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ECONOMIC REGIONAL IMPACT OF THE NATIONAL RECOVERY AND RESILIENCE PLAN: THE CASE OF SICILY

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Contents

Introduction.

During the last five years, Sicily has been characterised by a profound and dramatic economic and social crisis which has plunged the region into a continuous and ever deeper recession. Economic, social and territorial inequalities in Sicily remain not only within the urban areas but also in relation to the European regions. The international macroeconomic situation has drastically deteriorated. At the time this thesis is being written, economies worldwide are experiencing the most serious economic recession in history and an equally profound and complex geopolitical and social crisis.

The situation of the Sicilian regional economy is no less serious and causes much concern due to extraordinary events which increasingly highlight first economic and then social fragility. In 2020, the economic-health crisis due to the Covid-19 pandemic which continues to reap victims and dispense economic and psychological discomfort to each citizen has altered the regional production process, consumer behaviour, labour market dynamics, and international flow transactions. In 2022, the Russian-Ukrainian conflict with the sudden and further increase in energy and raw material prices and the emergence of new operational risks for firms. In this specific economic context, in which there is a high level of uncertainty that characterises the economic forecasts, there is a slowdown in the economic recovery and a remodulation of the times for the achievement of the objectives necessary to recover the losses suffered by the crises. Furthermore, the specific insularity condition of the Sicilian region implies an increase in transport costs with overall repercussions on the regional economy which have repercussions on the operators and economic sectors present in the territory (for example, an increase in consumer prices, the cost of raw materials, exports) causing a limiting factor of growth and a loss of competitiveness of the regional economic system due to the objective disadvantage compared to the other more advanced continental regions. The scale of the impact on the territory of this serious crisis, even more serious than the economic recession of 2008 presents a strongly weak Sicily afflicted by structural delays and socio-economic vulnerability. Furthermore, due to the negative effects of the national and regional restrictive and containment measures, there has been a dramatic decrease in household consumption, mainly due to the reduction in disposable income and to the downturns in the labour market and, from a reduction of production due to the slowdown or blockage of the same and, to a lower responsiveness of firms to increase investments due to unfavourable market prospects.

The disappointing regional productivity trend, with its slow growth rate, characterised by the prevalence of small and medium-sized enterprises, strongly adverse to the adoption of new technologies and new productions with higher added value, demonstrates the difficulties of the

Sicilian economy furthermore, from delays due to lower public and private investments which hinder the process of modernization of the public administration, infrastructures and production chains.

After the shock of the pandemic, the Sicilian region has experienced a moderate recovery, supported by the recovery of investments, especially those in construction, partially recovering the GDP losses generated in previous years, thanks to the flexibility mechanisms and the measures planned and adopted at the level European and national and, to the financial interventions in support of the territorial economy prepared by the regional government, which have outlined a coherent and organic strategy aimed at relaunching economic growth and employment. With a wide range of diversified resources for development policies in the coming years (Next Generation EU), the European Union has formulated huge economic support packages available to the Member States, necessary for the achievement of the objectives converging on a solid recovery of the economy under the banner of ecological transition, digitization, competitiveness, training and social, territorial and gender inclusion.

The ability of the regional government to plan an expansive policy aimed at stimulating the recovery phase, therefore, appears to be of fundamental importance and peculiarity, in a programmatic perspective in which opportunities for development, investments and reforms are foreseen, aimed at a modernization of the regional public administration, the strengthening of the regional economic productive system and the achievement of greater gender, territorial and generational equity, for the purpose of sustainable economic growth. In line with the economic planning guidelines of the European Commission and with national directives, the Sicilian region has presented a package of investments and reforms and, elaborated a far-reaching financial proposal to repair the economic and social damage caused by the spread of the pandemic, address the structural weaknesses of the regional economy and achieve greater environmental sustainability. The interactions between the regional economic system and the economic activities and institutional sectors make it possible to know the typical characteristics of the development of the territorial fabric and to identify the key sectors driving economic growth; possessing this information is therefore a fundamental element for planning regional economic policy intervention measures for the purpose of building a continuous recovery. The proposal of the Sicilian Region for the Recovery Plan, sent to the national Government for the construction and definition of the National Recovery and Resilience Plan, was analysed for the development of the present work.

The study of the formulation of the regional proposal made it possible to illustrate and highlight the areas of application, the motivations, the construction paths and the contents, allowing to identify the needs and objectives, describing the areas of intervention. The clarification and

quantification of the objectives to be achieved, defining the strategic objectives of an economic and political nature to be pursued on the basis of the government programme, are essential tools for improving the choices of public policies by the policy maker. After having indicated the areas of application, the design of the evaluation research is presented, describing the construction and remodelling of the regional recovery and resilience proposal for the purpose of determining the tools necessary for the analysis and evaluation of the results generated by the impact of this measure in a framework of general economic equilibrium. The analysis requires a detailed description of the economic system which represents the interrelationships existing in the system, which interprets the interactions between the economic operators and the institutional sectors, through the fundamental functions of behaviour and which allows to describe the direct and indirect effects generated by the policies of implementation using general equilibrium computational models.

In the first chapter, the Sicilian regional economic system is presented, describing its economic, structural and territorial characteristics, in a regulatory context defined and regulated by a special regional autonomy and a delicate stage of transition for a better development perspective. On the basis of the information available and the surveys carried out, we proceeded to explore, describe and summarise the data of the economic research of Sicily region for an accurate understanding and knowledge of the regional territorial fabric, identifying its strengths and weaknesses. The work offers a starting point for the knowledge and analysis of the main problems of the Sicilian economy.

The second chapter presents the proposal of the regional administration for the implementation of a portion of interventions of the National Recovery and Resilience Plan (NPRR), as well as the planning difficulties, for the purposes of resource allocation and project eligibility. Development policies, related programs and knowledge of the areas of intervention are necessary tools for achieving the development and transformation of the region. For the realisation of these interventions, it is necessary to have interpretative tools available to the policy maker which allow to plan implementation policies aimed at achieving the expected results. In this context, the tool chosen for the purpose of analysing the impact of regional economic policies on the territorial economic fabric is the computational model of general economic equilibrium (CGE); we proceeded with the construction of the computational model, through a theoretical framework, defining its characteristics and peculiarities. The CGE regional model has been calibrated on the social accounting matrix for Sicily, and makes it possible to evaluate the direct, indirect and induced effects on the main macroeconomic variables, in aggregate and disaggregated terms of public policies, in particular in the case of the Sicilian region, the regional proposal for recovery and resilience.

The third chapter presents the analysis of the results of the regional recovery and resilience proposal, approved by the regional government, to overcome the crisis due to the pandemic emergency. The analysis of the different scenarios identifies peculiarities of the regional economy, characterised by existing interactions between production processes, generation of added value and institutional sectors; the model allows to compare an initial equilibrium situation with a counterfactual, due to the implementation of the economic policy manoeuvre, allows to define the importance and the validity of the impacts of this manoeuvre on the regional macroeconomic dimensions, providing useful policy indications.

Chapter 1. The macroeconomic context of the Sicily Region: analysis and strategies.

"L'autonomia regionale costituì la risposta giusta, corretta, democratica alle domande drammatiche della Sicilia del dopoguerra e servì ad inalveare, secondo una corretta mediazione politica, la vocazione all'autogoverno della Sicilia dell'Ottocento e del primo Novecento: essa rimane lo strumento idoneo al definitivo riscatto dell'Isola".

"…l'Autonomia regionale, sorta appunto dall'esigenza di decentramento dello Stato per un più pronto intervento pubblico in una zona particolarmente depressa a causa di antiche trascuratezze, postulava una organizzazione burocratica snella ed efficiente, in grado, cioè, di tradurre in atti concreti quella esigenza di origine. In realtà già dagli inizi si instaurò, invece, un sistema che ripeteva a Palermo il centralismo romano, con le complicanze derivanti dalle interferenze proprie di una politica più sensibile alle esigenze ed alle valutazioni particolari che a quelle generali e di prospettiva".

Piersanti Mattarella, Palermo 9 novembre 1979, in A.R.S., Scritti e discorsi di Piersanti Mattarella, Palermo, 2004

1.1 Introduction.

In the programmatic representation of a macroeconomic framework of Sicily Region it is necessary to highlight, first of all, the value of a far-reaching negotiation, such as the one in progress between the Region and the State for the overall redefinition of financial relations and for the full implementation of the Statute. The lack of coordination of regional finance with the state one, in the final analysis, should have taken place since the 1971 tax reform (Article 12, fourth paragraph, of the delegated law no.825 of 1971), with the revision of the statutory implementation rules.

The prospect of a concretization of Sicilian regional financial autonomy remains the first real margin of development, of social and infrastructural equalisation for an economic-financial rebalancing imposed in the first place on the country, without which Sicily risks being condemned to a process of impoverishment, moreover already highlighted in the context of the fragile fiscal consolidation, the widespread weakness of the entrepreneurial system, the scarce presence of an industrial and infrastructural sector, with the danger of determining, among other things, the exclusion of young generations from the world of work, also in the light of the results of the last years of pandemic emergency that have compromised the already worn out regional economic system. In 2050, according to the most recent demographic surveys, Sicily will contemplate a population of

working age reduced by 24%, with an average age of over 55 and a production capacity of the GDP decreased by 36% (Armao, 2013).

Starting from these aspects is necessary for the purpose of a discussion that does not only concern the regional economy in the strict sense, but that historically analyses the administrative impact and the structural and cultural perspective, indispensable starting points for a subsequent hypothesis of rehabilitation and planning after the pandemic crisis that has swept the globe.

A correct analysis of the Sicilian regional economic situation is substantiated by the need to counter the persistence of the crisis, which was not limited to the two-year period 2020-2021, in order to drive the recovery of the economy to cancel the recessive effects of the COVID 19 period. The fragility of the island's economy, its instability in fact requires careful socio-political analysis, as well as prevention strategies and extraordinary investments through the unitary policies of cohesion and inclusion financed by the European Union, exploiting community resources, as well as those of National Recovery and Resilience Plan (NPRR), which offer themselves as an extraordinary and unrepeatable opportunity to relaunch our country. In fact, the public investments envisaged by the lines of intervention and by the projects of the NPRR are of fundamental importance in determining a permanent positive impact on growth, increasing public capital and also stimulating greater private investment. In addition, the heavy cuts sanctioned by national manoeuvres make the Sicilian context extremely delicate and worrying, exposing it to an increase in the gap with the rest of the nation. A condition, moreover, also outlined for the serious problems of increasing the efficiency of public spending and for the lack of timeliness in the taking of programmatic and administrative decisions, which also resulted in a worsening of services to citizens and firms.

Sicily continues to serve its insular position in terms of external accessibility (Sicilian Regional Assembly, in the session of 19 February 2020, approved the voting law relating to the legislative decree no. 199, bearing the "Insertion in the special statute of the Sicilian Region of article 38-bis concerning the recognition of the disadvantages deriving from the condition of insularity"). In fact, its geographical specificity with respect to the Mediterranean and Europe determines, more than in other areas of the country, a close connection between the transport system and socio-economic development. Yet, the Sicilian Region is right on the direction of the traffic flow that crosses Mediterranean, so the Sicilian port system, as well as the related logistic system, could be proposed as a strategic node for the trans-European transport network, which includes motorways of the sea from West to East and towards the countries of Middle East, and vice versa, from North to South and towards Third Countries of North Africa and vice versa. In this regard, it should be noted the absence of Messina Strait Bridge project among those envisaged in the investment plans of the NPRR, as well

as Complementary Fund, and the completion of Scandinavian-Mediterranean Corridor, difficult to achieve, despite the fact that the availability of enormous financial resources of European and national matrix. The experience in terms of financial relations and litigation between the Sicilian Region and the State demonstrates what negative repercussions are achieved, given how the interdependencies between the different national areas, in fact, are now clear and indisputable, also by virtue of production chains which extend along Italian territory.

The impoverishment of South and the consequent lowering of the level of demand penalised firms in North, with the relative halving of the internal market. The aforementioned firms have been forced to grapple with growing international competitiveness. On the other hand, it seems fundamental to increase the production capacity of the entire country by focusing on public and private investments that do not lead to new relocations and which, on the contrary, bring back Italian production activities, which are currently allocated abroad, in South by taking advantage of the facilities connected to Special Economic Zones (SEZ), in line with the wishes of the law-vote approved by Sicilian Regional Assembly, as long as they are duly recognized and financed by the state legislator. If, as has been said for some time, Sicily has lived beyond its means, pushing current expenditure beyond the limits of overrun, it is equally true that since 2009 a series of initiatives have been launched precisely to limit the surplus of that expenditure, with a gradual reduction that made it possible to restore the levels reaching those relating to 2000. In particular, in the three-year period 2010/2012, the regional government launched a rigorous budget policy to contain administrative costs by reducing the regional bureaucrats. If, on the one hand, the differences in sectoral and provincial growth rates did not produce a significant change in the productive structure of the region, on the other they certainly contributed to reducing the differences with the national one, also due to the progressive outsourcing of the economy. In any case, the region maintains a strong under-dimensioning of industry in the strict sense (about -12% compared to the national value, in 2004) and in particular of the manufacturing sector, which absorbs just over 10% of the total value added, or more than eleven percentage points below the national value. At the same time, services accounted on average, in 2004, almost seven points more than the national value. On a local level, the province of Ragusa stands out for the high incidence of the agricultural sector on the value added; while a percentage impact on value added above the regional average is found, also in the industrial branch, once again in Ragusa, but also in Caltanissetta, Trapani and Catania. On the other hand, by analysing the evolution of active firms in Sicily in the period 2000-2006, we see a growth of 6.1% and a substantial invariability of manufacturing, mining and transport firms. Although in tendential reduction, agricultural enterprises continued to represent just under 28% of the entrepreneurial fabric.

As for the other sectors, there was a more favourable growth than the national average for the branches of commerce, tourism, education and financial services. From what has been described so far, the Sicilian entrepreneurial system appeared to be subject to various constraints which, ultimately, still constitute a strong obstacle to the dimensional growth of the sector. The detection of an average profitability lower than the national average, also in the service sector, one of the most profitable in the region; labour productivity on average below national values (with the exception of some provincial peaks such as Syracuse in the manufacturing sector and Ragusa in the agricultural sector); a scarce affiliation of the companies to groups and a modest push towards processes of internationalisation of the business system have characterised the structure of Sicilian production.

