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**INDIGENOUS INNOVATION IN THE EU:
THE CASE OF SICILY**

Prof. Fernando Christian Iaione

SUPERVISOR

Prof. Alessandro Lanza

CO-SUPERVISOR

Agnese Davì 753331

CANDIDATE

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ABSTRACT

Cities represent the perfect incubators of innovation, the phenomenon of which is constantly evolving throughout the world, but still leaves open a development gap between Northern and Southern European countries. The failures of projects proposed in the South are due to a mere imitation of standard models, without the application of any form of readaptation to the context. The heart of the research is the Italian region of Sicily, analysed through four variables - industrial diversification, system differentiation, governance and sustainability - which outline the positioning of the two main productive ecosystems of Palermo and Catania in the innovation framework. By investigating local factors, the research aims to define a place-based innovation policy to overcome obstacles, exploit potential and maximise the four issues, based on a strategy that preserves Sicily's indigenous innovation.

INTRODUCTION

In the current era of progress and new knowledge, cities and regions can be the perfect incubator for innovation. The role of innovation is to translate research results into new and better services and products in order to become competitive on the global market and to improve the quality of life of citizens. However, as is typically the case with other economic, cultural and social phenomena, innovation has found greater speed and fertility in Northern countries, thus becoming an “inspirational muse” for the global South. Europe is oriented towards horizontal models, with a hierarchical matrix, a complex body of rules and an application on the local territory based on integration logic with planning principles. Evidence, however, belies the success of the same planning recipe transferred to another region according to a top-down approach, which does not consider the local context and needs. The empirical case through which the dissertation intends to observe the phenomenon is an island region of Southern Italy and Southern Europe, located in the heart of the Mediterranean: *Sicily*. The island has several obstacles to innovation, which are related to the availability of resources and the economic and social inequalities to which it is subjected. Major criticalities concern the territory governance, the inability to spend funds and the lack of technical planning. Therefore, the paper analyses the limits, potentials and needs inherent to the entrepreneurial dimension and the local quality of life, in order to demonstrate how innovation policy in Sicily can be structured, following a place-based logic and aimed at preserving the indigenusness of the place. Innovation policy, as the European Commission states, is the link between research and development policy and industrial policy and its objective is to create a favourable environment for ideas to reach the market. To this end, this text implements the theoretical framework of Markus Grillitsch & Bjørn Asheim (2018), adding two new variables, to respond to the need that has emerged from the literature and regional results, to create a model that is more contextualised to local sustainability. In particular, to gain a more detailed view and to take advantage of shared expertise, which logically differs across the regional territory, data and interviews are collected on the two largest production ecosystems: Palermo and Catania. Transferring these experiences to the Sicilian macro-scenario, the fourth

chapter proposes a place-based innovation policy for the region. Filled with examples of success and failure, the dissertation uses a comparative analysis to compare different areas within the region and to learn about the evolution of place-based innovation models in other international regions. This analytical choice underpins the thinking maintained in this thesis, which concludes by proposing a bottom-up model, which must start from internal knowledge and be enriched with external resources that can contribute through their experience.

CHAPTER I. INNOVATION IN EUROPE AND IN THE SOUTH

1.1 Innovation as a catalyst for sustainable economic growth

In economic studies and financial literature since the last century, several researchers have demonstrated the positive correlation between economic growth and innovation. According to Solow's model, aggregate production depends in the long run on capital, labor and technology. Solow (1957) analyzes the results obtained between 1909 and 1949 in the United States and, using a Cobb-Douglas function, concludes that average output growth was influenced 0,32% by capital, 1,09% by labor and especially 1,81% by technological progress, which turns out to be a very good catalyst for per capita income growth over time. Schumpeter (1912, 1939) explains that economic development is influenced by internal changes caused by economic innovations, which are crucial to competitiveness and defines the entrepreneur as a creator-revolutionary who can seize opportunities and turn them into change. Schumpeter is most notably associated with the phenomenon of innovation, which he described in terms of "creative destruction": competitive processes in a context of technological change serve to sweep away older technology and modes of production in favor of new ideas, and competition itself serves to drive technological change¹. Recently there has been talk of "exponential technologies" that lead to believe well in a future of abundance: consider Moore's law, which states that the number of transistors per integrated circuit doubles every twenty-four months, and Metcalfe's law, which says that the value of a communication network increases by a factor equal to the square of the number of people involved². Thus, it is likely that, in a surprisingly short time, many important assets will become much cheaper, more powerful and widespread³. Nowadays, the indirect effects on life are manifold: a myriad of information on the Web can be accessed with a single click; smartphones have the power of a 1980s supercomputer, with greatly scaled-down costs; medical care has progressed thanks to advanced technologies (such as DNA sequencing); and the same is true for business startups, which can leverage open source software to bundle all data. Emerging technologies, such as blockchain and artificial intelligence, has many complementary characteristics such as trust-free, automation, decentralization, democracy, and security⁴. Moreover, innovation as defined by Schumpeter⁵, refers not only to the technical introduction into the economic and social system of a new product or process, but also extends to organizational innovations, opening of new markets, discovery of new sources of supply and financial innovations. At this point, however, it is necessary to make an important clarification. Relying too much on the success of innovations in increasing productivity can be misleading and can lead to the phase that Chesbrough calls the "exponential paradox": technologies do not produce on their own, and in order to actually bring prosperity to the economy, it is absolutely necessary

¹ Hong, Oxley, L., & McCann, P. (2012). A survey of the innovation surveys. *Journal of Economic Surveys*, 26(3), 420–444.

² Chesbrough, Prencipe, A., & Palmieriello, P. (2021). *Il futuro della open innovation: creare valore dall'innovazione aperta nell'era della tecnologia esponenziale*. Roma: LUISS University Press.

³ *Ibidem*.

⁴ Singh, Sharma, P. K., Yoon, B., & Shojafar, M. (2020). Convergence of blockchain and artificial intelligence in IoT network for the sustainable smart city. *Sustainable Cities and Society*, 63.

⁵ Schumpeter, JA. (1934). *The Theory of Economic Development*.

to review the ways in which innovation is invested in firms and cities and in which the links between inputs and outputs are defined. The process of innovation diffusion essentially depends on three aspects - business, environment and technology - the combination of which establishes the preconditions for the adoption of an innovation (Camagni, 2017). As for the degree of adaptability of companies, i.e., the ability to receive new knowledge, it depends on the facility, business sector, type of management and research and marketing function, and R&D expenditures. Then, the environment is really decisive for speed, as it represents the economic and infrastructural prerequisites necessary for the circulation of information (Nelson and Winter, 1982; Kamann, 1984). In addition, it provides the base for the psychological, cultural and social variables which define the level of education, taste for risk, and attitudes towards technology⁶. Finally, the internal properties of the innovation should be considered and its compatibility with existing organizational structures, costs, communicability, and pervasiveness should be observed in relation to potential adopters in different sectors (Rogers, 1962; Hayward, 1979).

1.2 Open Innovation and Innovation Ecosystem in cities

A strategic model for generating innovation in both individual companies and entire production ecosystems is *open innovation*. The paradigm was theorized in 2003 by the American economist Henry Chesbrough⁷ who states that companies should use external ideas, as well as internal ones, to access markets and advance their technological skills, resulting in better revenues. For example, two strategic mechanisms are technology scouting and crowdsourcing. Open innovation is the basis for the design of *innovation ecosystems*, which are understood as networks of universities, public research organizations, local government agencies, startups, consultants and other highly skilled public and private entities. Among these, as economist Mariana Mazzucato explains, the public actor plays a key role in ensuring the smooth functioning of competitive and innovation mechanisms, without being limited to the mere correction of markets. According to the principle of knowledge sharing, actors, by providing a variety of competences, benefit from network externalities, thanks to which new business opportunities open up and risk levels are reduced. With the introduction of innovation output, the innovation ecosystem is the evolution of another concept, *business ecosystem*⁸, i.e. a cross-sectoral network of companies cooperating to offer better solutions to consumers. Therefore, it can be inferred that cities are aggregate ecosystems of various ecosystems (Visnjic et al., 2016). The critical mass of population, the increasing heterogeneity of residents, and the density of their relationships make cities a fertile ground for innovations⁹. Innovation today finds its greatest application in the *smart city*¹⁰, through an ingenious

⁶ Camagni. (2017). Technological change, uncertainty and innovation networks: Towards a dynamic theory of economic space. In *Seminal Studies in Regional and Urban Economics Contributions from an Impressive Mind* / (pp. 65–92).

⁷ Chesbrough, H. (2003). The era of open innovation. *MIT Sloan Management Review*, 44(3).

⁸ Business ecosystem is defined as "companies co-evolving capabilities around a new innovation, cooperating to support new products, meet customer needs and ultimately incorporate the next round of innovations" (Moore, 1993).

⁹ Chesbrough, Prencipe, A., & Palminiello, P. (2021). *Il futuro della open innovation: creare valore dall'innovazione aperta nell'era della tecnologia esponenziale*. Roma: LUISS University Press.

¹⁰ Smart city is defined by the European Union as "a place where traditional networks and services are made more efficient with the use of digital solutions for the benefit of inhabitants and businesses".

combination of low-emission transportation networks, circular economy processes and renewable energy sources. The complementarity between new technologies and components of the urban system (structures, activities, actors), represents the premise of the Smart City paradigm where inhabitants and users of the city take an active role, as both "detectors" and "disseminators" of data and information¹¹. Some innovative city-sized success works are reported: IBM created an Intelligent Operations Center to centralize information from various city centers, focusing on crime prevention and law enforcement needs (e.g. facial recognition and surveillance technologies); Philips has developed interconnected LED lighting systems in cities, to make energy distribution more efficient and reduce maintenance costs; Siemens has designed operational fire, security, building automation, lighting and air conditioning systems; or again, several countries have developed digital identification tools to more easily access online public services, such as SPID in Italy or Singpass in Singapore.

Silicon Valley

The world's most popular innovation ecosystem is Silicon Valley, whose fame is inextricably linked to the success of small, innovative start-ups of the past, now known as the famous IT giants¹². It is an industrial area, referred to as the "cradle of technology," located in the southern part of the San Francisco Bay Area in California and whose name derives precisely from the presence of silicon with which the first microcircuits were produced here. To name just a few of the most important technology companies, with the largest turnover, there are Adobe Systems, Apple, Cisco Systems, Facebook, Google, Intel, Microsoft and PayPal. In addition, there are 150 "unicorns" (i.e., companies worth more than \$1 billion), about 30.000 startups, and a 43% concentration of venture capital investment¹³. This large ecosystem draws on highly skilled resources from major universities, such as Stanford and Berkeley, Santa Clara, USCF, and San Jose State University, and from large Federal Research Laboratories, such as NASA and SLAC. The process is logical and continuous: companies engage in internships and orientation activities with universities, so as to facilitate the transition of young people from academia to the world of work and to enhance their talents. Silicon Valley's worldwide success can certainly be attributed to the well-structured network of actors, which is a fundamental precondition for the circulation of knowledge, but also by other strategic factors:

- a. Strong concentration of different cultures and profound open-mindedness: about 60% of graduates are foreigners, more than 50% speak a language other than English, and 25% of the companies founded here have at least one co-founder from outside the United States.

¹¹ Rocco Papa. (2016). *Città Metropolitane e Smart Governance: Iniziative di successo e nodi critici verso la Smart City Metropolitan Areas and Smart Governance: Successful Initiatives and Critical Aspects towards Smart City*. FedOA - Federico II University Press.

¹² Sviluppumbria (2021, October 7). *Gli ecosistemi dell'innovazione. Alcuni modelli di successo*. Retrieved from: https://www.sviluppumbria.it/documents/20182/381205/Report_Modelli+EI.pdf/5346d082-628a-476c-861c-1770232f28d4

¹³ Venture capital is a high-risk form of investment, as it is typically oriented towards financing innovative startups.

- b. Numerous funding and investors, including venture capital funds, business angels, and crowdfunding platforms. In addition to these, there is substantial public investment of a military nature, used since World War II to establish laboratories and research institutes.
- c. Incentives for entrepreneurship, providing, for example, coworking areas, incubation programs and mentorship practices.
- d. High level of innovativeness, prompting companies to prefer new markets rather than occupying existing market niches, expanding for example into the internet and mobile sectors.
- e. Streamlined regulatory and tax system, providing some simplifications for innovative entrepreneurial projects, such as the possibility of setting up a company with a simplified regime (required share capital of \$1).
- f. Intervention by the federal government, which, beginning in 1980, initiated a policy in favor of new business creation, allowing universities and individuals to commercialize the results of government-subsidized research.

1.3 State of the art of Innovation in Europe

Historically, the importance attached to innovation on the European continent is rooted in the creation of the European single market and economic and monetary union, which fostered greater productive, commercial and technological contacts among European companies, and also encouraged the emergence of a market for research and innovation at the community level rather than at the national level¹⁴. The European Parliament enunciates "innovation not only benefits both consumers and workers in the EU, it is crucial to creating better jobs, building a more environmentally friendly society and improving our quality of life, but also to safeguarding the EU's competitiveness in the global market". The novelty that has emerged in the market concerns "deep tech innovations", namely those technological breakthroughs that can bring significant progress to humanity. Thanks to its long history in innovation, Europe has the expertise to lead this trend: it is a leader in science and knowledge production, in quality of talent, in number of green patents and is responsible for one-fifth of the world's publications. In addition, it has a strong industrial base that, together with partnerships between companies and researchers and various measures, such as European semiconductor legislation, provides fertile ground for deep tech innovations. Finally, bold policy choices, such as those on climate change and environmental protection (e.g., the EU's position in the wind energy sector and the presence of half of such active companies in its territory) also play a key role¹⁵.

¹⁴ Consiglio Nazionale delle Ricerche (2010, December 1). *La politica per l'innovazione nell'Unione Europea*. Retrieved from: https://www2.ceris.cnr.it/homedipendenti/vitali/dispense2010_11_PE/politica%20per%20innovazione%20corso%20pol%20eco%2001%2012%202010.pdf

¹⁵ European Commission, General Directorate of Research and Innovation (2022). *Communication from the commission to the european parliament, the council, the european economic and social committee and the committee of the regions: a new european innovation*, EU Publications.

However, the history of innovation in Europe is very contrasting. When the new European Commission took office in 2014, the EU was facing a series of difficult challenges in the global scenario, consequent to one of the worst financial crises. Despite decades of technological progress, the EU's productivity had been growing at a slower pace, mainly due to the inability to translate much of this knowledge into economic and social value¹⁶, threatening the natural link between input and output. In 2021, the EU allocated R&D spending of 328 billion euros, a 6% increase from the previous year. Among the EU member states, the highest R&D intensity in 2021 was recorded in Sweden (3,35%), followed by Austria and Belgium; six member states, on the other hand, reported R&D expenditure below 1% of their GDP: Romania (0,48%), Malta, Latvia, Bulgaria, Cyprus and Slovakia (Eurostat, 2022). In addition, the EU spends a smaller percentage each year (2,3% in 2020), than the United States (3,45%) and Japan (3,26%) on R&D¹⁷. According to Eurostat, the barriers to innovation activities in European companies are: lack of internal and external funding, lack of qualified staff and partnerships, difficulties in obtaining public subsidies, high costs, slow regulations, lack of access to external knowledge¹⁸ and certainly also the cultural factor (more so when considering the issue related to data protection). Moreover, European companies do not seem to embrace the role of clusters and networks in dynamic innovation; in fact, less than a third of companies cooperate with startups or universities¹⁹. As for external financing sources, the main ones are traditional bank products, such as loans, credit lines and bank overdrafts²⁰, while equity capital, which would be strategic for deep tech²¹, plays a marginal role among the available alternatives, and the tax system reinforces the status quo. The initial public offering (IPO) market is also not fully tapped, as in the U.S.²². Unlike the European system, which suffers from fragmented projects and a highly bureaucratic government, the U.S. innovation system is oriented toward technological "displacement" rather than "deepening": radical innovations are more easily achieved in the United States because it is able to quickly reallocate resources in line with the requirements of new technological paradigms²³. A key issue therefore concerns market regulations, which are typically more stringent in the EU. A split exists in the literature between those who advocate regulation as a source of competitiveness (Porter hypothesis) and those who believe that it hinders innovation (Pollution heaven hypothesis, Wu, 2000).

¹⁶ European Commission, General Directorate of Research and Innovation, Labareda, J. (2019). *Open Europe – Policies, reforms and achievements in EU science and innovation 2014-2019 under EU Commissioner Carlos Moedas: open innovation, open science, open to the world*, Publications Office.

¹⁷ Polluveer, K. (2022), Innovation Policy. *Fact Sheets on the European Union*.

¹⁸ Eurostat, (2021). *Enterprises by hampering factor for innovation activities, level of importance of the hampering factor, NACE Rev. 2 activity and size class*. Retrieved from <https://ec.europa.eu/eurostat/databrowser/bookmark/771a1da1-0be9-465b-82e2-047dfbffa578?lang=en>

¹⁹ Andersen, N., Boersch A. & Blohmke J. (2019). *Innovation in Europe: A Deloitte survey on European companies and how digital technologies can strategically enhance innovation*. Deloitte University EMEA CVBA

²⁰ European Commission, General Directorate of Research and Innovation (2022). *Communication from the commission to the european parliament, the council, the european economic and social committee and the committee of the regions: a new european innovation*, EU Publications.

²¹ Deep tech innovation requires large amounts of equity because the companies involved, although rich in intellectual property, generally do not have guaranteed revenue streams and cash, so they need more time to turn results into marketable products and a return from a financial perspective.

²² IPOs give scale-ups access to 5.5 times the amount of venture capital raised by those who remain private

²³ Brooks, Harvey and Bruce R. Guile. (1987). *Technology and global industry: firms and nations in the world economy*. National Academies Press.

Certainly, the impact of regulation on innovation turns out to be positive when the incentives to innovate outweigh the compliance costs borne by the economic operator. To this end, the recommendations are: strengthen the link between innovation and other policy objectives, improve the quality of regulation, include ex ante and ex post evaluations, and improve dialogue between authorities and industry to facilitate the implementation of regulations²⁴.

1.4 Measures and Funds for European Research & Innovation strategy

The European Union, through the cooperation of member states, needs to address mainly two major challenges: to overcome the fragmentation of funding for innovative startups and SMEs (venture capital investments are in fact 4-5 times higher in the U.S.) and to foster technology transfer by accelerating research results and improving the connection of universities with the business fabric, which to date is very weak²⁵. The first initiative, launched in 2010, was the *Innovation Union* program to take action on funding, research systems and the private sector. In 2017, the Commission established a group of fifteen excellent innovators, which then helped define the *European Innovation Council* (EIC) and collaboration with the *European Institute of Innovation* (EIT), which has brought together more than 1200 leading innovation partners since 2008. The two most important funds supporting R&I are *Horizon Europe* and the *European Structural and Investment Funds* (EIS), whose planned financial envelope for the 2021-2027 programming is 95,5 and 392 billion euros, respectively. The EIS funds are the financial instruments for the implementation of the European Cohesion Policy, the EU's main investment policy on the legal basis of Article 174 TFEU²⁶. They include the following specific funds: the European Regional Development Fund (ERDF) to invest in the social and economic development of all EU regions; the Cohesion Fund (CF) to invest in the environment and transport in the less prosperous countries; the European Social Fund Plus (ESF+) to support jobs and create a socially inclusive society; the Just Transition Fund (JTF) to support the regions most affected by the transition towards climate neutrality²⁷. Cohesion Policy gives higher priority to Goal One "a more competitive and smarter Europe", and then be devoted to climate neutrality, mobility, inclusion, and territorial development. The Horizon Europe program, on the legal basis of Article 179 TFEU²⁸, is based on the R&I strategy, and its main intent is to unleash the full innovative potential of European research by improving the relationship between

²⁴ Federchimica (2018). *La regolamentazione favorisce o ostacola l'innovazione? 5a Conferenza Nazionale della Chimica Sostenibile*, Federchimica. Retrieved from: https://www.federchimica.it/docs/default-source/eventi_0118_conferenzachimicasostenibile/6-francesca-giannotti-mise.pdf?sfvrsn=94457893_2

²⁵ Sviluppumbria (2021, October 7). *Gli ecosistemi dell'innovazione. Alcuni modelli di successo*. Retrieved from: https://www.sviluppumbria.it/documents/20182/381205/Report_Modelli+EI.pdf/5346d082-628a-476c-861c-1770232f28d4

²⁶ The Article 174 TFEU enunciates: "To promote its harmonious overall development, the European Union is strengthening its economic, social and territorial cohesion. In particular, the Union aims to reduce disparities between the levels of development of its various regions and the backwardness of the least-favored regions."

²⁷ European Commission (2021). *Available budget of Cohesion Policy 2021-2027*. Retrieved from: https://ec.europa.eu/regional_policy/funding/available-budget_en

²⁸ The Article 179 TFEU enunciates: "The Union shall have the objective of strengthening its scientific and technological bases by achieving a European research area in which researchers, scientific knowledge and technology circulate freely, and encouraging it to become more competitive, including in its industry, while promoting all the research activities deemed necessary by virtue of other Chapters of the Treaties".

companies, startups, universities and research centers²⁹. The structure is based on three pillars: (a) Excellence Science (support for researchers and dissemination of knowledge, totaling 25 billion euros), (b) Global Challenges and European Industrial Competitiveness (adoption of innovative solutions in industry to improve its competitiveness, totaling 53,5 billion euros) and (c) Innovative Europe (promotion of all forms of innovations, including non-technological ones, totaling 13,6 billion euros). Participation in the EU's multi-year R&I programs depends on the selection of the best proposals. This implies that in countries where there are poor R&I systems, researchers do not have sufficient resources to compete and thus contribute to national performance. To correct this glaring gap, Horizon Europe has earmarked 2,95 billion euros for "extension measures" to benefit states whose performance is unsatisfactory. However, as the Court has expressed, such support can only act as a catalyst to unlock excellence, but the decisive outcome depends on the commitment of national governments. Finally, however, one of the main feedbacks from the 2014-2020 programming emphasized the lack of synergy between Horizon 2020 and the EIS Funds, at the expense of the development of innovation. Therefore, the ECA identified the following strategies for the 2021-2027 period: alignment between rules and regulations, cooperation between member states and research stakeholders, interoperability of databases, and establishment of a monitoring system.

1.5 Comparison between European countries

According to the *Global Innovation Index* (GII), which annually ranks the performance of 132 economies³⁰, in 2022, the world's most innovative economies are Switzerland (topping the rankings for the 12th consecutive year), followed by the United States of America, which overtakes Sweden and continues to lead on 15 of the 81 innovation indicators considered³¹. The top five also include the United Kingdom and the Netherlands. European success comes from the placement of 15 countries in the top 25 rankings. On the continent, Switzerland leads in innovation production and has the best-performing institutions (second in the world), Germany in human capital and research and Sweden in infrastructure and business sophistication. While Estonia, although ranked 18th, leads the world in electronic participation and venture capital operations. The *European Innovation Scoreboard* (EIS), produced annually by the European Commission to compare the performance of EU countries in innovation, provides overall positive results in 2022: compared to 2015, performance in the EU has increased by 10%, and compared to 2021, 19 member states have shown improved performance (8 countries, on the other hand, have found a downgrade). Figure 1 shows the 2022 EIS, compared with the previous year, distinguishing the EU countries into the following four bands. The innovation leaders, with performance above 125% of the EU average are Sweden, which resumes leading the ranking in the EU (as in 2019), followed by Finland, Denmark, the Netherlands, and Belgium, which has managed to move up

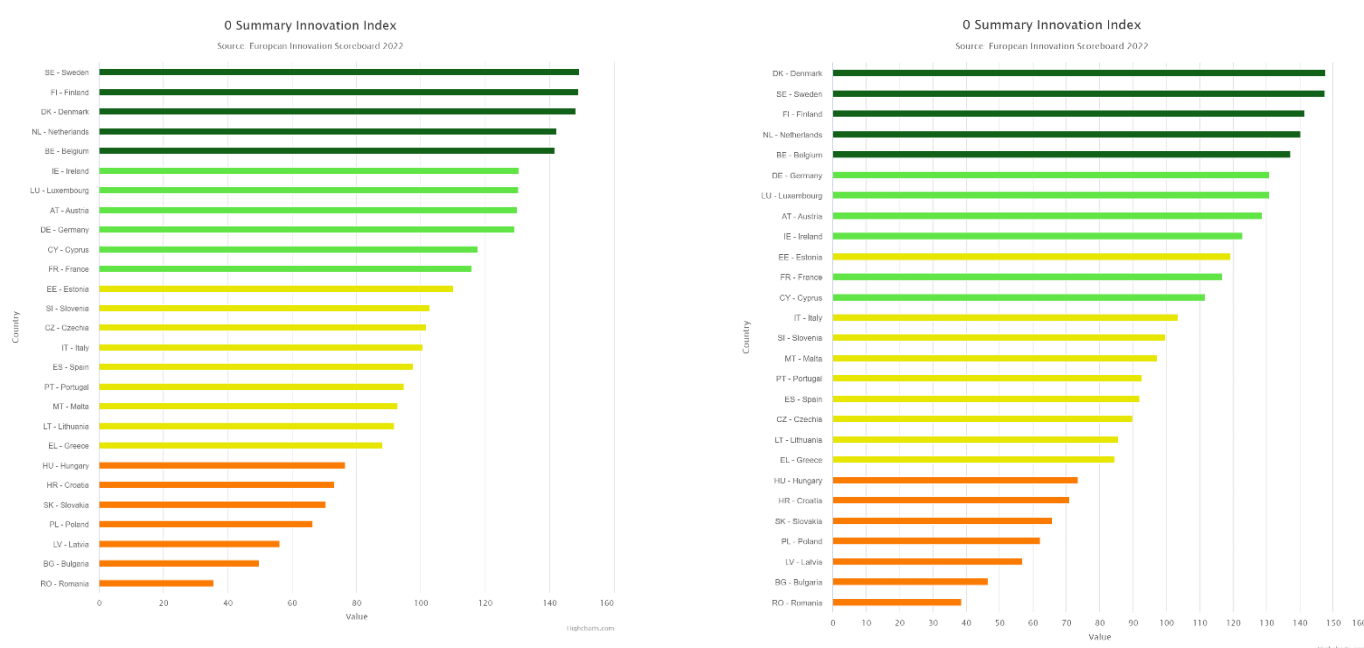
²⁹ Sviluppumbria (2021, October 7). *Gli ecosistemi dell'innovazione. Alcuni modelli di successo*. Retrieved from: https://www.sviluppumbria.it/documents/20182/381205/Report_Modelli+EI.pdf/5346d082-628a-476c-861c-1770232f28d4

³⁰ The GII ranks the global economies on the basis of human capital, institutions, research, infrastructure, business, market, technology output, and creative output

³¹ World Intellectual Property Organization (WIPO) (2022). *Global Innovation Index 2022: What is the future of innovation-driven growth?* Geneva: WIPO.

to the second band since 2019. The strong innovators, with performance between 100% and 125%, are Ireland, Luxembourg, Austria, Germany, Cyprus, and France. In particular, performance slightly decreased for Germany, compared with improvements for Ireland and Cyprus. But the most negative figure is recorded by Estonia, the only country to have slipped into another group, reaching the third band. The moderate innovators, with performance between 70% and 100% (below EU averages) are Estonia, Slovenia, the Czech Republic, Italy, Spain, Portugal, Malta, Lithuania and Greece. The most obvious negative results were achieved by Italy (which dropped from first to fourth position in the group) and Malta (from third to seventh position); while Czech Republic from sixth rose to third position. Finally, the emerging innovators, with performance below 70%, are Hungary, Croatia, Slovakia, Poland, Latvia, Bulgaria and Romania who, unfortunately, remained in a stationary situation without making any progress, even within the group itself.

