



Microelectronics Cluster in Sicily



ITALIAN TRADE AGENCY
ICE - Agenzia per la promozione all'estero e
l'internazionalizzazione delle imprese Italiane



Piano
export
per le
Regioni
della
Convergenza



Ministero dello Sviluppo Economico



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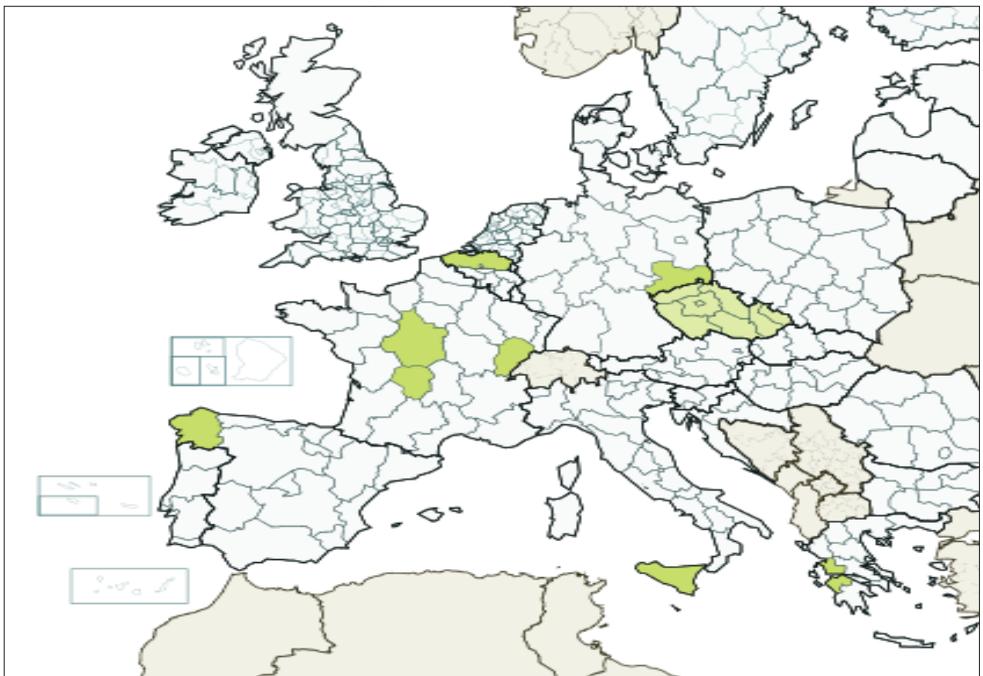
A. BACKGROUND OF MICROELECTRONICS IN SICILY

Similar to the rest of the world, Europe's micro- and nanoelectronics industry is concentrated around major regional production and design sites. The regions around Dresden (DE), Grenoble (FR) and Eindhoven-Leuven (NL-BE) host three main research and production centres with increased specialisation in one of the three areas of "more Moore", "more than Moore" and equipment and materials. This clustering and regional specialisation is essential for the future development of the sector. This includes relatively smaller but highly innovative and specialised clusters such as the regions of Graz and Vienna (AT), Milan and Catania (IT) or Helsinki (FI).

Europe counts three large indigenous micro- and nanoelectronics companies STMicroelectronics, Infineon and NXP in worldwide sale. Micro- and nanoelectronics manufacturing in Europe is further served by a very competitive and extended value chain and ecosystem of companies, including many SMEs. The main manufacturing sites are embedded in the regional clusters as mentioned above.

Source: A European strategy for micro- and nanoelectronic components and systems, European Commission 23 May 2013

Chart n.1 - Smart Specialization Strategy - RIS3: EU Regions with micro-nanoelectronics as priority



In a traditional economic approach, Catania and Sicilia would be considered "marginal" because of its low competitiveness in terms of logistics, facilities, distribution and marketing, services. Benefits created by this new economy are now mainly based on producing "knowledge" through human resources, considered as "intangible assets" for firms. In the age of the "knowledge-based economy" a microelectronics area is developing where, years ago, traditional business activities were only construction, agriculture and manufacturing, though dispersed, fragmented and underperformed.

