the technology classes see the selected high-tech IPC classification in the annex.

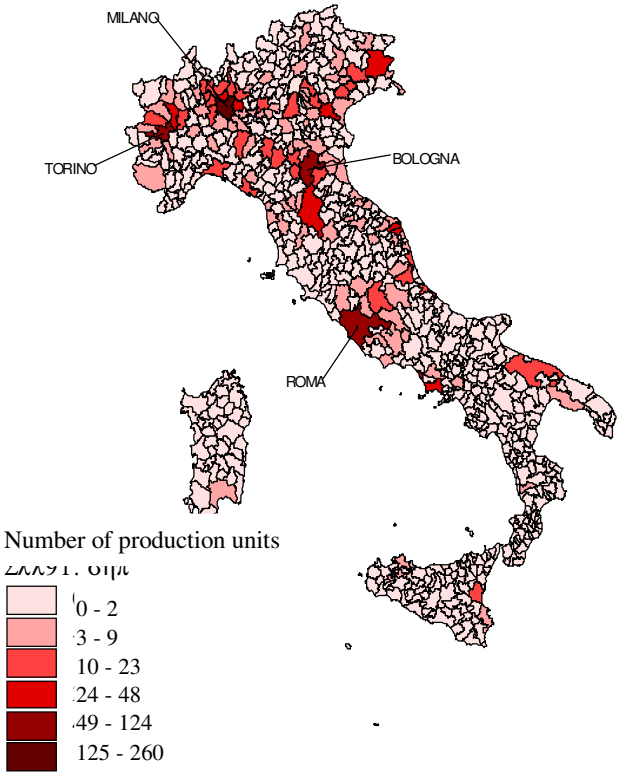
[9] By number of inventors (column 4) is meant the number of individuals who have filed at least one patent in the sectors specified in the first column, whereas the number of weighted inventors (column 5) is calculated as the number of inventors adjusted for their patent contributions. If an inventor has filed a patent with 2 colleagues his weight has been accounted as 1/3, if he has filed 4 patents alone his weight has been accounted as 4.
The number of production units (column 6), helps to identify and distinguish the cases where the high number of inventors depends on the presence of a single large business unit. In Catania, for instance, one big firm was responsible for most of the patents and caused the local system to rank high.
The last column reports the number of employees per local system.

components, followed by the maps relative to the number of inventors and weighted inventors (adjusted by the inventors' contribution to the patents).

Catania emerges especially as far as the number of inventors is concerned, while as for the number of production units and employees other areas in Italy, mainly around Milano, Torino, Bologna and Roma, are more relevant. The number of production units in Catania local labour system is only 13 and the number of employees 1,969[10], but in spite of these small numbers, it still shows the second most important concentration in inventors and patent applications.

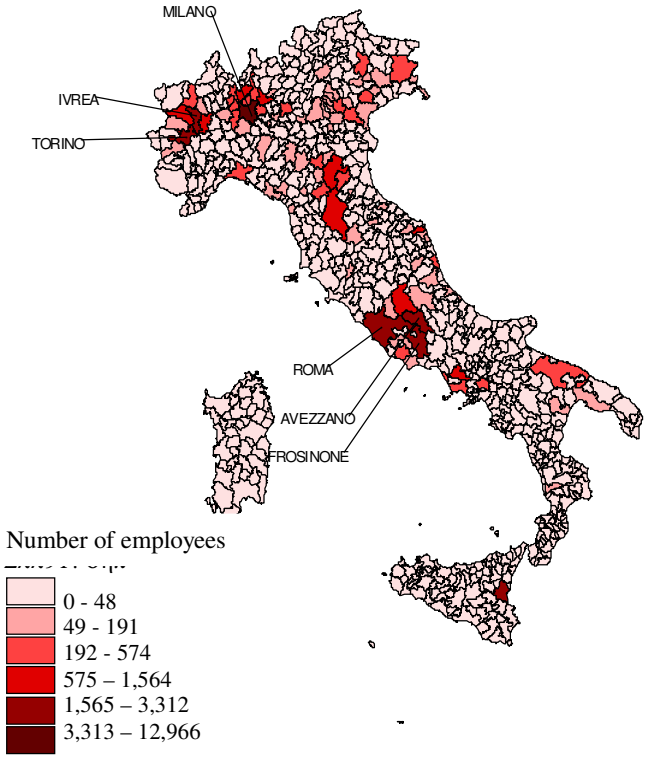
[10] It must be noticed that data on production units and employees are from Istat census 1996. This numbers have definitively increased at least due to the growth of the Catania site of STMicroelectronics in recent years.