Since the end of 2019, the epidemic crisis has exerted its weight markedly and in a differentiated manner on the island's production system. After years of uninterrupted and sometimes truly tragic downturns, the Sicilian system, starting from 2015, had begun to show signs of slow recovery in terms of growth in value added. 2020, on the other hand, has been the worst year since the post war period, also in relation to the two-year period 2018/2019 in which fluctuations in the value of production had already appeared in exponential decline. The effect induced by the pandemic, according to estimates, produced a retreat in added value at the end of 2020 which affected all production sectors in a trenchant manner. Specifically, agriculture, although not directly involved in the closures imposed by the restrictive measures to contain the virus, experienced an unfavourable trend for the fifth consecutive year, suffering from the sharp drop in demand from the catering supply chain and all over the world, induced by tourism, however not compensated by the corresponding increase in the demand for food for domestic use, which represents one of the few variables on which the Covid emergency has had a positive impact. Small and medium-sized enterprises (SMEs) therefore represent the nucleus of the Sicilian production system (increasingly in trouble) and could be the fulcrum of a transition towards a more inclusive and sustainable growth model, capable of guaranteeing concrete opportunities for young people who have to enter the world of work and to mitigate the unemployment or under-employment problems of the remaining part of the population.

The regional competitiveness index elaborated annually by the European Union places Sicily in 241th place out of 268, also and above all in relation to the development of innovation and the efficiency of institutions. The latter, factors that are combined with the scarce availability of large transport infrastructures, adequate educational development and a dynamism of the labour market. The distribution of wealth is strongly correlated with accessibility to the territories. There is still today a substantial gap between the urban and non-urban areas of the region (the latter include about 60% of the island's population), and between the coastal and inland areas. Sicily has very low levels of

accessibility for a significant portion of the island's municipalities (298 out of 390 municipalities), over 76.4% is more than twenty minutes away from the service providers; 45% over 40 minutes. The Region has made efforts to adapt digitization and, although with some slight difference between urban areas and less dense areas, expresses an overall situation that is not critical and is improving in view of the objectives set by the European Community. Broadband penetration throughout the region accounts for at least 80% of households, with the exception of the non-metropolitan areas of the provinces of Palermo, Agrigento, Messina, Enna and Catania. The overall coverage figure is of particular importance for access to culture, especially in a period such as the health emergency, which forced schools to train through DAD. In fact, the risk of an increase in so-called "educational poverty" is strengthened, which could incentivize an increase in the rate of early school leaving in a region which, paradoxically, is characterised by a notable vastness and variety of artistic and cultural heritage. In 2019, young people who leave vocational education and training courses prematurely exceed 20% of the population between the ages of 18 and 24. This quota of young people with at most the middle school certificate, has not completed a professional training course recognized by the Region lasting more than 2 years and does not attend school courses or carry out training activities. In this critical context, we must not forget the difficulties for students belonging to socially vulnerable families, in which it is impossible to take part even in distance learning activities. In the medium term, the current criticalities encountered in the field of education could lead to an ever-greater loss of causes and skills of the most fragile and less well-off pupils. The current health emergency situation from COVID19 has significantly changed not only the socio-economic context in the strict sense, but also the area of protection and enhancement of cultural assets and activities. This results in the reduction of economic activity linked to the use of the regional cultural heritage, with consequences that cannot be fully recovered in the short term, also in relation to the precautionary measures and social distancing in force in the countries of origin of most of the international tourism. Sicily detects a presence of monuments among the highest in Italy. The entire cultural heritage has always been a tourist attraction of fundamental importance, together with the presence of important Unesco sites. There are eleven Unesco sites, including material (7) and intangible (4) heritages. The Arab-Norman Palermo and the cathedrals of Cefalù and Monreale, the Archaeological Area of Agrigento, Mount Etna, the Villa Romana del Casale, the Val di Noto, the Aeolian Islands, Syracuse and the Necropolis of Pantalica are the first; the Mediterranean Diet, the sapling vines of Pantelleria and the art of dry-stone walls and the Teatro dei Pupi, the latter. Together they represent a driving force of the island's cultural tourism. However, the tourism sector is not adequately supported by the hospitality sector. A comparison with the other Italian regions shows that Sicily ranks among the last places both for the

number of beds (about 41 per 1,000 inhabitants, 8 per sq km), and for the number of accommodation establishments (Istat data processing).

In order to overcome the criticalities of the entities, the free consortia and metropolitan cities as a whole, a negotiation with the National Government was activated, in agreement with the Councilor for the Economy, requesting the right equalisation for the Sicilian regional institutions. More generally, it can be said that in order to activate forms of sustainable development it is considered fundamental to support the enhancement of a production system that is able to establish entrepreneurial initiatives connected to the sustainable management of resources, without neglecting the energy and environmental sectors. which have one of the most significant growth and turnover values in the European Union.

Collaboration must be encouraged between the public research system and private companies and between the companies themselves, in order to improve a climate of trust in institutions in general, creating the conditions for a greater culture of legality that decreases the possibility of interference in organised crime in investment choices. The economic structure and the consolidation of civil society, in fact, not only require what has been described so far, but presuppose a more efficient, responsible and transparent public administration and institutional capacities, capable of determining competitiveness and higher quality of life levels.

A "regional system", therefore, modern and innovative based on a real knowledge economy and therefore capable of responding to the challenges posed by globalisation for a greater international opening of the regional territory.

The history of Sicilian economic development has always been characterised, since the Unification, by a series of strategic contradictions, such as to generate perplexity on the way in which national political institutions have influenced Sicilian economic dynamics, especially from the second post-war period onwards. The nature of the political, institutional and economic relations between the centre and the periphery that have contributed to the evolution of the industrialization of Sicily remain in depth. While on the one hand in the constituent seat the legislator paid great attention to guaranteeing the regional institution the maximum possible protection from any abuses or intrusions by the central organs of the State, on the other hand the procedural functions and their exact distribution were never completely defined, revealing ambiguities. In fact, more generally, it is possible to affirm that the topic of South did not have a relevant role during the work of the Constituent Assembly nor, even less, in the debates that subsequently took place, as demonstrated by the same constitutional dictate (Fiorelli, 1979). From a careful analysis, the gap between the project forecasts within the legislative provisions and the real scope of the question to be resolved is evident,

which caused an insufficient start-up of an adequate process of industrial development of the island (Annesi, 1996).

The Sicilian population from 1860 onwards has been increasing up to the present day with significant inflections in the last ten years. It has always focused on the coastal strips for obvious economic reasons (agriculture) and for greater ease of movement. If at December 31, 1861 the total Sicilian population amounted to 2,392,414 inhabitants and to October 15, 1961 to 4,711,783, we can see that according to Istat data updated to January 1, 2014, 5,094,937 citizens resided in the 390 Sicilian municipalities, while at 31 December 2019 there were 4,875,290 inhabitants, with a reduction of 33,258 units (-6.8 per thousand) compared to 2018 and 127.614 inhabitants (-3.2 per thousand on average each year) compared to the 2011 census. The average density ranges from 93 to 186 inhabitants per km^2 in the period 1861-1958, to reach the present day with a value of 197 citizens per km^2, which varies according to the provinces, with 244 inhabitants per km^2 in Palermo and 300 inhabitants per km^2 in Catania. (Saba & Solano, 1966) (Istat, 2011; 2018-2019). The gender structure of the resident population is characterised by a greater presence of women, 2,504,348, 51.4% of the total. The average age is 43.9 years against 45.2 in Italy. The comparison with the data of the 2011 Census highlights a progressive ageing of the population, at a rate higher than the national average. As regards the foreign population settled in the region, it is estimated at 189,713 inhabitants in 2020. In the period 2011-2019 it increased by 5.4% on average every year. The growth concerns all the provinces, with peaks in Trapani (+ 9.1%) and Ragusa (+ 7.3%).

However, analysing the demographic trends of 2021, a significant slowdown in the growth of the number of foreign residents emerges, which had instead characterised the previous years. It can be seen that from 2018 to 2019 there was an increase of 2,170 foreigners (+ 1.2%), against a decrease in the Italian citizenship component of 35,428 units on the island. The trend by gender of the foreign population is in favour of men (with an average annual growth rate of 6.6% against 4.2% of women), with a prevalence of the male component among foreigners who have settled in last years; this increase changes the composition by gender of the foreign population compared to 2011, in which the female component prevailed (52.2%).

Almost a fifth of foreigners (34,143, equal to 18% of the total) are concentrated in the province of Palermo and in an almost equal percentage in that of Catania (34,875, 18.4%); followed, with just under a sixth of the total, the province of Ragusa (29,207 units, 15.4%). If we compare the foreign populations by ethnicity of origin with the national average, in 2019 in Sicily the percentage of Africans is higher (33.4% against 22%) while that of Europeans is lower (43.3% against 49.6%) and of Americans (3.0% versus 7.3%). In the macro-areas the incidence of the foreign population is

heterogeneous among the provinces. The share of Europeans prevails. The African population exceeds the regional average in the provinces of Trapani and Ragusa (43.7%). While in the province of Palermo there is a greater concentration of Asians (36.4%).

An important factor that should not be underestimated is that in Sicily the foreign population is on average younger than the component of Italian nationality. The average age is 33.9 years compared to 44.6 for Italians. It can also be said with certainty that compared to the regional average values, the province of Ragusa is the one with the youngest foreign population (average age 31.7 years) and Trapani the one in which there is a more pronounced prevalence of the male gender (150, 6 foreigners every 100 foreigners). Four out of every five foreign citizens are under the age of 50 and two out of five are aged between 30 and 49; just under 2% are over 70 years old. Conversely, one out of three Italian citizens are present in the classes from 40 to 59 years old and almost one in four is between 60 and 79 years old (Istat, 2022).

This aspect emphasises the projection stated at the beginning and which referred to the reduction of 24% of the Sicilian population in working age. It is conceivable that the inclusion of the foreign population could be an impetus for a revival of the labour market, as is actually already happening in some sectors. More generally, it is possible to affirm that the trend and transformation of the active population within the flow of migrations have determined the fundamental features of the evolution that the Sicilian economic structure has undergone.

To define the main elements useful for defining the most valid economic intervention policies, it is necessary, first of all, to analyse the characteristics of families in terms of size and type. According to Istat 2019 data, 2,011,285 families live in Sicily, 7.7% of the national total, with an average size of 2.5 members, slightly higher than the national figure (of 2.3 members). This distribution is almost homogeneous throughout the region. The lowest average size is observed in the province of Messina (of 2.3 components) while the highest in the province of Catania (of 2.6 components). However, it is noted that just under one in 3 families (30.2%) is made up of single people, with a lower incidence than the national figure (33%). Among these, the component relating to over sixty years old prevails (17.2%), slightly lower than the national figure (17.8%). One in ten families is made up of a single parent with one or more children, while couples (even net of those living in families with several households) represent more than half of the total number of families: 37.8% have children cohabiting (the national figure is 33.2%); 17.8% have no cohabiting children (compared to the national figure of 20.1%), (Istat, 2019).

An interesting and emblematic fact of the lack of cultural acceleration within Sicilian society and specifically family is highlighted by the scarce use of the network, which in the region remains

below the national average: almost one in three people does not have an Internet connection. If the availability of a stable and fast telematic infrastructure is one of the crucial elements on which the transition to digital is based, for a correct and more advanced transmission of knowledge and a more simplified access to goods and services, it can therefore be deduced that citizens' behaviours (use of cultural contents, tourism, shopping, communication, teaching) are strongly affected, given that a significant number of families do not have access to the Internet from home. The share of Sicilian families who declare that they have no access to the network is higher than the national average (30.6% in Sicily against 23.9% in Italy). Among the reasons for not having access to the Internet, 58.7% of Sicilian families indicated a lack of computer skills. Furthermore, more than one in 4 families do not consider the Internet a useful and interesting tool (26.2% against 25.5% in Italy). A curiosity is the use of fixed broadband connection, which is undoubtedly the most widespread, but far below the national average; on the other hand, the data shows that in Sicily the broadband connection via the mobile telephone network has a higher incidence than the national figure (39.9% against 33.7%).

The main source of income in Sicily is represented by public transfers which are clearly higher than the national figure (44.1% against 38.7% in Italy), followed by that from employees (42.4% against 45.1%) and lastly, that deriving from self-employment (10.0% against 13.4%).

This statement is preparatory to the economic dynamics, to be carefully examined in relation to the conditions of families. The relative poverty indicators, the data on the main source of family income and the number of employed components, make it possible to map any critical issues. In 2018, the relative poverty indicators in Sicily are higher than the national ones and highlight the lack of equity in the distribution of expenses (and therefore of income) on the national territory. The incidence of relative family poverty is almost double the national average (22.5% against 11.8% in Italy); the incidence of individual relative poverty is much higher than the total for the country (26% against 15% in Italy). In families with at least one member aged 15 to 64, in the majority of cases, only one member is employed (46.3% against 47.1% in Italy). The figure for households without any employed person is higher than the national average (32.5% against 18.4% in Italy), (Regione & Istat, 2016-2019).

These data are fundamental to try to outline a cultural substrate that would also underlie the creation and development of the Sicilian entrepreneurial network. In Sicily in 2017 there were 270,119 firms, equal to 6.1% of the national total. All these firms employ 727,829 people, 4.3% of the country's total.

1.2 Analysis of the general economic framework of the Sicilian economy.

The question of the evolution and growth of the economy of Southern Italy, especially that of Sicily, has always been a subject of particular interest and the subject of many studies (Frisella Vella, 1953). With the rapid economic growth at national level, which occurred in the fifties and sixties, there is an increase in efficiency and development on the one hand and the continuous expansion of disparities between the Italian regions on the other. This is an increasingly industrial-oriented northern area and a southern area characterised by deep stagnation and a predominantly agricultural economy (Antonelli, et al., 1991). In this regard, it is useful to point out that, in the analysis of an economic situation as complex as the Italian one, in which the different regions have heterogeneous degrees of development, the study becomes necessary and vital, on a regional basis, disaggregation and spatial imbalances to understand trends and changes in the structure of the national economy and its development process. The availability of sufficiently analytical data and the in-depth knowledge of regional economic structures, moreover, allow the regions to fulfil their functions in the economic field - provided for by the Italian legal system - by intervening directly and incisively on the planning of national policy planning (Sylos-Labini, 1966).