Some of the following statements are drawn from an extensive research project conducted by the University of Catania (Department of Management at the Business Economics School) and STMicroelectronics. Previous researches on technological districts have highlighted the importance of interactive exchanges between knowledge-based centers (University, laboratories, large hi-tech firms, etc.) and entrepreneurial activities surrounding them. The growth of a hi-tech area is depending on two main conditions.

- ◆ On one side, competence centers have the role of spreading knowledge and creating opportunities for new entrepreneurial ventures.
- ◆ On the other side, local enterprises must be able to appropriate technological opportunities created by competence centers.

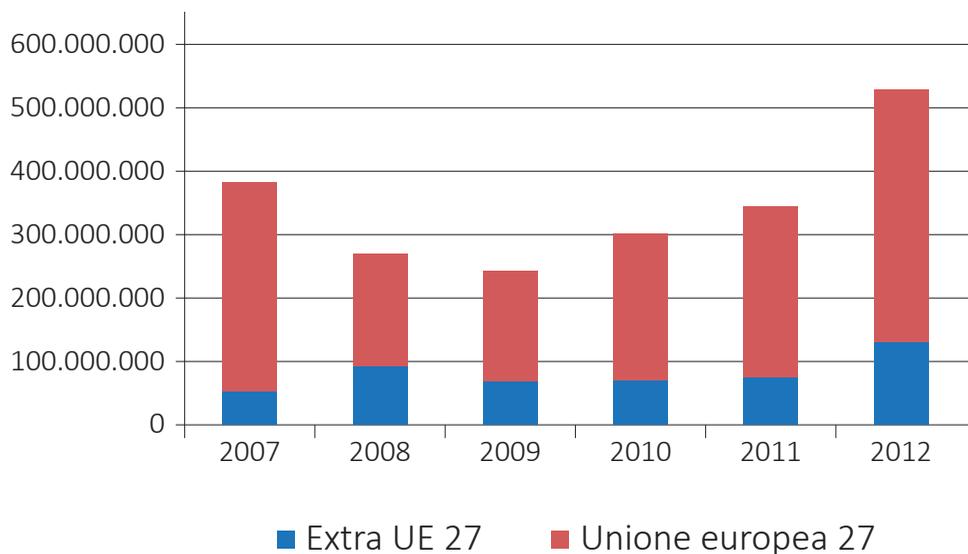
This double-loop learning process promoted the accumulation of knowledge in Catania area because there are some important crucial conditions, among the above mentioned:

- ◆ a competence center is provided by STMicroelectronics, one of largest multinational companies in the semi-conductor industry. ST has a site in Catania focused on brain-intensive activities, such as R&D and hi-tech manufacturing. This was helped by the large availability of high-value human resources coming from the University of Catania, Messina and Palermo. The presence of STMicroelectronics will be more enhanced in the future since new investments are scheduled in the next years.
- ◆ effective link with the local University, CNR and other public laboratories of the area are provided by the large number of jointly research projects, by new specialized courses offered in the semiconductor field, and by a great number of co-developed patents.
- ◆ in the past years marketing policies of local municipality have contributed to create a climate favorable to business to attract and develop new investments (i.e. "InvestiaCatania" has been the first center in Italy to facilitate all bureaucratic requirements and it has been awarded by the EU as a best practise of local policy to support new jobs).

Smart Specialization Strategy set up by Sicily Region stated the role of microelectronics in Sicily supported by empiric data collected in this field in terms of export (chart n.2).