**Production units of computer hardware, semiconductor devices and electronic components firms per Local Labour System**



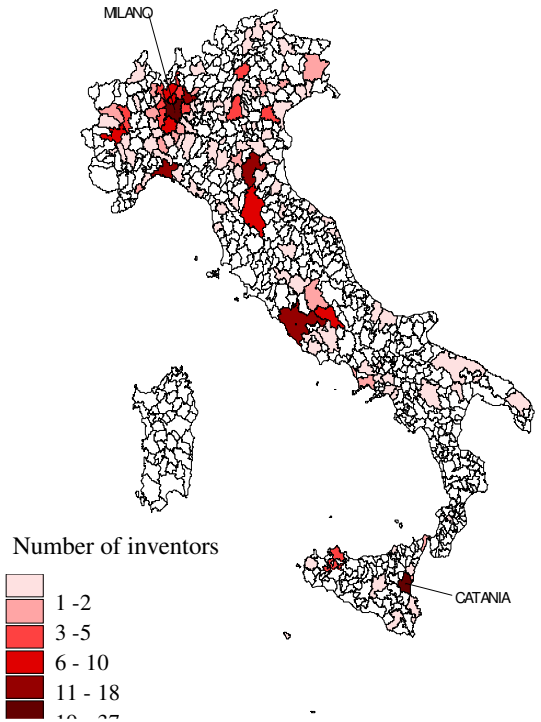

Total production units in computer hardware, semiconductor devices and electronic components: **1,906**

**Employees of computer hardware, semiconductor devices and electronic components firms per Local Labour System**



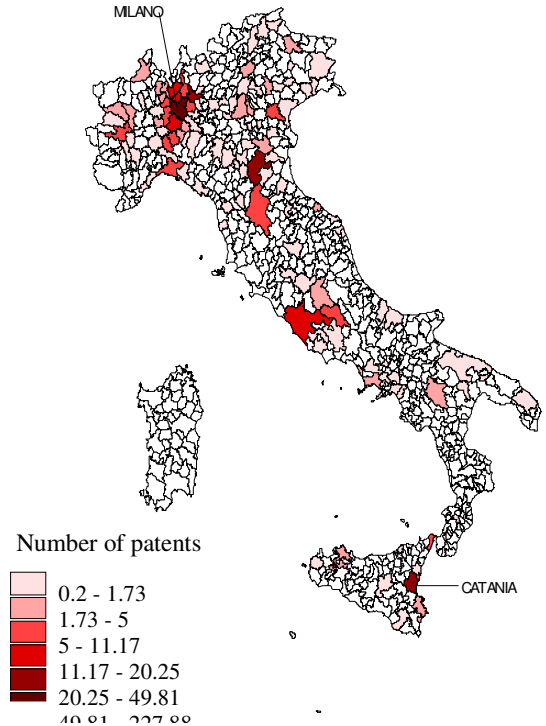

Total employees in computer hardware, semiconductor devices and electronic components: **49,668**

**Inventors in computer hardware, semiconductor devices and electronic components per Local Labour System**




Total inventors in computer hardware, semiconductor devices and electronic components (years 1995-2000): **655**

**Patent applications in computer hardware, semiconductor devices and electronic components per Local Labour System**




Total patent applications in computer hardware, semiconductor devices and electronic components (years 1995-2000): **644**

The data presented show a net predominance of Milano as an active area in computer hardware, semiconductor devices and electronic components. Indeed, as it has already emerged from the preliminary work on the Italian Innovation System, Milano is the major centre for most high-tech sectors in Italy. Catania, instead, is the only area of concentration of innovative activities, measured by the production of patents, in any of the considered high-tech classes in the south of Italy. For this reason the research was focused on a deeper analysis of the Catania context.

The overview of the general entrepreneurial environment of the area presented in the following section is based on a number of interviews with institutions' officials, university professors, experienced researchers and managers (13 in Catania, 6 in Milano).

## 3.1. THE CATANIA AREA

The identification of Catania as one of the geographic areas active in high-tech sectors is strictly related to the presence of an important site of STMicroelectronics, the major multinational semiconductor company in Italy. Therefore, after presenting the main aspects characterising the Catania territory with its local institutions and policies, this section will deal with a presentation of STMicroelectronics and its impact on the territory.

The in depth interviews with entrepreneurs and local institutions' officials helped identifying the most relevant aspects characterising the Catania area positively or negatively affecting the potential for a high-tech pole development.

### *3.2.1. The Catania entrepreneurial environment characteristics*

A relevant local advantage, which can exert a certain attraction on multinational companies, is definitely the availability of low cost qualified labour force (the cost of an engineer is around 25,000 euro against around 30,000 euro in the rest of the country)[11]. Moreover personnel mobility in STMicroelectronics is low, minimising the waste of personnel training costs (turnover of professionals is in Catania 4%, versus the

[11] Interview with Augusto Bricola, Industrialisation & Research Activity Management Responsible, STMicroelectronics, Catania. Some public support comes from the fact that Sicily is an objective 1 region.

European average of 8% and 15% in the Silicon Valley). This phenomenon is mostly explained by the absence of equivalent alternatives in the area and in the country.

There is an historically high level of unemployment (22% in the south of Italy[12]), which partially explains the risk aversion characterising the local mentality. Young people definitely prefer a job in a large company than starting their own firm[13].

Moreover a local institution official asserted that: "Historically open to commerce, Catania has a different mentality from the rest of the island. However, the social esteem of the role of entrepreneur is rather low. Careers in politics, public institutions and university are more highly considered than entrepreneurial activities."[14]

The high quality of life (improved also by a series of actions taken by the local authorities in recent years, such as the revitalisation of the historical centre and a significant reduction of criminality[15]) added to the low cost of living, encourages experienced managers and engineers of Catania origin, working in the north of Italy or abroad, to come back when opportunities in the area emerge in spite of lower expected revenues.