Figure 1: Summary Innovation Index



Source: *European Innovation Scoreboard, 2022, 2021.*

1.6 Innovation in the Mediterranean

The world has been experiencing sharp inequalities between the North and South since the discovery of the Americas and the formation of what Wallerstein called the "world-economy" and thus the arrangement of the dominance of the center (located in the Norths of the world) and the peripheries (the Souths)³², then continuing with colonialism, the robbery of the South's material and human resources, and the devastation of territories³³. Since 1957, Europe has been configured as a eurocentric economic entity, where hegemony involves Northern European countries; while the most unequal region is the Middle East and North Africa

³² Wallerstein, I., (1980). *The modern world-system II. Mercantilism and the consolidation of the European world-economy, 1600-1750*, New York.

³³ Palidda, S. (2022 July 1). *Il divario Sud-Nord in Italia e nel mondo euro-mediterraneo. La tragica eredità della marginalità storica*. Retrieved from: <http://www.istitutoeuroarabo.it/DM/il-divario-sud-nord-in-italia-e-nel-mondo-euro-mediterraneo-la-tragica-eredita-della-marginalita-storica/>

(MENA), where the top 10% absorbs 58% of total income (more than in Latin America)³⁴. The Euro-Mediterranean area is not economically integrated with the rest of the world. The Mediterranean basin is a very interesting network of regions that are culturally diverse but accumulated by a number of issues, such as climate change, environmental degradation, air pollution, and infectious diseases threats³⁵. The economic and geographical difficulties have certainly spilled over into the field of innovation. The Mediterranean innovation system is not yet a priority and is weak, with limitations related to financial structure, R&D spending and technology transfer. As the Evaluation of science, technology and innovation capabilities in the Mediterranean countries (ESTIME) project³⁶ found, with the notable exception of Tunisia, Turkey, and Israel, most research teams have a hard time obtaining the necessary legitimacy in their institutions, usually universities, which are dedicated to training rather than research³⁷. A crucial issue in these regions, on which financial instruments to support innovation should focus, is "tech justice", which aims at developing targeted actions to grant vulnerable minorities and disadvantaged populations access to the benefits of technology³⁸.

Cooperation with the European Union was initiated in 1995, as part of the Barcelona Process, when the Euro-Mediterranean Partnership (EMP) was born to promote cooperation in research, technology and development in Mediterranean countries. In 2008, the Union for the Mediterranean (UfM), an intergovernmental institution that unites EU countries and 15 countries³⁹ of the southern and eastern shores of the Mediterranean, with the aim of promoting dialogue and cooperation. Some of these countries are now candidates for EU membership, while others have bilateral action plans through the European Neighborhood Policy (ENP)⁴⁰. With more than 60 projects and over 300 ministerial forums and expert fora gathering 25.000 stakeholders since 2012, UfM activities illustrate the strong belief that regional challenges call for regional solutions and that there is no security without development⁴¹. The main objectives can be categorized as follows: modernising R&D policies, supporting institutional capacity, improving participation in the Framework Programme by valuing its needs, to promote technological development in industry, and to foster research mobility. There are several institutional partners, including the Association of Euro-Mediterranean Economists (EMEA), ENI CBC Med Program, European Bank for Reconstruction and Development (EBRD), European Investment Bank (EIB), League of Arab States, Union of Mediterranean Universities, World Bank, UNESCO and many other

³⁴ *Ibidem*.

³⁵ Union for the Mediterranean (2021, June 21). *Support for the Union for the Mediterranean Regional Platform in Research and Innovation: Theories of Change and Impact Pathways*. Retrieved from: https://ufmsecretariat.org/wp-content/uploads/2021/10/2021-06-21_UfM-Platform_Theories-of-Change-and-IPs_and_Horizontal-Integration_Final-Version.pdf

³⁶ The EU-funded project ESTIME aims to propose strategic policy tools for research and innovation systems in the Mediterranean countries.

³⁷ Arvantis, R. (2012). *Euro-Med Cooperation on Research and Innovation*. IEMed Mediterranean Yearbook.

³⁸ Iaione, De Nictolis, E., & Suman, A. B. (2019). The Internet of Humans (IoH): Human Rights and Co-Governance to Achieve Tech Justice in the City. *Law & Ethics of Human Rights.*, 13(2), 263–299.

³⁹ In addition to the 27 EU countries, 15 partner countries are members of the UfM: Albania, Algeria, Bosnia and Herzegovina, Egypt, Israel, Jordan, Lebanon, Mauritania, Monaco, Montenegro, Morocco, the Palestinian Authority, Syria, Tunisia and Turkey.

⁴⁰ EUR-Lex (2021). *Union for the Mediterranean*. Retrieved from: https://eur-lex.europa.eu/legal-content/IT/TXT/HTML/?uri=LEGISSUM%3Abarcelona_process

⁴¹ Union for the Mediterranean, *Who we are*. Retrieved from <https://ufmsecretariat.org/who-we-are/>

universities and organizations. The financial institutions involved, as the private sector, include Natural Gas, Intesa San Paolo S.p.A. and Unicredit S.p.A. The innovation and entrepreneurship ecosystem has grown rapidly since 2018, and the region is seeing growth in new venture capital, business incubators, seed funds, and entrepreneurship capacity building entities, and innovation clusters in particular⁴².

1.7 Innovation in Italy

Since the 1990s, thanks to technological progress and globalization, the global economy has grown more than 30 times, and in developed countries in particular, productivity, international trade and life expectancy have increased. Although Italy certainly represents one of the success stories of economic growth in the postwar period, in the face of these changes the responsiveness of Italian firms has been weak: efforts focused on reforms to reduce labor costs, while investment (public and private) was insufficient. As argued by Malerba (1993), historically the Italian innovation system has been based on two pivotal pillars: network of small and medium-sized enterprises, connected at the local level, and a central R&D system, including large companies with industrial laboratories, universities, public research institutes and also small high-tech companies, connected at the national level. Indeed, the Italian advantage derives from a quality university fabric, which includes excellent researchers and academic paths, accompanied by private-public publications and international scientific co-publications. Intellectual assets (such as trademark applications) and innovators (product and process innovations) also positively affect performance. Actually, there is a clear imbalance of the production system toward small enterprises, which possess few financial means and managerial skills, to be able to innovate successfully. Public policies to support innovation (and coordination among them), is a sore point for Italy. Consider also the inability of the public administration to adapt: delays in infrastructure modernization have been accompanied by the insufficient use of new technologies in administrative processes with substantial burdens on businesses and society as a whole (Banca d'Italia, 2020). The Agency for the Promotion of European Research (APRE) states that under the Horizon 2020 Program, Italy has increased participation in projects (+21,4% compared to 2019). However, it has the lowest success rate among the eight most active countries in 2020 (13,10%) and especially the financial success rate lower than the EU average rate, confirming its penultimate position⁴³. Among others, the criticality increases if we consider the success of projects in which Italy is coordinator (8,6%), and not mere partner, unfortunately demonstrating a deficit in the quality of content, design capacity and aggregation of strong partnerships. On the other hand, with regard to the partnership agreement between the EU and Italy for Cohesion Policy funds, which amounted to 49,88 billion euros in 2014-2020, all 51 Operational Programs (OPs) co-financed by the ERDF and ESF exceeded

⁴² European Commission, *Mediterranean. Policy background, UfM regional platform, roadmaps, projects and results, funding and events*. Retrieved from: https://research-and-innovation.ec.europa.eu/strategy/strategy-2020-2024/europe-world/international-cooperation/mediterranean_en

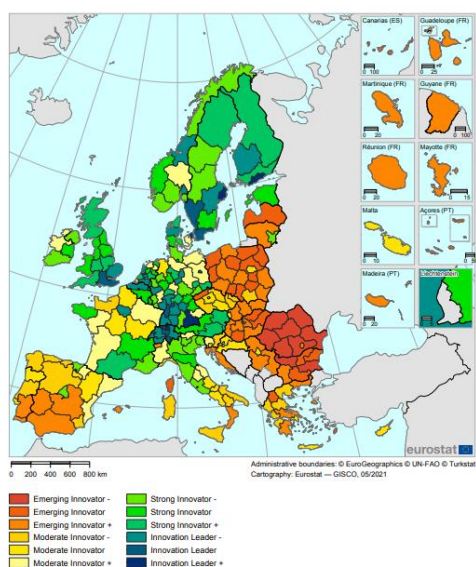
⁴³ APRE, (2020). *Una panoramica sulla partecipazione italiana a Horizon 2020*.

their spending targets⁴⁴. However, while other European states had spent 51 percent of funds by mid-2020, Italy had spent only 39 percent, demonstrating to be among the slowest countries in using European resources⁴⁵.

1.8 Innovation gap between northern and southern Italy

The Ministry of European Affairs highlights the phenomenon, from which Italy is markedly affected, known as the "Development Trap", which describes the condition of territories in which the expected narrowing of gaps between regions does not occur, but on the contrary there is a tendency for increasing disparities, accentuated at this historical stage by peculiarly critical conditions⁴⁶. The *Regional Innovation Scoreboard* (Figure 2) confirms the gap between Italian regions, contextualising it in the European picture: almost all northern Italian regions, colored green, are strong innovators, winning an excellent role in European innovation. However, the road to progress is long, with five more stages ahead to become innovation leaders. Then looking at the color scale in the Italian country (ranging from green to orange), compared to other countries where green appears, is inferred a worrying piece of information, leading to reflect on the deep innovation gap in Italy: in the same nation, there are strong innovators and emerging innovators, unlike Germany, Sweden or England, for example, which beyond the regions coloured green, at most count moderate innovators of the last stage.

Figure 2: Regional Innovation Scoreboard



⁴⁴ Agenzia per la Coesione Territoriale, (2020, December 31). *Programmazione comunitaria 2014-2020: centrato obiettivo, target di spesa raggiunti da tutti i Programmi*. Retrieved from: https://www.agenziacoesione.gov.it/news_istituzionali/programmazione-comunitaria-2014-2020-centrato-obiettivo-target-di-spesa-raggiunti-da-tutti-i-programmi-2/.

⁴⁵ Osservatorio CPI, (2021 January 29). *Fondi strutturali e d'investimento europei: a che punto siamo?* Retrieved from: https://osservatoriocpi.unicatt.it/cpi-archivio-studi-e-analisi-fondi-strutturali-e-d-investimento-europei-a-che-punto-siamo#_ftnref11

⁴⁶ Il Ministero per gli Affari Europei, il Sud, e le Politiche di Coesione e il PNRR (2023, February 15). *Relazione sullo stato di attuazione della politica di coesione europea e nazionale: Programmazione 2014 – 2020*. Retrieved from: <https://www.agenziacoesione.gov.it/wp-content/uploads/2023/03/relazione-politica-di-coesione-2014-2020.pdf>

According to the *Smart City Index Report* (EY, 2022), more than half of Italy's territory has at least one manufacturing specialization, but the provinces with the most production chains (between 10 and 17 production chains) are all concentrated in the North, with the exception of Rome, Naples and Bari. The supply chains with the highest level of "human smartness" are those related to technology, automotive manufacturing, medical devices and media. The southern manufacturing sector is characterized by high fragmentation, low openness to international markets and a sector specialization that is highly oriented to low-technology and knowledge-intensive sectors⁴⁷. The South employs the least amount of R&D spending, at 14,5%, compared to more than 60% concentrated in the North (Istat, 2021). Another fundamental gap is the level of education: it quantifies the lowest number of university graduates (16,2% against the national average of 20,1%), 16,3% of young people between 18 and 24 years of age drop out of school early, and there are more than one million of Not in Education, Employment or Training (NEET), that is, young people between 15 and 19 years of age who are not studying and not working (32,6%, which is the highest figure in Italy, where the average is 23,3%)⁴⁸. An entrepreneur with a degree tends to adopt better quality managerial practices that are reflected in higher rates of innovation; in the South, the relative scarcity of high human capital managers hinders the adoption of digital technologies (Calvino et al., 2022). Another sore point for the South is digitization: innovative enterprises correspond to 17% of the national figure, 48% have not yet achieved innovation, and 87% of enterprises with at least 10 employees are at a low/very low level of ICT adoption⁴⁹. However, there are some signs of reaction, such as an increase in the number of innovative enterprises, spending per employee and the use of e-commerce. In addition, there are 6 of the 24 national technology hubs, and the spread of SMEs (418) and startups (3.378) is growing.

⁴⁷ Accetturo A., G. Albanese, R. M. Ballatore, T. Ropele e P. Sestito (2022). *I divari territoriali in Italia tra crisi economiche, ripresa ed emergenza sanitaria*. Banca d'Italia, Questioni di Economia e Finanza, n. 685.

⁴⁸ Intesa Sanpaolo (2021). *Sintesi panorama economico mezz'estate srm 2021*. Retrieved from: <https://www.srm.it/media/files/SINTESI-PANORAMA-MEZZESTATE.pdf>

⁴⁹ *Ibidem*.

CHAPTER II. THE DECOLONIZATION OF INNOVATION TOWARD A PLACE-BASED FRAMEWORK

2.1 Research question for a place-based approach in the European South

As shown in the previous chapter, there is a wide innovation gap in Europe, as well as in the rest of the world, with the greatest performance concentrated in Northern and Western Europe. The role of the EU is crucial for the management of innovation funds, but on the other hand it must be recognised that regional innovation policies should not imply a one-size-fits-all approach, nor should they be based on unique recipes (Constantin et al., 2011; De Propriis, 2007; Pug, 2017; Todtling & Trippel, 2005). Certainly, through Cohesion Policy, Europe has demonstrated its commitment to reducing disparities in innovation and competitiveness, however, it has not been effective in increasing economic convergence between nations and regions (Pylak, 2015). The current phenomenon can be defined as the “decolonisation of innovation” to better describe the new response to a system that over time has led European countries to meticulously imitate Anglo-Saxon or “standard” models of innovation (such as Silicon Valley) in the hope of replicating the same forms of success. Therefore, the most widespread approach in Europe to date has been the *top-down approach*, in which tested programming models are transferred to local communities. At the European level, the factors that have conditioned this choice have been the importance attributed to public intervention combined with a complex regulatory system, which inevitably push actors to follow a logic of integration with existing planning principles. This is a hierarchical relationship mechanism, which relies on the centralisation of power, information and policy management. This phenomenon is most emphasised in Southern Europe, where evidently, given the difficulties involved in managing innovation, the path of imitation is the most strategic, and also the most feasible. A pillar of this debate concerns the topic of the *geography of innovation*, according to which there is a close relationship between the level of development of regions and the different shares of innovation: in 2016 about 30% of the population of less developed regions lived in an “emerging innovator” region, and none in a “leader innovator” region; in 2021, the share of emerging innovators had become more than twice as high⁵⁰, including part of the regions that were previously “moderate innovators”. This is an indication of the fact that in the last five years, the less developed regions have failed to improve their performance and the innovation leaders correspond precisely to the more developed regions. Dealing with the spatial organisation of sources of innovation, despite the contribution of the ICT revolution to digital connectivity, physical proximity is considered a determining factor for knowledge transfer and learning⁵¹, as is the sharing of common infrastructures within a system of connections (production, cooperation, competition, social and institutional)⁵². Moreover, researchers have recently broadened the concept of distance to include

⁵⁰ Dijkstra, L., Brons, M., De Dominicis L. (April 2022). *Exploring EU regional innovation gaps*. Retrieved from <https://cohesiondata.ec.europa.eu/stories/s/Exploring-regional-innovation-gaps/wdm6-n4iz/>

⁵¹ Brandsma, Andries, et al. (2014). Assessing policy options for the EU Cohesion Policy 2014-2020. *Investigaciones Regionales- Journal of Regional Research* 29: 17-46.

⁵² Constantin, Daniela-Luminita, et al. (2011). The question of clusters in lagging regions: do they really make the difference? A case study in Romania. *Environment and Planning C: Government and Policy* 29.5: 889-910.

social, cultural, institutional, behavioural aspects, shared experiences and past collaborations⁵³. Among these, large differences in regulatory models have been highlighted: European countries differ the most in their regulation of credit, intellectual property and market and product regulation (Barbosa, N., Faria AP., 2011).

In the geography of innovation, regions are now assumed to be the most appropriate units of analysis to study the transition to a knowledge-based economy (Braczyk, Cooke, & Heidenreich, 1998; Cooke, 2002; Feldman & Storper, 2016; Florida, 2002; Storper, Kemeny, Makarem, & Osman, 2015). Indeed, in policies aimed at smart and sustainable growth, the EU sees innovation as a valuable catalyst for regional development. Studies on the regional economy are indebted to the intuitions of Marshall, who stressed the importance of local externalities in favouring the geographical concentration of economic and innovative activities⁵⁴. The idea that territorial imbalances in the intensity and quality of economic development are to be linked to the different factor endowments of individual territories is inherent in the essence of political economy⁵⁵. This dissertation examines Sicily, a characteristic region of Southern Italy and Europe, precisely located in the centre of the Mediterranean, which is subject to geographical disparity and top-down logic. The research question of this paper is as follows: *how should the Innovation Policy in Sicily be structured, what strengths should it exploit and what weaknesses should it overcome to make the area competitive?*. This paper will use a *place-based* logic, understanding of the institutions, history and corporate culture that are key characteristics that define a region, even if it is seen as disadvantaged (e.g. due to rurality, remoteness, harsh climate, sparse population)⁵⁶.

2.2 Analysis of Europe through the two-variable theoretical framework

The framework of this thesis is based on the theoretical model proposed by Markus Grillitsch & Bjørn Asheim (2018), which, in order to study contextualised innovation in Europe, compares a number of European regions according to two variables: industrial diversification (on the X-axis) and system differentiation (on the Y-axis). Diversification refers to business processes by which knowledge and resources from an existing industry can be utilised in a new one, whether related or not. Differentiation refers to *smart specialisation*, a tool that has been used by European regions since 2014 to maximise the effects of EIS fund investments, and which consists of countries' efforts to identify strategic sectors of existing and/or potential competitive advantage, where they can specialise and create capabilities in a way that is different from other countries (Asheim et al., 2017).

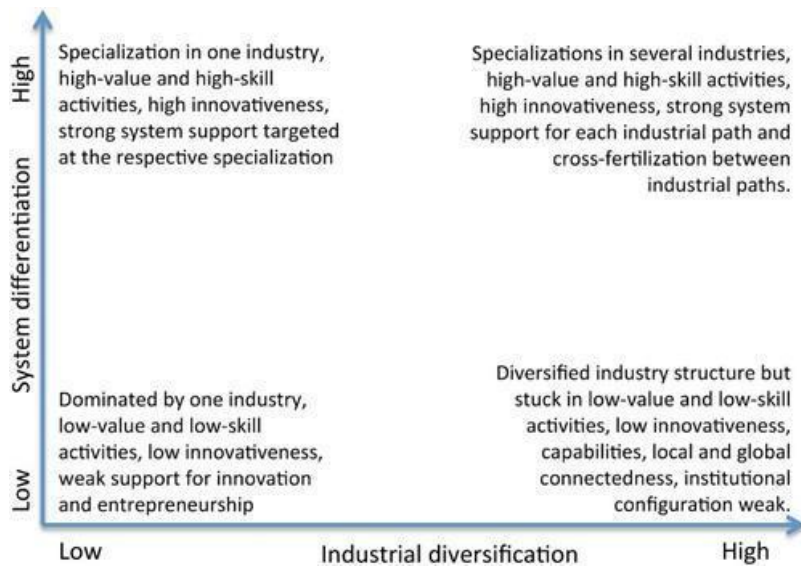
⁵³ Greunz, L. (2005). Intra-and inter-regional knowledge spillovers: Evidence from European regions. *European Planning Studies* 13.3: 449-473.

⁵⁴ Evangelista, R., Iammarino, S., Mastrostefano, V., & Silvani, A. (2002). Looking for regional systems of innovation: Evidence from the Italian innovation survey. *Regional Studies*, 36(2), 173-186.

⁵⁵ Parente, R. (2008). *Co-evoluzione e cluster tecnologici*. Aracne.

⁵⁶ Markus Grillitsch & Bjørn Asheim (2018) Place-based innovation policy for industrial diversification in regions. *European Planning Studies*, 26:8, 1638-1662.

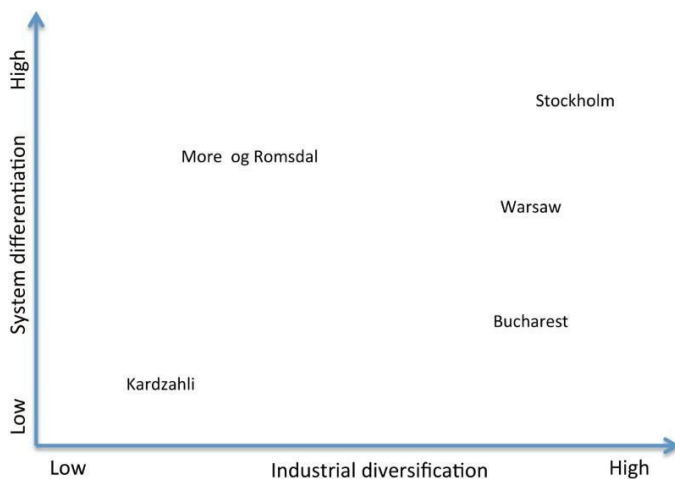
Figure 3. Representation of regional pre-conditions along two dimensions – system differentiation and industrial diversification.



Source: Grillitsch, M & Asheim, B. (2018), *Place-based innovation policy for industrial diversification in regions*.

Based on the two variables, Figure 4 examines the levels of the following European cities: Stockholm, Warsaw, Bucharest, Kardzahli and More og Romsdal. The first three cities are capitals committed to diversification of industrial activities and local and global connections, especially Stockholm, followed by Warsaw, where there are high levels of skills, asset value and innovation. In fact, there is also a high level of differentiation in these cities. Bucharest, on the other hand, fails to specialise in specific sectors, suggesting that the multitude of activities in which it diversifies are actually of low value and that its institutional base is low. Finally, More og Romsdal boasts a good quality of education and governance, which certainly favour the adoptability of innovations. Indeed, it has a good level of specialisation guaranteed by the renewal of its maritime cluster, which is one of the leading ones in the world. Kardzahil, on the other hand, has low levels of industrial activity: it is mostly engaged in agriculture, which, however, fails to contribute to economic innovation and, moreover, still fails to exploit a great potential related to tourism.

Figure 4. Empirical illustration of analytical framework.



Source: Grillitsch, M & Asheim, B. (2018), *Place-based innovation policy for industrial diversification in regions*.

The aim should be to generate vertical policies to build place-based competitive advantages, on the basis of an analysis of regional pre-conditions. According to Foray, one of the fathers of the smart specialisation approach, the European gap lies in an exaggerated homogeneity between the sub-systems, which in other words means that everyone engages in the same activities: there is a need to diversify towards more complex economic activities, while at the same time applying specialisation on the basis of untapped potential. "There are an infinite number of potential innovations, which are context-, sector-, and region-specific, and which will never be invented in Silicon Valley!" (Foray, 2017, p.47). It is correct to consider that each region has a different starting point: while metropolitan regions may suffer from fragmentation, which is characterised by a lack of networks, interactive learning, regional cooperation and mutual trust, old industrialised regions may face lock-in, often expressed by a strong regional clustering in mature and obsolete industries, and peripheral regions often suffer from organisational scarcity, which occurs when a region lacks sufficient agents to form a functioning system (Isaken, 2001). The bottom-up approach is strategic for any region, without distinction between north and south: to demonstrate this, the cases of Stockholm and Tel Aviv⁵⁷ will be presented in the next two paragraphs to demonstrate two successes resulting from harnessing local strengths, regardless of their geographical location.