Chart n.2 - Electronics export trend in Sicily 2007-2012

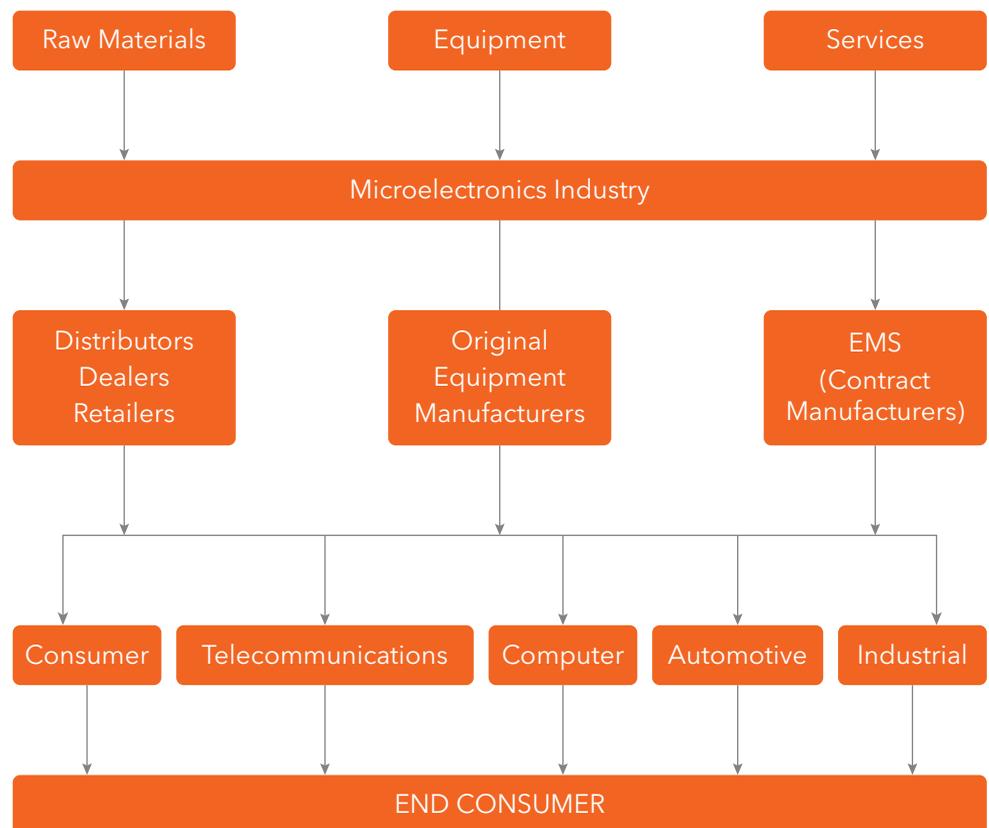


In particular the ICT cluster in Sicily, established in 1997, is one of the most important specialization sectors in the Region. In 2015 ICT exports in Sicily recorded a growth rate of 5.5% over 2014 (ISTAT data).

The microelectronics industry structure demonstrates a very competitive arena, characterized by the global dimension of competitors, the cross-fertilization processes, the importance of economies of scale and scope and, overall, by the crucial role of technological innovation allowing a lot of opportunities as showed below.

Regarding the intellectual property, the highest number of patents recorded in Sicily is linked to the electronics and microelectronics sector.