[12] From Istat data 2000.
[13] An interesting example is the case of a group of postgraduate students at the Physics department who had the opportunity to develop a own entrepreneurial activity and gave up the project when were offered a job by STMicroelectronics.
[14] Investi a Catania responsible
[15] The problem of racket is a topic which has not been analysed in detail, but it needs to be mentioned. It emerges that it is typically related to commercial activities, while high-tech enterprises seem to have no problems.

### *3.2.2. Local institutions*

The most active local institutions of the Catania area with regards to research, technology transfer and development of entrepreneurship are briefly presented in the boxes which follow.

RESEARCH INSTITUTIONS

University of Catania Department of Electronic Engineering

Within the department of electronic engineering (with a total of 1,394 students in 1998/99, MURST, 1999) the Microelectronics Group is a team which is involved in analysis and design of integrated circuits, with emphasis on analog circuits based on CMOS, BiCMOS and Bipolar technologies such as voltage and current Operational Amplifiers, Switched Capacitor and Switched Current circuits (for filters or A/D and D/A converters), RF circuits etc. The projects in common with STMicroelectronics are several.

SUPERLAB (Laboratory of Surfaces and Interfaces) was founded in 1990, as a result of common efforts of Department of Chemical Sciences of the University of Catania, and STMicroelectronics. It is installed over an area of 250 Sq. m. located within the industrial plant of STMicroelectronics. The permanent scientific staff of Superlab comprises 5 university members, 4 researchers and 1 technician, but according to the different projects the laboratory hires additional personnel. Its research activity includes all aspects of material science dealing with preparation, modification and characterisation of solid surfaces and interfaces of relevant technological importance. Specific fields of application are currently: microelectronics, opteolectronics, thin film technology for packaging, biomaterials, polymeric material for package, optical, electrical, and chemical applications.

IMETEM is a research centre on methodology and technology for microelectronics founded by the Italian Council for Research (CNR) in 1993. The permanent staff of Imetem consists of about 20 members among scientists, engineers and associated professors and engineers form the University of Catania. Several doctorate and undergraduate students use the Imetem facilities for their studies and thesis.

Imetem is hosted inside the premises of STMicroelectronics and conducts advanced basic research oriented to silicon microelectronics. The research outgoing in the laboratory covers many subjects on silicon based optoelectronics, new materials, new processes and advanced characterisation.

TECHNOLOGY TRANSFER INSTITUTIONS

Consorzio Catania Ricerche (CCR) is a consortium of different research agencies, companies and local institutions aiming at the development of applied research and at the co-ordination of technology transfer. CCR was constituted in 1987 and has now 25 employees. Technology transfer addressed to SMEs is carried out through the Innovation Relay Centre (IRC) of Catania. The IRCs are a European support network for the promotion of technology partnership and transfer between SMEs, providing technology advisory for trans-national technology cooperation.

AGENCIES FOR THE DEVELOPMENT OF ENTREPRENEURSHIP

Investi a Catania is a municipality initiative aimed at supporting potential entrepreneurs by providing guidelines for the preparation of the business plan and assistance in the application to public support for new enterprises.

BIC Sicilia (Business Innovation Centre). BIC Sicilia started its activity in 1996. It was mainly addressed to the creation of new SMEs.

BIC Sicilia covers an area of 7,500 Sq. m. and hosts up to 30 enterprises for a maximum of 8 years (4 years renewable for 2 plus 2 years more). It offers basic services of reception, secretary, meeting rooms, parking, power and telephone contracts, and has a cost between 50 to 60 euro per Sq. m.. BIC Sicilia provides also assistance in selecting the appropriate public support measures and in presenting the relative applications.

In 1994 a fund for a total of 500,000 euro (50% BIC funds and 50% government funds) was created with the aim of investing in start-ups of the area (maximum 35% of the firm's capital, 150,000 euro, for 3 years). From the interview with an official of BIC Sicilia it emerged, however, that the fund has never been used.

### *3.2.3. Policies affecting high-tech industries*

Catania is situated in an objective 1 region and benefits for this reason of all EU supports addressed to depressed areas (including fiscal benefits for new employment). At national level the most important measures targeting high-tech start-ups creation are, as already presented in the introductory section, STARTECH, operating as a public venture capital fund, and the law L.297/99 for academic spin-offs.

Other relevant support laws, although not specifically addressing high-tech activities are:

L.44/86, L95/95 – favour of juvenile entrepreneurship. Grants and subsidised credit to newly constituted firms, founded by less than 35 years old people. The maximum allowed investment is around 2.5m euro. The program provides subsidised credit up to 90% of the investment in the South, 60-80% in the Centre and North and grants of 50% of expenses in the first two years of activity up to 860,000 euro in the South and 100,000 euro in the first three years of activity in the Centre and North[16].

L.297/99 substitutes L.46/82 – on research and innovation. It gives support to research projects of universities and research centres in collaboration with firms (maximum 7.5m euro, a part exceptional cases, grants up to 50%, the rest is provided at subsidised credit) and to start-ups established by public research institutions' employees (maximum contribution 516,000 euro).

L.488/92 - especially designed for depressed areas in Italy, it gives support to investments for new plants and restructuring up to 50% of the admitted investment (special evaluation for investments over 25m euro).

In addition to the policies presented before, the municipality adopts the policy to offer free land to multinational firms for establishing industrial branches in the area.