2.3 Successful place-based model in the North: the case of Stockholm

As an illustration of the effectiveness of the bottom-up model in any location (North or South), a successful northern case based on the valorisation of its characteristic assets is reported: Stockholm, the capital of Sweden in Northern Europe. A high quality of governance, university, institutional base, innovative activities and entrepreneurial culture give it a good level of diversification and differentiation. This has made it easier for the city to attract funding and investors from all over the world. In this regard, the role of politics, which has been investing in technology for public services in Sweden since 1990, and incentives for digitisation have been decisive. Furthermore, the fact that the network of competent actors has cutting-edge technology, resources and financial capabilities allows for high-value activities. This is significant on a qualitative level because it determines an "organisational depth", but also on a quantitative level because it provides the basis for diversification into more areas. Stockholm has specialised in several fields, having reached a critical mass of expertise and players in industries such as automotive, aeronautics, electronics and mechatronics. Stockholm, an innovation leader in Europe, has been able to tap the potential behind the megatrends of digitization and sustainability early on, successfully investing in smart solutions in the areas of environment, digital technology and inhabitants' well-being. One example is the Valla Torg district, where energy retrofitting actions were implemented to reduce energy consumption by 60%. Other technologies have also been adopted to monitor the collection of waste, using an optical sensor and a scale to send feedback to citizens. As for transport, trains and city buses, they run on renewable fuels. Another typical element of Stockholm's

⁵⁷ The case of Stockholm is reported to represent Northern Europe. Whereas, the case of Tel Aviv, an Israeli city outside the EU, is analysed in this paper to observe a success in the Mediterranean (an extension of Southern Europe in which Sicily is also located).

innovation ecosystem concerns social innovation, which, through business development, incubation and knowledge dissemination, is aimed at stimulating entrepreneurship among young people and the protection of workers' rights. Stockholm is today regarded as the startup capital of Europe and in fact its innovation ecosystem, commonly known as “Sthlmtech”, produces startups worth more than \$1 billion per capita. SthlmTech is often referred to in the media as the “Silicon Valley of the Nordics”; however, this was not the intention of the planners, nor does it reflect its history or the people working there. Underlying these considerations is an analysis of the contextual differences between Silicon Valley and SthlmTech. In terms of the socio-political environment, the USA is characterised by deregulation, union repression, fiscal animosity, poor social welfare and neo-liberal policies. In contrast, in Sweden we find stricter (European) market regulations, high taxes and generous social welfare combined with reduced entrepreneurial risk. In addition, social equity would seem to be better ensured here due to employment support, leave policies, anti-discrimination laws and gender equality, thus fostering increased diversity in the entrepreneurial population.

2.4 Successful place-based model in the South: the case of Tel Aviv

In the Middle East, the State of Israel faces the Mediterranean Sea for almost 230 km. Tel Aviv, the Israeli capital, is the third largest innovation hub in the world, specialising in high-tech services. Israel has survived several calamities in the past and has an important history dating back to the persecution of people from all over the world, who came together after one of the worst tragedies of mankind to build an area in the middle of the desert. Moreover, being a small state, in terms of territorial extension, with few natural resources, Israel has thought to focus on the service economy, investing in particular in technological innovation and skills, in order to provide efficient services to the population and produce value to attract foreign companies and partners. Due to wars and security needs, it was forced to increasingly revolutionise its innovation system, especially military innovation. Thus, the knowledge-intensive services and software development of the 1980s enabled Tel Aviv to regain its competitive advantage. The Tel Aviv ecosystem is composed of 3869 tech-centered companies (entities with over \$1.000.000 in sales), 2052 start-ups, 191 R&D centers and 256 investors⁵⁸. In this Startup Nation, innovation is realised in startups and multinationals and is radical, technological and product-related. It boasts a significant amount of resources to operate in various research areas, such as medicine, agriculture, cybersecurity, robotics, energy, aviation and others. In particular, according to the Start-Up Nation Central (SNC), Tel Aviv has launched more than 350 agribusiness startups in the last ten years, demonstrating great potential in the \$8,7 trillion agribusiness technology sector⁵⁹. The Israeli innovation ecosystem is made up of open innovation, based on strong interconnection between people, effective public-private collaboration, the presence of capital from all over the world and a military industry

⁵⁸ Garbi, I., Garzik, L. (2022). Tel Aviv Innovation System. *Successful Innovation Systems. Future of Business and Finance*.

⁵⁹ Zebuloni, D. (2020, November 18). Ecco come Tel Aviv è diventata una superpotenza mondiale di tecnologia e innovazione. Retrieved from <https://www.mosaico-cem.it/cultura-e-societa/tecnologia/tel-aviv-superpotenza-innovazione/#:~:text=Secondo%20la%20Start%20Up%20Nation,8%2C7%20triloni%20di%20dollari>.

that acts as an accelerator⁶⁰. First of all, the uniqueness of the state must be recognised, as more than 70 ethnic groups and three religions coexist here, which must always demonstrate a spirit of adaptation and respect for diversity. Such multiculturalism triggers a vast network and international openness; indeed, in Israeli hubs, resources from all over the world work. The hierarchy-free model, summarised in the *kibbutz* concept, allows all actors to express their ideas on the basis of egalitarian principles. Furthermore, Israel has a good education system and is the third most educated country in the world (45% of inhabitants attend university). Governance is clear and provides public support in all sectors, following a horizontal policy. The financial system, based on the venture capital market, is dynamic and prone to risk: the Yozma programme was launched in 1993 to encourage foreign investment by private capital, which actually increased by 6000% between 1991 and 2000⁶¹. Moreover, it imposes fairly low taxes compared to the rest of the world, with rates between 6 and 12%, which seem to point towards deregulation. Israel invests incredibly in research: 4,54% of GDP (Italy in 2019 invested just over 1%). The university is a key player in local research, from which ideas and technologies are derived for the creation of new businesses and to which research centres such as Yeda and Yissum are linked. In addition, the Israel State Innovation Authority (IIA) has been established, an independent organisation supported by the government that manages government funds of \$ 500 million a year and operates on the basis of a bottom-up approach, i.e. without deciding a priori where to allocate investments, but leaving the choice to the market. While in Silicon Valley there is a strong link between university and enterprise and the target market is, primarily, the United States, in Israel there is a perfect alignment of interests between start-ups, multinationals, the government and the university: each participant puts in something and gets more. something and gets more⁶².

2.5 Analysis of Sicily through the four-variable experimental framework

As Markus Grillitsch & Bjørn Asheim (2018) specify, since the empirical cases are most likely not to score exactly high or low on all aspects of system differentiation and industrial diversification, it cannot expect to observe stylized regional types such as those described in the model. The fact that regional preconditions actually contain many elements that manifest themselves on continuous scales provides the cue to opt for place-based policies. In order to develop a more in-depth contextualised analysis of the Sicilian innovation system, a new framework is proposed in this dissertation, which adds to the two variables proposed by the aforementioned authors, the study of two other variables, namely *governance* (on the X-axis) and *sustainability* (on the Y-axis). A functional innovation model that effectively responds to local needs must be able to integrate the business context with the study of public administration and the commitment to the macro-area of sustainability, which are decisive in defining the quality of life. A place-based policy is defined as "a

⁶⁰Sviluppumbria (2021, October 7). *Gli ecosistemi dell'innovazione. Alcuni modelli di successo*. Retrieved from: https://www.sviluppumbria.it/documents/20182/381205/Report_Modelli+EI.pdf/5346d082-628a-476c-861c-1770232f28d4

⁶¹ Garbi, I. & Garzik, L. (2021).

⁶² Sviluppumbria (2021, October 7). *Gli ecosistemi dell'innovazione. Alcuni modelli di successo*. Retrieved from: https://www.sviluppumbria.it/documents/20182/381205/Report_Modelli+EI.pdf/5346d082-628a-476c-861c-1770232f28d4

long-term strategy aimed at addressing persistent underutilization of potential and reducing persistent social exclusion in specific places through external interventions and multilevel governance” (Barca, 2009). Below is the theoretical explanation of the two added variables, which will then be analyzed in Chapter 3, along with the other two, through the case studies.

Governance

Governance capabilities for innovation, coordination mechanisms, power and trust are strongly emphasized in the literature as critical links to strengthening institutional capacity (Antopoulos et al., 2009; Betulla and Cetrioli, 2010). The regional institutional framework shapes the learning process in a region (Oughton et al., 2022). Governance refers to the ability of public administration to manage and direct networks, involving diverse public and private actors in policy-decision-making processes, promoting dialogue, shared responsibility and participation (EC, 2001). The difficulty of multilevel governance underscores the need to create coordination mechanisms to ensure policy management between different policy contexts (horizontal coordination), between regional, national and European policy hierarchies (vertical coordination) and between different actors (business, public agencies, higher education/research organizations, social sector, community, etc.) (Amin & Tomaney, 1995; Kastrinos & Romero, 1997; Landabaso, 1997; Tödting & Trippel, 2005). The governance variable is thus crucial to understanding spatially diverse interests, the degree of administrative autonomy and simplification, and the management of public services, which nowadays must give way to digital and quality services.

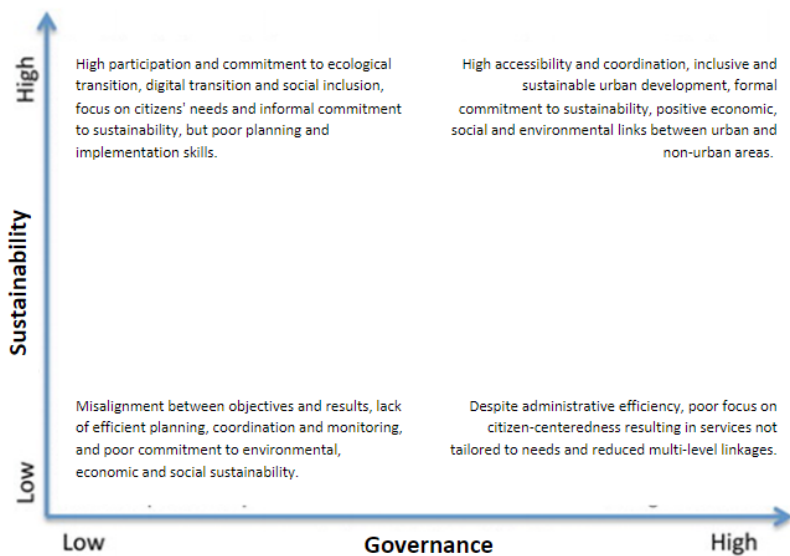
Sustainability

There is an important combination of innovation and sustainability that consists in a reinterpretation of the concept of economic development, which must aim at wealth creation, but also intends to eliminate negative impacts on ecological systems, human health and community well-being. Sustainability, which has become a crucial requirement for ecosystems, requires respecting the centrality of the needs of citizens, or more generally of "city users" (resident, commuter, tourist, worker, consumer), using digital as a tool for accessibility and aiming at the social, environmental and economic sustainability of the urban environment⁶³. The importance attached to this variable expresses the true essence of innovation ecosystems, which, unlike national ones, must be more specifically tailored to local needs to solve emerging problems and improve the quality of life (Oksanen, K., & Hautamäki, A., 2015).

While figure 3 will be referred to for the area called *Entrepreneurial Dimension* in this paper, the following graph (figure 5) shows the two new variables, which will constitute the Dimension *Quality of Life*. The two dimensions, and their respective graphs, will constitute the framework of this dissertation.

⁶³ EY (2022, June 30). City of Humans - Human Smart City Index 2022. Retrieved from: https://assets.ey.com/content/dam/ey-sites/ey-com/it_it/topics/workforce/humansmartcityindex_2022.pdf

Figure 5. Representation of regional pre-conditions along two dimensions – sustainability and governance.



Source: Own elaboration.

CHAPTER III. ANALYSIS OF THE PRODUCTIVE ECOSYSTEMS OF PALERMO AND CATANIA

3.1 Methodology

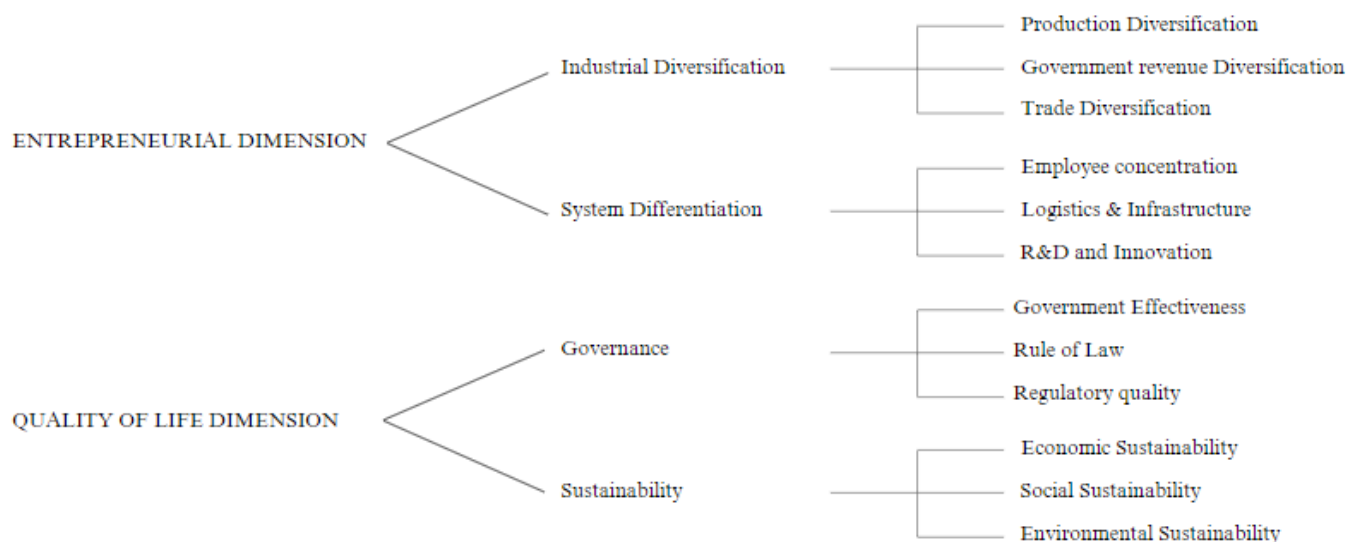
Based on the four-variable experimental framework, aimed at the formulation of a place-based Innovation Policy, this paper adopts an inductive-experimental reasoning, starting from the experience of individual contexts, from which hypotheses are derived based on quantitative data, understood as relations between variables, to arrive at the definition of the regional context. Therefore, in order to provide a more in-depth analysis, the research analyzes Sicily's two main production ecosystems, namely the Metropolitan City of Palermo (section 3.2) and the Metropolitan City of Catania (section 3.4). They are the two largest ecosystems in Western Sicily and Eastern Sicily respectively, in terms of population, surface area, density and major relevance on the regional economic system⁶⁴. In detail, it will proceed through the study of the two dimensions mentioned above (section 2.5): Entrepreneurial Dimension and Quality of Life Dimension. As shown in Figure 6, defining the first dimension are the variable of Industrial Diversification and System Differentiation, which will be examined through the indicators argued in the study by Markus Grillitsch & Bjørn Asheim (2018): production diversification, government revenue diversification and trade diversification; employee concentration, logistics & infrastructure and R&D & innovation. The second dimension "Quality of Life" includes Governance and Sustainability, which represent the two additional variables, which have been included in the theoretical model to make it more contextualized. In particular, the indicators provided for the calculation of the Institutional Quality Index (IQI) will be used to analyze Governance: Government effectiveness, Rule of law and Regulatory Quality. The IQI is an index that measures the quality of public institutions at provincial level and, based on objective data, considers public services, territorial economic activity, justice, corruption, cultural level and citizen participation in public life⁶⁵. On the other hand, to analyze Sustainability, will use the calculation of the Sustainable Equitable Wellbeing indicators (BES), developed by ISTAT and CNEL, divided between the three macro-areas, namely economic, social and environmental⁶⁶.

⁶⁴ It should be recalled that in Sicily, a region with a special statute, Regional Law No. 7 of 27 March 2013 abolished the regional provinces, setting the terms for the establishment of metropolitan cities, whose territorial perimeter remains unchanged.

⁶⁵ Casamonti, M. Liaci, S. (2021, May 19). *La qualità delle istituzioni pubbliche nelle province italiane*. Osservatorio CPI. Retrieved from: <https://osservatoriocpi.unicatt.it/cpi-archivio-studi-e-analisi-la-qualita-delle-istituzioni-pubbliche-nelle-province-italiane>

⁶⁶ It should be noted that, in order to make the search smoother and clearer, three indicators were selected for each variable and, in cases where certain indices comprised more than three indicators, the latter were appropriately grouped by macro-area.

Figure 6. Indicators of Industrial Diversification, System Differentiation, Governance and Sustainability variables.



Source: Own elaboration.

The discussion of the four themes, which can vary from “low” to “high” grade according to their efficiency, will allow in the last chapter to position Palermo and Catania within the empirical graphs (with reference to Figure 3 and Figure 5 in chapter two). The research is based on two macro-cases of study at provincial level, the extension of which certainly requires a multitude of data and information. The definition of each variable will first of all be derived from objective results of official statistics from: ISTAT, EUROSTAT, ANAC, Cerved, InfoCamere, Reports of the Metropolitan City of Palermo and the Metropolitan City of Catania and the institutional websites of the Sicilian Region⁶⁷. Then, as Grillitsch and Asheim suggest, while hard data provides background information about structural preconditions, the opportunities for new path development will rest largely on factors that are not measurable quantitatively. Therefore, this picture needs to be complemented with the inspirations and perceived future of regional actors, which is only possible through qualitative approaches⁶⁸. For this reason, this text is enriched by the elaboration of four interviews that will be perfectly integrated within this chapter to confirm the statistical investigations. As generators of subjective results that cannot be functionally generalised to the entire provincial context, unlike statistics, they will serve as a supporting tool from whose experience it is necessary to learn. Two interviews were conducted for each case study, one specifically with a local reality and the other with an external reality operating in Sicily. Those conducted in the City of Palermo were subjected to: Professor Pietro Paolo Corso, researcher and delegate of the Rector of the University of Palermo, and Professor Enrico Foglia, co-founder of the Regenerative Marketing Institute and consultant at Bip Consulting. The two interviews conducted in the City of Catania

⁶⁷ For the development of the research, the available data from the most recent surveys were selected. It should be noted that, due to the failure to update official data, it is sometimes possible that the latest data for the Region of Sicily date back to the year 2019.

⁶⁸ Markus Grillitsch & Bjørn Asheim (2018) Place-based innovation policy for industrial diversification in regions. *European Planning Studies*, 26:8, 1638-1662.

were submitted to: Dario Strano, CEO of Strano S.p.A., and Eliano Russo, head of Enel Green Power's 3Sun Gigafactory in Catania. The link between the four interviews is innovation, as the four personalities are involved in important innovation projects in the Palermo and Catania area.

Professor Corso is university lecturer teaching Physics and delegate of the Rector of the University of Palermo for extra-ordinary projects and the University's digital infrastructure. He is the scientific responsible, for the University of Palermo, of the PON Smart Cities project and is involved in the scientific collaboration agreement "Adaptive eLearning platform based on the acquisition of context information and data analysis through Sentiment Analysis and feature extraction algorithms" and "Innovative ICT Platform for PA Process Management". In addition, he is the founder of Palermo's first University Spin-Off "U4Learn s.r.l.", engaged in the provision of eLearning courses and solutions to support continuous and innovative training. Professor Corso also boasts a series of consultancies on behalf of third parties and more than 30 publications on technological and scientific subjects. His research areas are: advanced scientific computing (in particular High Performance Computing), theoretical study of the interaction of laser radiation (in the sense of atoms, molecules and nanomaterials), development of information systems in the health sector, design of Cloud systems and systems for advanced management of Public Administration and platforms for Big Data Analytics.

Enrico Foglia is strategic consultant for top management at BIP Consulting and university lecturer teaching Law, Digital Innovation & Sustainability at Luiss Guido Carli University. The multinational BIP, a consulting company with 13 offices worldwide, has recently invested in Palermo to open a new office, the only one in Sicily, with the aim of "providing expertise and experience in digital, innovation, cybersecurity and sustainability to trigger a process of acceleration of digital innovations in the local context, so as to reduce emigration and the digital divide". In particular, together with Philip Kotler and Christian Sarkar, Mr. Foglia has initiated a regenerative marketing project in the city of Palermo, aimed at local development, with a focus on tourism and the extension of the economy beyond the tourism sector. In addition, he has extensive experience in international companies, including EnelX, Procter & Gamble, Mastercard, Finmeccanica and General Motors.

On the Catania side, Dario Strano is the CEO of Strano S.p.A., a company founded in Catania in 1945 by Roberto Nunzio Strano and among the first in Italy in the field of electrical, electro-industrial, lighting, home automation security systems and thermo-hydraulics supplies. It is a family business, now in its third generation, with 350 employees and a turnover of 160 million euros. It offers specialized technical consultancy on both the advanced tertiary market and the private supply market. In the areas of photovoltaics, security, ITS and robotics, it was the first electrical wholesaler in Italy to integrate these business divisions into its structure. The operations center is located in the Industrial Zone of Catania: a modern headquarters, the hub of the group, where the group's strategies come to life. In the headquarters is the distribution center (CE.DI), an imposing structure of more than 35,000 square metres covered by 12 metres in height with the capacity to

handle more than 60,000 articles. In addition to this there are showrooms dedicated to lighting technology and bathroom furnishings (H2O) capable of responding to every need of professionals, designers and private individuals. Strano S.p.A.'s offices are distributed throughout Sicily, Calabria and Malta, with a total of 19 sales outlets and 2 distribution centers in Catania and Lamezia Terme.

Eliano Russo is the head of Enel Green Power's 3Sun Gigafactory, based in Catania, precisely in the so-called Etna Valley. The company was founded in 2010 from an equal joint venture between Enel Green Power, Sharp and STMicroelectronics. 3Sun's mission is to “produce photovoltaic panels in Europe and abroad, combining research, innovation and sustainability in the construction of next-generation photovoltaic modules, to support Enel and other companies in the clean energy transition”. The 3SUN Gigafactory is the most automated factory in the world in the solar industry and serves major international markets. The core technology is the 3SUN CORE-H heterojunction (Hjt), which combines layers of crystalline silicon and amorphous silicon, entirely developed by 3SUN. This technology allows more solar energy to be extracted, making solar modules more efficient and competitive. Furthermore, with the European Commission, the company signed an agreement for innovation projects, from which TANGO (iTalian pv Giga factOry) was born, which envisages the construction of an industrial plant for the production of innovative and sustainable photovoltaic cells and modules. Thanks to the research project, 3Sun's production capacity will increase from 200 MWp to over 3 GWp per year.

PALERMO'S PRODUCTIVE ECOSYSTEM

3.2 Entrepreneurial Dimension in Palermo

The Metropolitan City of Palermo, in terms of territorial extension and administrative boundaries, coincides with the former Province of Palermo, including the capital of Sicily. It is the largest area on the Sicilian territory, with an area of 5009.28 km², 82 municipalities and 1.214.291 residents. The production ecosystem comprises six macro-systems. The Partinicese system comprises three sections of the socioeconomic milieu, including the Partinico-Alto Belice agricultural system, the western tertiary manufacturing system and the tourist system on the west coast⁶⁹. The prevailing sector in terms of added value, as in the rest of the province, is the tertiary sector; while the industrial area of Carini has been in sharp decline since the closure of important industrial sites, mostly engaged in the automotive industry. The closure of the former Fiat plant in Termini Imerese was especially decisive for the Imerese - Valle del Torto system, with serious consequences in terms of both employment and development prospects, to the point that today there are still no valid projects for plant reconversion. In the Palermo macro-system, there are five milieu systems: the inner metropolitan belt, the capital, the agro-industrial and tourism system on the east coast, the west manufacturing system and the

⁶⁹ Città Metropolitana di Palermo (2022). *Relazione Performance*.

tourism system on the west coast. Due to the large concentration of cultural assets, the productive specializations are purely related to tourism. In particular, the Madonita - Cefaludese system, thanks to one of the main coastal tourist districts and the Madonie Park, has two major factors of tourist attraction, in addition to being involved in quality agricultural production. Finally, the Corleonese system and the Alto Belice system are strongly involved in the agricultural sector, with some D.O.C. specialities, especially in the wine sector, and also in tourism, limited, however, by critical points in the transport system and connections.

Variable I: Industrial Diversification

In Palermo, the **number of active enterprises** in 2022 is 79.368 and, despite the variation of -226 compared to the year 2010, it is indicative of continuous growth recorded over the last three years following the major negative peak reached between 2015 and 2020. The number of enterprises in Palermo contributes 20,6% to the total recorded in Sicily and 1,5% to the total in Italy. In 2022, the largest share of the local economy is concentrated in sector G (Wholesale and Retail Trade) with 35%, followed by sector A (Agriculture) with 12,6%, sector F (Construction) with 11%, sector I (Accommodation and Food Services) with 7,7% and sector C (Manufacturing) with 7%; the remaining sectors occupy less than 4%⁷⁰. The only sectors in which Palermo deviates by several points from the Sicilian average are agriculture, mining and manufacturing. This scenario clearly shows the prevalence of the tertiary sector in Palermo's economy, as in the cities of Catania, Trapani, Agrigento and Syracuse, unlike all the other municipalities belonging to the same provinces and especially those located in the Sicilian hinterland, where the primary sector prevails⁷¹. In fact, if we consider the macro data at regional level, the tertiary sector only employs 14.9% compared to the 70.8% occupied by the primary sector. The secondary sector, on the other hand, accounts for 14.4% in Sicily. With regard to local industry, the only outstanding element concerns Palermo's shipyards, and in fact the province's main source of exports consists of ships and boats⁷². Palermo's industrial fabric clearly has gaps that have historically prevented the development of local and global businesses and networks. As Enrico Foglia explained during the interview, the number of companies per capita in Palermo is lower than both the average of Sicily and the rest of Italy, and furthermore, the system is mainly made up of small and medium-sized enterprises, with a number of employees less than or equal to 249. As evidence of this, Istat counts 63.970 enterprises with 0-9 employees, 2258 enterprises with class 10-49, 161 enterprises with class 50-249 and 34 enterprises with more than 250 employees. This factor, also considering that in Palermo the main source of income comes from the Public Administration (PA), and only to a small extent from corporate business, certainly hinders the possibility of successful progress and innovation. Moreover, an economy that survives only on services is not able to

⁷⁰ Camera di Commercio delle Marche (2023, August 3). Imprese attive in Italia per Territorio, Settore Ateco e Tempo. Retrieved from: <https://opendata.marche.camcom.it/stock-impres.htm?url=https://opendata.marche.camcom.it/data/Stock-Imprese-Attive-Italia.json&f2v=22>

⁷¹ iFel (2022). I comuni italiani 2022. Retrieved from: https://anci.lombardia.it/documenti/15154-IFEL_I_Comuni_italiani_2022.pdf

⁷² Ministero del Commercio Internazionale. Scheda regione: SICILIA. Retrieved from: https://www.mimit.gov.it/images/stories/recuperi/Impresa_internazionalizzazione/mincomes/DIREZGENE/schedasicilia.pdf

diversify and benefit from a margin to survive in the event of sudden economic shocks. In fact, the Covid-19 pandemic crisis affected the production capacity of more than 30% of the smallest companies, with the greatest incidence in the service business, which was the most affected by the health emergency⁷³. Diversified production also contributes to diversified education, since the increase in human resources with different skills and training in the labour market corresponds to a greater probability of success in more sectors, explained by the strategic transfer of knowledge from one field to another. Palermo provides a wide range of training in schools and in the university, which according to Censis with a score of 80,8 points is the best performing in Sicily. But the aptitude of those enrolled at UniPa is directed towards courses in economics, political-social sciences and the humanities, with less interest in STEM disciplines.