Chart n.3 - Microelectronics industry applications in other sectors





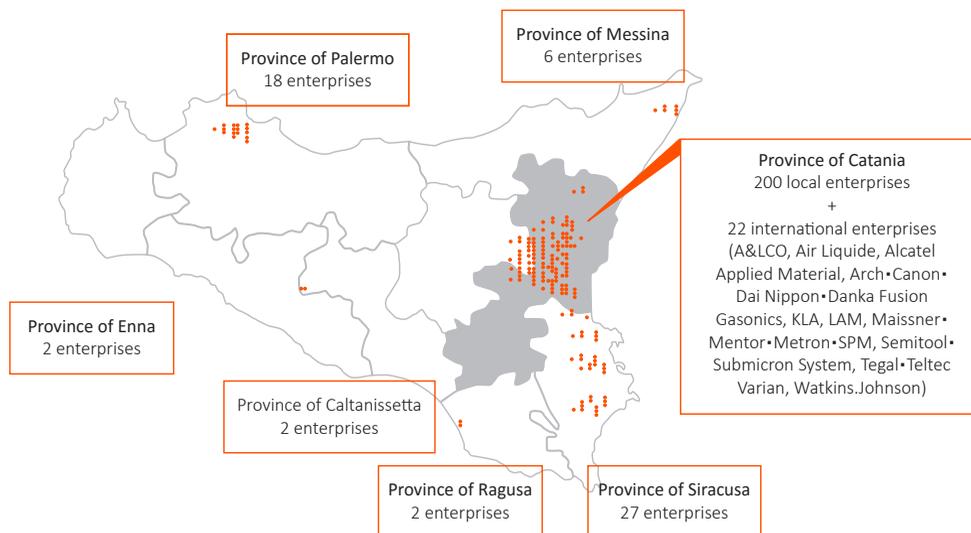
For the importance of this last reason, the microelectronics industry is characterized not only by a labor division among firms at different levels of the supply chain, but also by sharing knowledge and innovation through a chain of demand-pull and technological-push flows. In this industry, large and medium companies plays an important role towards up-stream levels (suppliers) and down-stream levels (customers) of the business systems, since it offers a broad range of products to several markets (automotive, consumer, ...):

- ◆ International companies located subsidiaries in Catania to supply this important customer (Air Liquide, Sol, LPE, Applied Materials, Alcatel, Canon, Tegal, M+W, etc.). Their presence is an important attraction for other players like 3SUN that decided to locate its site in Catania.

More than 200 local entrepreneurial activities associated with microelectronic business system, namely in the up-stream levels (suppliers) developed their business.

The chart below shows the distribution of subcontracting companies in Sicily in the microelectronics sector, with a primary focus on the Catania area.

Chart n.4 - Subcontracting companies distribution in Sicily in microelectronics sector



Source: STMicroelectronics

Most of them started their activities in the 90s. Such period has been very important for Catania, since new manufacturing premises have been established to process 200 mm silicon wafers. Investment in R&D and manufacturing, carried out in Catania year by year, have brought relevant innovation in technological process and products. Currently works are ongoing for a new clean room extension to be completed shortly . Local companies are small-sized firms, with high flexibility, and they are placed in the interstitial activities without entry barriers and with small capital investments.

Most of these companies are service businesses, and most of them provides hi-tech services such as assistance for equipment and plants, CIM, CAD, CAM services and management software. So they contribute to enhance innovation processes and some of them are now supplying other ST sites around the world.

Thanks to that, being innovation and human resources important for these firms, many of them hired new qualified employees because they could count on the solid relations with ST. Some of these qualified employees are mainly devoted to ST's activities. New jobs have been generated by microelectronics in Sicily. These companies made new investments, introduced products and processes innovations, and enhanced their competitiveness in new markets. So, this local entrepreneurial system is still dynamic and with capabilities in hi-tech service businesses.

B. THE BUSINESS AND RESEARCH INTEGRATED SYSTEM IN CATANIA: THE PLAYERS

The presence of a network composed by big companies, academic institutions and research centers focused on microelectronics, nanotech and smart cities is a key asset for the new technology development in this area. In consideration of the strategic geographical position of Sicily in the Mediterranean Sea, this integrated system is useful to develop innovation and create conditions for cooperation also with Southern Europe countries.