This reflection implies the need to use targeted, differentiated and coherent intervention policies in the resolution of the various regional economic imbalances. In particular, the active participation of local political institutions, social forces and all actors (public and private) is necessary to understand the reasons for these imbalances, improving possible weaknesses and guaranteeing capillary intervention solutions and strategies (Antonelli, et al., 1991). The national economic dynamics, the specialisation index of the regional industrial system, the competitive productive sectors and a highly specialised occupational structure are some of the determining factors of a process of development and competitive local growth (Hoffmann, et al., 2001). This last consideration therefore shows how national economic dynamics can influence the development trajectories of the regions, and how this development is marked by the exploitation of local resources, the growth of their productivity, The consolidation of the existing production system and all available resources (Garofoli, 1991). In this specific context, the examination of the evolution of the Sicilian economic framework is emblematic, analysing the various cyclical fluctuations occurred over the period of medium-long-term and investigating the variables and determinants that have influenced and affect production and income, labour market participation, the quality of human capital, the efficiency of public administration, on tangible and intangible investments.

The Sicilian regional analysis has an economic structure strongly characterised by serious delays compared to the other regional economies of the rest of Italy and outlines a disappointing performance compared to an advanced European context, also considering the two major crises: the financial one, the Great Recession (2008); the economic one, due to the pandemic from Covid-19 (2019) with consequent contraction in the productive and employment dynamics (Asmundo & Mazzola, 2021). The structural changes in the Sicilian regional economy have generated considerable interest in a thorough study and a thorough knowledge of the economy of the region, characterised by a model of endogenous development consolidated by a predominantly agricultural and artisanal entrepreneurial tradition (Goffi, 2013), as well as a limited manufacturing capacity and, a differentiation of the local production structure compared to the enterprises of the other regions of Italy. The Sicilian productive sector is enclosed in an economic system mainly delineated by the absence of appropriate tangible and intangible infrastructures and organisational inefficiency in the various forms of enterprise; it also has an entrepreneurial productive fabric of mainly medium-sized micro and small enterprises with a low number of employees, a modest level of specialisation and productive integration and a considerable delay in adopting appropriate innovative interventions in the production processes (Schilirò & Timpanaro, 2012). The other criticalities of the Sicilian regional production system are identified in the poor development of an adequate network of territorial services, limited orientation to markets especially foreign ones and poor capacity to attract foreign investments as a strategy for economic growth, activities and business sectors dependent on public grants and funding.

The relevant aspects for a better understanding and analysis of the problems of Sicilian regional development concern different areas of interest. Among the most essential are the modernization of craft enterprises, the creation of new enterprises, the various structural transformations of agriculture, demographic problems and those relating to employment.

During its administrative and financial autonomy relating to the historical period 1947-1950, Sicily was the protagonist of important reforms, institutional changes and market changes that accompanied the region to a new economic and social order, identifying regionalism as a potential political intervention to encourage decentralised industrial development and therefore the growth of the Sicilian economy. The main diversified interventions in support of regional growth are summarised in the following points. The first concerns the land reform and consequent elimination of the dominance of large estates which will allow a better and fair redistribution of land between large and small owners, resulting in an improvement in productivity and a better distribution of income. The second aimed at the issue of a specific provision for the development of industries in the

Region (L.R. March 20, 1950, n. 29) with which the concession is granted the exemption from the tax on movable wealth on the related industrial income to new industrial plants. Still, interventions aimed at the development of public works policies with European Recovery Program Funds (Marshall Plan), state and regional funds and first allocations from the "Cassa del Mezzogiorno". Interventions aimed at training of new industrial agglomerations and creation of new large industries for the exploitation of liquid and gaseous hydrocarbons following the discovery of new mineral resources in the geographical areas of Ragusa, Siracusa and Gela. Also, interventions aimed at creation of the Sicilian Electricity Authority (1947) and consequent growth in the production of electricity. Interventions aimed at establishment of the Regional Institute for the Financing of Industries in Sicily - I.R.F.I.S with facilitated credit tasks for small and medium-sized enterprises.

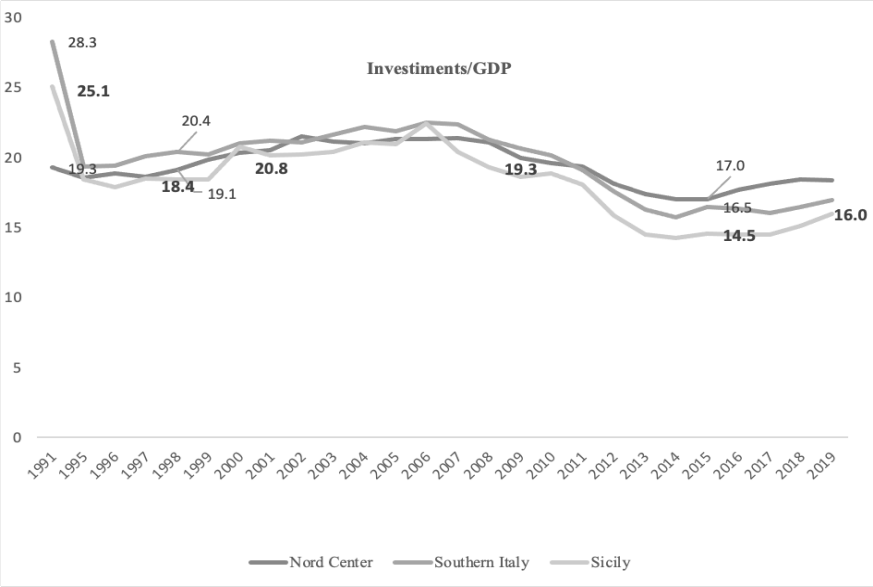
From a purely backward and agricultural economy, characterised by strong slowdowns in growth, there has been a gradual economic expansion and a process of industrial development that have also allowed the creation of some important industrial districts in specific areas of the region, in particular that Oriental.

During the fifties, the structure of the regional economy was mainly organised in agricultural economic activities that absorb a large part of the active population (equal to 51%) contributing to the formation of the regional added value for 49%. For the industrial activities present in the local territory, on the other hand, there is a participation of the workforce equal to 24%, contributing to the formation of the regional added value for 16%. These are values that differ considerably in comparison with a national trend, whose industrial production, equal to 34%, exceeds the agricultural one by 32% (Ciaccio, 2003). Subsequently, after the Second World War up to the 1980s, the growth in income and consumption levels, the creation of new businesses, the development of the production system, the increase in the endowment of fixed capital led to an increase in the gross domestic product and per capita, with an improvement in the standard of living of the population. During this time span, in fact, there is a slight increase in national and regional wealth, identifying a share of the Sicilian gross domestic product equal to 6.2%, for the year 1981 compared to that recorded in the year 1951, equal to 5.4%, in consideration of the positive trend of the national wealth produced by the South for which there was a growth in GDP from 22.45% to 24.2% (Regione Siciliana, 2018).

The following years will be characterised by a slowdown in economic growth in Sicily and Southern Italy. The downward trend of the regional cyclical phase, recorded in 1992, is specifically due to the end of the extraordinary interventions, by the "Cassa del Mezzogiorno", for the preparation of the programs planned by the regional governments and other public institutions, the necessary measures for financing and the execution of works for the development of economic activities relating to

industry, infrastructures, environment, natural resources, marketing of products. This political choice is justified by the criticalities relating to the inability to create production and waste of public spending in the South, as well as by compliance with the rules dictated by European Commission on the inapplicability of social security contributions and taxation of social security contributions, such as public aid; the latter will lead to an infringement procedure against Italy and the abolition of the facilitating instruments made available. In addition, partial or total sale of public enterprises will be carried out, leading to the end of state shareholdings with management changes in large enterprises and the transfer of industrial activities to the north of the country. The value of fixed investments in percentage terms of GDP fell for Sicily from 25.1% in 1991 to 18.4% in 1998 and to 14.5% in 2015, to then record a slight recovery in 2019 with a percentage rate of 16.0% according to Istat calculations (Figure 1).

Figure 1. Gross fixed investments in relation to GDP (% values).



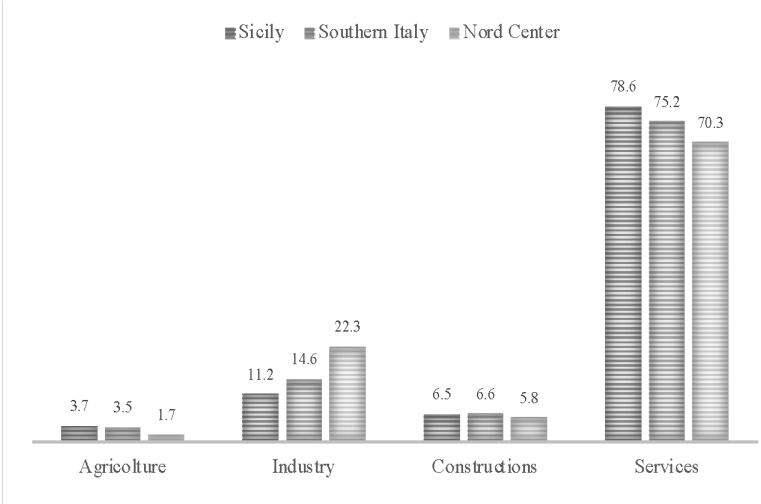
Source: Own elaboration on ISTAT data.

Thus, began a new phase of financing of structural interventions with the multiannual programming of cohesion policies (2000-2006) with which we try to promote cohesion and territorial development; the structural funds were addressed to all the weak geographical areas of the national territory with the aim of reducing the different economic inequalities between the regions and the

structural problems of the economies. In addition, another priority objective of the aforementioned funds is the issue of updating measures relating to topics on employment, education and training. From this moment on, the resources of the structural funds of the European Union assume a predominant role, which will involve new multiannual programming strategies through co-financing criteria and the certification of the additional character of the resources invested. Despite this, the effects produced are lower than expected, in fact the period between 2000 and 2006, the new European planning cycle, shows a decrease in the amounts disbursed in Sicily, which are equivalent to 5.6% of regional GDP. The real difference is that which lies between the strategies and the results obtained and which finds its raison d'être in the limited response of firms to incentives. Investment policies highlight an inconsistency between the planning and implementation of spending. Ultimately, local entrepreneurship systems record positive results in relation to the qualitative characteristics of some territorial areas which therefore cannot be ascribed to the entire region.

More generally, at the end of the decade, we are in 2007, the programmatic objectives are not met. The tertiary sector, although characterising the greater part in the composition of the value added, does not fully contribute to the development of South and Sicily due to the marginalisation in which southern firms find themselves in relation to the restructuring and delocalization processes that instead affect the north-central firms. Added to this is the loss of the contribution of large industrial groups and the small fabric of small businesses. These phenomena are mainly due to the refractoriness towards the digital revolution that should have triggered a process of technological innovation with consequent increases in productivity. The composition of total value added for Sicily, Southern Italy and North-Centre is shown in Figure 2.

Figure 2. Composition of total value added (% values) – 2007.

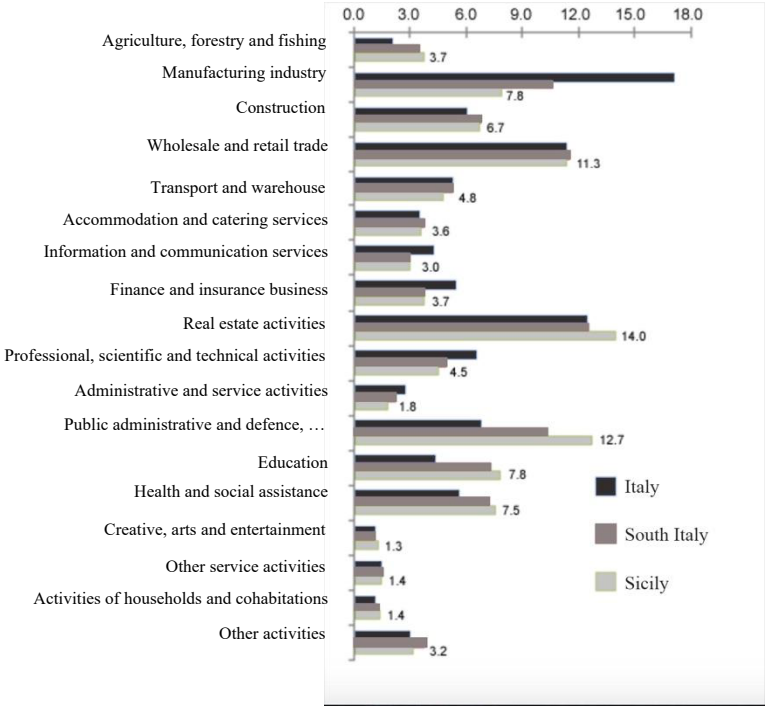


Source: Own elaboration on ISTAT data.

What has hitherto been prefigured as a delay in the development of the regional economy takes on the characteristics of a real recession since 2008, the prelude to a crisis that from now on will heavily affect Western economies. The GDP generated by the Sicily region is equal to 5.6% overall, which translates into a level of GDP per inhabitant of 65.8%, when internal consumption per inhabitant corresponds to 88.2%, due to transfers that support household disposable income.

As far as the labour market is concerned, we can observe the phenomenon whereby despite an improvement in the unemployment rate which had already reduced from 15% to 11% in the South and which in Sicily reached 12.9% in 2007, compared to of 24.4% in 1998, the number of employed persons remains low if we consider the population between 15 and 64 years of age. This figure is characterised above all as the effect of a growing flexibility of contractual relationships, an inadequate enhancement of human capital, as well as a preponderance of inactive people for the same age groups (Sicily 48.8%; Italy 37.6%). To underline the vocation of the Sicily region towards public administration, education and health services. Furthermore, the analysis of the distribution of added value by economic activities shows a manufacturing sector that is not very dynamic in terms of added value growth with an incidence equal to 7.8%, compared to 10.6% in the South and 17.1. % of Italy (Figure 3). The main critical elements that delay the regional industrialization process are summarised in specific factors that characterise the industrial fabric. Over a fifth of Sicilian companies are located in the provinces of Palermo, Catania, Syracuse and Caltanissetta; their size distribution records a more marked presence of micro and small enterprises (1-9 employees) of a mainly artisanal nature and a few large units (250 employees) that operate primarily in the refining of petroleum products, in basic chemicals and in electronics. Another factor that identifies the delay in the level of industrialization in the region is due to the ratio between workers in the sector and the population, with the employment of only 31 workers in the industry of the sector per 1000 inhabitants; while the corresponding share at national level is equal to 77 units. Finally, the scarce presence of medium-sized enterprises in the territory represents a weakness of the regional industrial fabric.

Figure 3. Distribution of value added by sector of economic activity – Year 2008 (% values).



Source: Own elaboration on ISTAT data (values shown on the label only for Sicily).

If we look at the following seven years, i.e., the period between 2008 and 2014, we see a worsening of the main macroeconomic indicators, starting with GDP, the contraction in private consumption and employment, as well as the setback in income. available and the reduction of bank credit disbursed (Table 1).