Palermo has an intensified **public revenue system**, heavily dependent on limited sources such as natural resource taxation, which typically exposes public finances to volatility and uncertainty, compromising budgetary sustainability⁷⁴. This factor affects the reduction of economic diversification of the territory. The collection capacity⁷⁵ of the provincial administration is 94,2%⁷⁶, the highest value in the whole of Sicily and also compared to the national average (85,5%). The budget drawn up by the Metropolitan City of Palermo for 2023, which can be consulted in the transparent administration section, reports total general revenues of 611.979.653,41 euro⁷⁷. Capital revenue contributed 33%, current revenue of a fiscal nature (including taxes and duties) 11,1%, current transfers 14,1% and extra-tax revenue 1,22%. It should be noted that the total current transfers, amounting to 86.395.498,06 euro, derive mainly from the item “current transfers from public administrations”, which account for 97%. According to ISTAT, in the tertiary sector in the province of Palermo, the largest share of added value, i.e. 34% of Palermo's economy, comes from Public Administration and Defence (in all the sub-categories of education, health, social assistance and artistic and entertainment activities), which, with a value of 5063,3 euro at basic and current prices, is double that of Catania and about three times that of all the other Sicilian provinces, also exceeding the overall average for Southern Italy. The only southern province that benefits the most from the tertiary sector is Naples, even though the relative added value of the public administration remains lower than Palermo, demonstrating that, despite the large public revenues, the Neapolitan economy also feeds on other sectors, with a total number of enterprises of 257.200.

Lastly, with regard to the area's **commercial diversification** and degree of internationalisation, it is necessary to assess the amount of Palermo's exports, which in 2022 amounted to 322 million euro, without being able to contribute to total Italian exports⁷⁸. Among the metropolitan cities, Palermo is the only one that recorded a

⁷³ Istat (2022, May 10). *Due anni di Pandemia: l'impatto su cittadini e imprese*. Rapporto annuale 2022 (chapter 2). Retrieved from: https://www.istat.it/storage/rapporto-annuale/2022/Capitolo_2.pdf

⁷⁴ Mohammed Bin Rashid School of Government (2023). *Global Economic Diversification Index*.

⁷⁵ The collection capacity is the ratio of the accruals to the collections for the financial year.

⁷⁶ Elaborated on ISTAT data - BES2023_territory.

⁷⁷ Città Metropolitana di Palermo (2023). *Parere dell'Organo di revisione sulla proposta di Bilancio di previsione 2023 – 2025 e documenti allegati*.

⁷⁸ Città Metropolitane a confronto (2022). Commercio estero dati e grafici. Retrieved from: <http://inumeridibolognametropolitana.it/citametropolitaneconfronto/economia/commercio-estero>

negative change of 0,7% compared to 2021. The absolute value of imports, on the other hand, is 1.229 million euro, which corresponds to 0,2% of total Italian imports⁷⁹. Compared to 2021, they increased by 35,1% (above the national average of 30%). Palermo is the last province in terms of export volume in relation to GDP, with 1,9%, confirming a weakly export-oriented local economy. While ships and boats are the main exported products, motor vehicles are the most imported in the province⁸⁰. The main country to which it exports is Germany, while from which it imports is France⁸¹. Finally, in 2022, Palermo's trade balance is -907 million euro, i.e. a variation of -322 million euro compared to 2021. Therefore, it falls into the category of provinces with a worsening negative balance variation.

Variable II: System Differentiation

In 2022, the statistics on the **number of employees** confirms a greater concentration in the tertiary sector, specifically in Wholesale and Retail Trade with 25,34% (the highest value in Sicily, after Catania and Agrigento), followed by Construction with 10,71% (a result, however, lower than all the other Sicilian provinces) and Accomodation Services with 10,63% (also overcome by Trapani, Siracusa and Messina)⁸², and then moving far away from the percentage recorded in all the other sectors. The added value from services in Palermo is 87%, incredibly higher than the average in Sicily of 14,9% and in Italy of 9,8%⁸³. Tourism is considered a local excellence by public opinion, thanks to its vast cultural and landscape heritage, which certainly represents great potential. Palermo, in Sicily, is first in terms of the number of arrivals (503.529) and the number of tourist presences (1.396.417)⁸⁴. Added to this are the excellent gastronomic products, marketed at very cheap prices. Actually, it is also necessary to recognise the important relationship between tourism and the agricultural sector, which should translate into programming plans, in investments aimed at urban regeneration, the rehabilitation of degraded contexts and support for production. However, the results in terms of efficiency are not as impressive. Among the 15 metropolitan cities, Palermo is third last with a tourism index of 1,1 presences per inhabitant, followed only by Catania and Reggio Calabria, which drops to 0,34 presences per inhabitant in the non-summer months⁸⁵. There are 198 accommodation facilities and the accommodation rate is 3.302,9 beds per 100,000 inhabitants, below the national average. In addition, there is a widespread inability to enhance the place through entertainment events or strategic marketing, and to protect the cleanliness of the environment, which in most cases leaves tourists in awe. In the ranking of the 107 Italian

⁷⁹ *Ibidem.*

⁸⁰ Ministero del Commercio Internazionale. Scheda regione: SICILIA. Retrieved from: https://www.mimit.gov.it/images/stories/recuperi/Impresa_internazionalizzazione/mincomes/DIREZGENE/schedasicilia.pdf

⁸¹ *Ibidem.*

⁸² Camera di Commercio delle Marche (2023, August 3). Addetti Localizzazioni attive. Retrieved from: <https://opendata.marche.camcom.it/pivot-table.htm?indic=Addetti>

⁸³ iFel (2022). I comuni italiani 2022. Retrieved from: https://anci.lombardia.it/documenti/15154-IFEL_I_Comuni_italiani_2022.pdf

⁸⁴ Città Metropolitane a confronto (2022). Il Turismo dati e grafici. Retrieved from: <http://inumeridibolognametropolitana.it/cittametropolitaneconfronto/economia/turismohttp://inumeridibolognametropolitana.it/cittametropolitaneconfronto/economia/turismo>

⁸⁵ *Ibidem.*

provinces by added value, in the services sector Palermo ranks thirteenth. However, as Prof. Corso and Prof. Foglia agree, Palermo has not surpassed the critical mass of actors and skills to be able to declare itself specialized in a particular field. According to Professor Corso, the concept of “specialization” and “intelligent” cannot walk together in Sicily, as the results show that specialization is applied in a non-strategic manner, and there is very little that is intelligent about it.

According to the Cerved report, Palermo ranks eighth for **infrastructure system**, among those Italian provinces with international airports, large port areas, and internal network nodes. With 105 points, it demonstrates a better infrastructure system than the other “fragile provinces” in terms of economic sustainability, including Catania, Reggio Calabria and Taranto. The mobility infrastructure of the metropolitan city of Palermo is characterized by the presence of two main motorway arteries connecting the three metropolitan cities of Sicily, the A20 Palermo-Messina motorway and the A19 Palermo-Catania motorway: the latter, following the collapse of the Imera viaduct in April 2015, is currently interrupted, constituting a very critical link between the two metropolitan poles⁸⁶. Considering the various interruptions and interminable works on the 600 km of motorway, the level of efficiency is low, especially outside the territory of the capital, where the condition of connections with the rest of Sicily tends to worsen. This certainly has repercussions at a regional level, but also at a national level if, to reach the rest of the peninsula by land, 236.4 km must be travelled in uncomfortable conditions from Palermo to the Strait of Messina. These logistical problems, as denounced by Cna Fita Sicilia, place the transport of goods and persons in serious difficulty, with repercussions on the development of the territory. In addition, the vehicles used for transport are obsolete and polluting and in fact 57% of commercial vehicles are pre-euro 4. E. Foglia, sees logistics as the main cause of the failure of the Fiat plant in Termini: “for Fiat to build a Panda there cost much more for logistics factors, labour costs and bridge drainage. There are still no economically viable conditions for investing in an industrial hub and no one would pay extra for it rather than opt for another area”. Indeed, the industrial area of Termini Imerese, opened in 1970 and used by Fiat for the production of small cars until 2011, has seen a succession of innovative projects that have had very little life expectancy. Among these was the case of Blutec S.p.A. in 2015 for the production of car components, to exploit existing plants and expertise. However, the directors were arrested for embezzlement to the detriment of the state, declaring yet another case of infiltration of business projects and management of public funds. Regarding the same discouraging condition of Sicilian ports, Palermo would seem to gain a few more points, being the main port for container ships. In 2022, the port of Palermo once again achieved a record in terms of cargo and passenger traffic, following the loss caused by the Covid-19 pandemic: the port of Palermo handled 7.30 million tonnes of cargo (an increase of 6% compared to 2021 and 33,5% compared to 2019). In 2023, the Steering Committee unanimously voted for the entry of the port of Palermo, and therefore of the Port System Authority of the Western Sicily Sea, into the

⁸⁶ Papa, R., Battarra, R. and Gargiulo, C. (2016) *Città Metropolitane e Smart Governance: Iniziative di successo e nodi critici verso la Smart City* (Volume 1). Federico II University Press.

European School of Intermodal Transport, a centre for advanced training in intermodal transport for sustainable logistics. This represents an opportunity for Palermo's role in logistics and maritime-port professions in the South. As for soft mobility, the endowment of cycle paths in the Sicilian capitals amounts (as of 2019) to about 75 km, of which 63,3% in the municipality of Palermo; while the other provinces record very low values and as many as three (CL, EN and TP) have no cycle paths⁸⁷. However, services related to transport, rental and accommodation are characterized by disorganization and reduced innovation.

The third element that strongly influences the production system's chances of specialization is investment in **innovation**. In the provincial analysis, Palermo belongs to the second lowest quintile in terms of both R&D expenditure by companies and current expenditure by companies' personnel on R&D activities, which does not exceed 15 million euro⁸⁸. On the other hand, the value rises when considering R&D expenditure by funding from Italian public institutions, placing it in the top quintile, and the same applies to funding from abroad, where only Palermo, in the region, exceeds 10%. In particular, the highest expenditure is recorded in the experimental development category, where it exceeds 63%. The generation turnover index of researchers in companies spending on R&D is in the median quintile, between 1,55 and 1,87%. The number of researchers under 25 years of age is mainly employed in companies in Northern Italy and in Palermo remains below the threshold of 0,88%. The highest concentration of expenditure is employed in NACE Rev.2 sectors 13,14,15,62, 63, 72⁸⁹. However, according to the ISTAT survey based on the LISA (Local Indicator of Spatial Association) methodology, which uses spatial association indices to contextualize the percentages calculated with respect to the resources and connections present in the location, it can be stated that the province of Palermo is a “non-significant cluster” in all the sectors considered (10-12, 13-15, 28, 29, 30, 62-63 and 72). According to the OECD, the propensity to patent in 2019 is 7,4 per million inhabitants, 3,9 percentage points higher than in 2017 and 1,4 points lower than the regional average⁹⁰. On the other hand, the municipalities with fully online household services are 14,8%, the third highest value among all Sicilian provinces. In the dissemination of innovation, the university must play a fundamental role. The University of Palermo, according to the Censis 2022 ranking, qualifies as the best mega-university⁹¹ in Sicily and seventh nationwide, with a score of 80,8 points⁹². However, Professor Foglia criticises the lack of a network between government, businesses and universities to share know-how: “it is not enough to have the physical asset, as the port of Palermo can be (for example), but it is necessary to build on it a system of development, infrastructure, communication and skills. It is fundamental to have technicians, to do research and to have an international position”. During the

⁸⁷ Agenzia per la Coesione Territoriale (2022). *Programma SFC2021 finanziato a titolo del FESR (obiettivo Investimenti a favore dell'occupazione e della crescita), del FSE+, del Fondo di coesione, del JTF e del FEAMPA* - articolo 21, paragrafo 3.

⁸⁸ Istat (2021). *La spesa in Ricerca e Sviluppo*. Retrieved from: <https://www.istat.it/it/files/2021/05/La-spesa-in-ricerca-e-sviluppo.pdf>

⁸⁹ Textiles, clothing, leather goods manufacturing (Ateco 13-15), Software production, IT consultancy and services (Ateco 62-63), Scientific research and development (Ateco 72).

⁹⁰ Elaborated on ISTAT data - BES2023_territory.

⁹¹ The mega-university is a public university with over 40.000 enrolled students.

⁹² Censis (2022). *La Classifica Censis delle Università Italiane (edizione 2022/2023)*.

interview, he recalls the case of the ARCA Consortium, a university incubator for start-ups in Palermo. Set up in 2023 as a partnership between the University of Palermo and the university consortia of Agrigento, Trapani and Caltanissetta, it has developed over 80 projects, more than half of which are now companies. The consortium acted as support, developing business models and searching for partners. In addition, together with the Federico II University of Naples, it had become project coordinator for Eit health, an independent organization co-founded by the EU to promote enterprises in Italy and to participate in the EEN (Enterprise Europe Network) circuit. However, due to territorial obstacles to the detriment of business and innovation, the incubator went into liquidation in 2022. Another project, in collaboration with the Region, in which Professor Corso is participating, concerns the enhancement of the role of the four universities: Palermo, Enna, Messina and Catania. He explains: “based on the three pillars of the university, i.e. teaching, research and third mission (relations with the territory), it is fundamental that the public administration conceives of universities as intermediary bodies rich in potential to create innovation hubs and territorial development”.

The data gathered so far shows how misleading it can be to believe nowadays that Palermo is specialised in one particular sector. In any case, according to Professor Corso, the area has enormous potential in several assets, so it could opt for a *diversified specialisation*: among these, certainly the most valuable elements are culture and leisure, tourism, gastronomy and land products. An example given by the professor dates back to the early 2000s in San Francisco, where 200g trays of Belice olives were sold for \$200 each: this is an unstrategic approach to the market, which should be replaced with a support system, made up of local partnerships and trade agreements, and thus create a supply chain that is not the prerogative of the individual. He also comments: “the gastronomic supply chain is certainly a peculiar fact, but we are not able to valorise our gastronomic products because we have not reached critical mass. The value of km 0, in my opinion, is pure rhetoric: if km 0 leads to remaining in the economic pleistocene, the products will remain local, but will not be valorized because there will be no one able to buy them at the right price. So it is necessary to get out of the local context and attack (constructively) the high-spending markets in order to valorize the products”.

3.3 Quality of Life Dimension in Palermo

Variable III: Governance

According to the Institutional Quality Index (IQI), an index that measures the quality of public institutions at the provincial level, in the 2021 Italian ranking, the Mezzogiorno occupied the last level and Sicily the last position. In Italy, the provincial average of the IQI index is 58%. Palermo is in 98th place with 16% and a positive variation of 5% compared to 2004, followed at the bottom of the ranking only by Catania, Trapani, Caltanissetta, Crotone and Vibo Valentia. Compared to the previous year, however, the index decreased by 3 points, mainly due to the change in government effectiveness and rule of law.

In order to assess the indicator of government **effectiveness**, it is intended to investigate the quality of services offered by the public administration. According to the data collected in 2019, Palermo ranks at the bottom of

the ranking in 92nd place with the value of service quality at 17.6%, which has been almost stable since 2015⁹³. Instead, the highest value is reached by Florence with 78%. At the regional level, Palermo is surpassed by the provinces of Agrigento, Caltanissetta, Enna and Messina. From the analysis of the infrastructural theme, already addressed in the previous section as logistics is fundamental to understanding business dynamics, it clearly emerges that Palermo suffers from a high saturation of the motorway axes entering and leaving the city, both towards Trapani and Messina. In terms of transport, Palermo still offers 1823 km of public service per inhabitant, certainly more than Sicily where it is the capital, but less than the Italian average of 4624 km. Palermo exceeds the Italian average in terms of the number of buses, which are 193 per 100,000 inhabitants (Italian averages is 170), 62.4% of which are dedicated to public use⁹⁴. The anomalies in the functioning of mobility cause the risks to the right to move comfortably and freely. Then, with regard to education, the number of children between the ages of 0-2 who have used childcare services is 5,5% and the number of accessible schools is 28,9%⁹⁵. In health care, Palermo manages to recover a few points thanks to the quality of its services and skills in the medical field, and in fact hospital emigration to other regions, at 4,2%, is lower than both Sicily (5,9%) and the Italian average (7,3%). The number of specialist doctors is 40,6 per 10,000 inhabitants, higher than the national value of 30,2. In the matter of healthcare, during the interview Professor Enrico Foglia mentions the new Centre for Biotechnology and Biomedical Research of the Ri.Med Foundation in Carini (PA), the new Mediterranean hub for medical research, on whose campus the ISMETT2 hospital is also located. The mission is to transfer the results of scientific innovation into cutting-edge clinical applications, benefiting from a network that includes the National Government, the Sicilian Region, the National Research Council, and foreign partners such as the University of Pittsburgh and UPMC.

Finally, another important aspect concerns the index of the digital performance of the public administration, that gives the City of Palermo 48% of the quality and the PA sites 52%. Moreover, Professor Corso says: "a recent revolution has been cloud computing, which, however, has not been easily taken up by the PA, which still uses old system applications. Today, we are forced to invalidate past investments, concerning realities that are obsolete in terms of resource management and service quality."

In the **rule of law** dimension, Palermo totals 22.9%⁹⁶, that is 6,8 percentage points less than the previous year and 0,4 points less than the regional average⁹⁷. In order to analyse the causes behind this decrease, it is necessary to look at crime rates and therefore the efficiency of civil justice. According to the ANAC, offences against public order and the environment in Palermo are 7,1 per 100,000 inhabitants (the maximum in Italy is

⁹³ A. Nifo e G. Vecchione (2014), "*Do Institutions play a role in skilled migration? The case of Italy*", Regional Studies, Volume 48, Issue 10, 2014, pages 1628-1649.

⁹⁴ Città Metropolitane a confronto (2022). Veicoli dati e grafici. Retrieved from: <http://inumeridibolognametropolitana.it/cittametropolitaneconfronto/mobilita/veicoli>

⁹⁵ Elaborated on ISTAT data - BES2023_territory.

⁹⁶ The index can vary from 0 to 1, i.e. from very poor to excellent quality. For simplicity, the value can be read in percentage terms (up to 100%).

⁹⁷ A. Nifo e G. Vecchione (2014), "*Do Institutions play a role in skilled migration? The case of Italy*", Regional Studies, Volume 48, Issue 10, 2014, pages 1628-1649.

25), an increase of 19,18% compared to the previous year. Secondly, crimes against property and the public economy are 438,5 (maximum in Italy is 1188) with a growth of 35,28%. In 2021, the crime rate corresponds to 3359 crimes per 100,000 inhabitants, a change of +3,7% compared to 2020⁹⁸. By number of thefts, amounting to 15.866 in 2021, of which 1033 in dwellings, Palermo ranks ninth, below the Italian average (20.736). By rate of voluntary homicides consumed in 2021, equal to 0,5 per 100,000 inhabitants, Palermo is at the same level as the average among the Metropolitan Cities. In particular, a relevant phenomenon in the history of Palermo is the threatening infiltration of organised crime into the business fabric. For a long time, many entrepreneurs have conducted their economic activities “cohabiting”, almost as if it were an element of the now consolidated environmental context, with the payment of the so-called “pizzo” (protection money) to mafia-type criminal organisations⁹⁹. As far as corruption is concerned, it should be noted that according to the report by the National Anti-Corruption Authority (ANAC), Sicily has recorded the highest number of episodes in recent years compared to all the regions of Italy, where 74% relate to public tenders and 26% to competitions, administrative procedures and building concessions. According to the ranking drawn up at provincial level, Palermo is third in Italy for the highest corruption risk. Also contributing to defining the Sicilian podium is Enna, which ranks first, and Caltanissetta, Agrigento, Catania and Siracusa are also in the top ten. Palermo for every 100.000 inhabitants registers 108 cases of crime (in Italy the maximum value is 123), of which 7,7 are corruption, extortion and embezzlement offences (out of a maximum of 23) with a year-on-year variation of +163.83%, defining a net increase in the risk of corruption since 2015¹⁰⁰. The other crimes against the Public Administration number 87,8 (maximum in Italy is 298) with a reduction of 25,72%. Faced with an obvious problem on the ground linked to crime, the efficiency of the judiciary should respond. In Palermo, however, the number of losing cases is growing and the judicial offices are increasingly flooded. In the offices of the Court of Appeal in Palermo, out of 66 magistrates, only 47 are working, i.e. 14% less. And again: of the 88 justices of the peace listed in the organic plan, 28 are missing, while in the non-togaed honorary judiciary, there is a 32% overflow. No less significant are the staffing gaps among the administrative personnel: 293 fewer employees than the 1830 planned (16% less) and, again among the missing figures, 38 out of the 55 planned director of chancery posts and 17 out of 72 chancellors. Despite the critical staffing situation, which then affects the entire public administration, it is necessary to recognise the history of the judiciary in the city of Palermo, which has been significant for the entire nation, thanks to the fight against the Mafia led by magistrates such as Giovanni Falcone and Paolo Borsellino.

The **regulatory quality** dimension is the one in which Palermo performs the least, being below the Sicilian and Italian averages. The current context, although studded with exceptional measures typical of management

⁹⁸ Città Metropolitane a confronto (2022). Giustizia penale dati e grafici. Retrieved from: <http://inumeridibolognametropolitana.it/cittametropolitaneconfronto/giustizia/giustizia-penale>

⁹⁹ G. Faldetta (2010), L'analisi dei comportamenti imprenditoriali di fronte al fenomeno delle estorsioni

¹⁰⁰ Autorità Nazionale Anticorruzione. Base Dati-Contesto. Retrieved from: <https://anac-cl.board.com/#/screen/?capsulePath=Cruscotti%5CIndicatori%20di%20contesto.bcps&screenId=8e785fea-9a24-45ed-b086-6c5cf0cd1518&showMenu=false>

emergency, still leaves government entities in a critical condition. First of all, the objective state of weakness resulting from the unsustainable shortage of staff and specific professional figures, such as technical figures (surveyors and engineers) as well as specific figures in the highly relevant field of technological innovation¹⁰¹ is evident. Whereas, the only promising aspect concerns young people and female inclusion: administrators under 40 years of age account for 31,9% and female administrators for 39,3%, both values above the Italian average of 28,5% and 33,6% respectively¹⁰². During the interview, Professor Corso illustrates two critical issues, namely the lack of motivation, in relation to the obstacles of an organisation's administrative functionality, and the lack of skills: economists, jurists, philosophers and social scientists have been recruited, whose role is absolutely important for local administration, but technical roles, such as engineers, chemists, architects, geologists and statisticians are not present in the workforce. According to the professor, this element is absolutely related to the historical inability to plan in Palermo: “I can on the one hand understand the desire to leave planning to the market, but on the other hand the city must keep within the administration resources capable of evaluating and assigning design, i.e. evaluating, giving indications, writing tender specifications and monitoring the work according to the needs of the authority”. There is also an important issue of poor monitoring. Professor Corso states: “no one has bothered with a trivial but essential element: prosecuting those who do nothing. Nowadays, if the administration has resources that it does not use and returns, no one will claim anything, because losing resources is not a crime”. Finally, it is appropriate to summarise citizens' participation in public life, which is another clear indicator of quality. The turnout in the province of Palermo in 2023 was 60,2% of the eligible voters (59,299)¹⁰³. In the 2019 European elections, compared to the Italian average of 56,1%, turnout in Palermo was 39,5%, a negative variation of 3,2 points compared to the 2014 elections. In any case, it was the best participation in the whole of Sicily and the South (except for Bari).

There have been several national supports and notices, covering “European digital innovation hubs”, “innovation poles” and “emerging technology houses”, in which BIP also participated. These measures aimed at the development and innovative entrepreneurship of the territory, however, have clashed with local authorities that are unable to intercept and region that is unable to respond, mainly due to fragile planning capacity. Beyond the economic and human resources, it is important to recognize that in Palermo there is historically a very weak entrepreneurial culture, compared to Catania, anchored to a system averse to cooperation “perhaps dictated by economic reasons or an unwillingness to trust others, preferring to remain within one's own company perimeter” explains Pietro Corso, as happened ten years ago in the failed attempt to create a cooperative for breeders, in the organisation of which the Professor was involved. In Palermo, it

¹⁰¹ Città Metropolitana di Palermo (2022). *Relazione Performance*.

¹⁰² Elaborated on ISTAT data - BES2023_territory.

¹⁰³ Regione Siciliana (2023, May 29). *Amministrative, affluenza in Sicilia del 56,39 per cento nei 128 comuni al voto*, Regione Siciliana. Retrieved from: <https://www.regione.sicilia.it/la-regione-informa/amministrative-affluenza-sicilia-5639-cento-nei-128-comuni-al-voto>

has always been sufficient to rely on the services of the PA to do business. This is the main cultural reason why little is invested in innovation and research in Palermo, compared to the rest of Italy.

Variable IV: Sustainability

At the European level, Italy's general sustainability index ranks 15th out of 29 nations, whose lag is attributable to the low performance of the southern regions¹⁰⁴, especially in relation to productivity and economic performance. The general sustainability of Palermo, defined as a “fragile province” by Cerved, is low, as is the rest of Sicily, with the exception of Enna.