STMICROELECTRONICS

Among the world's largest semiconductors companies, STMicroelectronics is a leading Integrated Device Manufacturer serving all electronics segments. With a rich and diversified portfolio (discrete and standard commodity components, ASICs, full-custom and semi-custom devices, and Application-specific standard products), ST delivers innovative solutions that are key for the rapidly-growing Smart Driving and Internet of Things sectors. Approximately 7.500 people work in R&D for ST, a leading technology innovator owning around 16.000 patents in around 9.500 patent families. In 2016 more than 500 new patents have been filed by ST.

In 2016, ST's net revenues were US\$ 6.97 billion the Company totals 43,500 employees worldwide, 11 main manufacturing sites and over 75 sales offices in 35 countries. ST is also a pioneer and visionary leader in sustainability, a guiding principle for ST since more than 20 years.

THE TECHNOLOGICAL DISTRICT SICILY MICRO AND NANO SYSTEMS OF SICILY

The Technological District Sicily Micro and Nano Systems of Sicily is a consortium included into the 25 districts promoted by the Italian Ministry of Education & Research.

The members of the District are the Region of Sicily, 3 Sicilian Universities (Palermo, Catania and Messina), the Italian National Research Council, research centers and development enterprises of the territory (SMEs and large companies). As a matter of fact, the Consortium owns really strong competencies, due to the fact that among its parties it includes several national and global firms dedicated to research, development and experimentation of micro-nano industrial systems.

In particular, the District, in the priority sector of nanotechnology, focuses the activities on micro and nano systems able to introduce radical innovations, with specific and wide impacts in the following areas:

- ◆ micro and nano systems for Energy and Energy Efficiency;
- ◆ micro and nano systems for human Health and Biotechnologies;

- ◆ micro and nano systems for the Agrofood System;
- ◆ micro and nano systems for Transports and Advanced Logistics Systems.

As part of the programming period 2007-2013, Technological District Sicily Micro and Nano Systems implemented, as project leader, important national cutting-edge projects about nanotechnology in the areas of health, energy and plastic materials.

It is also member of two Italian **Technology Clusters**: Life Sciences - ALISEI - and the Smart Factory.

Due to the fact that it is an innovative and representative cluster of centers of excellence of the Sicily Region, the District would like to promote itself as partner for cooperation projects and collaborations inside European networks in order to:

- ◆ facilitate investments in research, new technologies and innovation (in particular in the following areas: nanoelectronics, photonics, nanotechnology, biotechnology, advanced materials and advanced manufacturing systems);
- ◆ promote the adoption of innovative solutions in companies and public administration;
- ◆ facilitate internationalization processes, improving the ability to attract investments and talents, creating the conditions for the birth of start-ups and research spin-offs, with the aim of achieving a better international competitiveness, and a better ability to achieve synergies between different industries of the same technological nature.

THE UNIVERSITY OF CATANIA

The University of Catania is one of the oldest academic institution in Italy with 18 Departments and an university center for outstanding students, The Scuola Superiore of Catania a School of Excellence. The research institution of UNICT working within the project is the Department of Electrical and Electronics Engineering and Informatics (DIEEI). The scientific groups working at the Department of Electrical and Electronics Engineering and Informatics (DIEEI) of the University of Catania have been active since 1971 in the sectors of Electrical and Electronic Engineering, Systems, Automation, Informatics and Telecommunications. The Department carries out its institutional activities within the territory of eastern Sicily, but with strong scientific links with other Italian and foreign universities and cooperative relationships with industries and public institutions (Fiat, Ansaldo, CNR, ENEA, TIM). Among the collaborations, particularly important is that with various groups within STMicroelectronics. The Department operates in an international context, from the relationships that each researchers have woven over the years, which allows to carry out research activities aligned with those developed in the best engineering schools and train young researchers with significant experience abroad. They are conducted using the experimental facilities of the Department and are developed on the basis of modern and competitive strategies, with results of high scientific

value, witnessed by national and international awards. The Department includes several laboratories, including that of Power Electronics, Electrical Machines and Drives, that of Microelectronics, the Electrical Measures and Electronic Equipment, the Automation and Systems, all equipped with machines, equipment and measuring instruments and advanced calculation, allowing the realization of experimental research.