The economic crisis, which globally, in 2009, gave rise to the speculative real estate bubble, which began in the US market, also due to the securitization of real estate - which would have represented a way to speed up the acquisition of liquidity by those entities that had various real estate assets against them that did not create cash flows - proved to be a double-edged sword, particularly as regards the dynamics of the regional functioning of mortgages. In fact, the distrust of the US market is transmitted to Italy and Sicily, territories in which the processes of economic financialization and business risk propensity are in any case more contained and should paradoxically have preserved their performance. The resultant crystallises in a particular way from 2011 onwards, because in some way Sicily and South, precisely due to the aforementioned characteristics, had managed to maintain confidence in the public sector up to that moment, but now, in this new phase, with the entry into the

European economy proper, restrictive measures are necessary within the budget policies and programs to recover from the imbalances generated by the speculative attacks to contrast the spread, increasing between the yields of the BPTs and similar German securities .

Table 1. Values of the main macroeconomic indicators in the 2008-2014 - (comparison among Sicily, Southern Italy and Italy).

	2008	2014	Var, %	2008	2014	Var, %	2008	2014	Var, %
	GDP			*GDP pc (euro 2010)*			*Employed (thousands)*		
Sicily	93.28	81.13	-13	18.57	15.93	-14.2	1.48	1.32	-10.6
Southern Italy	394.48	350.44	-11.2	19.02	16.76	11.9	6.43	5.86	-9
Italy	1,667.99	1,540.90	-7.6	28.16	25.35	-10	23.09	22.28	3.5
	Gross Fixed Investments			*Real estate transactions (n.)*			*Investments BPS pc*		
Sicily	17.88	11.73	-34.4	60.72	36.97	-39.1	0.95	0.54	-43.3
Southern Italy	86.37	56.83	-34.2	233.97	153.25	-34.5	0.96	0.63	-34.5
Italy	356.99	257.54	-27.9	913.93	592.01	35.2	1.14	0.71	-37.5
	Private consumption			*Consumption of the PA*			*Current BPS expenditure pc*		
Sicily	67.75	59.93	-11.5	31.49	29.72	-5.6	11.03	11.22	-4.2
Southern Italy	273.98	242.94	-11.3	119.83	113.31	-5.4	11.49	11.24	-2.2
Italy	988.89	928.48	-6.1	332.91	322.23	-3.2	14.38	14.00	-2.7

Source: Own elaboration on ISTAT e Agenzia per la Coesione Territoriale (System CPT) data.

In addition to this, the reduction in investments (-6.7% on an annual average) produces a significant drop in expenditure on fixed assets (-34.4%). The factors influencing this reduction are the tightening of the real estate market and the decline in investment spending by the enlarged public sector, which is more severe than in the rest of the country. These further damages the infrastructures and their related maintenance. Continuing to refer to the public sector, consumption by the public administration contracted by -5.6%, a figure which is also reflected in the shrinkage of per capita expenditure which stands at -4.2%, with a consequent decrease in the resources available for services. To corroborate this economic picture, the figure for employed in Sicily is emblematic, which drops from 1,478 in 2008 to 1,322 in 2014, a percentage that stands at -10.6%, when in Italy, despite a decrease in the national figure from 23,090 in 2008 to 22,279 in 2014, there was a percentage change of around -3.5%. The figure relating to private consumption undergoes a similar contraction equal to the percentage change of -11.5% compared to the figure for the South of -11.3%, and the national figure of -6.1%. The per capita GDP is a faithful synthesis, in fact the data relating to the national framework ranging from 28,156 in 2008 to 25,348 in 2014 (-10%), in the South concur for -11.9% while in Sicily the percentage rises further settling at -14.2%, going from 18,566 in 2008 to 15,927 in 2014. As can be deduced from what has been stated so far, the set of structural funds disbursed up to 2013 gives rise to the implementation of strategies with results strongly affected by the economic

crisis, a situation that has continued in Sicily until the most recent years and how easily deductible from the PA's capital expenditure in relation to GDP (Table 2).

Table 2. Trend of P.A.'s capital expenditure in relation to GDP (% values).

	2008	2009	2010	2011	2012	2013	2014	2015	2016	Media
Sicily	5.24	5.11	4.10	4.72	3.68	3.34	3.14	3.51	2.55	4.36
Southern Italy	5.33	5.75	4.67	4.66	4.10	3.86	3.62	4.29	3.30	4.73
North Center	3.19	3.33	2.89	2.49	2.38	2.22	1.89	1.83	1.88	2.75
Italy	3.70	3.90	3.30	2.98	2.78	2.60	2.28	2.39	2.20	3.21

Source: Own elaboration on Conti Pubblici Territoriali (CPT) and Eurostat data.

However, since 2015 an inversion of the regional economic cycle has begun with a GDP growth of 0.7%. This data is inscribed in a context of moderate dynamism of the national economy which, mindful of the uncertainties of the previous economic and financial condition, must still deal with the structural limits that affect the calibre of production activities. Even during the crisis, Sicilian economic activity settled on a strong vocation ascribable to the tertiary sector which, however, made industrial activities play a vicarious role, with a consequent scarcity of application of business and productivity systems. The analysis of the value added by the economic sector generated by the various branches, for the period 2008-2015, identifies a lower incidence of the industrial sector in the composition of the value added compared to the coefficients of the other productive activities, reducing it more and more weight. In the regional manufacturing sector, increasingly characterised by a strong polarisation towards small and medium-sized enterprises, the sectors of the refining industry, the food industry, the manufacture of rubber and plastics, electronics and shipyards, stand out to a greater degree of productivity and specialisation. In this context, real estate and public administration activities recorded higher growth rates consolidating their production structure, while the construction sector remains of lesser incidence despite its importance in terms of increasing the local production system and the made in Italy sector dominated by micro firms. The latter sector is characterised by the prevalence of firms that can be placed in the 0-9 employees' range and they represent 93.3% of the total number of firms, covering 54.6% of the employees. Another important figure relates to the intermediate company classes in which companies with between 10 and 249 employees are placed, accounting for 6.8% of the residual value. Large firms are mainly located in the oil processing sector. In the strategy of a growth path, the agri-food activities for which Sicily

boasts a more marked specialisation than the other regions of South should not be underestimated. In fact, in the beverage industry firms make up 16% of the total with a 57.4% employment level. Since 2015, following a further phase of recession accompanied by continuous uncertainties, the regional GDP, after having registered a growth rate of 0.7%, slows down for the following two years (0.3% and 0.5 % for the years 2016 and 2017 respectively), however signalling a climate of consumer confidence for the second half of 2017.

The economic indicators in this recovery phase reveal interesting flows in the spending of Sicilian travellers abroad (7.1% according to the estimates reported by Bank of Italy); in the increase in transactions for the purchase of residential properties as well as in investment spending which recorded a slight expansion compared to the negative trend in 2015. In addition, foreign demand grew exponentially reaching a value of exported goods equal to 9.3 billion euro, over half of which is made up of the oil sector. Istat data on foreign trade do nothing but reiterate, especially for the year 2017, an intensification of the driving economic sectors of the island with consequent growth in commercial relations and the exchange of goods. The most significant sector concerns articles in rubber and plastic (50.4%), but metallurgy (43.2%), electronics (37.5%), chemistry (34.6%) are not to be neglected. , pharmaceuticals (29.5%). The positive trend of exports is also confirmed in 2018 with an increase in the value of 8.1 billion euros. Precisely in reference to the average exported value (2017), Sicily owns 155 firms with foreign participation which constitute 1.2% of the national total. But if we evaluate the foreign firms with Italian participation, it appears that Sicily participates for 0.9% of the total number of firms. The following three years confirm the recovery of the labour market coinciding with a rise in the employment rate. However, the sector that continues to remain in trouble is the construction sector. Agriculture, industry and services are holding the helm of the restart.

The trend in the disposable income of Sicilian families has so far experienced fluctuating phases; from growth in 2012 to levelling off in 2015 and 2016, flows of new growth in 2017 to a halt during the pandemic. The economic conditions of Sicilian families present important critical issues regarding the indicators of greatest interest, highlighting a continuous social malaise and territorial economic gap with respect to Italian families. The values of the relative family poverty indices, for the year 2018, measure an incidence of relative poverty of families of 22.5% compared to the national one of 11.8% (Table 3), indicating a distribution of consumption and of unfair income with regard to the national territory. Furthermore, the weight of relative personal poverty confirms the fragility and disparity of the economic dynamics of Sicilian families, registering a relative incidence equal to 26% compared to the national one equal to 15% equal to almost double the national average.

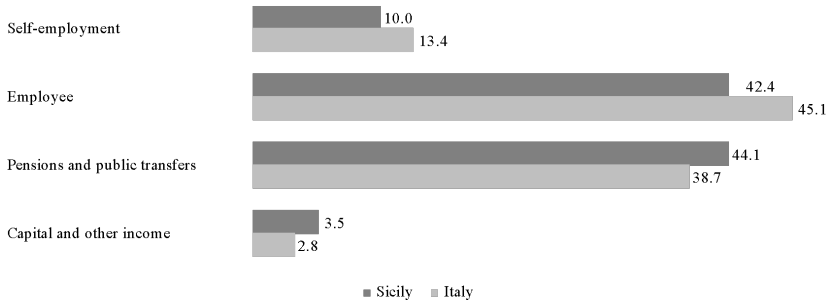
Table 3. Relative poverty indicators. Sicily and Italy. Year 2018 (percentage values).

Indicator	Sicily	Italy
Individual relative poverty rate	26	15
Relative incidence of family poverty	23	12

Source: Own elaboration on ISTAT data.

In relation to the main source of income it is interesting to observe how the percentage value of pensions and public transfers, equal to 44.1% (compared to 38.7% in Italy) and that from work per employee, equal to 42.4% (against 45.1%), shows a significant growth compared to self-employment equal to 10% (against 13.4%) (Figure 4).

Figure 4. Households by main source of income. Sicily and Italy. Year 2017 (percentage composition)



Source: Own elaboration on ISTAT data.

Despite the economic growth differential of the Southern Italy compared to the rest of the regions of Italy which differentiated the period 2016 - 2018, and the pandemic crisis, in 2020 the disposable income of households measured at current prices, marked with respect to 2019, for the overall Sicilian regional economy contracted by -0.1% compared to a contraction of 2.9% in the national economy. This contraction, lower than the national average, is justified by the fact that disposable income was supported, as in all regions of the South, by social benefits, in particular by basic income and by measures to combat the pandemic. Based on the data reported by Istat for 2019, the disposable income per inhabitant in the region is 14,100 euros (Istat, 2021).

The economic framework of the Sicily region for the three-year period 2018-2020 is strongly influenced by a period of economic recession due to two important events that compromised the world economy; the first factor due to the gap on the trade side and tariff increases in trade between China and the United States, which generated a loss of confidence on the part of companies, worse financial conditions and unfavourable influences and profound uncertainty; the second, in 2020, marked by the Coronavirus pandemic which caused, following the adoption of the restrictive measures, a significant slowdown in productivity and growth. In 2018, the regional GDP growth rate was 0.2%, slowing down compared to the previous two-year period in which there was a positive trend of 0.3% for 2016 and 0.5% for 2017, continuing to outline the recovery difficulties in Sicily and an increasingly accentuated gap with respect to the South and Italy. However, there was a weak recovery in the average monthly expenditure for internal consumption by Sicilian families, equal to the average value of 2,036 euros at current prices compared to the average value of the previous year of 1,943 euros. The signs of recovery are also identified in other short-term indicators; in detail, there was an increase in spending on travel abroad by Sicilian families (8.4%) according to data from the Bank of Italy; a strong growth of 7.5% compared to the previous year, in the sales of residential properties, according to data from Agenzia del Territorio. Exports contributed to regional growth with an increase of 15.3%, albeit to a lesser extent than the peak phase recorded in 2017 (30.4%). This boost is attributable to the oil and non-oil components and to the good performance of some regional sectors, such as chemicals, food, electronics, metallurgy and electrical equipment. In terms of value added, confirming the negative cyclical phase, there is a decrease in the value of production which involves all sectors to varying degrees; in particular, the industry sector recorded a decrease in the value of production for the third consecutive year equal to -2%; the tertiary sector is less affected by the economic crisis and shows a decrease compared to the previous year equal to -0.9%; the construction sector, on the other hand, showed a greater increase in added value, with a variation equal to 2.9% compared to the negative one of the previous year (Table 4).

Table 4. Value added by economic activity sectors (% variations).

	2016	2017	2018
Agricolutre	-0.5	-1.3	-0.5
Industry	-3.0	-1.4	-2.0
Construction	-5.6	-1.8	2.9
Services	0.8	0.9	-0.9

Source: Own elaboration on ISTAT data.

For the period considered, the economic data relating to employment show a slowdown in production activities and a climate of uncertainty which has repercussions in particular in the tertiary sector; the numbers of employees in Sicily in 2018 totalled 1 million and 514 thousand units, with a decrease of -1.01% compared to the previous year; in detail and with reference to the three regional sectors, there was an overall decrease of -2.62%, -1.49% and -0.75% respectively for the agricultural sector, for the industrial sector and for the tertiary sector.

In this economic context, the programmatic lines of the regional government are aimed at the reform and modernization of public administration infrastructures, the rationalisation of spending, the full use of resources for investments in the main sectors of the region (agriculture, fishing, tourism), green economy and innovative industry. The available economic resources, such as European Development and Investment Funds, the resources relating to Cohesion Action Plan, Development and Cohesion Fund and Pact for Sicily, are used in compliance with the various areas of application to support the various sectoral strategies and territorial in order to create a multiplicative effect on GDP and employment.

During the year 2019, the regional economic situation continues to show a weak performance in which decreases are recorded in almost all sectors and activities. The reasons for this phase of recession are to be found in the international economic trend, characterised above all by the trade tensions between China and the United States, by the political and social conflicts of the countries of North Africa and the Middle East as well as by the negotiation process for the exit of Great Britain from European Community involving new socio-political-economic balances in Europe and beyond. Furthermore, the manoeuvres of domestic economic policy present important obligations and restrictive limits. In fact, budgetary policies, pursuing the objectives of growth, fiscal consolidation, income redistribution and reduction of territorial and sectoral imbalances, bind the State in respect of containing its own deficit and public debt within certain percentages of gross domestic product. In this particular scenario, the national and regional economies were affected by the loss of industrial production, the low variation in aggregate demand and for the Sicily region also by the considerable difficulties in recovering from the fall in GDP. The first months of 2019 recorded a negative decline in tourist flows leading to a consequent worsening of revenues in the services sector; a drop in exports even if sales of manufacturing products are positive; a phase of arrest for industrial investments and a slight decline also for the construction sector.