According to the survey conducted by ISTAT to calculate the Sustainable Equitable Wellbeing Index, with 95,8 points, Palermo has a medium-low **economic sustainability**, distinguishing itself from most of the other southern provinces, which are in the last range. In fact, it exceeds the average for Sicily and the Mezzogiorno, but remains below the Italian average, demonstrating the gap experienced in general by the South. In the three-year period marked by the effects of the pandemic, Palermo's economic system is less impacted due to the greater incidence of the public sector, which provides essential services. Indeed, Palermo is on the Cerved list of provinces with the greatest improvement, with a positive change of 1,19 points between 2019 and 2021. The GDP of the Metropolitan City of Palermo amounts to 23,7 billion euro, with growth of 3.2%¹⁰⁵. The average disposable income per capita in Palermo is 13.971,7 euro, while it is 13.300,7 euro in Sicily, 13.699,1 euro in Mezzogiorno and 18.525,3 euro in Italy. Per capita wealth is worth 101.846,1 euro, while in Sicily it is 95926,18 euro. The average annual salary of employees amounts to 15.346,6 euro, compared to 15.664,8 euro in Sicily, where men (18629,3 euro) are paid more than women (13492,3 euro). According to the Bank of Italy, the rate of non-performing bank loans to households is also better at 0,7%, compared to 1,1% in Sicily. Pensioners with low pension incomes account for 13,7%, compared to 15,2% in Sicily. In employment and reconciliation of lifetimes, the employment rate (20-64 years), up by only two points from 2019, is 45% in 2022 compared to 48% in the Mezzogiorno and 62,6% in Italy. This figure already provides an overview of the clear distance dividing Northern and Southern Italy, especially as regards gender employment gaps, which are amplified in Southern Italy. Although the employment gap between women and men continues to persist, the increase in the generic rate has been more influenced by the growth in female employment by two percentage points. The employment rate for young people (15-29 years) is 17,2%. Decreasing, compared to the 2019 figures, are the rate of non-participation in work, the rate of fatal accidents and permanent disability and the youth non-participation rate. Despite the growth in employment, the number of unemployed people also increased in Palermo, from 34.000 in 2020 to 47.000 in 2021, an increase of 39%¹⁰⁶. The same is true if consider the pre-pandemic data, which grew by 22,1% from 2019 to 2021. The increase in the number of unemployed people, given the trend in the number of employed people, is mainly attributable to the reduction

¹⁰⁴ Cerved Research (2022). *Rapporto Italia Sostenibile 2022*.

¹⁰⁵ Città Metropolitana di Catania (2022). *Piano Strategico*.

¹⁰⁶ SISTAN Sistema Statistico Nazionale (2022). *Il Mercato del Lavoro a Palermo nel 2021*.

in inactive people: in other words, the post- pandemic economic recovery may have prompted many people (who were previously classified as inactive) to actively seek work¹⁰⁷. It can be observed that the unemployment rate is in all the cities of the centre-north under 10%, while in the cities of the south of Italy it is dramatically high, including 15,3% in Palermo¹⁰⁸. The youth unemployment rate is 52.6%¹⁰⁹.

With 95,9 points, there is a similar scenario in **social sustainability**, consistent with the South as a whole. In fact, the social dimension is correlated with the economic one, since the provinces that manage to create greater wealth and employment, as in the North, manage to mitigate social difficulties. It is recognized that in the province of Palermo, development has involved only some areas and in different ways, leaving behind the peripheries, which are subject to inadequate infrastructure and IT networks, services and economic conditions. If in the large northern cities the post-war economic boom contributed to the construction of typical middle-class residential neighbourhoods, in the southern capitals we see a completely different urban landscape: these are often fragile working-class neighbourhoods, with large families, low levels of education and high unemployment rates¹¹⁰. In Mezzogiorno, Palermo and Naples house about two thirds of the inhabitants in working-class areas, while less than 25% live in middle-class areas. In addition, Palermo has a widespread presence of working-class areas at risk of degradation at 5,5% (a scenario lower only in Reggio Calabria and Naples). The 40% of residents live in neighbourhoods with potential economic distress¹¹¹. According to the Openpolis survey, based on ISTAT's calculation of social vulnerability, the index recorded by Palermo is 105, a value that declares a high risk of fragility, greater susceptibility to the effects of the economic crisis and the presence of potentially weaker social strata¹¹². In the health domain, life expectancy at birth is 81,9 years (79,2 for men and 83,6 for women), in line with the average for Sicily and the Mezzogiorno. Infant mortality is 3,7 per 1.000 live births, up by 0,8 compared to 2019. In education and training, the picture is deficient compared to the national average. People with at least a diploma (25-64 years old) account for 51,9% and participation in continuous training for 5,4%. According to the Invalsi surveys, inadequate literacy skills amount to 47,6% (34,1% in Italy) and inadequate numerical skills to 60,9% (39,2% in Italy). Another crucial factor for the South in general concerns young people not working and not studying (NEET), at 32,6%, which in Palermo rises to 36,8% and in Sicily to 37,5%. The number of people with at least a diploma (25-64 years old) is 52,7%, two points lower than in the Mezzogiorno and ten points lower than in Italy. Graduates or those with other tertiary qualifications (25-39 years old) are 20,6%, one point higher than the regional average, but 7,7 points lower than Italy. Regarding social participation, non-profit organisations in 2020 amount to 40,4%. In the province, volunteer activities are particularly linked to the territory and, as in Catania, there are Volunteer Service

¹⁰⁷ *Ibidem*.

¹⁰⁸ Città Metropolitana di Catania (2022). *Piano Strategico*.

¹⁰⁹ *Ibidem*.

¹¹⁰ Openpolis (2018, May 1). *Le aree urbane nelle città del Mezzogiorno*. Retrieved from <https://www.openpolis.it/aree-urbane-prevalgono-citta-mezzogiorno/>

¹¹¹ Openpolis (2018, April 10). *La vulnerabilità sociale nelle città metropolitane*. Retrieved from <https://www.openpolis.it/la-vulnerabilita-sociale-nelle-citta-metropolitane/>

¹¹² *Ibidem*.

Centres (CE.S.VO.P.) with an interprovincial structure. The six areas of intervention of the CSV, governed by the Third Sector Code (art. 63), in order of services provided in 2022 are: consultancy (28%), territorial promotion, training, information and communication, logistics and research (4%). The recipients were 931 non-profit organisations, 693 individuals, 40 public bodies and 8 private bodies and the budget was mainly for promotional materials, consumables and rentals¹¹³. In the CesSVoP area, more than half of the co-planning tables in collaboration with local administrations for consultancy were activated in the province of Palermo. But the most surprising performance concerns technical and logistical support, where Palermo contributes 83.5% compared to the other western provinces¹¹⁴. Finally, security contributes to defining social quality: per 100.000 inhabitants, 0,5 are voluntary homicides, exactly the same as the national average, and only 0,1 points lower than the average for the region. Under the heading of other reported violent crimes, there are 17,4 per 100.000 inhabitants, which, among the Sicilian provinces, are exceeded only by Trapani and Syracuse. Finally, the extra-urban road mortality rate is 3,8% compared to the 5% recorded in 2020. The figure is also lower than the regional average of 5,2% and the Italian average of 4,2%. In Sicily, Messina is the province with the lowest indicator, with a value of 1,9%. Among other things, as Pietro Corso explains, old video surveillance systems controlled by individual employees persist in the area, according to a system that is still far removed from video analysis and AI.

Environmental sustainability, on the other hand, allows Palermo to gain a few positions with a score of 98, although in this dimension it is exceeded by several southern provinces (mainly belonging to Sardinia and Apulia), which demonstrate medium-high sustainability. Palermo boasts an interesting environmental system, thanks to the presence of the sea and relevant natural, landscape and historical-cultural sites. It also boasts a better position than the national average in energy conversion and hydrogeological sustainability. The density and relevance of the museum heritage is 0.88 per 100 km². The availability of urban green space amounts to 12 m² per inhabitant, which in Italy increases to an average of 33.8 m² per inhabitant. The Sicilian average is also higher, with a value of 16,4%, to which the provinces of Agrigento, with as much as 94,2 m² per inhabitant, Ragusa and Catania contribute the most. With regard to air pollution, the annual average concentration of PM10, i.e. fine dust, is 30 micrograms per m³, higher than all the other Sicilian provinces, with the exception of Ragusa, which records the same value. The annual average concentration of PM2.5 amounts to 12 micrograms per m³, far higher than the regional average of 2 micrograms. By contrast, the Italian average is surprisingly higher at 78 micrograms, to which the northern regions contribute the most. Certainly, being a metropolitan city justifies the high level of pollution (air pollution and water consumption over 90 points out of 105), but the situation is aggravated by a lack of services and a collective insensitivity to environmental protection issues. There is also an aspect related to building expansion, which, particularly in the *Conca d'Oro* area¹¹⁵, has developed wildly in the recent past, wiping out much of the agricultural land that

¹¹³ CesSVoP Centro di Servizi per il Volontariato di Palermo (2022). *Bilancio Sociale Anno 2022*.

¹¹⁴ *Ibidem*.

¹¹⁵ The Conca d'Oro area is the flat region that stretches irregularly around Palermo, with a radius varying from 3 to 8 km.

once characterized the citrus groves plain¹¹⁶. The natural gas distribution network in Sicily is the second largest in terms of extension (after that of Emilia Romagna) and is largely supplied by imports from Algeria and Libya, through the two access points of Mazara del Vallo (western Sicily) and Gela (eastern Sicily): in the metropolitan city of Palermo the distribution network reaches 75 municipalities with a length of 2935 km¹¹⁷. In addition, Palermo, like Genoa, Catania, Trieste and Rome, has serious difficulties in the management of industrial and urban waste, reserving the penultimate place in the Italian ranking¹¹⁸ and declaring itself less competent than Catania. The urban waste produced by the province in 2022 is 472 kg per inhabitant, corresponding to a separate collection rate of 33,3%, up 3,9 percentage points. The collection system is more efficient in all the other Sicilian provinces, such as in Ragusa with 57,8% and Trapani with 56,7%, close to the national threshold of 61,3%. Electricity from renewable sources is also sufficiently lower than the regional average of 43%. In particular, Enna produces 116,1% and Trapani 72,2% renewable energy.

CATANIA'S PRODUCTIVE ECOSYSTEM

3.4 Entrepreneurial Dimension in Catania

Catania, one of the seven Metropolitan Cities of the South, is a territorial entity whose territory coincides with the former province. It has an area of 3.573,51 km², a density of 299.96 inhabitants/km² and a population of 1.071.914 inhabitants and 58 municipalities. In Sicily, in terms of population, it ranks after Palermo and seventh in Italy, representing the most populous non capital Metropolitan City in the country¹¹⁹. Catania stands out in the region as a centre of gravity for exports, manufacturing and innovation. The territory comprises four macro-areas: Catania's urban area and Etna-South, Calatino Sud-Simeto, Area Jonico Etna and Etna North and West. The Catanese urban area is certainly based on the central role of the city of Catania, which has an important industrial-productive fabric comprising about 300 enterprises. Within it, there is also the Pantano d'Arcei agglomeration. The Jonico Etna area, which occupies the eastern part of the province along the coast, bases its attractiveness on environmental and tourist elements. This area also has agricultural and craft production of excellence. The Calatino Sud-Simeto area includes the southern zone, based on the valorisation of the ex-Asi industrial area (of Caltagirone) and cultural and landscape resources. The Etna North and West area is developed around the Etna Park and therefore enjoys an incredible natural and environmental heritage.

¹¹⁶ Papa, R., Battarra, R. and Gargiulo, C. (2016) *Città Metropolitane e Smart Governance: Iniziative di successo e nodi critici verso la Smart City* (Volume 1). Federico II University Press.

¹¹⁷ Papa, R., Battarra, R. and Gargiulo, C. (2016) *Città Metropolitane e Smart Governance: Iniziative di successo e nodi critici verso la Smart City* (Volume 1). Federico II University Press.

¹¹⁸ Cerved Research (2022). *Rapporto Italia Sostenibile 2022*.

¹¹⁹ Città Metropolitana di Catania (2022). *Piano Strategico*.

Variable I: Industrial Diversification

In the Catanese territory, the **number of active enterprises** at the end of 2022 was 84.923, 693 more than the previous year and up since 2017, when there were 79.393¹²⁰. The highest concentration of enterprises is in Wholesale and Retail Trade (sector G) with 33,3%. In this regard, the main catalysts are the port and airport of Catania, which are strongly influential in the development of tourism and trade. Then, Agriculture, Forestry and Fishing (sector A) records 16% of active enterprises, followed by Construction (sector F) with 12%. Manufacturing (sector C) employs 7,5% of enterprises, accounting for 23% of the number of enterprises in Sicily in sector C (thus 0,5% more than in Palermo). There is certainly an important contribution from the food industry sector, manufacture of metal products and repair of machinery. For example, the Catania plant of Parmalat, which produces 50% of Sicily's milk, and Sibeg, which produces and markets Coca-Cola drinks, are located here. The agricultural and tourism sectors, on the other hand, find the greatest number of enterprises in the Etna North and West area, dominated by the volcanic system of Mount Etna. The fertility of the volcanic debris makes the land favourable for wine and wine production, olive growing and citrus cultivation. The famous "Etna Valley", a regional district with a high technological content, extends into the Catanese territory: the industrial presence in the urban area is associated with the establishment of STMicroelectronics, an Italian-French group and leader in the production of semiconductor electronic components¹²¹. With regard to the degree of diversification of education, among those enrolled at the University of Catania, amounting to 9341 (less than half of those enrolled in Palermo), there are different student preferences, which are more concentrated in the political-social sphere, followed by economics-statistics and medicine¹²². On the contrary, a lower turnout is recorded in the agricultural, physical education and defence and security groups.

On **government revenue diversification**, the provincial administration's collection capacity is 74,7%¹²³, below both the regional and national average. According to the budget stated by the Metropolitan City of Catania, available in the transparent administration section, in 2022 the cash for the general revenue total is 460.585.907,88 euro. Current account revenues accounted for 73,9% of the total, current tax revenues for 25,8%, current transfers for 15%, and extra-tax revenues contribute 1,25%. The only item in which Catania collects more than Palermo is current revenue of a tax nature, which actually contains within it a greater amount of revenue from control and repression of irregularities and offences (+1.632.747 euro compared to Palermo). In fact, according to Openpolis, Catania is among the top 14 cities that benefit most from fines for control and repression of offences as a source of revenue¹²⁴. Rather, it should be noted that, unlike Palermo, current transfers from public administrations are 15,4 million euro lower. The weight of the public

¹²⁰ Camera di Commercio delle Marche (2023, August 3). Imprese attive in Italia per Territorio, Settore Ateco e Tempo. Retrieved from: <https://opendata.marche.camcom.it/stock-impreses.htm?url=https://opendata.marche.camcom.it/data/Stock-Imprese-Attive-Italia.json&f2v=22>

¹²¹ Città Metropolitana di Catania (2022). Piano Strategico.

¹²² MIUR, Portale dei dati dell'istruzione superiore. *Iscritti, immatricolati e laureati*.

¹²³ Elaborated on ISTAT data - BES2023_territory.

¹²⁴ Openpolis (2023, January 19). *Le città che incassano di più per le multe*. Retrieved from <https://www.openpolis.it/le-citta-che-incassano-di-piu-per-le-multe/>

administration sector (defence, education, health and entertainment) on the Catania economy is 28,39%, compared to the 34% recorded by Palermo. Catania, in fact, as Strano's CEO explains, is more entrepreneurial, unlike Palermo, whose main source of income is heavily derived from public administration.

Finally, with regard to **trade diversification**, in 2022 the trade balance of the Metropolitan City of Catania, given by the difference between exports and imports, is equal to +492 million euro, ranking 1st among the Metropolitan Cities of the South and among the only 5 to have recorded a positive balance. The absolute value of imports is 1.730 million euro, which corresponds to 0,3% of total Italian imports¹²⁵. Imports grew by +30,2% compared to 2021. The absolute value of exports was 2.222 million euro, equal to 0,3% of Italian exports and with an increase of 21,4% over 2021. Catania shows a commitment to exports, which in 2020 will represent 9,7% of the metropolitan added value, higher than the average of Palermo and Messina, which is around 7%¹²⁶. In particular, thanks to the presence of important companies such as STMicroelectronics, Pfizer, SIFI and Parmalat, Catania exports 95,5% of the region's electronic components (635 million euro), 99,2% of pharmaceuticals (329 million euro), and 20,8% of agrifood (142 million euro)¹²⁷. In addition, retail trade also contributes to commercial traffic, especially as regards the city of Catania and tourist resorts. In addition, the port of Catania also serves the provinces of Syracuse, Ragusa and Enna for the export of their production. Trade takes place mainly with Germany, France, the United Kingdom and the United States and the import-export ratio stands at 2:1 to the advantage of exports¹²⁸.

Variable II: System Differentiation

In Catania, as in Palermo and most of Sicily, the main **concentration of employees** is in Trade, with 26,25%, which is the highest value among all regional provinces. According to ISTAT, in 2018 Catania ranks first in Sicily in terms of both added value (which amounts to around 1,2 billion euro) and manufacturing employment (11,59%). Then, 10,9% of employees are employed in Construction, 7,8% in Agriculture and 8,3% in Accommodation and Food Services. In most sectors, there is a higher number of employees than the regional average, except for electricity supply, water supply, construction, catering, healthcare and artistic activities. In particular, in the Catanese Urban area and in the Calatino area respectively 51% and 25% of employment is concentrated in hi-tech, while in the Jonico Etna area over 80% of employment is in agriculture, in the Calatino area and in the Etna North and West area, 64% of employment is in tourism. The tourism sector, however, suffers from inadequate accommodation facilities, deficiencies in the skills of operators and in the culture of welcoming and complex use of resources. There are 142 accommodation facilities, with an accommodation rate of 2.192 beds per 100.000 inhabitants. In terms of tourism rate, Catania is the penultimate

¹²⁵ Città Metropolitane a confronto (2022). Commercio estero dati e grafici. Retrieved from: <http://inumeridibolognametropolitana.it/cittametropolitaneconfronto/economia/commercio-estero>

¹²⁶ Città Metropolitana di Catania (2022). Piano Strategico.

¹²⁷ *Ibidem*.

¹²⁸ Città Metropolitana di Catania. *Commercio, l'attività commerciale*. Retrieved from https://www.cittametropolitana.ct.it/il_territorio/Commercio.aspx

metropolitan city, with 0,7 admissions per inhabitant and 221,6 admissions per square kilometre. Moreover, with regard to seaside tourism, along the territory's coasts there are several bathing bans due to the state of the water (also due to sewage discharges into the sea). Dario Strano proposes a comparison with Malta: “the territory of Malta is half the size of the province of Catania with a third of the population, but it excels extraordinarily in terms of the number of beds compared to Sicily. In Agrigento, Rather, in Agrigento it started to invest in famous hotels, but with very slow growth, not taking advantage of a margin for growth at low costs (because European funding exists, but it is not used properly)”. Instead, today Catania's strong point is its specialisation in high-tech in the Etna Valley industrial hub: in the 1990s it attracted 11% of the high-tech companies in the Metropolitan City of Catania and employed around 40% of the workers in the sector. The relevance of this industry is confirmed by the fact that the electronic components are, in value, the province's leading export production, accounting for 40% of total exports (635 million euro), to the point of constituting almost the entirety (95,5%) of Sicily's electronic component exports¹²⁹. The Catania area hosts additional medium-large industrial realities specialising in the production and assembly of electronic components for semi-finished and finished goods in several sectors, including consumer electronics, automotive, ICT and mobile telephony (such as semiconductor devices, microprocessors, network components, chipsets for motherboards, chips for video cards and integrated circuits). Internationally, there is a shortage of semiconductors, while demand for electronic products (such as PCs and smartphones) is expanding. In addition, the EU intends to double semiconductor production from 10% to 20% by 2030, thus reducing dependence on Asia. Therefore, this can lead the city of Catania to increase its strategic role and economic importance, also giving Sicily recognition at international level. Eliano Russo, who strongly believes in the potential of the semiconductor field, explains that 3Sun shares the same technologies with ST, although aimed at different products: this is an important synergy between two very competitive and strategic fields that could lead to both energy and technological independence.

The Cerved report ranks Catania 15th among the Italian provinces with the best **infrastructure system**. In economic sustainability, the infrastructure area is the only one where it exceeds the national average and in fact performs better than the other “fragile provinces”, except for Palermo¹³⁰. Today, the Catania territory is characterised by the presence of some of the main strategic infrastructural nodes in Sicily: the railway, the Circumetnea railway, the airport, the port, the agrifood market, and the industrial area, in potential connection due to their close territorial proximity¹³¹. The port of Catania is located in the centre of the Mediterranean basin and is served by a land basin represented by six out of nine Sicilian provinces, with a total population of three million inhabitants¹³². It is of strategic importance for trade, cruise, shipbuilding, technological, fishing

¹²⁹ Città Metropolitana di Catania (2022). Piano Strategico.

¹³⁰ In the Italian ranking, the only southern provinces that are among the best performing are in order: Naples, Palermo, Messina and Catania.

¹³¹ Città di Catania (2019). *Direzione Urbanistica, Gestione Del Territorio E Decoro Urbano Servizio P.R.G. Pianificazione Urbanistica, Progetti Speciali*.

¹³² *Ibidem*.

and industrial activities. However, as stated in the report of the Metropolitan City of Catania, the connections with the other territories of the island are inadequate, with reference to road maintenance, congestion of the city-periphery connection routes, and the quality of bus and train service. Eliano Russo comments on the infrastructure aspect: “Although we are in a logistically well-connected area thanks to our proximity to the airport and the port of Catania, if I look at the road network and the availability of infrastructure, we are very defective, compared to North America for example, where we are planning equivalent investments”. Strano's CEO shares the same opinion: “For a company like mine, which operates in the service sector, being in a region lacking in infrastructure is a huge problem. The two main Sicilian cities, Catania and Palermo, are connected by 190 km of motorway that can be travelled in more than four hours”. Moreover, despite the fact that Etna Valley represents the innovation pole of excellence for the entire region, it has widespread criticalities, related, for example, to plant engineering, common services (video surveillance, lighting, etc.), transport infrastructure (roads, signs, etc.), maintenance, and the water system¹³³. Thus, Catania boasts a strategic geographical position, in the heart of the Mediterranean, but suffers from a lack of weak development, due to the conditions of infrastructures and connectivity, intra and extra-territorial.

The Catania scenario acquires points of advantage over the rest of the region thanks to **innovation**. According to the ISTAT survey on business research and development, in terms of R&D expenditure and current expenditure for personnel of companies for R&D activities, it respects the southern average, being in the second lowest quintile. The generational turnover index demonstrates an excellent valorisation of young people and investment in competent and research-oriented personnel (top quintile). In fact, Catania is the only Sicilian province to have the highest concentration of researchers under 25 years of age of the companies spending on R&D. In contrast, as age advances, the concentration of researchers in the province of Palermo increases. In 2018, Catania is among the top five Italian provinces for software production, IT consultancy and related activities¹³⁴. The companies that invest the most in R&D are concentrated in Ateco sectors 10-11-12, 62-63 and 72¹³⁵. According to the OECD, the propensity to patent in 2019 is 29,2 per million inhabitants, 16,7 points higher than the regional average¹³⁶. With 6,9 percentage points more than the previous year, together with Messina and Siracusa, it is the only Sicilian province to grow. On the other hand, the municipalities with entirely online household services are 7,2%, the lowest value among all the Sicilian provinces. The metropolitan city of Catania has 5,7% of innovative start-ups per 1.000 companies, which is the fourth highest value among southern cities. According to Startup Blink, Catania is even the 7th largest startup ecosystem in Italy. In particular, Etna Valley is the high-tech district, which in the 1990s was able to attract 11% of all high-tech companies in the Metropolitan City, employing around 40% of those working in

¹³³ Città Metropolitana di Catania (2022). *Piano Strategico*.

¹³⁴ The other four provinces topping the list in this sector are also southern: Naples, Bari, Avellino and Cosenza.

¹³⁵ Food, drink and tobacco industries (Ateco 10-12); Software production, computer consultancy and IT services (Ateco 62-63); Scientific research and development (Ateco 72).

¹³⁶ Elaborated on ISTAT data - BES2023_territory.

this sector and positioning itself as the reference hub for innovation in Sicily¹³⁷. Here, in collaboration with STMicroelectronics, the University of Catania has created special departments (e.g. Materials Science) to collaborate on R&D activities. An effective network has been established, involving companies, the university and other institutions, such as the CNR, the Catania Institute of Volcanology, the Institute of Nuclear Physics, the Science and Technology Park of Sicily, the Agricultural Research Council and the Sicily Micro and Nano Systems Technology District. In addition, the pharmaceutical industry, including Pfizer and SIFI, has also successfully developed in this area, with around 1.000 direct employees and an allied industry of 1.500 employees. The cluster is still growing strongly: ST has announced an investment of 250 million euros for a highly innovative project to expand the production capacity of the plant, which to date is the only one in the world for the high-volume production of processors with silicon carbide-based technologies; Enel has planned an investment of 100 million euros for the construction of the 3Sun gigafactory, which also includes an Innovation Lab where various excellences in research on renewable technologies are engaged. According to 3Sun's CEO, the university has an established role in the Catania network. However, he points out that there is still a lot of work to be done to strengthen the link and to bring academic paths closer to the company in order to make them more operational, through internships and projects, for example. The Strano company has been in partnership with the University of Catania for about two years and commits new resources to innovation with an average of 15-20 interns per year, to develop innovation in both production and sales cycles. D. S. comments: "innovative activity is possible because we have quite good university poles, such as in Palermo and Catania. The gigafactories that are opening in Etna Valley are acquiring resources and skills precisely from the university". In a market like high tech, which is highly volatile and changes at a speed the region is not used to, Strano was very optimistic about local networking capabilities. He recounts: "at the peak of the high-tech boom in Catania (late 1990s and early 2000s), there were all multinationals in the network of companies, such as Nokia, Philips, Magneti Marelli, which networked with STMicro for semiconductors and semi-finished products for highly specialised electronics. Today, this new activity is taking place again, net of changes in world scenarios, European requirements and investments that Europe is financing (like ST in Catania). There is a lot of interchange of expertise, more than in Palermo". In this regard, E. R. recounts during the interview that Enel's decision to invest in Catania was taken in 2010 when partners, including STMicroelectronics, were already rooted in the territory. The strategy was therefore influenced by the presence of ST., which among other things provided the building, which was still in progress thanks to a facility to extend the space. "It was therefore not a desert initiative, but a very deep-rooted one. The strength lies in the ability to leverage an established local fabric, including third-party companies, universities and research institutes. We are talking about a big ecosystem, which today is called Etna Valley."