### *3.2.4. The role of STMicroelectronics in the Catania area*

The Catania site used to be an assembling site for the Italian SGS which had its headquarters in Agrate Brianza (Milano area). After the merging with the French Thomson, the Catania site went through a relevant restructuring and drastically changed its mission.

[16] http://www.opportunitalia.it/L9595/default.asp

STMicroelectronics in Catania has today around 4,000 employees. It is significantly engaged in R&D activities, with almost 1,000 researchers operating for the development of high-tech production processes.

The location of brain-intensive departments of ST in the Catania area has to do with the availability of qualified human resources at competitive costs, and the strong link of the company with the local university, in terms of common projects, patent development, and other different initiatives which help maintaining a direct access to skilled manpower. Lately STMicroelectronics and the University of Catania have been planning a new postgraduate course in microelectronics.

The knowledge pole created by ST has a considerable impact on the local production system since:

- It has contributed to the development of local small and medium enterprises not necessarily related to the electronic sector.

- It has created a spin off effect, although still quite limited in number of cases.

- It has produced an attraction effect with regards to other multinational companies operating in related fields[17].

Local small firms have increased their revenues although they maintained a small size. As a consequence of the accumulation of knowledge in the sector, they started searching for other clients than ST, but ST is often for the local suppliers still in a monopsonistic position. Moreover, local suppliers represent around 200 over a total of around 2,000 suppliers of the ST unit in Catania (Schillaci et al, 2000). Among local suppliers one success story is represented by Meridionale Impianti, a local company which has developed internationally.

The spin off effect related to the core business of ST, is not part of a strategy of the company, but a spontaneous process. The neutral position of ST with respect to spin-offs is in line with the objective of keeping personnel mobility very low.
The main reason leading to the set up of new firms is mainly the identification of lack of local offer of some support activities to the multinational company. Spin-offs of ST in the Catania area are: S.A.T. (package for semiconductors, copper frames), Hitec (design and production of equipment for research in physics), Ion Beam (spare equipment part

[17] This aspect has been defined in Schillaci et al (2000) a “spin-in” effect.

supply), and Tecnosmedia (design of microelectronic components and automation systems).

ST exerted an attraction effect on multinational suppliers, customers and other companies with activities related to the microelectronic sector. 23 multinational companies, suppliers of ST are located in the Catania area (Applied Materials, Arch chemicals, Metron Technology, Tegal, Lam Research, etc). In some cases the location of the suppliers' plants allows a direct connection with ST (for example: Air Liquid and Messner).
Among ST's customers Nokia and Magneti Marelli decided to locate one of their plants in the Catania area, attracted by the presence of certain expertise, human resources, and facilities favourable to their activities. Attracted by the favourable environment, IBM as well opened a research centre few months ago.

### *3.2.5. Weaknesses of the emerging technological pole*

The above mentioned aspects testify the catalytic effect of the presence of an important multinational firm in the territory, but the present situation still does not allow to identify the Catania area as a full-blown "technological pole" because of a group of factors summarised below.

- The development of the potential high-tech district is too much dependent on the evolution of a single multinational company (STMicroelectronics). Other synergetic effects should come from other multinational companies placed in the area.

- The entrepreneurial activities in the area are exclusively of very small size and still too weak, especially with respect to global competition pressures.

- Lack of institutional investors, venture capitalists or any other infrastructure supporting start-up processes in high-tech sectors.

- The spin-off phenomenon is still very limited, both from companies and from academy.

- The number of R&D personnel is not so high as real "technological poles".

- Information flows and links among firms are mostly bi-directional. In order to better exploit the potentials of the system the constitution of a networking practice among firms in the area is necessary (Schillaci et al., 2000).

- Lack of efficiency in the supply of services in the industrial area and no provision of advanced services. STMicroelectronics is in the position to make up both for the lack of public transport directed to the industrial area, and inefficient power and water distribution with its own means, but smaller firms highly suffer from this situation (Russo, 1997).

# 4. FIELD SURVEY

Field survey includes interviews with both potential entrepreneurs and start-up managers in the sector of semiconductors and electronic components in the areas of Milano and Catania. Aim of this survey is to understand difficulties encountered by the former and difficulties perceived by the latter. Comparison of data of the two areas allow for some "geographical" consideration.

Section 4.1 will briefly present the methodology, 4.2 the results of the interviews with start-up companies and 4.3 the results of the survey of potential entrepreneurs.

## 4.1. General methodology

The field survey has been carried out both in the Milano area and in the Catania area. Start-up managers operating in the selected areas have been identified and interviewed in depth (9 in Catania, 5 in Milano).

Potential entrepreneurs have been first identified either through a database of inventors in high-tech classes (see Modena et al, 2001) or through contacts built during the field survey. Potential entrepreneurs who declared they had thought of setting up a new company were selected for a personal interview. During the interview they were both asked to express freely their experience and to fill a questionnaire. The total number of potential entrepreneurs that have been interviewed is 32 (19 in Catania, 13 in Milano).

## 4.2. START UPS

The survey carried out on high-tech start-ups related to the electronic components sector in the Catania area is, in spite of the small number of cases, exhaustive. Almost the totality of start-ups in the field have been interviewed. Five start-ups of Milano area are also included.