1.3 Quantitative economic context of the Sicily Region.

The macro-economic context of the Sicily region has always been characterised by deep structural and sectoral gaps both within the same region as well as with respect to the rest of the other regions of Italy; this reality reveals a region increasingly characterised by levels of inequality in terms of overall income, social inequalities and profound institutional and economic changes.

Analysing the trend of economic indicators and in particular that of GDP and understanding their economic dynamics is a topic of considerable interest not only for economic experts but also for policy makers and other institutional actors who are responsible for planning and plan economic policy manoeuvres based on the availability and reliability of economic information, in order to promote territorial economic development, implementing necessary interventions for regional economic growth, the reduction of territorial differences between regions, for a better redistribution of local resources, and also for a better redistribution of wealth and well-being among all citizens (Blakely & Green Leigh, 2013). In this specific context, it is relevant to analyse the evolution of the regional GDP produced by the Sicily region, based on the availability of statistical data released by the National Institute of Statistics (Istat) for the period of time between 1995 and 2019 (Table 5).

Table 5. Regional GDP values of Sicily (chain-linked values with reference year 2015).

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Household consumption	64,938	64,821	67,151	69,401	71,709	72,960	73,628	73,193	73,562	73,730	74,379	75,352	76,793
ISP consumption	332	347	374	405	430	431	442	462	450	457	466	494	505
Public administration consum	26,547	26,938	27,333	27,903	27,933	27,937	30,018	31,198	31,508	31,602	31,514	31,769	31,652
Fixed investments	16,130	15,868	16,548	16,831	16,798	19,646	19,503	19,399	19,576	20,313	20,574	22,371	20,322
Net exports	-20,344	-19,266	-21,882	-23,179	-25,846	-26,507	-26,971	-28,200	-29,199	-29,879	-28,802	-30,246	-29,796
GDP	**87,602**	**88,708**	**89,523**	**91,361**	**91,023**	**94,467**	**96,621**	**96,053**	**95,897**	**96,223**	**98,130**	**99,740**	**99,476**

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Household consumption	75,378	72,848	72,084	70,962	68,288	66,101	64,847	65,730	66,228	67,224	67,734	67,814
ISP consumption	470	494	494	489	459	460	464	456	452	467	474	479
Public administration consum	31,431	31,051	30,911	30,839	30,273	29,663	29,202	28,859	29,002	29,298	28,831	28,460
Fixed investments	18,892	17,453	17,630	16,626	14,259	12,709	12,189	12,485	12,501	12,536	12,975	13,676
Net exports	-28,207	-28,059	-27,655	-26,863	-23,353	-21,322	-21,179	-21,643	-22,155	-22,994	-24,367	-24,832
GDP	**97,964**	**93,786**	**93,464**	**92,053**	**89,926**	**87,610**	**85,523**	**85,887**	**86,027**	**86,529**	**85,647**	**85,596**

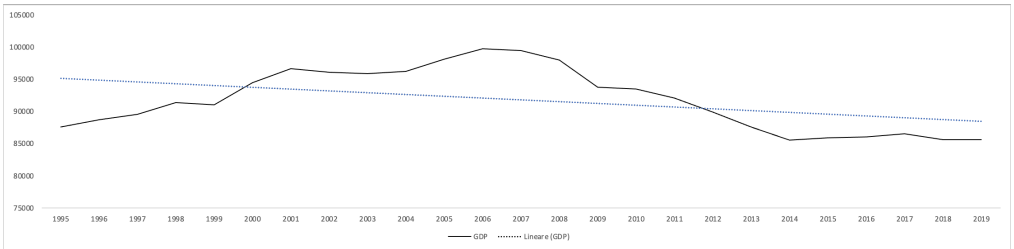
Source: Own elaboration on ISTAT data.

We will try to examine and interpret the macroeconomic fluctuations that occurred in the interval considered with interest in the quantitative development of both the long (growth) and short (cycle) period (Marchetti, 2009) of the Sicilian regional economic system.

The regional analysis of Sicily presents an economic structure strongly characterised by serious delays compared to the other regional economies of the rest of Italy and outlines a disappointing performance compared to an advanced European context, also in consideration of the

two major crises: the financial one, the Great Recession (2008); the economic one, due to the Covid-19 pandemic (2019) with a consequent contraction in production and employment dynamics. Figure 5 shows the long-term linear trend for Sicily's regional GDP from 1995 to 2019.

Figure 5. GDP trend of the Sicily region (1995 - 2019).



Source: Own elaboration on ISTAT data.

Observing the graph, it can be seen that the regional GDP trend is quite irregular for the period considered with minimum and maximum peak values that vary from one year to the next, while the linear trend shows a trend in continuous decrease. In highlighting this economic instability, the percentage changes in GDP from one year to the next are calculated (Table 6).

Table 6. Calculation of the GDP growth rate of Sicily (1995 -2019).

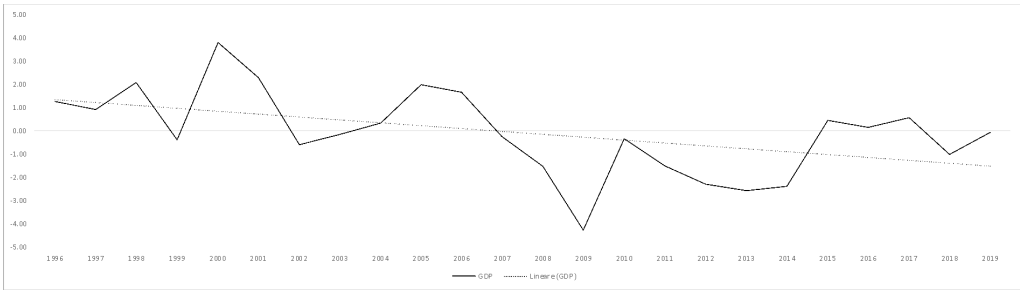
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Household consumption	-0.18	3.59	3.35	3.32	1.74	0.92	-0.59	0.5	0.23	0.88	1.31	1.91
ISP consumption	4.55	7.73	8.48	5.99	0.23	2.62	4.57	-2.64	1.53	1.99	5.99	2.33
Public administration consı	1.47	1.46	2.09	0.11	0.02	7.45	3.93	0.99	0.3	-0.28	0.81	-0.37
Fixed investments	-1.63	4.29	1.71	-0.2	16.96	-0.73	-0.53	0.91	3.77	1.29	8.74	-9.16
Net exports	-5.3	13.58	5.92	11.51	2.56	1.75	4.56	3.54	2.33	-3.6	5.01	-1.49
GDP	**1.26**	**0.92**	**2.05**	**-0.37**	**3.78**	**2.28**	**-0.59**	**-0.16**	**0.34**	**1.98**	**1.64**	**-0.26**

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Household consumption	-1.84	-3.36	-1.05	-1.56	-3.77	-3.2	-1.9	1.36	0.76	1.5	0.76	0.12
ISP consumption	-6.98	5.08	0	-1.07	-6.02	0.07	1.02	-1.74	-0.94	3.25	1.52	1.03
Public administration consı	-0.7	-1.21	-0.45	-0.23	-1.83	-2.02	-1.55	-1.17	0.49	1.02	-1.59	-1.29
Fixed investments	-7.04	-7.62	1.02	-5.7	-14.24	-10.87	-4.09	2.43	0.13	0.28	3.5	5.4
Net exports	-5.33	-0.52	-1.44	-2.86	-13.07	-8.7	-0.67	2.19	2.37	3.79	5.97	1.91
GDP	**-1.52**	**-4.26**	**-0.34**	**-1.51**	**-2.31**	**-2.58**	**-2.38**	**0.43**	**0.16**	**0.58**	**-1.02**	**-0.06**

Source: Own elaboration on ISTAT data.

Figure 6 graphically reproduces the historical series of regional GDP growth rates for Sicily for the period 1995-2019:

Figure 6. Growth rate of real GDP of Sicily (1995 – 2019).



Source: Own elaboration on ISTAT data.

The analysis of the graph shows how the reference period was influenced by different and significant variations in GDP growth from one year to the next; for example, a GDP growth of 2% in 1998 is followed immediately afterwards (1999) by a not small decrease equal to about -1%, to then record a further growth of 4% in the year 2000. Proceeding for the following years, the presence of peaks of minimum and maximum levels of productivity is highlighted that trace in a well-defined way precise phases of recession and expansion of the Sicilian economy.

When the economy is in a period of contraction and crisis and, therefore, the production activity undergoes a strong decrease, the growth rate of the GDP presents discontinuous trends until it reaches negative levels. With reference to the year 2009, and in consideration of the exceptional nature of the fluctuations due to the financial crisis, it is noted that the Sicilian economy is represented, in absolute terms, by a negative regional GDP growth rate of -4.26%, and registers, in terms of the level of GDP, a negative difference equal to $Y_{2009} - Y_{2008} = -4{,}178$ million euros.

This implies the need to plan any type of intervention that aims to avoid any deviation from the situation of efficient development which is economically undesirable, in particular, when such deviations are negative (Marchetti, 2009).

The analysis of these data is interesting to understand, not only, the importance of the cyclical fluctuations of the regional GDP of Sicily but also, to investigate the territorial economic policy manoeuvres implemented by the regional government aimed at economic growth and, on the national ones that they cannot fail to influence the political choices of policy makers. Furthermore, from a further study of the main components of aggregate demand it is possible to show the dynamics of the individual variables regarding the trend of the economic cycle and the respective correlations with the regional GDP of Sicily (Figure 7).

Figure7. Dynamics of the main components of aggregate demand.

Figure (7a) Household consumption

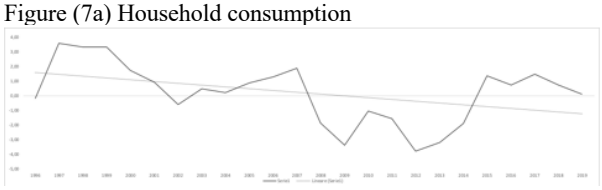


Figure (7b) Gross fixed investments

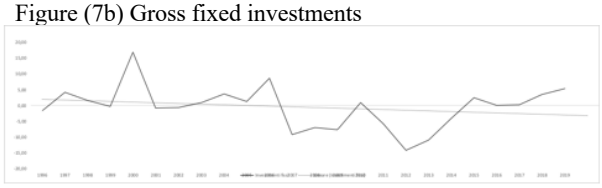


Figure (7c) Consumption of the Public administration

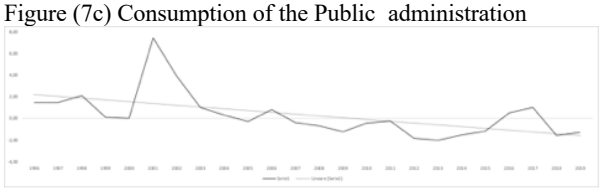
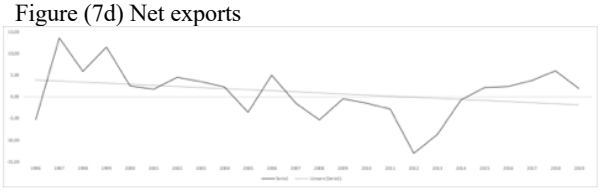


Figure (7d) Net exports



Source: Own elaboration on ISTAT data.

The level of household consumption (Figure 7a) in the 2008 economic cycle phase undergoes a significant decrease due to the financial crisis; after a phase of slight recovery there is a further contraction (equal to -3%) compared to the GDP trend for the same period; this suggests a decrease in consumption expenditure by Sicilian households (Istat, 2009), a poor dynamic of internal demand and a further reduction in disposable income (Assessorato Economia, 2011). After the period of 2012, there is a recovery phase up to 2015 which will determine percentage variations equal to about 2%; this improvement is explained by the programming of national and regional policies through the refinancing of social safety nets and by targeted inclusion, cohesion and social protection policies (Assessorato Economia, 2014-2017).

Gross fixed investment expenditure (Figure 7b) is the component that has been most affected by the effects of the economic crisis. The growth rates of gross fixed investments seem to outline periods of severe recession, in particular from 2008 to 2012 (for the year 2012, values equal to approximately - 15%); this result is explained by a decrease in investment spending and in foreign demand due to the continuing uncertainties on the economic prospects at the international level (Bank of Italy, 2012); while the three-year period 2012 - 2015 shows a modest recovery.

In this period, regional policy plans interventions in favour of firms through funds financed by the European Union Cohesion Policy of the 2014-2020 programming cycle. The phase of investment recovery, even if moderate, influences the subsequent years up to 2019 with a positive contribution to the increase in GDP even if this contribution is reduced (Assessorato Economia, 2014-2017).

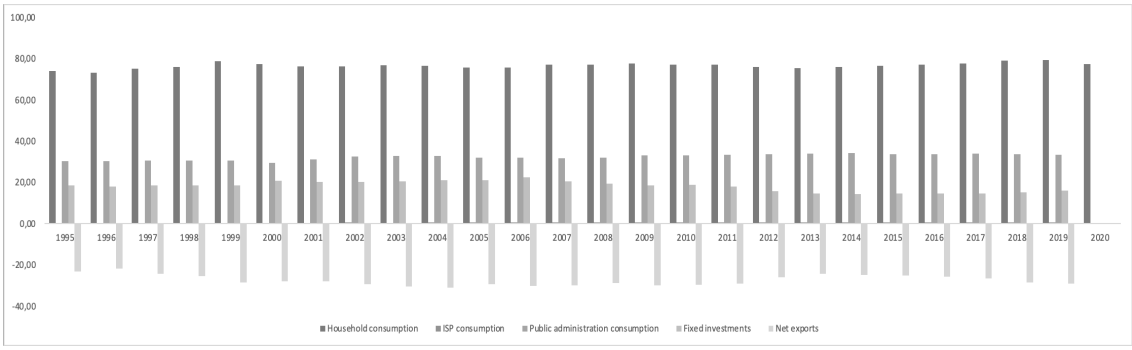
With reference to public administration expenditure (Figure 7c), growth rates record a continuous decrease for the decade 2006-2016 even if its trend in terms of GDP is higher than the comparison with that of GDP; the two-year period 2016 - 2017, on the other hand, shows a slight increase of approximately 2%. The inequalities of public spending for collective services and the imbalance of public transfers (pensions, public salaries, interest on debt) with respect to investments are fundamental determinants that influence regional spending mainly structured by a high percentage of current expenditure. In this context, the institutions implement economic policy manoeuvres aimed at revising and containing expenditure in order to pursue greater results with the same expenditure, identifying the critical issues in the production and provision of public services, avoiding waste of public money and making improvements in budget (Law no.135 of 7 August 2012).