¹³⁷ Città Metropolitana di Catania (2022). *Piano Strategico*.

3.5 Quality of Life Dimension in Catania

Variable III: Governance

In the ranking of Italian provinces on the quality of governance, in 2019 the IQI Index gives Catania a value of 13%, down from the 16% recorded in 2018 and 5 percentage points lower than the regional IQI. Among Italian provinces, it ranks 99th, thus among the last ten, followed only by Trapani, Caltanissetta, Crotone and Vibo Valentia. All the values of the sub-indicators are lower than the regional average and also compared to Palermo, with the exception of the regulatory quality indicator.

According to the **government effectiveness** indicator, in 2019 Catania has a general quality of services and infrastructure of 15,5%, compared to the Italian average of 40,5%. Among the Sicilian provinces, Catania is third last, followed only by Syracuse and Trapani. Moreover, the scenario, at the time of the analysis, states three percentage points less than the previous year and has been in sharp decline since 2014, when it stood at 35,4%. In the education sector, the number of children between 0-2 years old who used childcare services is 4,7%, the lowest value only after Caltanissetta. Accessible schools, on the other hand, account for 33%. In the health sector, in 2022, there are 40,2 specialist doctors per 10.000 inhabitants, an increase since 2012 when there were 35,9. Hospital beds are 35,1 per 10,000 inhabitants. Hospital emigration is 4,8%, lower than the rest of Sicily. As far as digitalisation is concerned, Catania ranks third last out of 14 Metropolitan Cities in terms of digital transformation index and 10th in terms of the percentage of buildings covered by high-speed connection, thus risking to undermine its attractiveness for international talent and investors and to miss out on the benefits related to the smart cities paradigm¹³⁸. Fixed network coverage of ultra fast internet access is 58,5%, up from the previous year (46,3%). With regard to transport, Catania offers 2534 km of public transport per inhabitant in 2021, which represents the highest availability among all the Sicilian provinces. Among the other metropolitan cities, Catania has 1575 buses in 2021, below the average, which is instead exceeded by Palermo (with 2318 buses). A similar gap is obtained by calculating the number of buses per 100.000 inhabitants, which are 147 in Catania, 193 in Palermo and 170 on average in Italy¹³⁹. In particular, 39,2% of the available buses are for public use, unlike the 51,7% recorded in Italy. Furthermore, as in Sicily in general, the public transport service suffers from poor organization due to traffic problems, timetable management and the number of trips. D. S., talking about Catania's governance during the interview, says: “in Catania, for the last four years, ordinary management has been entrusted to the deputy mayor, since the mayor had been banned from public activities. By the way, the latter had already found the city in default. So, in eight years, the administrative management and consequent local performance was a failure. Palermo, on the other hand, with the last two-term junta, has experienced progress in recent years, which can be measured through a quality of life (in terms of daily life, nightlife, and the ferment of commercial activities) that is definitely better”.

¹³⁸ Città Metropolitana di Catania (2022). *Piano Strategico*.

¹³⁹ Città Metropolitane a confronto (2022). Veicoli dati e grafici. Retrieved from: <http://inumeridibolognametropolitana.it/cittametropolitaneconfronto/mobilita/veicoli>

The **rule of law** indicator (12,8%) is quite low compared to Palermo, the regional average (23,3%) and the Italian average (56,9%). According to the survey developed by ANAC, Catania records 13,2 offences against public order and the environment per 100.000 inhabitants (the maximum in Italy is 25), a variation of +106,27% compared to the previous year. Then, there are 270,7 offences against property and the public economy per 100.000 inhabitants (the maximum in Italy is 1188). In 2021, the crime rate corresponds to 3509 crimes per 100.000 inhabitants, a change of +3% compared to 2020¹⁴⁰. The number of burglaries also increases compared to the City of Palermo, with a total of 17.447 in 2021, of which 1305 in dwellings. By rate of voluntary homicides consumed in 2021, equal to 1,1 per 100.000 inhabitants, Catania is the second Metropolitan City with the highest incidence, after Naples. A particularly influential phenomenon in the workings of governance is corruption. According to the calculation of the IQI index, the corruption risk (60,1%) is slightly lower than in Palermo (61,1%). Despite the almost imperceptible difference in the data compared to Palermo, it must be acknowledged that the corruption risk is still high and above the regional average. The phenomenon of infiltration by organized crime hinders the smooth functioning of governance and the free competition of local business activities. Based on the ranking stated by ANAC at provincial level, Catania ranks seventh in terms of corruptive risk. The province has a composite crime index of 105,4, considering that the maximum value in Italy is 123, with a growth of +4,3%¹⁴¹. It follows that corruption, extortion and embezzlement offences account for 3,6 per 100.000 inhabitants (in Italy they are 25 per 100.000 inhabitants). Then, offences against the public administration are 51,5 per 100.000 inhabitants (highest value in Italy is 298).

The **regulatory quality** indicator, among the three analysed, is the one that performs better than Palermo, with 19,4% compared to 11,5%. However, the result is still far from the regional average (22,4%) and the national average (47,5%). In the public workforce of the Metropolitan City of Catania in 2023, 33,7% female municipal administrators are recognized, which is lower than the average in Sicily of 37,08%¹⁴². Municipal administrators under 40 years of age represent 30,4%, a lower percentage than the Sicilian average of 32,9% and a negative variation of 1,9 percentage points. Electoral participation is the lowest of all Italian metropolitan cities. In the 2019 European elections, compared to the Italian average of 56,1%, electoral participation in Catania was 37,8%, with a negative variation of 6,6 points compared to the 2014 elections¹⁴³. On the other hand, the turnout in the local elections in Sicily was 57%, leaving Catania in fourth last place among the

¹⁴⁰ Città Metropolitane a confronto (2022). Giustizia penale dati e grafici. Retrieved from: <http://inumeridibolognametropolitana.it/cittametropolitaneconfronto/giustizia/giustizia-penale>

¹⁴¹ Autorità Nazionale Anticorruzione. Base Dati-Contesto. Retrieved from: <https://anac-c1.board.com/#/screen/?capsulePath=Cruscotti%5CIndicatori%20di%20contesto.bcps&screenId=8e785fea-9a24-45ed-b086-6c5cf0cd1518&showMenu=false>

¹⁴² Elaborated on ISTAT data - BES2023_territory.

¹⁴³ Città Metropolitane a confronto (2022). Istituzioni e partecipazioni dati e grafici. Retrieved from: <http://inumeridibolognametropolitana.it/cittametropolitaneconfronto/governance/istituzioni-e-partecipazione>

provinces¹⁴⁴. Another important issue relates to incentives for entrepreneurship and innovation, the basis of which is the local entrepreneurial culture that defines the degree to which externally provided support is received and implemented. The interviewees agree that Catania, compared to Palermo, is more “effervescent” and fertile for innovative entrepreneurial activities. Historically, not being tied to the public administration, it has had to reinvent itself and do business to become competitive. In this way, local companies and forces have worked together to create an industrial basin in eastern Sicily (stretching from the province of Ragusa to that of Catania), which requires 60% of Sicilian industry. D. S. says: “in any case, consider that this is an entrepreneurial level equal to the average Sicilian one. In the North, Sicilian companies would turnover three or four times more, because here we are hindered by major problems of an infrastructural, territorial, endemic, criminal and widespread poverty-related nature”. According to 3Sun's CEO, the national and European instruments, which are the most powerful available, are also somewhat obsolete, as they are victims of slow and highly bureaucratic procedures. He explains: “European funds for innovation are absolutely useful, but we have been limited by procedural issues: we received confirmation that we could receive the funds more than a year ago, but due to bureaucratic issues we have still not received any money. Enel has a strong budget and still manages to move forward, but if we had waited, we would never have started. We have already spent almost 300 million euro and are almost halfway through our investment. But those in real need cannot freeze”. Regarding Sicily's ERDF funds, Dario Strano recounts: “in the energy field, funding had been launched for the upgrading of costs and opportunities for all municipalities. There was a ranking list and the project was free of charge: the municipalities would not spend anything, rather they would receive money to monitor costs, energy loads and benefits according to possible investments in innovation. The result was that only 30% of the municipalities participated. In any case, the energy communities have slowed down considerably, as implementation decrees are still missing (despite the energy crisis)”.

Variable IV: Sustainability

The Cerved Report distinguishes Italian provinces into five levels of general sustainability. In the macro scenario in which the entire south is placed in the last quintile (with the exception of a few provinces in the fourth quintile), Catania also presents a low general sustainability, scoring 95,1 points in 101st place (considering that the last ranked province, Syracuse, manages to score 93,7 points). The report also pointed out 22 provinces in Italy as “fragile provinces”, all belonging to the South, which record a figure below the national average in every dimension. Catania's performance, like that of Messina and Syracuse, is at the last level in all three areas (economic, social and environmental), with serious environmental problems. Moreover, according to EY's Smart Human Cities ranking, Catania is in 72nd place (out of 109 cities, among which Palermo is 46th).

¹⁴⁴ Regione Siciliana (2023, May 29). *Amministrative, affluenza in Sicilia del 56,39 per cento nei 128 comuni al voto, Regione Siciliana*. Retrieved from: <https://www.regione.sicilia.it/la-regione-informa/amministrative-affluenza-sicilia-5639-cento-nei-128-comuni-al-voto>

The **economic sustainability** index is 95,5 points, on which the levels of employment, solidity of companies, attractiveness and production fabric are affected. Only in the infrastructural network indicator does it rise in the ranking, with around 100 points. In the Catania-Palermo comparison, Cerved recognizes Catania's higher quality only in production fabric and company solidity; while Palermo's higher quality in attractiveness, infrastructure, employment and labour dynamics. Certainly in Catania's competitiveness, digital transformation (in which it performs better than Palermo) is decisive, thanks to its connectivity system, ICT human capital and digital index¹⁴⁵. The GDP of the Metropolitan City of Catania, in 2019, was 20,9 billion euro, corresponding to 23,3% of Sicily's total, but in 11th place among the 14 Metropolitan Cities, ahead only of Cagliari, Messina and Reggio Calabria¹⁴⁶. The GDP per capita is 18.827 euro, 945 euro lower than the average for the South. As regards the effects of the pandemic on household wealth, according to the Bank of Italy, in 2020 in the province about one third of households suffered an average reduction in income of -2,8%. The average disposable income per capita is 12.85,6 euro, compared to 13.699,1 euro in the Mezzogiorno and 18.525,3 euro in Italy¹⁴⁷. Per capita assets are worth 91434 euro, below the Sicilian average of 95926,18 euro. In 2022, the rate of non-performing bank loans to households is 0,8%, down from previous years. About employment, the average annual wage of employees is 15298,2 euro, with men earning 18768,5 euro and women 12984,9 euro. The employment rate (20-64 years) is 44,3%, below the average for the Mezzogiorno and Italy. The youth employment rate (15-29 years) is 19,9%, two percentage points higher than the previous year. Here too, there is a higher incidence of male employment (21,4%). As in Palermo, compared to 2019, in 2022 the province of Catania registers a positive decrease in: the rate of non-participation in employment (-2,1), the rate of fatal accidents and permanent disability (-5,5) and the rate of non-participation in youth employment (-7). However, in 2022 Catania ranks third among metropolitan cities in terms of unemployment rate, at 15,6%, higher than the national average of 9,2%, but still lower than the regional average (17,9%). Youth unemployment is also high: 46,5%, i.e. 17,1 percentage points higher than the Italian average. Therefore, according to the Cerved report, in labour dynamics Catania's condition is lower than Palermo's, based on the level of employment, youth employment, female employment and labour market dynamism.

According to the **social sustainability** index, Catania ranks among the bottom 11 provinces, with a value of 95,7 points, which is mainly affected by the security aspect. In the Catania-Palermo comparison, Cerved recognizes Catania's higher quality only in the condition of the elderly and assistance to families; while Palermo's higher quality in human capital, family wealth, inclusion, the health system and justice. Regarding health, life expectancy at birth in 2022 is 81,5 years on average (83,7 for women and 79,2 for men). Infant mortality is 2,9 per 1000 live births, lower than in 2019 (3,2 per 1000). As regards housing, in Catania more than half of the population lives in working-class areas with young families renting (51,6%), while 30% live

¹⁴⁵ Cerved Research (2022). *Rapporto Italia Sostenibile 2022*.

¹⁴⁶ *Ibidm.*

¹⁴⁷ Elaborated on ISTAT data - BES2023_territory.

in middle-class areas and 2,70% in working-class areas at risk of decay¹⁴⁸. Moreover, Openpolis ranks Catania second for households with potential economic hardship, after Naples, with 7,8%. The 40,4% of residents live in deprived neighbourhoods, after Naples (41,1%) and Cagliari (44,8%). The picture continues to be negative when considering social and material vulnerability, which worsens towards the South and which estimates a high social index (over 103) for Catania, Palermo and Messina: Catania, in second place, reaches 107,3 points¹⁴⁹. Obviously, such high vulnerability preserves greater fragility in the face of a possible economic crisis. In education and training, children's participation in preschool in 2020 is 98%, above the national average (95,9%), with a variation of -0,2% compared to 2019¹⁵⁰. For students' inadequate literacy, Catania is fourth with 48,9% (with higher incidence from the male population) and with 59,7% for inadequate numerical competence (with higher incidence from the female population). Then, the transition to university is 44,1%, below the national average of 51,9%, but with a positive variation of 0,6%. The difference between males and females is significant, reaching 14,8%. Graduates are 17,9%, followed only by Messina (16,9%) and with a variation of -1%. Here too, all the southern provinces are below the national average, except for Cagliari. Finally, to complete the cycle, consider continuing education, in 2021 equal to 8,1% and representing the only area of education in which Catania manages to perform better than Palermo. The change compared to 2020 is also positive: +3,3%. Young people who do not work or study (NEET) are 40,2%, more than the regional average¹⁵¹. As regards social participation, there are 45,4 non-profit organizations per 10.000 inhabitants, an increase compared to previous years. Catania is also seat of the Volunteer Service Centres (CE.S.VO.P.) with an interprovincial structure, engaged in the organisation of technical, training and information support services on volunteer activity in the territory. Among the needs identified in the 2021 report are: promotion of networking between ETS (Third Sector organisations), innovative urban welfare models and digitisation. Finally, in security, Catania records 0,5 voluntary homicides per 100.000 inhabitants (like Palermo). Other reported violent crimes are 15,7 per 100.000 inhabitants¹⁵², slightly higher than the regional average (+0,2). Finally, the extra-urban road mortality rate is 3% compared to 4,7% in 2020.

Even more drastic is the performance recorded in **environmental sustainability**, where Catania is among the bottom six provinces, with 94,3 points. In the Catania-Palermo comparison, Cerved quantifies Catania as having more atmospheric pollution. Palermo is also more sustainable in the following aspects investigated: hydrogeological sustainability, energy reconversion and lower transition risk. In Catania in 2021, the average annual concentration of PM10 is 35 micrograms per m³, an increase of 8 micrograms compared to 2018, and the average annual concentration of PM2.5 is 13 micrograms per m³. According to the energy consumption

¹⁴⁸ Openpolis (2018, May 1). *Le aree urbane nelle città del Mezzogiorno*. Retrieved from <https://www.openpolis.it/aree-urbane-prevalgono-citta-mezzogiorno/>

¹⁴⁹ Openpolis (2018, March 27). *Quante persone vivono nelle periferie più disagiate*. Retrieved from <https://www.openpolis.it/quante-persone-vivono-nelle-periferie-piu-disagiate/>

¹⁵⁰ Città Metropolitane a confronto (2022). *Scuola e formazione dati e grafici*. Retrieved from: <http://inumeridibolognametropolitana.it/cittametropolitaneconfronto/istruzione/scuola-e-formazione>

¹⁵¹ Elaborated on ISTAT data - BES2023_territory.

¹⁵² *Ibidem*.

and reconversion indicator, local energy consumption above the Italian average corresponds to a good degree of reconversion in Catania, given by the 17,3% of energy from renewable sources. However, despite the current global progress resulting from a widespread awareness on environmental issues, against all expectations, the figure is decreasing compared to past years (for example, in 2018 it was 19,5%)¹⁵³. Catania has a productive fabric with a low risk of transition, but has significant difficulties in waste management (for waste and refuse management, it is the fourth last province, followed only by Genoa, Palermo and Grosseto) and is very exposed to hydrogeological and seismic risk¹⁵⁴. This is an alarming aspect that can also have repercussions on economic systems: a company with strategic assets located in areas exposed to the risk of floods, landslides or earthquakes could suffer devaluations due to the possible losses associated with catastrophic physical events¹⁵⁵. Catania is among the 15 provinces most exposed to earthquake risk, with 81,7% of employees at very high risk, as in Syracuse. There is a clear connection between reduced environmental sustainability and social fragility, in terms of resilience to the costs of climate change and social structures equipped to cope with shocks. Moreover, with regard to heritage protection, the anthropic activity of recent years (urbanization of settlements, unauthorized building, environmental degradation and hydraulic drainage works) together with recent climatic phenomena (floods and droughts) or of malicious origin (fires) have contributed to the impoverishment of the local natural heritage¹⁵⁶. The main consequences are a negative perception of the quality of urban centers (accessibility, cleanliness and legality) and possible competition with the territories of eastern Sicily, which enjoy a better endowment of the accommodation system.

3.6 Innovation in Sicily

According to the *Regional Innovation Scoreboard* (2021), Sicily is a “Moderate Innovator –”, with a performance that grew by 21,9% between 2014 and 2021. Among the EU regions, it ranks 173rd and among the moderate innovators in Italy (Sardinia, Basilicata, Apulia, Campania, Molise, Abruzzo, Marche, Umbria, Liguria and Piedmont) it ranks last. Total expenditure on R&D relative to GDP is 0,84%, below the Italian average (1,47%), and below the Mezzogiorno (0,96%). The 26,9% are innovative companies, but even more alarming is the figure for patent intensity, which is 8,7% compared to the Italian average of 74,6%. The production system's low propensity for innovation and patenting also emerges from the data on R&D investments financed with private funds, which, with a modest 37% of the total, is below the leading regions (such as Lombardy with 82%) and the national average (63%) (Regione Sicilia, 2023). Added to this are the small number of graduates in STEM disciplines (8% per thousand inhabitants) and researchers employed in companies (0,3% of the total number of employees). According to the *Digital Economy and Society Index* (DESI), in 2021 Sicily is fourth to last in terms of digital skills, followed only by Calabria, Basilicata and Molise, and records the worst level for digital public services and human capital. Among industrial enterprises

¹⁵³ *Ibidem*.

¹⁵⁴ Cerved Research (2022). *Rapporto Italia Sostenibile 2022*.

¹⁵⁵ *Ibidem*.

¹⁵⁶ Città Metropolitana di Catania (2022). *Piano Strategico*.

with 10 or more employees, only 51,4% have a website and just 11,1% carry out online sales¹⁵⁷. While it recovers a few points in the connectivity dimension, which is determined by the use of fixed broadband, mobile connections and the broadband price index. The 6,4% of Sicilian companies invested in fibre optic connectivity (Italy 8,6%), 0,9% in the Internet of Things (Italy 1,2%), 0,4% in technologies for processing and analyzing Big Data (Italy 0,9%), 0,4% in advanced automation and robotics (Italy 0,9%) and 0,3% in 3D printers (Italy 0,7%). But there was progress in investments in social and environmental responsibility, which accounted for 23,3% in 2018, in line with average values and the regions of central and northern Italy. The StartupItalia (2022) report records a doubling in the number of start-ups in Sicily, from 359 in 2017 to 700 in 2022, with a turnover of 40,7%¹⁵⁸. An analysis of the Sicilian ecosystem reveals two fields that are most popular among start-uppers: software production and scientific research. One obstacle still concerns investment funds and low capitalisation, which impede growth: only 19,2% of start-ups reach 50.000 euro. Young people are at the helm of almost 18% of Sicilian start-ups, while the inclusion of women accounts for only 7,8%. In this scenario, only Catania and Palermo rank among the top 20 most innovative Italian start-ups by number, in 13th and 15th place respectively. Finally, an important local innovation potential, according to Professor Corso, is “south working”, which he explains as: “this is the attempt by people, including high-spending ones, to leave cities that offer little quality, also in terms of contact with nature or the environment. So, it can be strategic to think about leaving the big cities to carve out a slice of paradise in the South, which is more economically affordable”.

3.7 Innovation Funds management in Sicily

For the 2021-2027 Cohesion Policy programming, Sicily obtains the largest sum compared to the other regions of Italy: the funds amount to 7,3 billion euro, divided between the ERDF and ESF+ programme. This measure is justified by Sicily's evident structural backwardness, even more so if private expenditure is to be increased by supporting non-revenue-generating investments aimed at structurally weak companies. In particular, the Sicilian ERDF Fund provides for an endowment of 5,8 billion euro, of which 4,1 billion euro from the EU and 1,75 billion euro from the nation¹⁵⁹. In general, the greatest challenge involving the region is to develop intercontinental connections to overcome its condition of insularity. The two strategic areas the projects will focus on are research and the environment, in particular to support the green and digital transition and climate change mitigation.

The most critical issue that emerges from the 2014-2020 programming concerns the Sicilian Region's inability to spend, along with its inability to plan. Professor Corso explains that the Sicilian Region of the 14-20 ERDF OP, an initiative with an endowment of more than 4,5 billion euro, after 2 years and 4 months from the ordinary

¹⁵⁷ Istat (2021). *Registro Statistico delle Imprese attive*.

¹⁵⁸ Consider that the Italian ranking is led by Lombardy with 3885 start-ups, followed by Lazio, with 1729.

¹⁵⁹ EuroInfoSicilia (2022, February 19). *Fondi Ue 2021-27: il Programma Fesr Sicilia avrà una dotazione di 5,8 miliardi di euro e punterà su ambiente, ricerca e digitale*. Retrieved from <https://www.euoinfosicilia.it/fondi-ue-fesr-sicilia-2021-27/>

end of programming, had not yet spent more than 2 billion euro as of 31/12/2022. Moreover, he adds that about the Development and Cohesion Fund programming (managed by the Ministry of the South, linked to European programming, and therefore free from time constraints), of the 7,5 billion Sicilian (in addition to the new 5,5 billion 21-27 of the ERDF OP), 1,5 billion goes back to the 2000-2006 programming. 960 million have not yet been transferred from the regional programming, due to Sicily's inability to spend. In the 2007-2013 programming period, more than one and a half billion euro were not returned to Brussels, not because they were spent, but because the State considered the investments of Ferrovie dello Stato and Anas as spent on these funds. The consequence is that the State did not lose them, but Sicily essentially did, because the investments in Ferrovie dello Stato and Anas had to be made through other funds. Therefore, the inability to manage funds often causes these situations, in which either resources are lost or they are scattered among other programmes so as not to incur the rule of decommitment of European resources. As a result, FSC funds are frequently used to meet needs of a current expenditure nature (e.g. public finance cuts) and there is a widespread sense of the lack of cogency of the FSC rules, which are continually revised also in response to requests for extensions by administrations lagging behind in implementation. In this regard, we report Professor Corso's interesting anecdote from five years ago about the Territorial Cohesion Agency, which oversees the monitoring of all spending plans. The Agency, in order to improve the efficiency of expenditure management, initiated a request for evidence of the administrative steps to be taken by the Region in issuing calls for proposals, allocating resources, managing reporting, and so on. After many reminders, the Region finally produced a table in which it emerged that the average number of administrative steps between different subjects was 62. "Among these steps, there is a singular one: the Sicilian region not only has a special statute but, being a region, is not a central state administration. At the central level, the rule applies that all ministries must go through the Court of Auditors before a public notice providing for expenditure is implemented. Regions do not have this constraint, but the Sicilian Region has "self-given" it. It means that among these 62 administrative steps, there is also the passage from the Court of Auditors. When there are 62 passes, if there is a problem, there is very little chance of tracing the error and responsibility: this explains why the Region has given itself this process, consciously or not, to zero responsibility" explains the Professor.

CHAPTER IV: DISCUSSION RESULTS FOR THE INDIGENOUS INNOVATION POLICY IN SICILY

4.1 Empirical illustration of the four-variable framework

In this last chapter, all the information observed so far, in the Palermo Ecosystem and the Catania Ecosystem, is summarized through Swot Analysis. This strategic tool is able to compare all the local positive and negative factors, which are necessary to formulate the *ad hoc* Innovation Policy for Sicily at the end of the chapter. For each province, the figures are divided into four quadrants: “strengths” that include successful internal factors and initiatives, “opportunities” understood as aspects that have not yet been fully exploited, “weaknesses” relating to all fragile and limiting local initiatives, and “threats” that include external factors that may generate problems for local stability.

Figure 23: Swot Analysis of the Metropolitan City of Palermo

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> • Human Capital Quality • Skills, resources and facilities of excellence in healthcare (e.g. ISMETT) • High-quality University • Social facilities and voluntary services • Tourism and Trade produce high added value • High availability of Human Resources in Tourism • Gastronomic culture • Energy conversion and hydrogeological sustainability • Extensive natural gas distribution network 	<ul style="list-style-type: none"> • Few medium and large companies • Low tertiary education • Few STEM graduates • High presence of NEETs • Lack of technical and planning skills • Income mainly from public revenues • Weak infrastructure system • Low-efficiency public services • Low R&D and innovation expenditure • High waste production and low separate collection • Non-functional monitoring • Negative trade balance and low exports • High unemployment rate • Undeveloped surveillance systems • Air pollution • Poor environmental and monumental protection
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> • Geographical centrality in the communication nodes of Europe and the Mediterranean • Advantageous condition in the port system • Tourist flows to the Mediterranean • Heritage with tourism potential (cultural, landscape and natural) • Local fertility for Agriculture • South working • Evolution of e-Health • Solar and wind energy 	<ul style="list-style-type: none"> • Weak international role • Condition of insularity • The service-based economy is most affected by economic shocks • Public Administration Spending Incapacity • Competition in the cultural market in the most endowed areas of central-northern Italy • Shortage of skilled labour in the agricultural system • Poor product competitiveness in national and international markets • Weak local network • High corruption and rising crime rates • Social and economic inequality • High bureaucratisation • Possibility of conflicts between local and central administrations

Source: Own elaboration.