The following table presents the list of interviewed start-ups with some information on the activity of the firm, the number of employees and the year of foundation.

***Table 4.1: investigated start-ups***

| **CATANIA** | | | |
|---|---|---|---|
| *FIRM* | *ACTIVITY* | *N. EMPLOYEES* | *YEAR OF FOUNDATION* |
| ANTECH | satellite communications | 40 | 1989 |
| MASTERELETTRONICA | medical equipment | 10 | 1992 |
| CITIES ON LINE | Internet and tlc company | 130 | 1995 |
| PAPALEO | video-surveillance systems | 3 | 2000 |
| GEOVERTICAL | geophysical inspections | 6 | 1998 |
| TECNOS MEDIA | automation system design | 5 | 1997 |
| HITEC | equipment for physical research | 5 | 1990 |
| SAT | copper frames | 215 | 1995 |
| ION BEAM | spare part supply, 2nd market | 2 | 1998 |
| **MILANO** | | | |
| *FIRM* | *ACTIVITY* | *N. EMPLOYEES* | *YEAR OF FOUNDATION* |
| T.R.E. | land monitoring through satellite data | 3 | 2000 |
| DYLOGIG | software development and wireless devices | 12 | 1999 |
| MICRONOVA | design house | 6 | 1996 |
| BRIGHTSOLUTIONS | innovative laser applications | 8 | 1998 |
| SEA VISION | control system software for industrial processes | 7 | 1995 |

### *4.2.1. Financial aspects*

A series of common elements can be highlighted gathering the start-up managers' comments on the difficulties encountered with respect to financial aspects for the development of the entrepreneurial activity at different stages.

- The starting of an entrepreneurial activity is highly dependent on personal financial resources. It was therefore necessary to start with activities requiring low initial investments (e.g. supply of technical assistance or distribution of large companies' products).

- In the considered cases public support has not been crucial for starting an enterprise, due to the uncertainty and delay in receiving answer to the application and subsequently the money. These aspects are especially penalising for high-tech activities for which timing is crucial. As already mentioned, the amount of time needed for receiving an answer to applications, also for the recent law 297/99, is between 3 to 5 months.
  Moreover, some kind of public support to newly constituted firms (e.g. support to young and women entrepreneurs) requires the company structure not to be changed for a certain number of years limiting the potential role of VC at initial stages.

- Private banks pay too much attention to guarantees and very little to the project which needs funding (in the past, banks did not ask information about the project at all). Moreover, some Catania start-up managers reported that the cost of money is higher in Sicily than in the north of Italy.

- Venture capital is in general scarcely known: only few of the investigated start-up managers knew about VC funds and even fewer took them it into considered as a possible source of funding for their activity.
  Among the investigated start-ups of the Catania area, we encountered only one case of VC investment. It was involving a public VC fund (see case study ANTECH). Interestingly one of the start-ups of the Milano area refused a VC proposal (see case study T.R.E.) preferring considering VC involvement at a later stage of the company development.

**Case study summary: ANTECH**

- Antech provides fully integrated systems for ground satellite stations. It was founded in 1989 and 3 out of the 4 founders come from Alenia Spazio (Finmeccanica). In the first three years of activity it increased turnover from 100,000 euro to 1.6 m euro. It has now around 40 employees.
- The president of Antech is 41 and had already two entrepreneurial experiences before starting with this venture (IBM concessionaire and software development; electronic editing), and proved to be very active in the young entrepreneurs' association.
- Antech develops projects all over Europe (Belgium, Croatia, France, Germany, Italy, Norway, Spain, Russia, U.K., and Ukraine)
- Antech received **public support** through IRITECH (a public VC) for starting the activity, but encountered a series of difficulties when it become necessary to increase investments. IRITECH was not giving further funds, and due to this participation Antech could not access guarantee funds for credit to SMEs. In 1996 they decided to buy out the public quota, which was obstructing the further development of the company.
- **Family and Friends** have been the primary source of funding for this operation and personal guaranteed loans were asked to private banks.
- In 2000 further investments became necessary. **VC funds refused to invest in Antech**. Two new partners entered in the company and their project proved to be successful. The same VC funds admitted the mistake of not investing.
- Problems encountered:
    - **financial constraints** have been the major problem.
      The president of Antech together with some other entrepreneurs and professionals of Catania proposed an advisory service to VC funds interested in investing in Catania area.

**Case study summary: T.R.E. TELERILEVAMENTO EUROPA**

- T.R.E. offers advanced services using a new method of land monitoring from satellite data utilising a patent owned by Politecnico.
- It was founded in February 2000 and it is located in the Politecnico incubator.
- The founders are a university professor, a university researcher and Politecnico di Milano, which is controlling the company (55%). The initial capital has been 10,000 euro. TRE is the **first case of academic spin-off from Politecnico di Milano**.
- **In the first year of activity it reached 1m Euro of sales**.
- **Most of their clients are found through contacts taken during the development of the patent and their scientific publications**.
- TRE tried to obtain **public funds** through the regional law for innovative activities (L35/96), but being addressed to SMEs their project was not accepted (TRE is controlled by Politecnico). They are now preparing the application to the national law for academic spin-off (L297/99).
- **TRE has been contacted by VC funds**, but prefers letting the company grow slowly for the moment and will consider a VC involvement at a later stage. At this stage they find it difficult to estimate the value of the company. Moreover, they would need a relatively small amount of money, for which they would prefer addressing other sources of funding. Very good knowledge of the market is the crucial feature asked to a VC investor.
- Problems encountered:
    - difficult estimation of the **value of the company;**
    - **financial constraints** make the company grow very slowly, more money (although not an amount requiring a VC involvement) would have helped solving more quickly some problems: getting data from more than one satellite, hire somebody to work full time on the activity;
    - Being the first case of spin-off from Politecnico they encountered problems of **slow decision-making**. Standard steps to follow are useful. There is need of rules.