Following a period characterised by negative growth rates, net exports (Figure 7d) since 2013 show a phase of expansion that reaches positive peaks of over 5% in 2018, negatively affecting regional GDP growth. Exports of the region, net of petroleum products, continued to record a significant decline, against the growth of raw materials and foodstuffs on the import side (Banca d'Italia, 2014).

In this phase, there is a lack of production capacity and poor competition from the sectors of belonging of the Sicilian industries for which it would be appropriate to program adequate planning policies and investment flows for a better competitiveness and internalisation of Sicilian firms (Sicindustria, 2022).

The following graph (Figure 8) shows the percentage weight of each macro variable in the composition of regional GDP for the period 1995 - 2019; the most significant component that positively affects the level of aggregate production of the Sicilian economy is represented by household consumption (almost 80%). Public administration expenditure follows with an average of 32% and expenditure on gross fixed investments with an average of 18%. Net exports, on the other hand, due to the loss of income spent on imports and subtracted from the regional economic system, determine a significant decrease in Sicilian GDP.

Figure 8. Graphic representation of the percentage weight of the main GDP variables (1995 - 2019).



Source: Own elaboration on ISTAT data.

The following Table 7 summarises the results of the contributions to GDP growth, reporting for each of the main variables of Sicily the percentage value in the analysis period.
The contribution to GDP growth is expressed in the following formula:

$$\delta x_{t+1} = \frac{\Delta x_{t+1} * P_{\frac{xt}{yt}}}{100} \quad (1)$$

where Δx_{t+1} is the growth rate of each component of GDP for each reference year X_{t+1}, while $P_{\frac{xt}{yt}}$ is the percentage weight of each component on the total GDP.

Table 7. Contribution to growth for each of the main variables of Sicily.

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Household consumption	-0.13	2.63	2.51	2.53	1.37	0.71	-0.45	0.38	0.17	0.67	0.99	1.44
ISP consumption	0.02	0.03	0.04	0.03	0	0.01	0.02	-0.01	0.01	0.01	0.03	0.01
Public administration consu	0.45	0.44	0.64	0.03	0	2.2	1.22	0.32	0.1	-0.09	0.26	-0.12
Fixed investments	-0.3	0.77	0.32	-0.04	3.13	-0.15	-0.11	0.18	0.77	0.27	1.83	-2.05
Net exports	1.23	-2.95	-1.45	-2.92	-0.73	-0.49	-1.27	-1.04	-0.71	1.12	-1.47	0.45
GDP	**1.26**	**0.92**	**2.05**	**-0.37**	**3.78**	**2.28**	**-0.59**	**-0.16**	**0.34**	**1.98**	**1.64**	**-0.26**

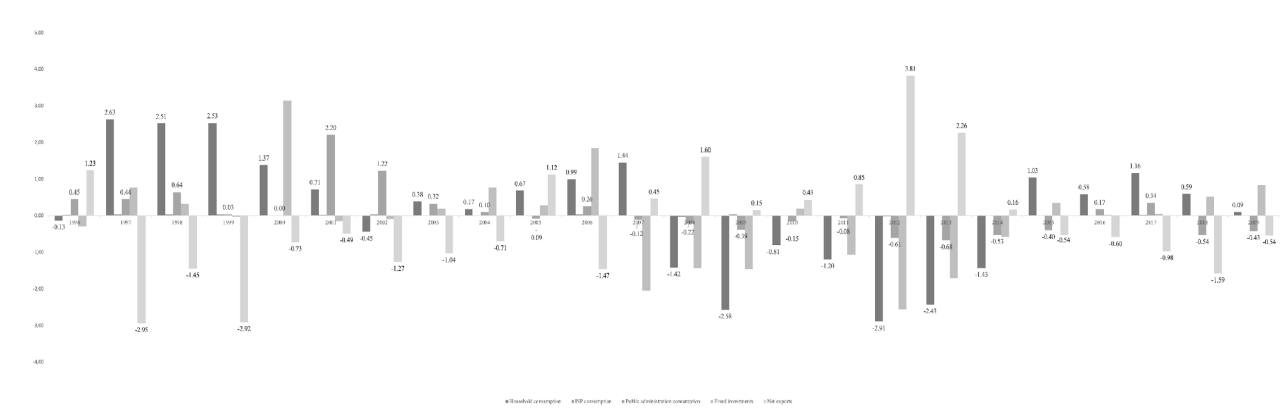
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Household consumption	-1.42	-2.58	-0.81	-1.2	-2.91	-2.43	-1.43	1.03	0.58	1.16	0.59	0.09
ISP consumption	-0.04	0.02	0	-0.01	-0.03	0	0.01	-0.01	-0.01	0.02	0.01	0.01
Public administration consu	-0.22	-0.39	-0.15	-0.08	-0.61	-0.68	-0.53	-0.4	0.17	0.34	-0.54	-0.43
Fixed investments	-1.44	-1.47	0.19	-1.07	-2.57	-1.72	-0.59	0.35	0.02	0.04	0.51	0.82
Net exports	1.6	0.15	0.43	0.85	3.81	2.26	0.16	-0.54	-0.6	-0.98	-1.59	-0.54
GDP	**-1.52**	**-4.26**	**-0.34**	**-1.51**	**-2.31**	**-2.58**	**-2.38**	**0.43**	**0.16**	**0.58**	**-1.02**	**-0.06**

Source: Own elaboration on ISTAT data.

Figure 9 shows how the short-term variations of each macro aggregate, referred to each year, contribute to GDP growth with an unstable trend. For example, "household consumption", even if it appears to be the component with the greatest percentage weight in the formation of GDP with a value equal to 80%, reveals that the contribution to GDP growth is not so constant for all years; in fact, the three-year period 1997 - 1999 with a percentage contribution of almost 3% is followed by years in which there are decreasing values to reach even negative levels, such as for example 2009 (- 2.58%) and 2012 (- 2.91%).

As regards net imports, with respect to the consumption component, they reveal a specular behaviour, in the sense that this component, considering, for example, the year 2012 records a percentage contribution equal to 3.81% as opposed to the consumption component of households for which a negative contribution of -2.91% is recorded; this means that every time household consumption increases, net imports also increase. Therefore, since a decrease in domestic consumption there is a decrease in net imports, these contribute positively to the growth of GDP despite their percentage weight for the year in question registers a negative value of about 30%.

Figure 9. Graphical representation of the contribution of the components to GDP growth.



Source: Own elaboration on ISTAT data.

Chapter 2. The National Recovery and Resilience Plan (NPRR) analysis for the Sicily Region: objectives and instruments.

2.1 Introduction.

In a context of autonomy and federalism in which the regions act with decentralised administrative functions (Domenicantonio, 2007), the economic evaluation of the effects of regional policies acquires particular relevance for the purposes of territorial economic planning and control. Development policies, related programs and knowledge of the areas of intervention are necessary tools for achieving the development and transformation of the region.

This chapter will deal with the regional administration's proposal to implement part of the interventions of the National Recovery and Resilience Plan (NPRR), as well as with the planning difficulties for the allocation of resources and the eligibility of the projects presented by the different regional departments. The main objectives to be achieved with the regional plan are mainly aimed at repairing the economic and social damage caused by the pandemic crisis and reducing the territorial gaps between the different regions in a medium- to long-term perspective; the regional plan, with the economic resources foreseen in the different project proposals, intends to foster a boost to low regional productivity growth and to make investments in human and physical capital. In addition, the allocation of resources is accompanied by various reforms in public administration, with the aim of overcoming the various structural divergences that have characterised the regional economy, in particular by contributing to an accomplished ecological transaction.

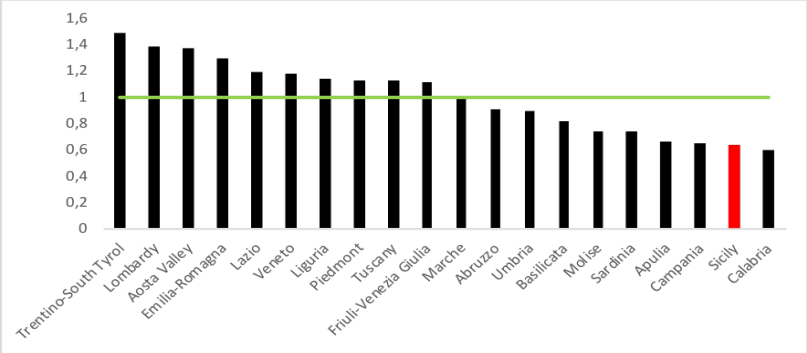
In consideration of the socio-economic system represented, the thesis will try to evaluate the quantitative impact of the Regional Plan for Sicily using a SAM based CGE model for the Sicilian economy. The simulations will consider the effects of the plan due to fiscal policy interventions such as increases in public spending and investments, transfers to enterprises, production subsidies; in particular of selected public investments that should stimulate the productivity and competence of the economic system and thus estimate different levels of GDP due to the size of these investments. The model, calibrated on the Social Accounting Matrix (SAM) for Sicily, disaggregated by product, by production activity and by institutional sector, will evaluate the direct and indirect relations and effects deriving from a shock within the economic system and simulates the implementation of economic policies (Socci, et al., 2020).

2.2 From the structural crisis of the Sicilian economy to the definition of recovery proposals.

The covid-19 pandemic has generated considerable health, social and economic damage worldwide causing a deep recession and serious repercussions on national and regional economic activity. For the case of the Sicily region, the effects of the pandemic have outlined strong negative implications, accentuating the historical gap between the Region and the rest of Italy and identifying a phase of slow economic growth that has always conditioned the Sicilian economy. Significant reduction in householders' consumption, increase in inequality, reduction of production and in private and public investments, contraction in national and international trade are just some of the effects observed. Moreover, the pandemic crisis has had strong repercussions on strategic production sectors for the local economy such as the manufacturing sector and the tourism one, outlining the conditions for unsatisfactory growth in employment. Indeed, following the restrictive measures due to the health emergency, manufacturing industries have reported a drastic decrease in domestic demand and consequently a drop in expected revenues, recording a marked reduction in gross domestic product. At the same time, on the supply side of goods and services, a reduction in added value has been reported. About the tourism sector, we can evaluate an extreme reduction in turnover due to the loss of foreign demand and the distrust of travellers. These phenomena have led to a reduction in the employment rate and income.

The Sicilian regional economic system is particularly penalised; just consider that one in four families lives in conditions of absolute poverty and that the average income level of Sicilian householders is lower than that the national average. At the end of 2020, the regional GDP loss of -7.8 percent has been estimated (Regione Siciliana. Giunta Regionale, 2020). Probably, this contraction is supposed to be destined to a very slow level of growth and lower than the national average. Sicilian GDP per capita falls within the last group of the subdivision, positioning itself among the lowest in Italy, and through Figure 10 it is possible to observe as the deviation from national average is very wide.

Figure 10. GDP per-capita in the Italian regions.



Source: Own elaboration on ISTAT data.

With the aim of revitalising the regional economy and mitigating the negative effects on employment, measures to support businesses have been envisaged through the introduction of the 'Covid-19' redundancy fund and a freeze on redundancies. In this phase of a serious economic crisis, the acceleration of investment spending is one of the most significant ways out to give new impetus to economic activities and stimulate productive sectors, especially in disadvantaged areas and with greater problems of budget balance in the public sector.

To try to overcome the causes and the economic loss, the Sicilian region has formulated a proposal for the achievement of the fundamental Missions of the National Plan for Recovery and Resilience (Governo Italiano, 2021). The resources for the priority interventions, divided into thirteen macro interventions and organized in the six missions identified by the guidelines of the plan, amount to more than 20 billion.

It should be pointed out that the regional government has to intervene with a view to strict control of public spending, which places a number of constraints on investment spending, slowing down its implementation and curbing its potential positive impact on the regional economic fabric. In particular, strict limits have been introduced for the Regions pursuant to article 1, paragraph 897 of the law no. 145/2018 and the accounting standard referred to in paragraph 9.2 of attachment 4/2 to legislative decree no. 118/2011 for the use of the restricted surplus of the administration result, which substantially limited the use of the restricted surplus for the Regions in deficit, composed almost exclusively of extra-regional funds, aimed at spending on investments. Specifically, the limit introduced prevents the use of resources for investments in excess of the budget deficit recovery quota that the Region is required to make annually. In order to overcome this constraint, which is difficult to understand in a context of economic crisis, and which should be limited to regional funds or current

expenditure resources only, it is deemed necessary to introduce a law which aims to allow, even to regions with a deficit (which therefore they would have the greatest need to overcome the gap in which they find themselves), to make full use of national and Community resources, accelerating investment spending and not quantitatively limiting their annual use, so as to simplify accounting obligations and implementation. In this sense, a first step forward has been introduced thanks to the article 15, paragraph 3, of decree law 31 May 2021 no. 77, but this derogation is limited to the resources for the implementation of the National plan of recovery and resilience and national plan for complementary investments. In fact, the rigorous limit introduced risks disengaging Community resources that cannot be spent for the application of accounting principles incompatible with the current emergency phase, the use of which at this moment could instead allow to alleviate the situation of serious economic and financial suffering, creating conditions of equal treatment throughout the national territory. From another point of view, the same paragraph 897 provides that institutions who are late in approving their reports cannot apply the restricted, set aside and earmarked portions of the administration result to the forecast budget until the accounting document has been approved. This temporal foreclosure appears unjustified in relation to investment expenditure (capital expenditure) for the same reasons set out above. In fact, it is quite evident that the public institutions in greater financial difficulty approve the statement late and, in this hypothesis, the use of the restricted surplus is once again precluded, within which the extra-regional funds indispensable for create the conditions for an improvement of the economic fabric through a rapid use of resources aimed at investment costs. A further temporal foreclosure that slows down investment spending is present in the current regulatory framework, inspired by binding principles of strict control of public spending, in the hypothesis of a delay in the approval of the regional budget and an appeal for the first four months of the financial year to the provisional operating law.

Under provisional arrangements, the provisions of Article 43 and point 8 of Annex 4/2 of Legislative Decree No 118/2011, as amended, apply; among other things, these provisions expressly contemplate limited types of changes to the budget that can be implemented administratively. In this regulatory context, budget changes cannot be made to enter new expenses to be made in the current year by applying new revenues relating to extra-regional resources: this type of budget changes is in fact not included among those envisaged by the law.