Figure 24: Swot Analysis of the Metropolitan City of Catania

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> • Regional Manufacturing Concentration • Quality production fabric and solidity of enterprises • High-tech industry • Etna Valley district • Wine production, olive and citrus cultivation • Agriculture and Trade produce high added value • International role of Catania port and airport • Positive trade balance and international exports • Networking and sharing know-how • Expenditure on R&D and innovation • Generational change • Strong entrepreneurial culture 	<ul style="list-style-type: none"> • Insufficient local management • Low tertiary education • High presence of NEETs • Weak infrastructure system • Low-efficiency public services • Non-functional monitoring • Insufficient public transport • High unemployment rate • Undeveloped surveillance systems • Lack of technical and planning skills • Environmental degradation • Air pollution • High waste production and low separate collection • Unauthorised building phenomenon
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> • Geographical centrality in the communication nodes of Europe and the Mediterranean • Tourist flows to the Mediterranean • Local fertility for Agriculture • Digitalization • Growing continuing education system • South working • Significant growth in airport traffic • Solar and wind energy 	<ul style="list-style-type: none"> • Condition of insularity • High corruption and rising crime rates • Undynamic labour market • Gender employment gap • High social vulnerability • High number of families with economic hardship • Non-functional monitoring • Low electoral participation • High bureaucratisation • Highly exposed to hydrogeological and seismic risk • Inadequate accommodation offer compared to the competition

Source: Own elaboration.

The interviewees, Pietro Paolo Corso, Enrico Foglia, Dario Strano and Eliano Russo, agree on a common line: Sicily possesses enormous potential, in terms of geographical location, natural resources and sources of tourist attractiveness, which however are not fully exploited due to fragmented management, lack of expertise, inability to spend and mafia infiltration. Underlying the main issues is the condition of insularity, which by its nature is indicative of peculiar ecosystems for plant and animal species. However, in the current society, this translates into additional costs related to transport (due to the complex connections with the mainland), reduced economic activity (little diversified and specialized) and the environment (as there is greater vulnerability to climate change). Sicily is located in the heart of the Mediterranean and at the point of greatest contact with the African continent, thus enjoying a strategic position within the intercontinental communication network. Palermo and Catania, as poles generating transport and socio-economic flows, possess the region's major international airports and ports, which are, however, limited by constant disruptions and lack of manpower. It must be added that, within the regional territory, the road network and the use of public transport are complex. The infrastructure issue can provide answers to the weak economic system and the reduced attractiveness to external investors, who prefer to opt for a more equipped and accessible area. The Sicilian economic system is mainly composed of small and medium-sized enterprises, which are less likely to make major innovations due to the available resources. Most of the products manufactured are in low-value-added processing stages,

which do not require high levels of know-how. Moreover, they are often family-run businesses, whose typology certainly enhances the local context and activities but, if not organized in a managerial way, can limit the development of new initiatives. In Sicily, there is a higher concentration of employees in Trade, Construction and Tourism, and in an analysis by economic sectors, the local economy is more dependent on the Tertiary Sector. However, “system differentiation”, or specialization, requires skills, financial capacity, resources and cutting-edge technology to carry out high-value activities. Unfortunately, this is still not the case in Sicily, which, as Professor Corso explains, has not surpassed the “critical mass” of key players to be able to define itself as specialized. This is also confirmed by performance data, such as in the tourism sector, which has lower tourism rates than the national average, or in agriculture, whose products are not competitive. The territory has all the requisites to boast an incredible landscape and cultural heritage, which, however, it is unable to exploit due to insufficient beds and unsuitable accommodation. This leads to consumer dissatisfaction, which in turn threatens “word of mouth marketing” with discouraging reviews. Furthermore, specialization is hindered by a regionally inefficient innovation system, which, however, is evolving towards the Catania area. In fact, as illustrated in the graph, Catania has a better performing differentiation than Palermo, thanks to the success of the Etna Valley District and the research network it is building around it. Unlike Palermo, which is highly dependent on public activity, Catania has sought to develop its economy through innovative business activities and by involving international partners, as in the case of 3Sun Enel, which chose Sicily to invest in renewable energy. Moreover, this is also related to a better diversification of Catania's entrepreneurial fabric, which estimates greater homogeneity of results in the various economic sectors. The variety of actors and high skills define, in quantitative and qualitative terms, the organizational depth and provide the resources for innovation and entrepreneurship. Agriculture, especially towards the hinterland, is one of the most relevant sectors due to the climatic conditions and is engaged in citrus growing, fruit growing, horticulture, vine growing, vegetables and wheat. In the area of eastern Sicily, the manufacturing sector is developing, with a consequent increase in exports. Here, a culture of entrepreneurship has strengthened, which is more inclined to risk-taking and encourages the structure of a network of companies, government institutions, universities, research centers, incubators, science parks, banks and start-ups. Certainly, this explains the succession of more dynamic opportunities and international trade flows. On the other hand, Palermo does not yet feel the need to renew itself, as it is aware that it can count on the indissoluble profitability of public administration services. This leads to an over-reliance on local sources, resulting in lock-in and reduced innovation. In the Sicilian scenario (with less relevance to the Catania area), since differentiation is low and therefore there are few players in a specific field and there is no support for entrepreneurship, diversification is also complex since it would imply distributing even more of the already scarce resources. Another typical risk of low diversification, which Catania managed to balance thanks to local initiative, is the greater presence of incumbents who are logically more powerful than local actors.

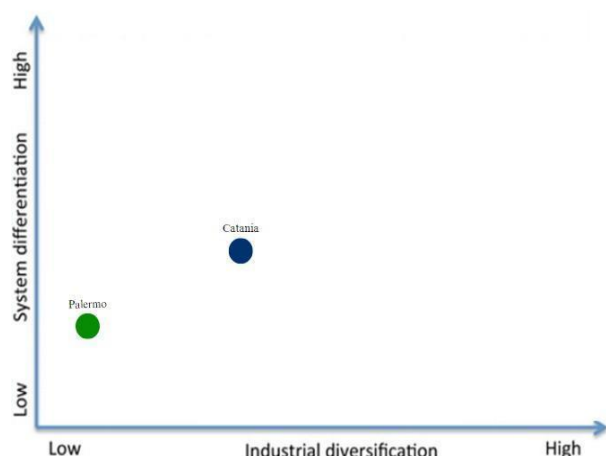
In terms of economic, social and environmental sustainability, all the Sicilian provinces are defined by the Cerved Report as “fragile provinces”. If on the entrepreneurial side, Catania performs better due to a higher

level of differentiation and diversification (which in any case remains close to the typical average of the South), as can be seen from the graph, Palermo has a better quality of life. The close connection to the Public Administration justifies the higher IQI results and thus a more functional system in the capital. Of all the sectors, the health sector in Palermo performs particularly well, with a good number of specialized doctors and modest hospital facilities. According to all the other BES public service quality indicators, Palermo on average ranks first among the Sicilian provinces. The only service in which it demonstrates major criticalities compared to the rest of the region concerns differentiated waste collection, which, among other things, fails to respond to the enormous quantity of waste produced per year. In general, the governance system in Sicily is far removed from the national average because it is limited by internal competences and bureaucratic time, affecting the provision of services. Policy instruments are not targeted and are ineffective in supporting innovation and entrepreneurship. Therefore, entrepreneurial activity lacks feasibility in terms of organizational, cognitive and implementation skills. As stated by Professor Corso, there are no technicians and planners in the workforce who can participate in tenders with strategy and originality. The staff in the offices is also severely understaffed, compared to the expected number, causing slow and fragmented processes. On top of this, there is a serious problem of corruption, family concessions, favouritism and multiple kinship ties between employees working in public offices, without valuing young talent. Sicily is historically marked by the Mafia phenomenon, which nowadays targets political and entrepreneurial levels, constituting a major obstacle to legality and to those who honestly intend to launch innovative local initiatives. Moreover, the quality of local life is threatened by crime, the risk of which derives more from the inadequacy of the surveillance and control system than from individual crime rates, which remain below the national average among the last provinces. On a social level, there are strong inequalities that separate Sicily and the South from the rest of the country. There is a high percentage of families living in poor economic conditions, mostly concentrated in the suburbs. The early exit from the education system, together with the complex accessibility of the labour market, results in excessively high percentages of young people not studying and not working (NEET). The most critical issues concern literacy and numeracy skills, consistent with southern dynamics. In addition, secondary and tertiary education is falling compared to the national average. The percentage of unemployed is also on the rise, especially the youth unemployment rate. The labour market is growing but is still precarious and subject to a strong gender gap. Finally, from the environmental point of view, Sicily has vast landscape and naturalistic areas of different types, from mountainous to coastal areas. However, it performs weakly in environmental sustainability, especially in the eastern ecosystem. This area is also more prone to physical hazards and a medium risk of transition¹⁶⁰. Palermo and Catania, being more engaged in productive activities, produce higher levels of air pollution and water consumption.

¹⁶⁰ Transition risk represents the costs resulting from the adjustment required by the evolution towards a zero-emission economic system.

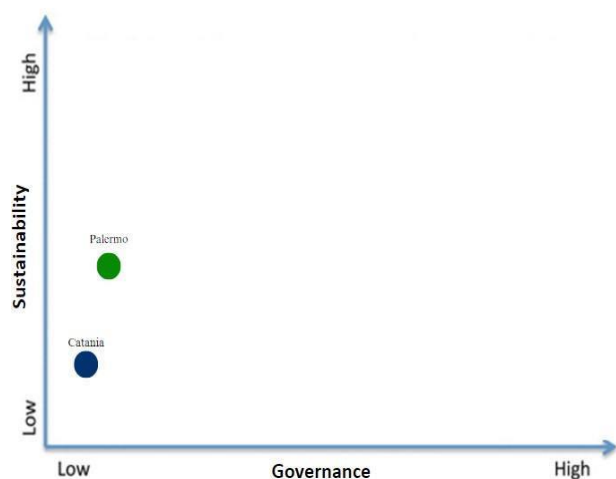
Below are empirical illustrations of the Entrepreneurial Dimension and the Quality of Life Dimension. As Grillitsch and Asheim (2018) suggest, most real cases do not score exactly high or low on all aspects. Based on the discussion in chapter three, the empirical illustration is derived from the positioning of Palermo and Catania with respect to the origin and ends of the axes. In this way, it is possible to deduce whether the individual case stands out from the other and whether it is closer to one quadrant than another. The graphical representation follows the one proposed by the authors.

Figure 25: Entrepreneurial dimension: empirical illustration.



Source: Own elaboration.

Figure 26: Quality of life dimension: empirical illustration.



Source: Own elaboration.

4.2 Place-based Innovation Policy for Sicily

According to the theoretical framework, illustrated in chapter two (figures 3 and 5), Palermo and Catania belong to the low quadrant in terms of both entrepreneurship and quality of life. They have a poorly diversified economy, mainly based on services and characterized by low value-added activities and fragile support for entrepreneurship. Catania, despite belonging to the same quadrant, has managed to distinguish itself at regional

level for its investments and resources for innovation, which have enabled the development a specialization in the high-tech sector, the heart of which is in the Etna Valley District. Similarly, the two provinces are characterized by low levels of governance and sustainability, which imply problems in terms of planning, coordination and control and consequent misalignments between objectives and actual results. The scenario of the two major ecosystems defines the regional framework, from which it is clear that Sicily is a fairly homogeneous territory in various aspects and how it is distant from the regions of central-northern Europe in economic and social terms. It is correct to consider that each region must start from different points, depending on the resources available: realizing innovation here is different from the case of a region that has already developed smart solutions or a region that possesses the prerequisites to be able to start a growth process. Since the Sicilian context presents upstream factors hindering innovation, the model must use a strategy that consciously intervenes on local needs and at the same time enhances economic assets to increase the territory's competitiveness. Therefore, the innovation policy for Sicily, defined in this chapter, focuses on the most promising assets for the context, deduced from the strengths and opportunities illustrated in the swot analysis (section 4.1).

The preliminary step, propaedeutic to the application of innovation policy (the operations of which are proposed below), is to define governance. The most innovative tool to overcome the current management inefficiencies in Sicily, caused by the lack of networks, is the *quintuple helix governance*, including: public institutions, businesses, cognitive institutions, civil society and the third sector. The urban co-governance paradigm is based on three levels, sharing, collaboration and polycentricity (Iaione, 2016; Iaione and Cannavò, 2015) and derives from Elinor Ostrom's insights¹⁶¹ on local knowledge and cooperation between different actors or users of a common resource¹⁶². The contribution of the quintuple helix, compared to the triple helix model¹⁶³, consists in the involvement of social innovation that, through new services and ideas, intends to respond to local needs. In this system that brings public and private into communication, involving citizens, Palermo, the capital city, can provide the highest functions of the public administration, quality social capital, an excellent university and wide-ranging political repertoires; Catania, on the other hand, can provide resources and experience in innovation, in which it has been investing for about twenty years to develop the high-tech sector and a network of international partners who have invested in Etna Valley and in the province in general. The role of universities is no longer just to train students, but can become the focus around which research and knowledge sharing between actors engaged in co-production revolve. Other qualified innovation actors include research centers, such as CNR (Italian National Research Council), Foundation Ri.MED, ENEA, the Euro-Mediterranean Institute of Science and Technology, the Experimental Zooprohylactic Institute of Sicily and many others. Furthermore, it is crucial to strengthen the link between universities and

¹⁶¹ Elinor Ostrom is an American political scientist, who won the Nobel Prize for Economics in 2009.

¹⁶² Iaione, FC. & De Nictolis, E. (2016). *La quintupla elica come approccio alla governance dell'innovazione sociale* (pp. 75-89).

¹⁶³ The triple helix model was theorised by Etzkowitz and Leydesdorff (1998) and includes: industry, research and development innovators and institutions.

companies to adapt skills consistently with business needs. In addition to responding to the primary employment need, through working opportunities and internships, this collaboration can generate great potential for the territory: local authorities are able to develop a local plan based on real strengths and weaknesses, without which external investors could not define a place-based project. However, the risk of multi-level governance should be monitored, whose complexity may otherwise lead to a discrepancy between scientific excellence and industrial specialization, whereby industrial actors may not be able to fully absorb research knowledge (Isaksen & Tripl, 2016).

The interviewees, when asked to express their opinion on industrial strategies, all agreed on one option for Sicily: “specialized diversification”. According to their experience, in the local private and public sectors, the region should invest in the most assets and opportunities it possesses, where it can simultaneously develop innovation activities to excel. This implies not locking into a single area of value, as this could be very risky in terms of profitability but also in terms of skills, which could then hardly be unlearned and allocated differently. However, specialized diversification, being intelligent, does not have to involve any sector, but must strategically differentiate itself for the elements that “the others” do not have and in which it can benefit from its geographical position in the center of the Mediterranean.

In view of the low level of general competitiveness, the first operation must aim to achieve a strong position in the specific sectors in which the area already demonstrates a good starting point, through an upgrading process. The province of Palermo performs well in the **health sector**, compared to the southern average, in terms of the number of beds, hospital facilities and specialist doctors. In fact, the tendency of regional residents is to emigrate to Palermo to access adequate healthcare. Consider the case of ISMETT, which, in addition to Palermo, is opening a new site in Carini (PA), whose project demonstrates a clear commitment to innovation in healthcare and to reducing passive mobility. As the former President of the Sicilian Region stated, the intention is not to become competitive with the countries of Northern Europe, but a point of reference for the Euro-Afro-Asian basin: must respond to the needs of millions of Africans who seek Europe in the North, to whom, instead, can provide the opportunity to find it in the South, in the first strip of European land just 75 kilometers from the coast. The practice of upgrading in healthcare is to take advantage of the resources already developed in the sector and renew them by introducing new technologies that can offer advanced and faster treatments. Investment in research is essential in this sector to develop prevention and to update medical care, applying new discoveries, such as molecular investigation, diagnostic imaging or large machines (e.g. Hadrontherapy). Funding must be distributed in infrastructure, training of healthcare personnel (for the use of new tech), prevention, technology and the pharmaceutical industry. High-performance computing and big data analysis are capable of revolutionizing healthcare, which can become a remote service in many cases, avoiding the need to visit a hospital. As a result, patients can access care without time and space constraints and medical staff can better organize their work, after filtering real needs and relying on electronic medical records and digital reports. Healthcare, as one of the main public services, if made efficient, can greatly increase the

attractiveness of the territory to the outside world and fortify the regional identity. In the Sicilian context, threatened by strong social inequalities compared to the rest of the country and by areas of social decay, the healthcare system can have the capacity to influence residents' daily lives and quality of life. In this regard, social and health services, as well as administrative and educational services, should be decentralized throughout the region so that the city peripheries and the hinterland of the region can benefit equally. It is also strategic to establish partnerships between regional structures and other cutting-edge organizations abroad, in order to involve talent and democratize knowledge.

The second upgrading operation must be carried out in the **high-tech sector**, which is already well established in Catania, where investments in research must be intensified in order to create a real specialisation of the district and improve its position at international level. Today, technology companies complain of a lack of technical-scientific skills, consistent with the unsatisfactory statistics on STEM graduates in Sicily. Underlying this is an important social area in which there is an urgent need to invest in Sicily, which concerns education and training. As reported in the analysis, the education system is underperforming and the percentages for the number of students are drastic, especially when compared to the rest of Italy. Widespread poverty leads to early drop-outs from the education system, sometimes opting for low-value employment solutions, but which offer the opportunity to earn money in the short term and to cope with family financial hardship. Similarly, the number of students enrolled in university also decreases, thus impacting the regional level of tertiary education. Thus, the financial constraint and the cultural factor would seem to be the causes with the greatest impact on academic performance, as the region has excellent universities with a wide range of courses on offer. The university pole of Catania, for example, is deepening the naturalistic, urbanistic, architectural, agro-alimentary and managerial themes. However, in view of the development of the microelectronics supply chain and corporate demands, universities need to invest more in STEM disciplines, expanding courses, projects, accessibility to laboratories and partnerships with foreign companies and universities. Among other things, the possibility of benefiting from a qualified service reduces the “brain drain” phenomenon, according to which talented students choose to emigrate to another region to benefit from better study conditions. STEM graduates, thanks to the technical skills they have acquired, are potential resources for innovation paths, as demonstrated by research carried out by 3Sun, STMicroelectronics and Strano S.p.A. on the labour market. A good education and training system has important spill-over effects on the labour market and employment levels. As the high-tech asset reaches critical mass, it can share its social capital, resources and skills with new sectors, triggering a related diversification. Weaker industrial paths can thus be supported in their competitive advantage and in overcoming barriers to entry. Here again, entrepreneurial culture and political incentives are essential for the territory to be able to take up and implement competences. An opportune strategy is to shift public support from low-growth paths to new and dynamic industrial paths, which can be difficult due to the rigidities associated with existing policy logics and repertoires (Morgan, 2016). Furthermore, in order to foster entrepreneurship, interconnectedness needs to be strengthened by removing barriers for interactions and

mobility between sectors or creating possibilities for actors to have positions in different social structures (e.g. university professor engaged in entrepreneurial ventures)¹⁶⁴.

The third operation is related to the high-tech sector, from which it could absorb resources and share synergies: diversification into the **renewable energy sector**. It is premised that since the high-tech sector, characterized by low differentiation, does not yet have sufficient resources to spread even in a diversification, this operation will be strategically applicable when the sector is sufficiently mature (avoiding a lock-in of skills). Thanks to the solar and wind potential stemming from the island's geographical location, Sicily could lead Italy's renewables production and become a major exporter. As stated by EU Commission President Von Der Leyen, Sicily could become a hub for clean energy in Europe. In reality, the results, according to the GreenItaly report, state that the region produces just under 4GW of renewable energy, with wind power prevailing. In comparative terms, this production corresponds to less than half that of Lombardy (first in Italy with more than 9 GW) and even less than Puglia and Piedmont. According to Legambiente's survey, Sicily has more than a quarter of requests for the installation of new plants blocked due to bureaucratic issues and uncertainty on the part of the local administration, which keep investors away. Among other things, the region is not yet energy self-sufficient, since instead of exploiting its natural wind and solar potential, it relies on imported fossil fuels. Regarding wind energy, there are already around 700 wind turbines, mostly located in the Trapani area, but most of them are out of use due to grid capacity. At this point, the operation must also promote extra-regional connections, playing on the partnerships already established in the high-tech sector in Catania. Investing in renewable energy, and sharing the knowledge developed, is strategic because it is a very dynamic and growing sector that, if seized in the immediate future, can guarantee a good competitive advantage. Sharing synergies also strengthens the existing network and connects partners from different sectors. The resulting increase in local attractiveness will also foster dialogue with incumbents, based on an interchange of internal and external skills. Here too, political support is crucial, to steer incentives towards the new industrial path and to facilitate access to financing. It must also intervene on the Sicilian culture, which is not very confident about the advantage of renewables for local competitiveness: the collective opinion is that the installation of the plants disfigures the landscape and then, as remote monitoring is sufficient, it also eliminates many jobs that would otherwise be engaged on that land. This position, which is identified with the local culture anchored to traditional systems, is averse to innovation and slows down the ecological transition. Once again, the tendency of Sicilian entrepreneurs to safeguard their own interests and stop at very short growth horizons emerges. Investing in renewable energy is also an excellent strategy to improve the regional degree of environmental sustainability, which, as observed during the analysis, is based on an ecosystem with great natural potential, but which is not at all valued and safeguarded. The relationship between the average Sicilian

¹⁶⁴ Markus Grillitsch & Bjørn Asheim (2018) Place-based innovation policy for industrial diversification in regions. *European Planning Studies*, 26:8, 1638-1662.

resident and the environment is unfortunately very weak: as 3Sun's CEO suggests, it is necessary to invest in a context of social initiatives, values and positivity, stimulating a sense of belonging to the territory.

The fourth operation is again based on an updating process, since it is necessary to make more innovative a sector that is already widespread in the region but has not yet reached critical mass: **tourism**. Thanks to the heterogeneity of its territory, Sicily offers a variety of opportunities, including cultural tourism (e.g. Palermo), nature tourism (e.g. Etna Park) and seaside tourism (e.g. Agrigento). Starting with a good amount of resources, it can introduce new technologies to develop smart tourism, in a perfect combination of digitalization and creativity. The first issue on which funding must be focused concerns infrastructure, to overcome the problem of logistics and allow smoother access to sea, rail, road and especially air routes, the costs of which have risen sharply in recent years. About the internal road system, a major maintenance process is urgently needed to resolve the areas of disruption and those at risk, and then the extension of provincial and state roads must be carried out. Secondly, the high flow of demand must be met with sufficient accommodation facilities. For example, the heritage of second homes must be exploited to expand the accommodation offer. The huge amount of non-recoverable waste produced by the region can be transformed into energy through the installation of waste-to-energy plants, which according to a circular economy system can contribute to environmental protection. In addition, buildings can be powered through solar and wind energy in which, as explained earlier, technological expertise can be invested. In this way, accommodations can obtain ecological certifications. Public transport, which must become the main option for tourists' mobility, must be regulated by more efficient management, by creating dedicated lanes that do not intersect with local traffic, by monitoring times through digital display boards at bus stops and through applications for smartphones. To protect the environment, these public means of transport should be subject to electric conversion. These conditions would make Sicilian territories more sustainable and thus more attractive to the flow of tourists. Also contributing to tourist demand is safety, which must be safeguarded by investing in artificial intelligence systems and IoT devices. As Professor Corso suggests, video analysis can quickly deduce a series of information on characters, the color of clothing, objects and vehicles, so as to recognize through past experience if similar anomalies and movements are repeated at the location. Lastly, the operation, which aims at specialization in the sector, must also include investment in the training of tour operators, for which, among other things, university courses are planned in the Department of Economics (which, however, still suffer from low take-up).

Finally, the fifth operation involves an upgrade in **agriculture**: the island rich in fertile soils and a mild climate, has historically been involved in agricultural production, including cereals, fruit, olives, vegetables and more. However, as the data on added value and exports show, the sector is not exploited enough to do justice to local potential. An important phenomenon these days is the adaptation of agriculture to the new climatic requirements, focusing on tropical crops, such as mango, avocado, passion fruit and the almond. For example, on the coasts of Messina, the cultivation of lychees has started, thanks to a partnership with the University of

Palermo. To seize these new trends, the sector must equip itself with cutting-edge techniques that do not stress the soil and that adapt to the new crops. For example, by monitoring climatic conditions and soil moisture, irrigation can be planned and water wastage avoided. In this regard, rainwater collection tanks can be installed on farms for reuse. The monitoring system, through smartphone applications connected to the sensors, can provide details on the progress of diseases, pests, weather conditions and more accurate economic diagnoses. In fact, there is a need to invest in computerization and digitization on farms, to take advantage of new software and operate precision agriculture, which is called “e-Agriculture”. By the way, using portable devices and equipment with image sensors, it is possible to monitor the progress of the activity remotely, improving timing. For the same purposes, satellites can also be used to provide a broader and more reliable picture from above, based on which the farmer can make quicker and more accurate decisions. Then, in this process, cloud computing cannot be omitted to collect all past data and to reconstruct crop trends. Here too, the circular economy can be exploited to transform waste into sustainable fertilizers. These measures lead to increased production and environmental sustainability. Growers can optimize their expenses and reduce their efforts. The upgrading path should mainly aim to modernize the Sicilian hinterland, where agriculture is still practiced with antiquated tools, and then intensify farming in coastal areas that are more fertile and more convenient for exports. Finally, it is worth clarifying the cultural issue (mentioned above) that would seem to put agriculture at odds with energy production, the installations of which would disturb the land. One strategy could be to build “agro-voltaic” installations to combine the two activities, so that energy production does not preclude the continuity of agricultural production. To be successful, this system must exploit the synergies between the two sectors, with positive effects also on the sharing of costs and resources. Finally, an excellent collaboration must be established with the tourism sector, to specialize in the branch of “enogastronomic tourism¹⁶⁵”, which can enhance the products of the local land. This niche strategy can attract investors and bring restaurateurs, producers and consumers closer together.

¹⁶⁵ Food and wine tourism consists of a travel itinerary designed to discover local gastronomy and thus local culture. It is a strategy aimed at enhancing the territory.