The example provided by this interesting case study allows the introduction of some comments on the academic spin-off issue.

The changes occurred in the Italian university system leading to a stronger link with the entrepreneurial world and encouraging the creation of academic spin-offs have already been introduced in the paper on the Italian innovation system. This trend is however contrasted by the lack of clear regulations within universities with respect to the university personnel actively participating to enterprises. Defining clear steps for the creation of a university spin-off and deciding on the problem of professors' conflict of interest when they dedicate some of their time to an entrepreneurial activity is an urgency common to most universities in Italy. For this reason a wide group of universities have constituted a work group in order to define an homogeneous approach.

Some of the problems encountered by T.R.E. are indeed related to the case by case approach currently adopted in universities willing to proceed with the creation of spin-offs in spite of the lack of an ad hoc regulation.

## 4.3. Potential entrepreneurs

### *4.3.1. General data on interviewees*

As explained in section 4.1 potential entrepreneurs have been identified using a database on inventors (see Modena et al., 2001), and through information acquired talking to various experts. Selection was made by asking to the interviewees about their intention to develop an entrepreneurial idea on their own.

The total number of interviewees is 32 (19 in the Catania area and 13 in Milano area). The number of contacted people from the initial database of inventors has been 43 in Catania and around 35 in Milano. The results are mostly presented for the total of the collected questionnaires, unless interesting differences emerge from a separate analysis of the two area groups.

As we can see in table 4.2 the group of age with highest frequency is 31-40.

***Table 4.2: age of the potential entrepreneurs***

| **age** | |
|---|---|
| 26-30 | 4 |
| 31-40 | 17 |
| 41-51 | 11 |
| **total** | 32 |

Most of potential entrepreneurs have been identified in R&D units of high-tech multinational firms (see table 4.3).

***Table 4.3: place of work of the potential entrepreneurs***

| **place of work** | |
|---|---|
| R&D unit in high-tech multinational company | 29 |
| Research centre or university | **3** |
| **total** | 32 |

As for the level of education, 26 of the 32 interviewees have a university degree in scientific faculties, while only 4 of the potential entrepreneurs have a Ph.D diploma (table 4.4).

***Table 4.4: level of education of the potential entrepreneurs***

| **level of education** | |
|---|---|
| secondary school diploma | 2 |
| university degree in scientific faculties | 26 |
| Ph.D | 4 |
| **total** | 32 |

Only in two cases the potential entrepreneur had a previous entrepreneurial experience.

### *4.3.2. Characteristics of the "would be" entrepreneurial venture*

No predominance of one type of enterprise emerges in the group of interviewees. There is a slight orientation towards services in Catania and products in Milano. For 27 of the 32 interviewees the intended market is made up of firms.
9 cases proposed to start a design house for semiconductor circuits or an independent research unit.

The identified competitive advantages of the potential ventures, as presented in table 4.5, are the technical knowledge and the knowledge of the sector. From a separate analysis of the two groups of interviewees it emerges that the existence of a cohesive team is a competitive advantage indicated by the group of Milano only.

***Table 4.5: competitive advantage of the potential venture***

| **competitive advantage** | |
|---|---|
| first mover | 5 |
| service | 5 |
| price | 5 |
| new need | 4 |
| impact on the production process | 0 |
| personal contacts | **7** |
| existence of a cohesive team | 3 |
| knowledge of the sector | **10** |
| technical knowledge | **14** |
| knowledge of the market | 3 |
| *other*[18] | *7* |

The location of the potential enterprise is important for 16/19 interviewees in Catania and for 7/13 interviewees in Milano. The most frequently indicated factors in determining the importance of the location are the presence of qualified manpower and proximity to clients together with the presence of services in the area (see table 4.6). In the Catania group it emerges also as relevant the presence of adequate infrastructures.

***Table 4.6: factors affecting the importance of the location***

| **factors affecting the importance of the location** | |
|---|---|
| availability of services in the area | **9** |
| adequate infrastructures | 7 |
| proximity to suppliers | 3 |
| proximity to clients | **9** |
| availability of qualified manpower | **12** |
| proximity of firms of the same sector | 3 |
| other | 4 |

Only in three cases a business plan was prepared for the potential enterprise (one in Catania for a spin-off of STMicroelectronics and CNR and two in Milano). For this reason the information on costs and time is not detailed to the phases initially identified (technological testing, prototype, and marketing) and costs and time to market are quite

approximate. Table 4.7 presents costs and time to market for the two area groups separately.