CNR - INSTITUTE FOR MICROELECTRONICS AND MICROSYSTEMS (IMM)

The Institute for Microelectronics and Microsystems (IMM) belongs to the National Research Council of Italy (CNR), has the headquarters in Catania and research units located in seven different sites in Italy (www.imm.cnr.it). The Institute has a permanent staff of about 200 people, with expertise in physics, chemistry and electronics engineering. The temporary staff counts also several Post-Docs and Ph.D. students. The activities of IMM are focused on innovative solutions for micro and nanoelectronics, advanced materials and processing for smart components, optoelectronics and photonics, sensors and multifunctional micro/nanosystems. The team involved in the present project has a recognized experience on wide band gap semiconductor materials (like SiC and GaN), processing, devices characterization and modelling, and has published more than 300 papers related to WBG semiconductors in the last 15 years. The Institute holds a relevant scientific relationship with STMicroelectronics, as the IMM headquarters in Catania has its labs inside an ST fab.

C. SMART CITY PROJECT PROPOSALS SUBMITTED TO THE BIAT

Company	Title
Centro Auto Ricambi Srl	Car Driver Repair
University of Messina	Enhancement of fruit and vegetable by-products for the supply chain of guaranteed quality livestock products
ECORA SAS DI S. ECORA & C. S.A.S.	Crossover E-bike
IT S.r.l.s.	CITYSAFE
Amorfood s.r.l.	Amorlife APP - The Wellness Circuit
WIB srl	WIB - The store of the future
Laboratorio Inntech srl	MOBILITY SYSTEM BY MEANS OF SUSPENDED ROUTE WITH FIXED CABLES OF AUTONOMOUS ELECTRICALLY POWERED LIGHT VEHICLES
VULCANiC S.c.r.l.	CarPlusCamp
Etna Hitech S.c.p.A.	Smart Urban Framework CLARA (Cloud platform and smart underground imaging for natural risk)





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The Italian Trade Agency - ICE is the Government agency that supports the globalization of Italian firms, implementing the strategies of the Ministry of Economic Development.

The Italian Trade Agency - ICE helps to develop, facilitate and promote Italian economic and trade relations with foreign countries, focusing on the needs of SME's, their associations and partnerships.

The Italian Trade Agency - ICE sustains Italian firms in their internationalization processes, in the marketing of Italian goods and services while promoting the "Made In Italy" image around the world , and it is directly involved in attracting foreign direct investments.

The Italian Trade Agency - ICE provides information, support and consultancy to Italian companies on foreign markets, promoting and fostering exports and cooperation in all areas - industry (consumer and capital goods), agricultural technology and agri-food, services, and training - with the aim of increasing and making more effective their presence on international markets.

The Italian Trade Agency - ICE works closely with the Italian Regions, the network of the Italian Chambers of Commerce, business organizations and other public and private entities.

The Italian Trade Agency - ICE headquarters is in Rome, with a large network of offices around the world and acts as "Trade Promotion Sections" of the Italian Embassies or Consulates.

The BIAT

Funded under the Cohesion Action Plan of the Economic Development Ministry, the BIAT - Innovation and High Technology Lab, is an initiative designed to enable the enterprises and research systems of Italy's so-called Convergence Regions - Campania, Calabria, Apulia and Sicily - to express their full potential for innovation and excellence. BIAT is part of the program of activities of the Export South Plan.

The event is organised by the Italian Trade Agency in collaboration with the Convergence Regional Governments.

BIAT aims to promote the placing on the market and/or the transfer of innovative products and services or high technology and intangible assets (patents in particular) by matching commercial and technology supply and demand between start ups, innovative SMEs, business networks, universities, technology parks and foreign counterparts.

BIAT aims to put in place a systematic offering of industrial application opportunities from which all entrepreneurs can benefit.





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