The regulatory discrepancy is authoritatively confirmed by the activity of accounting harmonisation of local authority's commission (ARCONET), which recently appreciated a legislative proposal which also allows the regions to budget new ascertained extra-regional revenues, even under a provisional regime, for the financial years 2021-2026, but this an absolutely acceptable proposal, it

does not appear to have been fully implemented by our legislator. In fact, the article 15, paragraph 4 bis, of the decree law 3/5/2021 no. 77 only allows local institutions and not the regions, which are in provisional operation or provisional management, to enter the related state and European funding for investments in the balance sheet through a specific change. It therefore appears necessary that this provision also envisages the Regions among its recipients and that it can also be extended to budget changes relating to expenditure changes, in order to speed up the times associated with accounting obligations. In such cases, the only exception is governed by the provision referred to in point 8.4 of the aforementioned attachment 4/2, in the case of extremely urgent public works or other extremely urgent interventions.

2.2.1 The National Recovery and Resilience Plan and cohesion policies for the region of Sicily.

To try to overcome the causes and the economic loss, the Sicilian region has formulated a proposal for the achievement of the fundamental Missions of the National Plan for Recovery and Resilience (Governo Italiano, 2021). The resources for the priority interventions, divided into thirteen macro interventions and organised in the six missions identified by the guidelines of the plan, amount to more than 20 billion. The concerted strategies to protect the regional economic and social fabric, in the particular pandemic situation that has occurred in the last three years, have led to a requalification of the recovery policies through the updated version of the Regional Recovery and Resilience Plan. In particular, considering the calculations carried out using the analytical tool provided by the Statistics Service, the multisectoral model of the Sicilian Region, which has as its object the identification, over the five-year period, of the effects of public spending on infrastructures, we obtain an important value of the multiplier equal to approximately 147,7%, considering the direct and indirect effects, and 254,2% in consideration of the effects induced on the system, following an estimated public planned expenditure for over 18.2 billion euro most of which destined for the railway network (Assessorato Economia, 2021). In addition, if we take into consideration the development expenditure of the Region, due to the use of resources for structural interventions, in the light of the reprogramming, there is an adjustment of the sums compared to the regional economic and financial document of July 2021 also for what concerns some non-regional funds. The consequent result of the various elements described up to now implies a further survey with relative adjustment of the data using the multisectoral model of the Sicily Region.

The set of instruments and related funding of the regional public intervention with purposes other than those envisaged by the National Recovery and Resilience Plan, on the basis of the available data, appears relevant. The Table 8 summarises the main types of cohesion policy.

Table 8. Main types of cohesion policies.

PO FESR Sicily 2014 - 2020: to take into account the measures aimed at countering the effects of the Covid-19 pandemic, this intervention was rescheduled with Regional Council resolution 325 of 6 August 2020 and approved by the European Commission with decision C(2020) 6492 of 21 September 2020
Complementary Operational Program (POC Sicily 2014-2020): with intervention rescheduled with Regional Council resolution no. 212 of 27 May 2021, the reprogramming was appreciated which contains the new financial plan by year which should guide the implementation of the programme, the expenditure of which, based on the provisions of article 242 of the decree law of 19 May 2020, n. 34 converted with amendments by law 17 July 2020, n.77 must be supported by 31 December 2025
Pact for Sicily – FSC
FSC Fund for Development and Cohesion in advance of resources 2021-2027 as a result of CIPESS resolution 79/2021
FSC Development and Cohesion Fund 2007-2013
PAC Youth Plan
PAC New Actions and anti-cyclical measures: the fund includes resources with prevailing anti-cyclical objectives agreed with the representatives of the Ministry of Economic Development (tax credit for new social shock absorber investments in derogation, "de minimis" aid for small businesses, etc.)
Sicily Rural Development Program 2012-2020: the areas of intervention for the growth of the agricultural and agri-food sector, the protection of the environment and the sustainable development of the rural territories of the region are grouped in the fund
OP EMFF 2014-20 (Sicily): the European Fund for Maritime Affairs and Fisheries brings together resources aimed at promoting competitive, profitable and environmentally sustainable fishing and aquaculture, socially responsible and aimed at balanced and inclusive territorial development
OP ESF 2014-2020: this Program brings together the financial resources in support of education and training activities, aimed at promoting access to the world of work on the one hand and the demand for work by companies aiming to make use of human resources suitable for the evolving production scenario

Source: Own elaboration.

Table 9 showed the other public intervention regional development expenditure for the years 2022-2024.

Table 9. Regional intervention development expenditure for the years 2022-2024.

Total gross fixed investments	6,370.10
Total current expenditure of the Public administration	1,202.50
Total expenditure	7,572.60

Source: Own elaboration on Regional Statistics and Economic Analysis Service data.

2.2.2 Sicilian region's guidelines in the Regional Recovery and Resilience Plan.

The economic crisis associated with the Covid-19 implicated a new debate about the fiscal rules, where the increase of public spending came back to be an important contra cyclical tool of economic policies. As part of the Next Generation EU initiative, Italy has received resources relating to the Recovery and Resilience Facility (RRF) for a total amount of 191.5 billion euro to be used in the period 2021-2026 through the implementation of the National Recovery and Resilience Plan (of which 68.9 billion in grants and 122.6 billion in loans. In order to finance all projects deemed valid and in line with the strategy of Italian National Recovery and Resilience Plan, a National Complementary Fund was set up, for a total amount of €30.6 billion and resources of €13 billion were allocated through the React EU Fund.

The National Recovery and Resilience Plan represents a valuable opportunity for development, investment and reform, which calls for a recovery in economic growth that is sustainable and long-lasting in order to remove the obstacles that have characterised Italian growth in recent decades and have led to macroeconomic and territorial imbalances. Following the guidelines issued by the national government for the definition of the National Recovery and Resilience Plan[1], the preparatory process for the definition of a regional proposal was therefore started with the request addressed by the President of the Region to the main national public companies and which was aimed at identifying the main projects of these potential co-investors in the area regional. After this first phase, the Regional Economics Department, in order to formulate a unitary regional proposal, launched a shared proposal collection system which made it possible to identify the proposals that the different regional administrative structures considered priorities, in consistency with the provisions dictated by the guidelines for the definition of the National Recovery and Resilience Plan.

The project proposals prepared by the competent departments of the region have hinged on the six missions of the Regional Recovery and Resilience Plan whose objectives are to accelerate the innovation of the regional ecosystem with a view to sustainable development, to enhance the digitization of the entire regional territory, support the culture of innovation and inclusive and sustainable development in the regional territory, by examining the different types and areas of intervention for the regional territory aimed at achieving greater equity and resilience capacity in order to try to reduce the territorial gap with respect to Europe's most advanced regions and territories,

[1] The guidelines issued by the national government for the definition of the National Recovery and Resilience Plan stipulated that the plan should be constructed by gathering proposals formulated by governments, local institutions and potential co-investors.

which characterises it as the rear end, in order to achieve in this way a direct path to change and a rapid economic recovery. This implies careful planning for the transition to a sustainable and inclusive model, aimed at generating an innovative fabric based on opportunities and at the diffusion and adoption of innovative technologies of the regional productive fabric for greater growth and strengthening of the resilience capacity of the production system regional; strengthening the industrial base; investing in new companies by attracting new entrepreneurial activities; and carrying out support actions for start-ups and potential innovators in order to develop and strengthen metropolitan areas and enhance the rural and internal centres of the region. The investments that we intend to make are aimed at achieving economic growth and also efficient and sustainable employment in consideration of the exploitation of resources. These investment proposals should be implemented over the 2022 – 2026-time frame.

Sicily, through the strategic proposals of the Regional Recovery and Resilience Plan, intends to achieve numerous articulated and complex projects to achieve a new season of convergence between Sicily and the rest of the country, determining the economic improvement plan not only from the point of national view but also in the European perspective. In this particular context, the structural interventions planned by the Sicilian region provide for the potential increase in regional economic growth, the creation of new jobs, the improvement of resilience and territorial resilience, the social and economic impact reduction due the pandemic health crisis as well as supporting a green and digital transaction. These interventions, linked to support and reform policies, such as support for public investments, reforms of the Public Administration, justice, labour and taxation, will be able to stimulate a positive and durable impact on the considered territory in compliance with the implementation times and the achievement of the planned objectives.

The proposals presented by the various regional Departments for the purposes of the unitary contribution for the resolution of the Regional Plan for Recovery and Resilience, have identified, in compliance with the guidelines provided, thirteen macro interventions (Table 10) divided into each of the six Missions.

Table 10. Regional macro interventions.

Nr.	Macro interventions
1	Plan for the digital transition
2	Plan for the competitiveness of the economic-productive system
3	Regional action strategy for the fight against desertification
4	Clean Sicily plan
5	Sicily energy
6	Bridge over the Strait
7	Mediterranean hub airport
8	Hub port of the Mediterranean
9	Acceleration of Palermo-Messina-Catania railway axis
10	Network of connections
11	Integrated development of the education and training system
12	Solidarity Sicily Plan
13	Sicily Regional Health System

Source: Own elaboration.

In the context of this work, a synthetic representation of the project proposals of the Sicilian region within the Regional Recovery and Resilience Plan and their financial needs to carry them out is provided.

In reference to the “Mission 1 - Digitalization, innovation, competitiveness and culture”, Sicilian projects have the general objective of favouring the digitalization of Public Administration as well as its modernization through the digitalization of administrative procedures typical of the regional administrative activity ("Region digital"); the transformation of the production processes of enterprises and support for the internationalisation of small and medium-sized enterprises by intervening on the weaknesses of the regional production system; the strengthening of competitiveness through the use of incentives and the granting of tax credits for the creation of new businesses in special economic zones; the support and development of the region's communication infrastructures and digital services. Particular effort will be devoted to the promotion of strategic investments that favour innovative projects such as agri-food, telecommunications, transport, aerospace. The estimated financial resources necessary for the realisation of the project proposals are equal to 11.09% of the total amount.

In relation to the “Mission 2 - Green Revolution and Green Transaction” the interventions intend to favour the green and ecological transition of the regional economy in line with the European Green Deal. In particular, actions are envisaged aimed at investment and research programs for renewable energy sources, improvement of air quality and enhancement of renewable sources. In addition, investments will be planned to combat hydrogeological instability, reforestation, efficient use of water and the improvement of the quality of inland and marine waters, regional action strategies adopted for a better use of natural and environmental resources, for the restoration of biodiversity and

reduction of pollution The financial resources estimated as necessary for the realisation of the project proposals are equal, in percentage, to 16.28% of the total amount.

Concerning the “Mission 3 - Infrastructure for sustainable mobility” the lines of action envisage interventions concerning the upgrading and modernization of the regional railway network, with a particular interest in high-speed rail for passengers and freight. Other measures concern the safety and digital monitoring of viaducts and road bridges in the areas of the regional territory and consequent strengthening of the road and motorway network. Investments are planned for the implementation of one of the most modern intercontinental airport systems and for a strategic port system that will allow the creation of a logistics platform in the Mediterranean and interconnection with the major European lines. The financial resources estimated as necessary for the realisation of the project proposals are equal, in percentage, to 60.58% of the total amount.

“Mission 4 - Education, training and research” provides lines of action aimed at guaranteeing the school training and university course for each potential beneficiary. It poses particular attention to young people and to the complex argument of early school leaving in Sicily region, in the opportunity to create new retrained learning environments (collaboration with universities and research centres) and relaunch potential growth, productivity, social inclusion and the ability to adapt to technological and environmental challenges (private investment in R&D). Specific lines of action are planned to support research systems and raise the levels of higher education provision through advanced skills acquired, thus implementing interactions with the world of small and medium-sized enterprises, improving their propensity for innovation. The financial resources estimated as necessary for the realisation of the project proposals are equal, in percentage, to 4.92% of the total amount.

The lines of action proposed by the regional administration regarding mission 5 "Social, gender and territorial equity" envisage measures to support social and territorial inclusion, aimed at reducing inequalities, poverty and territorial gaps in the region by encouraging urban regeneration programs (enhancement of real estate assets) and enhancement of marginal areas (historic, hilly, mountain and seaside villages). Particular interest is addressed to systemic and integrated infrastructural interventions aimed at families by providing a series of services (nursery schools, inclusive parks for disabled children, family counters, listening centres, residences for the elderly, etc.) to limit the depopulation of the territory, ageing of the population and birth rate. The financial resources estimated as necessary for the realisation of the project proposals are equal, in percentage, to 3.41% of the total amount.

Finally, the interventions of the Sicilian administration relating to mission 6 "Health" have the specific objective of favouring the reorganisation of health policies, stimulating investments in

health facilities and the improvement of the hospital network present in the region, carrying out processes of modernization of the equipment of the National Health Service and the enhancement of the Electronic Health Record. These reforms, necessary for a better strengthening of regional public health and its integration with social and environmental policies, promote social inclusion and will lead to overcoming the existing gaps between the various regional health systems. In this specific context, characterised by the pandemic health emergency, it is particularly important to ensure high quality health care accessible to all citizens with the expansion and extensive use of telemedicine. The financial resources estimated as necessary for the realisation of the project proposals are equal, in percentage, to 3.71% of the total amount.

Overall, the Region's proposal stands at 26.41billion euro, divided as follows between the six missions. The Sicilian proposal recovery and resilience plan budget is shown in Table 11.

Table 11. Economic resources within the regional recovery and resilience proposal for Sicily (million euro).

Mission	Budget
Digitization, innovation and competitiveness of the production system	2,930.00
The Green revolution and ecological transitions	4,300.00
Mobility infrastructure	16,000.00
Education, training, research and culture	1,300.00
Social, gender and territorial equity	900.00
Health	980.00
Total budget	26,410.00

Source: Own elaboration.

2.3 The tools and methodology for analysing the NPRR for the region of Sicily.

In relation to the Regional Recovery and Resilience Plan Proposal, a study was conducted to simulate and evaluate the economic impact achieved for the productive structure of the Sicilian region. Considering the financial interventions determined by the national government's transfers and therefore the region's project proposals, macroeconomic variables and their relationships were considered through the construction of CGE models. These models differ in terms of both the construction of the model and the objectives to be achieved, and their construction requires the

implementation of several stages. For the purposes of this work, it was necessary to build and expand a coherent database (Social Accounting Matrix, SAM) so that the information could faithfully represent the economic situation of the regional territory and to create a synergy between the same database and the model, organising the SAM in such a way as to provide the model with the required data and to build the model in accordance with the principles of national accounting.