***Table 4.7: costs and time to market of the potential venture per area***

| **COSTS TO MARKET** | CATANIA (N. of cases) | MILANO (N. of cases) | **TIME TO MARKET** | CATANIA (N. of cases) | MILANO (N. of cases) |
|---|---|---|---|---|---|
| < 300,000 ∈ | 2 | 2 | 3 – 6 months | 3 | 1 |
| 300,000-600,000 ∈ | 4 | 0 | 6m – 1 year | 6 | 3 |
| **600,000 – 1m ∈** | **7** | **1** | **1 - 3 years** | **7** | **4** |
| 1m - 2m ∈ | 2 | 1 | 3 – 5 years | 1 | 0 |
| 2m - 3m ∈ | 0 | 0 | 5 – 10 years | 0 | 0 |
| 3m - 5m ∈ | 0 | 1 | > 10 years | 0 | 0 |
| 5m – 10m ∈ | 2 | 0 | **Don't know** | **2** | **5** |
| 10m – 50m ∈ | 0 | 2 | TOTAL | 19 | 13 |
| 50m ∈ | 0 | 1 | | | |
| **Don't know** | **2** | **5** | | | |
| TOTAL | 19 | 13 | | | |

Of the 9 cases of potential design houses, 6 indicated costs within the range between 600,000 and 1 million euro and time from 6 months to 3 years. The other three cases could not quantify costs and time.

### *4.3.3. Financial aspects*

As we can see from the following table (table 4.8) the sources of funding indicated by the potential entrepreneurs notably differ in the two different area groups. In the Catania group it emerges the importance of public funding and the possibility to find a strategic partner for funding the potential venture, while in the Milano group most important are family and friends and banks.

The personal contribution of the potential entrepreneur to the project is in most cases limited to her own time and work. No information on the amount of money to invest could be obtained.

[18] Three interviewees indicated the importance of the proximity of a large multinational company such STMicroelectronics (Catania group).

*Table 4.8: sources of funds for the potential venture per area*

| sources of funds | Catania | Milano | Total |
|---|---|---|---|
| family and friends | 3 | **5** | **8** |
| business angels | 1 | 1 | 2 |
| venture capital funds | 3 | 2 | 5 |
| strategic partner | **8** | 2 | **10** |
| commercial partner | 0 | 1 | 1 |
| banks | 3 | 4 | 7 |
| investment companies | 0 | 3 | 3 |
| public funding | **12** | 0 | **12** |
| don' t know | 0 | 5 | 5 |

Venture capitalists are taken into consideration by only 3/19 interviewees in Catania and 2/13 in Milano. This is not surprising, if we consider that only 6/19 interviewees of the Catania group and 5/13 of the Milano group know about venture capital funds. However, being Milano the major financial centre in Italy, where most venture capital funds have their site, we would expect a wider knowledge of the existence of this source of funding for high-tech in Milano than in Catania, where in fact no venture capital fund has an office.
Only two interviewees took contact with venture capitalists and among the potential entrepreneurs knowing venture capital funds (11) the expected problems in being funded by venture capitalists are related to the loss of control (7/11) and to the disclosure of information on the project (3/11).

Coherently with the indication of most potential entrepreneurs of the Catania group, who consider public support as one of the sources of funds for starting their activity, most interviewees in Catania (16/19) know the laws supporting entrepreneurship. Three interviewees asked already for detailed information.

In the Milano group the situation is completely different: only 6 of the total 13 know these laws and only one asked for information.

The difference emerged in the two area groups is likely to be related to the stronger presence of public support in Sicily as an objective 1 area, and to the much wider availability of private funds in the north. Although the readiness of potential entrepreneurs to exploit the opportunities given by the availability of public funds may be regarded a positive aspect, the search of the availability of public funds may exclude the search for private sources of funds.

The better knowledge of public instruments in Catania is also confirmed by the fact that the local public incubator BIC Sicilia is known by 14/19 interviewees, while only one person in the Milano group know about public incubators.
As for private incubators the situation is not better for the Milano group (2/13), although these are mostly located in Milano area. In the Catania group only three interviewees know about private incubators.
The expected problems in locating the potential venture in an incubator are again related to the disclosure of information on the project.

### *4.3.4. Perceived difficulties and personal advantages and disadvantages related to becoming entrepreneur*

Table 4.9 shows the indexes of perceived difficulty (1=easy; 5=very difficult), associated to the different areas of entrepreneurial activity by the potential entrepreneurs. Data are shown for the total of interviewees and in detail for the two area groups. Generally, the most worrying activities related to entrepreneurship are fund raising, with an average index of 3.8, followed by strategic plans development (3.2) and legal matters (3).

Quite interestingly, the Milano group shows higher difficulty indexes related to contacts creation and management (with difficulty indexes of 3.2 and 3.1). This may reflect the different reality of the Catania area, where the people operating in a certain sector know each other more easily than in a more complex reality as the Milano one, but it might also be linked to a better awareness by the Milano group of interviewees of the role played by these aspects in an high-tech venture, especially when considering the relevance of international contacts.