CONCLUSIONS AND FUTURE PROSPECTS

The dissertation, on the closing point, addressed the issues characteristic of southern Europe, or more generally of the Mediterranean, which are crucial for competitiveness and innovation, for which it proposes an *ad hoc* model. As the European Commission explains, Innovation Policy must create a framework conducive to bringing ideas to market. In this paper, “framework” has been translated into four variables: industrial diversification, system differentiation, governance and sustainability. The analysis of these factors, aimed at maximising them, makes it possible to make the context “conducive” to welcoming new innovative proposals. In order to answer the research question “how to structure the Innovation Policy in Sicily?” a model has been proposed that, by leveraging strengths and weaknesses, intends to enhance the most characteristic assets through the powerful tool of innovation. In fact, the distribution of the five operations¹⁶⁶, mainly aimed at advanced upgrading, is also strategically designed to allow the Sicilian economy to diversify between the primary, secondary and tertiary sectors. The analysis has been enriched by data belonging to a multitude of themes (such as business, education, health, legality, wealth, security, the environment and many others), the purpose of which is to provide a more detailed picture of the territory: logically, all issues have points of contact and are able to influence each other according to the cause-effect principle. In this regard, it should be noted that the five operations are not limited to the identification of the most suitable industrial strategies (e.g. upgrading or diversification) for each selected asset, but also intervene on all the economic, social and environmental aspects. This strategic reasoning explains the idea of implementing the theoretical model of Markus Grillitsch & Bjørn Asheim (2018), adding a new dimension due to the need to combine the entrepreneurial aspect and the quality of life in an empirical case study.

In conclusion, a plan for the future agenda is proposed in order to make the five operations sustainable in the long run. Assuming that quintuple helix governance is an excellent tool to premise the effective implementation of innovation policy, the proposal intends to create an *innovation hub* that harnesses open innovation. According to the deductions in the last chapter, it may be strategic to build it near the university of Palermo, from which to draw resources: in particular the Ninni Cassarà Park, covering 255.000 m² in the Montegrappa-Santa Rosalia district, bordering the campus and the university hospital, and surrounded by the bus terminal, railway station and various cultural venues. The park, which has been closed to the public since 2014 because it was seized for soil pollution, is to undergo a recovery process, for the following purposes: knowledge transfer and redevelopment of the area, including green spaces for recreation and co-working areas. Young people and local entrepreneurs can work together and become a point of reference for external entrepreneurs. This activity should be carried out in the region following a macro-area mechanism that each university will preside over. The result would be that the region would no longer have a multitude of interlocutors, but only four, as the number of regional universities, which in turn would relate to the actors in

¹⁶⁶ The Five Operations argued in Chapter 4 are: Upgrading in health, high tech, tourism and agriculture and Diversification into renewable energy.

their own area. It is also right to start thinking in terms of sharing with other southern regions, to create a “Mediterranean ecosystem of innovation”. Finally, in this way, it is possible to exploit an important opportunity in Sicily: *south working*. “It represents the attempt by subjects, even high-spending ones, to abandon cities that offer little quality, even in terms of contact with nature or a human-scale environment (compared to the big cities) to move to the south and carve out a “slice of paradise”, among other things more accessible economically speaking”¹⁶⁷. The possibility of working for the best companies remotely, while staying in the south, makes it possible to combat the “brain drain” phenomenon and create possible valuable career paths locally. As a result, unemployment rates will finally recover. Another consequence is that unemployment rates will finally recover. Finally, if the region is able to intercept this opportunity, like other potential assets discussed, it will be able to achieve great development, because it leverages traditional factors and geographical location, which can lead to high international visibility.

¹⁶⁷ Quote taken from the interview with Professor Pietro Paolo Corso, University of Palermo.

APPENDICES

Figure 7: Ateco % Composition of Active Companies in Italy by Territory, Ateco Sector and Time (monthly frequency)¹⁶⁸.

ECONOMIC ACTIVITY SECTOR	TERRITORY			
	Palermo	Catania	Sicily	Italy
A - Agriculture, forestry and fishing	12,6	16,98	20,62	13,89
B - Mining and quarrying	0,07	0,05	0,09	0,05
C - Manufacturing	7	7,46	7,11	8,91
D - Electricity, gas, steam and air conditioning supply	0,15	0,13	0,19	0,25
E - Water supply, sewerage, waste management and remediation activities	0,33	0,3	0,28	0,19
F - Construction	11,23	12,07	11,99	14,73
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	35,09	33,27	30,4	25,57
H - Transportation and storage	2,88	3,28	2,71	2,81
I - Accommodation and food service activities	7,69	6,72	7,44	7,72
J - Information and communication	2,63	2,1	1,96	2,48
K - Financial and insurance activities	2,42	2,21	2,07	2,5
L - Real estate activities	2,1	1,81	1,67	5,23
M - Professional, scientific and technical activities	3,52	2,81	2,69	4,24
N - Administrative and support service activities	3,58	3,38	3,15	3,86
P - Education	1,07	0,73	0,79	0,62
Q - Human health and social work activities	1,69	1,51	1,47	0,82
R - Arts, entertainment and recreation	1,75	1,32	1,39	1,4
S - Other service activities	4,09	3,71	3,9	4,66
X - Non-classified enterprises	0,1	0,16	0,09	0,07

Source: opendata.marche.camcom.it - CCIAA Marche su dati InfoCamere

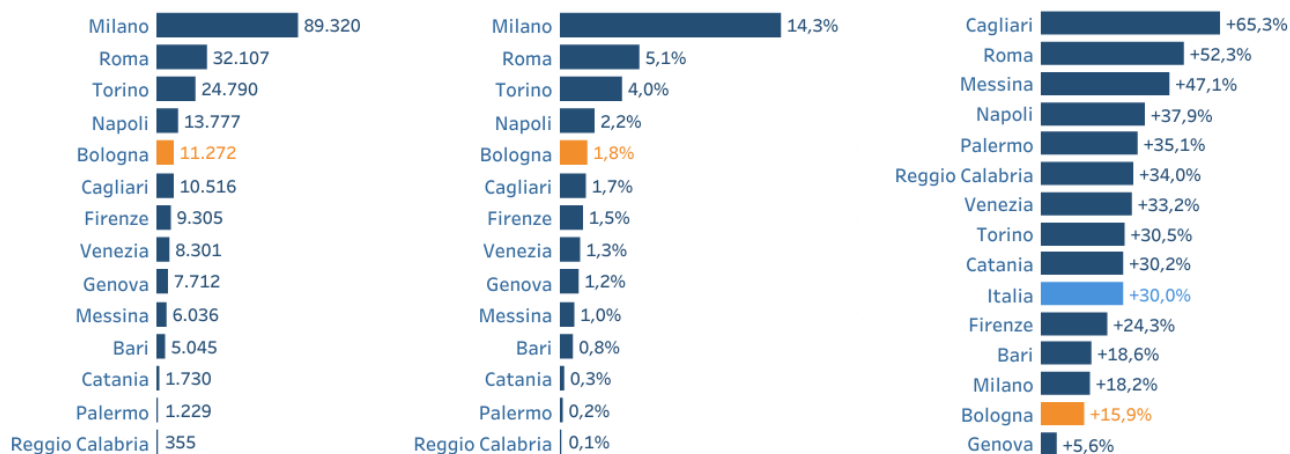
Figure 8: Budget, revenue, 2022.

TITLE REVENUE	TERRITORY	
	Palermo	Catania
Total Revenue	611.979.653,41	460.585.907,88
€	€	€
Current revenue of a fiscal nature, contributions and equalisation	68.256.319,51	118.906.299,69
€	€	€
Current transfers	86.395.498,06	69.413.974,15
€	€	€
Extra-tax revenue	7.464.266,25	5.743.777,44
€	€	€
Capital revenue	202.302.992,28	172.912.193,99
€	€	€
Income from reduction of assets financial assets	4.995.675,39	
€	€	- €
Taking out loans	1.266.683,48	
€	€	- €
Revenue on behalf of third parties and transfers	47.020.189,41	36.190.982,88
€	€	€
Cash Fund as at 1/1/2023	194.278.029,03	57.418.679,73
€	€	€

¹⁶⁸ Ateco 2007 classification is the national version of the European nomenclature, Nace Rev.2, published in the Official Journal of 20 December 2006 (Regulation (EC) no 1893/2006 of the European Parliament and of the Council of 20 December 2006).

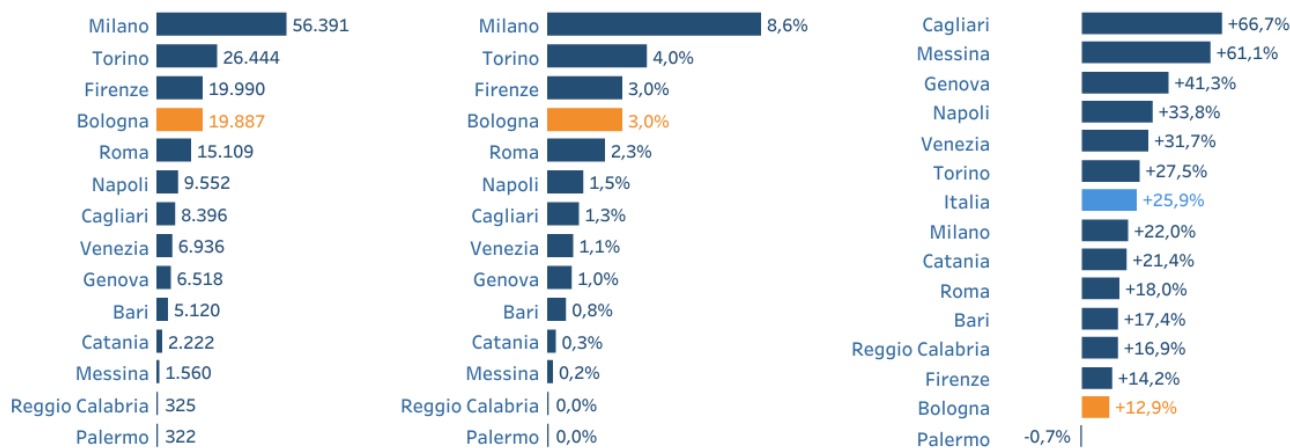
Source: Revised from the 2023-2025 Budget of the Metropolitan City of Palermo and the Metropolitan City of Catania¹⁶⁹.

Figure 9: Imports year 2022: absolute value (in millions of euros); % weight on total Italian imports; % change years 2022-2021.



Source: Istat, Coeweb

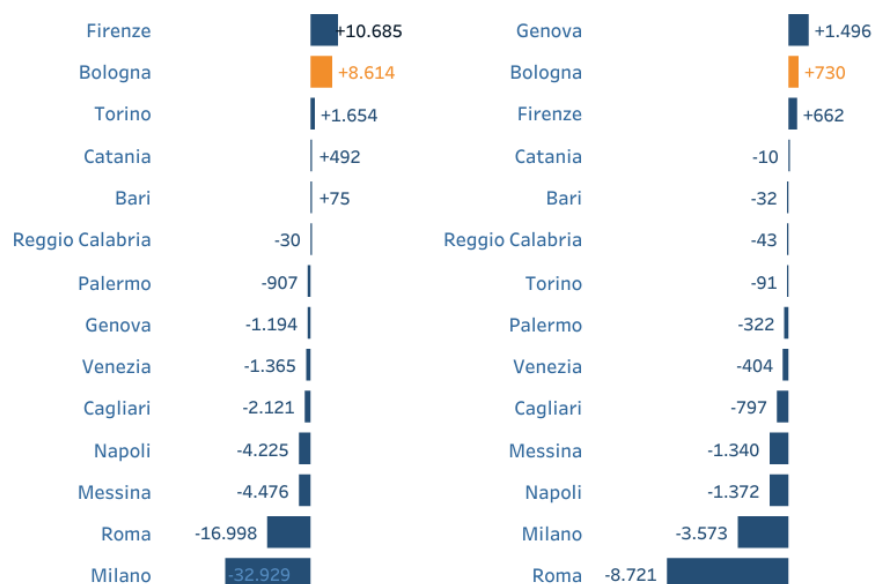
Figure 10: Exports year 2022: absolute value (in millions of euros); % weight on total Italian exports; % change years 2022-2021.



Source: Istat, Coeweb

¹⁶⁹ The budget of the Metropolitan City of Palermo can be found at <http://trasparenza.cittametropolitana.pa.it/> and the budget of the Metropolitan City of Catania at <https://trasparenza.cittametropolitana.ct.it/web/trasparenza/trasparenza>

Figure 11: Trade balances year 2022: Absolute value (in millions of euros); Absolute change years 2022-2021.



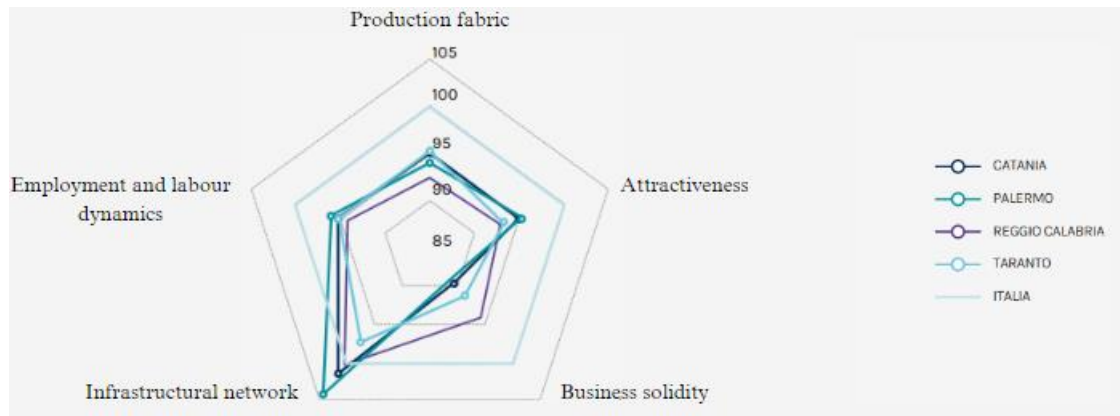
Source: Istat, Coeweb

Figure 12: Employees of Active Locations in Italy by Province, Sector, Division, Class, Ateco Subcategory and Time.

ECONOMIC ACTIVITY SECTOR	TERRITORY									
	Agrigento	Caltanissetta	Catania	Enna	Messina	Palermo	Ragusa	Siracusa	Trapani	
A	16,76%	10,55%	8,01%	13,52%	6,40%	3,52%	27,15%	14,95%	11,63%	
B	0,25%	0,63%	0,09%	0,12%	0,10%	0,19%	0,12%	0,30%	0,35%	
C	7,92%	12,42%	11,63%	11,12%	10,65%	7,97%	10,74%	12,05%	10,76%	
D	0,51%	0,36%	0,39%	0,41%	0,39%	0,66%	0,18%	0,66%	0,34%	
E	2,49%	1,66%	1,37%	1,19%	0,98%	1,21%	1,07%	2,04%	1,68%	
F	12,15%	14,82%	10,92%	14,22%	12,77%	10,71%	10,06%	12,73%	10,43%	
G	25,38%	22,40%	26,25%	24,93%	24,31%	25,34%	21,09%	19,45%	23,83%	
H	4,25%	5,12%	7,25%	4,03%	6,71%	8,33%	4,96%	4,44%	5,15%	
I	10,95%	7,02%	8,55%	8,21%	14,60%	10,63%	8,40%	11,58%	14,96%	
J	0,94%	1,12%	2,15%	0,93%	1,79%	2,99%	1,46%	1,24%	1,29%	
K	2,30%	2,07%	2,07%	1,85%	2,03%	2,58%	1,86%	1,68%	2,18%	
L	0,44%	0,36%	0,64%	0,55%	0,58%	1,05%	0,49%	0,67%	0,62%	
M	1,23%	1,74%	1,94%	1,22%	1,78%	2,25%	1,36%	3,42%	1,57%	
N	2,92%	10,39%	7,58%	3,44%	4,98%	8,00%	2,56%	4,66%	4,10%	
O	0,18%		0,00%			0,03%		0,00%		
P	1,49%	0,92%	1,25%	1,35%	1,50%	2,10%	1,13%	1,25%	0,83%	
Q	6,32%	4,96%	5,85%	8,92%	5,05%	7,04%	3,67%	4,75%	5,84%	
R	0,90%	0,88%	1,55%	0,69%	1,63%	2,71%	1,01%	1,46%	1,44%	
S	2,40%	2,52%	2,45%	3,22%	3,06%	2,58%	2,56%	2,57%	2,66%	
T										
U					0,00%					
X	0,22%	0,08%	0,07%	0,07%	0,68%	0,11%	0,13%	0,09%	0,32%	
Total	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	100,00%	

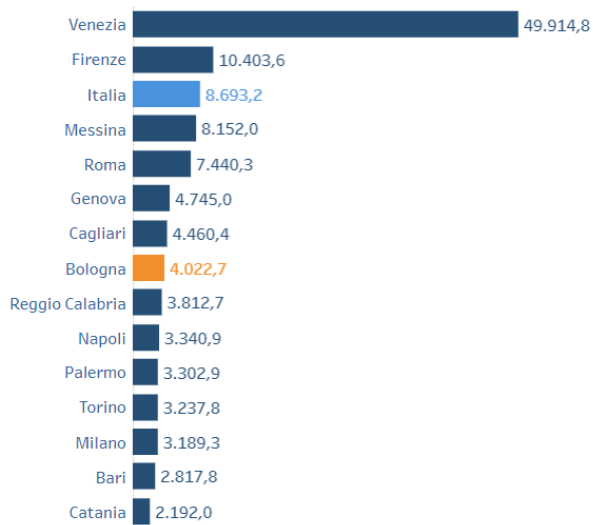
Source: Elaborazioni CCIAA delle Marche su dati InfoCamere.

Figure 13: Economic sustainability: component analysis



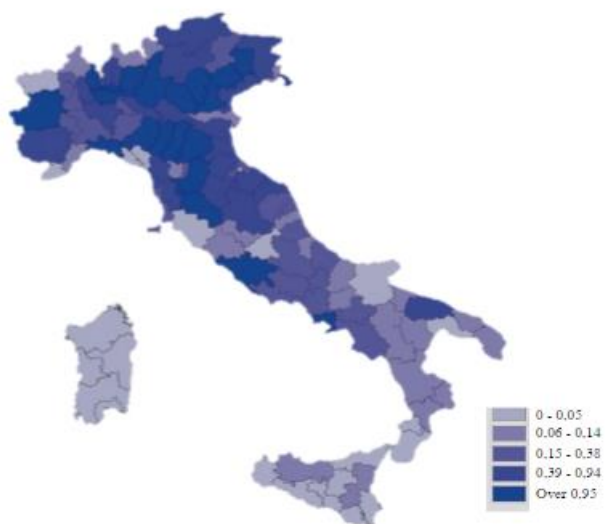
Source: Cerved Research, 2022

Figure 14: Accommodation rate: Beds per 100.000 inhabitants.



Source: Istat.

Figure 15: Business R&D expenditure by province. Year 2018 (percentage values of total national expenditure).



Source: Elaborazioni su dati Istat, Rilevazione su ricerca e sviluppo delle imprese

Figure 16: Innovation, research and creativity: Propensity to patenting (% per million inhabitants).

TERRITORY	2018	2019
Agrigento	2,3	2,5
Caltanissetta	18,8	3,8
Catania	22,3	29,2
Enna	6	1,8
Messina	7	14,4
Palermo	9,9	7,4
Ragusa	6,2	-
Siracusa	5,2	18
Trapani	3,5	2,6
Sicily	10,8	12,5

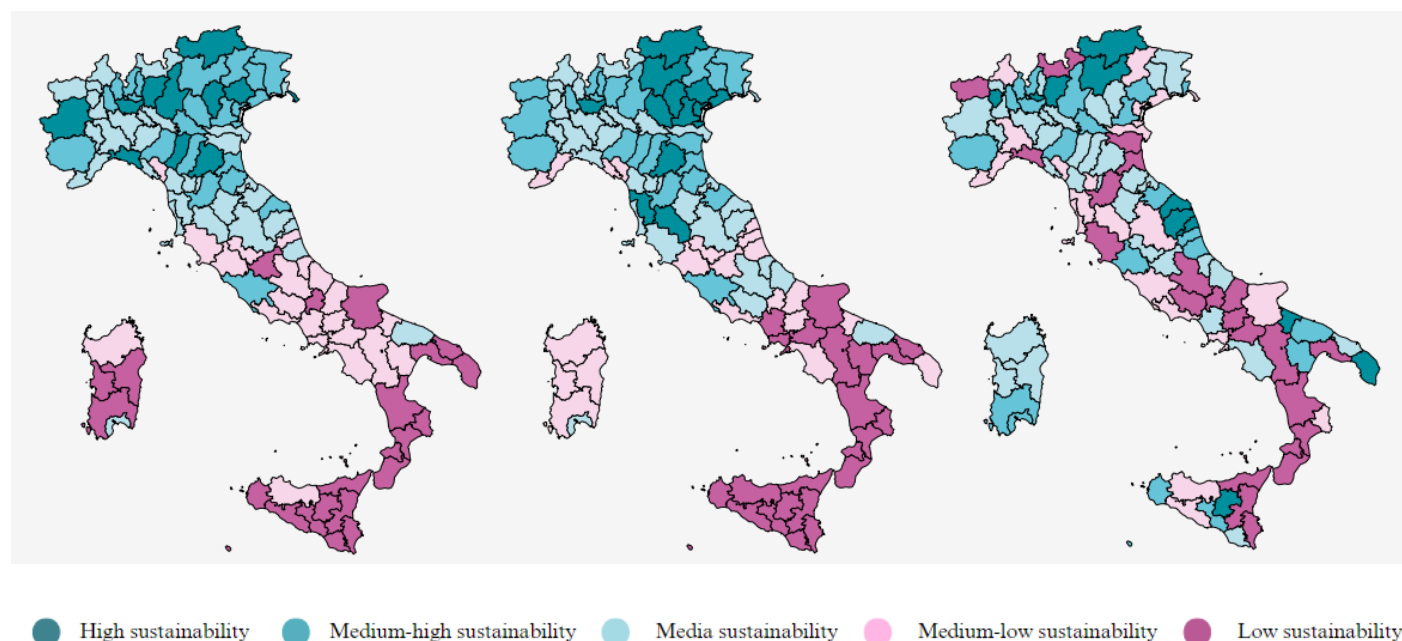
Source: BES2023_territory

Figure 17: IQI Dataset on Italian regions and provinces

IQI INDICATORS	TERRITORY									
	Agrigento	Caltanissetta	Catania	Enna	Messina	Palermo	Ragusa	Siracusa	Trapani	Sicily
Government effectiveness_2018	0,043187	0,109640022	0,185581	0,080835	0,259284	0,204853	0,155396	0,078007	0,139507	0,165244
Regulatory quality_2018	0,049357	0,08235477	0,109926	0,026398	0,375065	0	0,37166	0,796935	0,168722	0,182961
Rule of law_2018	0,35041	0,265812454	0,177696	0,269521	0,440595	0,297561	0,323988	0,341722	0,329129	0,29933
IQI_2018	0,137686	0,116140883	0,160386	0,148868	0,354396	0,192727	0,25973	0,253789	0,193596	0,204952
Government effectiveness_2019	0,340157	0,183283331	0,155517	0,214301	0,236545	0,176441	0,164085	0,131629	0,12838	0,186795
Regulatory quality_2019	0,08577	0,016776897	0,194836	0,102165	0,349754	0,115581	0,307367	0,833198	0,124588	0,224553
Rule of law_2019	0,27818	0,191417966	0,12841	0,16823	0,383742	0,229067	0,258146	0,287919	0,225611	0,233015
IQI_2019	0,242301	0,103170537	0,133855	0,170964	0,315794	0,156709	0,228659	0,265206	0,133757	0,188143

Source: IQI dataset.

Figure 18: The three areas of sustainability: economic, social and environmental sustainability.



Source: Cerved Research, 2022

Figure 19: BES measures: Economic well-being

Indicators	TERRITORY			
	Palermo	Catania	Sicily	Italy
Average disposable income per taxpayer	16848	16200	15759	19796
Average annual compensation of employees	15347	15298	14375	20658
Average annual pension amount	9912	9731	9473	12316
Low pensions	30,6	25,1	27,8	22,6
Gender difference in average compensation of employees (F-M)	-4740	-5666	-5489	-7573
Non-performing rate of bank loans to households	1	1,4	1,6	0,9

Source: BES2023_territory

Figure 20: BES measures: Health

Indicators	TERRITORY			
	Palermo	Catania	Sicily	Italy
Life expectancy at birth (total)	81,1	81,1	80,9	82,4
Life expectancy (males)	79	78,9	78,7	80,1
Life expectancy (females)	83,4	83,4	83,1	84,7
Life expectancy at 65 years	19,4	19,3	19,3	20,3
Standardised mortality rate	92,1	93,6	93,2	82,5
Standardised cancer mortality rate (20-64 years)	8,7	8,4	8,4	8,1
Standardised mortality rate (65 years and over)	465	481	474	416

Source: BES2023_territory

Figure 21: BES measures: Education and training

Indicators	TERRITORY			
	Palermo	Catania	Sicily	Italy
Young people (15-29 years) not working and not studying	36,8	38,1	36,3	23,1
People with at least a diploma (25-64 years)	53,4	51,5	52,4	62,7
Graduates and other tertiary degrees (25-39 years)	22,9	17,9	19,9	28,1
Literacy level of students	172,8	176,6	172,8	185,5
Students' numerical proficiency level	174,2	179	176	191
Graduates in technical-scientific disciplines (STEM)	29,3	29,3	31	27,3
Population 25-64 years in education and/or training	7,2	8,1	7,1	9,9

Source: BES2023_territory

Figure 22: BES measures: Environment

Indicators	TERRITORY			
	Palermo	Catania	Sicily	Italy
Availability of urban greenery	12	18,1	16,4	33,8
Annual average concentration of PM10	24	35	6	80
Annual average concentration of PM2.5	12	13	2	78
Separate collection of urban waste	29	35,4	38,5	61,3
Urban waste produced	472	489	457	504
Electricity from renewable sources	27,9	17,3	27,9	34,9

Source: BES2023_territory

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