***Table 4.9: perceived difficulties and expected public support per entrepreneurial activity and area group***

| **areas of the entrepreneurial activity** | **Index of perceived difficulty and expected public support (p.s.) per area group** | | | | |
|---|---|---|---|---|---|
| | **Catania** | | **Milano** | | **Total** |
| | **index** | **p.s. %** | **index** | **p.s. %** | **index** |
| fund raising | **3.7** | **100** | **3.9** | **54** | **3.8** |
| marketing | 2.9 | 21 | 2.8 | 8 | 2.9 |
| contacts creation | 2.4 | 16 | ***3.2*** | 15 | 2.7 |
| management | 2.2 | 26 | ***3.1*** | 0 | 2.5 |
| international contacts creation | 2.1 | 21 | ***3.2*** | ***31*** | 2.5 |
| technical information | 1.8 | 37 | 2.2 | 15 | 2 |
| personnel training | 2.6 | **79** | 2.2 | 31 | 2.4 |
| intellectual property rights protection | 3 | **58** | 2.5 | **38** | 2.8 |
| strategic plans development | **3.3** | 16 | **3** | 8 | **3.2** |
| information on market trends and technological developments | 2.5 | 16 | 2.7 | ***23*** | 2.6 |
| legal matters | **3** | **63** | **3.1** | **46** | **3** |
| personnel selection | 1.7 | 0 | 2 | 0 | 1.8 |

Public support is mostly requested by potential entrepreneurs of the Catania group. The percentage of interviewees who expect some kind of public support in most of the areas of entrepreneurial activity is higher for Catania. For this group of potential entrepreneurs public support is mostly wished for fund raising (100%), personnel training (79%), intellectual property rights protection (58%) and legal matters (63%). In the Milano group public support is mostly wished for fund raising (54%), intellectual property rights protection (38%) and legal matters (46%). Also from these data it emerges that the habit of relying upon public support is stronger in the Catania reality.

Tables 4.10 and 4.11 present the major disadvantages and advantages related to becoming entrepreneur together with an index measuring the degree of importance that potential entrepreneurs associate to each aspect (1=not important, 5=very important).

Leaving an ensured job is perceived as a strong disadvantage by the potential entrepreneurs both in the Catania and the Milano groups (2.8). The problem of facing too harsh legal consequences in case of bankruptcy is perceived more strongly by the interviewees of the Milano group (3.5). It should be mentioned that five interviewees in Milano and four in Catania do not know the law in case of failure.

Having less free time and more stress or changing place of living are not considered particularly relevant disadvantages.

***Table 4.10: disadvantages of becoming entrepreneur per area***

| **disadvantages of becoming entrepreneur** | **Level of perceived disadvantage** | | |
|---|---|---|---|
| | **Catania** | **Milano** | **Total** |
| leaving an assured job | **2.8** | **2.7** | **2.8** |
| having less free time | 1.9 | 2.4 | 2 |
| having more stress | 1.7 | 2.5 | 2 |
| facing too harsh legal consequences in case of bankruptcy | 2.7 | **3.5** | 3 |
| changing place of living | 1.1 | 2.3 | 1.7 |

As emerges from table 4.11, in the Catania group of interviewees the possibility of having a higher reward is the advantage of becoming entrepreneur showing the highest index (4.1). Professional fulfilment is instead more highly valued by the Milan potential entrepreneurs (4.6 index for Milano, 2.6 index for Catania).

***Table 4.11: advantages of becoming entrepreneur per area***

| **advantages of becoming entrepreneur** | **Level of perceived advantages** | | |
|---|---|---|---|
| | **Catania** | **Milano** | **Total** |
| professional fulfilment | 2.6 | **4.6** | 3.4 |
| possibility of higher reward | **4.1** | 3.8 | 4 |
| having more (time) flexibility | 2.4 | 3.6 | 2.9 |

Only 11 of the 32 interviewees really intend to start an activity (7/13 in Milano and 4/19 in Catania).

About the reasons for not starting the activity two types of answers could be identified:

- One related to the contingent crisis of the sector. Timing in starting high-tech activities is perceived to be crucial.
- The other related to the type of work. Some do not want to leave their research activity. Working on always new projects at the technological frontier is considered more exciting than bringing only one of these projects to be carried out through the establishment of an entrepreneurial activity.

## 5. PRELIMINARY CONCLUSIONS

- Milano is certainly the most important area active in the electronic sector.
- Many multinational companies have R&D centres in Italy in a variety of electronics and telecommunication related sectors. However, most of them employ few researchers.
- Catania has good potentialities as a nucleus of activities, but can only be considered the seed for a future technology pole.
- The only recurring type of potential activity among potential ventures consists of design houses for semiconductor circuits.
- Several actions are taken by the public sector for the development of the Catania area and support schemes for entrepreneurship are known and taken into consideration by potential entrepreneurs.
- Risk aversion is stronger in Catania than in Milano, probably because of the difficulty of finding a new job in case of failure of the entrepreneurial project. Moreover, researchers seem to prefer their actual job than playing the role of entrepreneur.
- Bad timing and willingness to continue researching in a variety of projects at the technological frontier have been two of the most important reasons reported for not starting a new venture.
- Public incubators are known in Catania, unknown in Milano.
- Private VC funds and private incubators are unknown in Catania and Milano.
- Fund raising is the most difficult problem to start an entrepreneurial activity. Public intervention on this aspect is expected by most interviewees.
- Main sources of funds are public funds and strategic partner (STM) in Catania, family and friends, and banks in Milano.
- The existing literature on the sector, although quite scarce, points out to a certain myopia of the public policy with respect to these sectors over the years.

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