The improvement of local resources, the growth of their productivity and the process of consolidation of the existing production structure are essential for a region to develop. Therefore, when we want to describe, within a given economic system, different areas that concern employment levels, productive structures, infrastructural endowments, the social accounting matrix (SAM) structure is adopted. The matrix allows us to reconstruct the transmission mechanisms of the impulses created by a variation of the final demand, in the sense that it includes the internal activations to the production system, the Keynesian multipliers of the demand, and the effects of the transfer policies. Due to its theoretical characteristics and its methodological potential, the SAM is a suitable tool for evaluating the direct and indirect effects of the implementation of a program in the form of stimulating productive activity and increasing income, considering the improvement of welfare among groups of families with particular social and economic characteristics. This consideration requires the preparation of theoretical models capable of verifying the relationships between the economic agents represented and the effects that internal (intraregional) and external (inter-regional) variations can have on the welfare of a region.

In this way, the social accounting matrix specially constructed to represent the Sicilian regional economic system is used as a conceptual framework for the construction and simulation of the CGE model. This model is developed using a system of linear and nonlinear equations, defining its functional forms, exogenous parameters and endogenous variables; in this way, it will be possible to compare the benchmark consisting of the initial equilibrium situation with the new scenario replicated following the application of a new policy. The proposed model is a disaggregated, static general economic equilibrium computational model, with the aim of quantifying the direct and indirect effects of the regional proposal, developed on the characteristics of the geographical area of our interest: the Sicily region. The model used in this thesis is a CGE model that stimulates the economy (as in the case of economic policies), investment decisions and economic dealings with the rest of the world. In the specific case of analysis, the Sam based CGE model for Sicily has been drawn up considering specifically the consumption and the investments (demand side), the product subsidies (supply side) and the transfers to households (income distribution) and specifically examining the following aspects, whose representation is outlined from the CGE regional model for Sicily. In

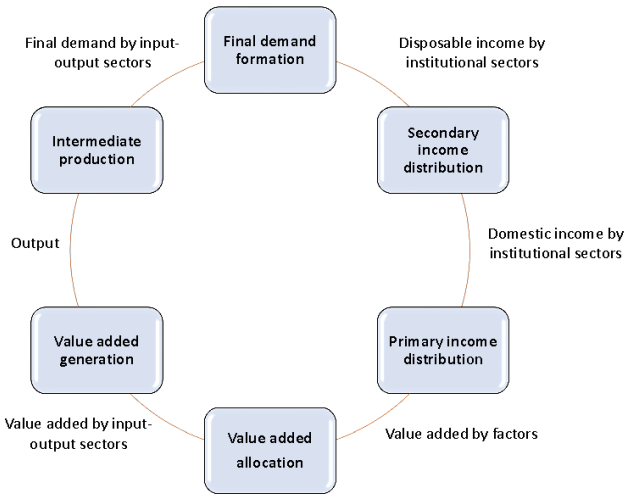
particular, with regard to the production technology, the value of output by commodity results from the combination (through a Nested production function) of intermediate goods, primary factors, taxes and imports (Armington, 1969). With reference to the commodity markets the value of output by commodity equals the sum of intermediate consumption and the final demand (Private and collective consumption expenditure, Exports, Investments). With reference to primary factor markets the industries employ entirely primary factors that are perfectly mobile between sectors; the demand for labour and capital derives from the profit-maximising process of activities and the supply of primary factors is exogenously determined. Finally, in relation to institutional sectors, institutional sectors are assumed to maximise their utility function, which depends on final consumption expenditure subject to the budget constraint (Ciaschini, et al., 2011).

Once the counterfactual equilibrium has been replicated following the application of regional policy interventions, it is possible to analyse the direct, indirect and induced effects of the measure on the entire regional economic system. The comparison of the results obtained from the simulations with the data from the real economy makes it possible to obtain useful information for the policy maker and to be able to interpret it for the purposes of efficient and effective economic policy planning.

2.3.1 Theory on the construction of regional Social Accounting Matrix.

A SAM is a particular representation of the macro and meso economic accounts of a socioeconomic system, which capture the transactions and transfers between all economic agents in the system (Pyatt & Round, 1985; Reinert & Roland-Holst, 1997). This accounting scheme offers a disaggregated analysis of the relationships existing between the phases of production of goods and services, of primary attribution, of secondary distribution and of the use of income, based on the management activities carried out by the various institutional sectors present in the economic system (Socci, 2004), thus describing the circular flow of income according to an accounting and matrix representation (Pretaroli, 2010). The circular flow of income is shown in Figure 11.

Figure 11. Circular flow of income.



Source: Own elaboration.

The SAM is a tool of regional analysis providing useful guidelines for the development of a regional economy (Fannin, 2001). An estimation of the impact of public policies and the examination of the links between social and economic development is useful to support the local policy-making decision process. Therefore, the SAM is the most suitable accounting scheme to represent the complex framework of connections that characterises the economic system. The social accounting matrix and interaction structure between institutional sectors is structured according to the scheme of Figure 12. Figure 12 is given in the Appendix 1 to this chapter.

In the case of this study, it was necessary to build a SAM for the regional economy. The SAM scheme makes it possible to link production accounting, in sectoral terms, and income accounting, offering the opportunity to describe the interrelationships between all economic operators. The structure of SAM for Sicily presents 54 types of products and 37 productive industries (the complete list is available in the Appendix 3 to this chapter); the value added is obtained through the combination of 2 productive factors, capital and labour. There are three private institutional sectors (households, financial and non-financial firms, and non-profit social institutions) to which are added the public institutional sector (Government), the Rest of Italy and the Rest of the world. There are also 2 types

of taxes: taxes on products and taxes on activities. The primary allocation of income is a function of income from labour and capital towards the institutional sectors that collect them; the secondary distribution of income, on the other hand, is linked to transfers between institutional sectors. The use of income is linked to consumption and capital accumulation, highlighting its circularity. The social accounting matrix for Sicily is represented in Figure 13. Figure 13 is given in the Appendix 2 to this chapter.

The matrix describes each phase of the economic process, recording for each row and each column respectively the income and expenditure of each account which expresses the phase; each type of transaction is recorded in the intersection of row and column of each cell and the total of each row is equal to the total of each corresponding column, thus ensuring the economic balance of each account (Siesto, 1996). Based on the objective of the analysis and the availability of information, the economic flows can be disaggregated in various ways and according to the degree of detail that one wishes to achieve, making it possible to represent a detailed breakdown of the accounts and, therefore, a precise description of the structure limited socio-economic; this allows us to highlight how the structure and composition of the social accounting matrix is characterised by a simple and flexible nomenclature adaptable to different uses in terms of economic analysis and as a basis for economic modelling. The matrix structure, which describes the process of the economic system, is made up of the intersectoral economic tables (IET) and the economic accounts of the institutional sectors. The production and resource allocation process are described in the first block of the matrix, which corresponds to an input-output table represented according to the national economic accounting rules. The main and secondary productions of productive activities are recorded in the resource table; specifically, read by line, the set of transactions of goods and services produced by the branches is recorded, while the columns identify the branches that generated the product or service. In the table of uses, the rows record the inputs used in the production process and the columns are headed to the production activities. The aforementioned presentation allows us to identify the production accounts and the income generation accounts (distribution of added value), (Pretaroli, 2010). The production account provides information on the flow of intermediate goods, on the flows related to the generation of value added by industry and also information on the final demand side. The accounting balance of the production account represents the flow relating to all the other primary factors used in production which, in terms of value, and at the aggregate level, is equal to the gross domestic product (Socci, 2004). The nomenclature of the account can also be analysed in a disaggregated way for the productive activities, aggregated on the basis of the principle of homogeneity of the main product; this process identifies the information on the flows of intermediate goods used in the different

production processes, which generate the income distributed to the production factors divided into compensation of employees, other internal income, indirect taxes on production, contributions to production and depreciation (primary distribution of value added). Further information can be gleaned from the cross-sectoral table regarding the final demand side; in detail, the table records the flows of goods and services aimed at the final consumption of households and the Public Administration and the flows of goods and services destined for the change in capital (gross investment and change in inventories). Furthermore, in consideration of relations with the rest of the world, the table provides information on the share of final demand destined for foreign countries. To understand the aspects of primary income attribution and secondary income distribution, in a social accounting matrix, the identification and disaggregation of institutional sectors is particularly relevant, which includes the household, business and public administration sectors. The identification of the institutional sectors, owners of the factors of production, allows to attribute to them respectively the relevant share of the primary income generated by the production activity. Once the primary income has been assigned, it is converted into disposable income of the institutional sectors through unilateral transfers, such as social contributions, social benefits and current transfers, thus implementing the process of secondary distribution of the income of the individual institutional sectors. The identification of the gross disposable income, that is of the available resources of the individual institutional sectors, closes the phase of income distribution and redistribution. By subtracting the flows in the use of income account by institutional sectors from the balance of gross disposable income arising from the income redistribution phase, we obtain the aggregate of gross savings, which, when included in the capital formation account, determines the position net position of institutional sectors, and the net position of the whole economy in relation to borrowing and lending towards the rest of the world.
For this reason, we can argue that the social accounting matrix turns out to be a valid accounting tool to describe the existing interactions between the economic agents in the economic system considered and represents the basis of initial economic equilibrium (benchmark) in the CGE model.

2.3.2 Computable General Equilibrium models for economic impact analysis.

The regions, following the changes made to Title V of the Constitution, are called upon to assume a main and relevant role in which the transfers and management of financial resources require the availability of specific economic-statistical data and models necessary for the analysis of impacts of

regional policies within the circular flow of income between the various institutional sectors of the economic system (Ciaschini, et al., 2008).

Computational General Equilibrium (CGE) models, based on purpose-built social accounting matrices (SAMs), represent an important tool for assessing the effects of economic policies (Scrieciu, 2007) both from the top of demand (Severini, et al., 2020) and on the supply side (Deriu, et al., 2021; Severini, et al., 2019). Considering the complexity of the interrelationships between the agents of the economic system, the allocation of resources as well as the distribution and redistribution of income play a key role (Kousnetzoff & Chauvin, 2004), in a context in which the market structure is mainly microeconomic and characterised from the endogenization of prices (Fossati & Targetti Lenti, 2009). CGE models, thanks to their ability to accurately describe the economic system and evaluate the impacts of economic policies on it, have been widely used for the analysis of a varied range of economic themes (Arrow & Debreu, 1954; Johansen, 1960; Harberger, 1962; Shoven & Whalley, 1984) and thanks to the scientific contribution of some mathematical economists, moreover, it was possible to develop models with numerical solutions to calculate the equilibrium price vectors in a Walrasian system (Scarf, 1967; Miller & Spencer, 1977; Van der Laan & Talman, 1979).

The adoption of these models depends on the type of simulation of the interventions to be carried out, on the availability of data, on the level of aggregation (Willenbockel, 1994) and, they can differ from each other based on the structure of the model itself and the objectives. that you intend to pursue. In particular, CGE models have been extensively developed to outline the effects of specific policies relating to international trade, tax reforms, environmental regulations (de Melo, 1988; Socci, et al., 2021), (Dixon & Parmenter, 1996), monetary policies (Socci, et al., 2018), mega events (Felici, et al., 2018) (Scandizzo & Pierleoni, 2018) (Bronzini, et al., 2020), gender policies (Severini, et al., 2019). In this economic context, the choices made by the various economic subjects are determined by the opportunity to maximise their utility function in compliance with their budget constraints, on the basis of a market price system for equality between supply and demand on all markets (Arrow, 1974; Arrow & Debreu, 1954).

The models are developed according to a system of optimising behaviour equations represented by the maximisation of the consumer's utility function respecting his budget constraint determined by his own disposable income and by the assumption that producers maximise their profits in the presence of non-scale returns increasing; therefore, the solution of the models requires the determination of equilibrium prices such as to determine the equality between supply and demand in all markets, generating zero extra-profits for each sector and thus guaranteeing the form of perfect competition in each market (Targetti Lenti, 1989).

Examining the modelling of the main functions of behaviour, such as that of production, consumption and accumulation and the relationships between institutional sectors, these models allow to describe an initial equilibrium of benchmarks (Ciaschini, et al., 2010), and to build a counterfactual equilibrium generated following a policy that allows analysing the effects of the policy itself, with reference to the economic flows identified in the production process and to the scheme of the social accounting matrix.

The disaggregated level of the SAM, by products, industries and institutional sectors, allows to examine the flows and the related sectoral interdependencies incorporated in the scheme (Ciaschini & Socci, 2007), offering the researcher the opportunity to calibrate and estimate the parameters that describe the behaviour of the operators present in the economic system (production technology, consumer demand, capital accumulation, imports, relations with the rest of the world, etc.) (Socci, et al., 2020). Therefore, calibrating the CGE models based on specially constructed social accounting matrices allows to describe the economic context considered in a precise and analytical way. This type of model, therefore, turns out to be a valid tool for analysing planned economic policies (Pretaroli & Severini, 2009) as they allow to analyse the disaggregated effects of the policies considered and, with regard to the objectives of the analysis, allow to simulate the effects of different measures of economic policy interventions. The direct, indirect and induced effects of any type of economic intervention can therefore be assessed by considering the interdependencies between productive activities, between institutional sectors (Deriu, et al., 2021; Severini, et al., 2019) and through the primary and secondary distribution of income (Severini, et al., 2020). The need to have information flows that describe the economic system in disaggregated terms is a fundamental condition for the assessment of economic impacts. Furthermore, by also examining the indirect and induced effects of the manoeuvres under analysis, we avoid neglecting an underestimation of the impacts of a specific activity, expenditure or investment, on the reference economy (Ciccarone, et al., 2021).

The models provide a quantitative perspective of policy changes, both in the short and long term, with regard to the production structure and the allocation and distribution of income and, they allow to estimate ex-ante the impacts of these intervention policies, influencing them the structure of products and relative prices of factors borne by economic operators (Willenbockel, 1994).

The characteristics of the CGE models that outline their growing interest and wide use for the analysis of the impacts of economic policies can be summarised in the following main points. The first: once the shocks deriving from the application of economic policy measures have been outlined, the CGE models make it possible to analyse and quantify the direct and indirect effects with an interest in the reference economic framework (Ciccarone, et al., 2021). The second: using these

models, the policy maker has the opportunity and the advantage of quantifying the impact of a manoeuvre on a specific sector and therefore being able to influence its well-being in aggregate terms. The third: the production and demand functions of all economic agents are explicitly calculated; the Arrow-Debreu theory of general equilibrium, in particular the microeconomic approach of behavioural relations, theoretical presuppositions on which these models are based, allow us to explain and understand how economies work (Willenbockel, 1994). The fourth: economic observations and analyses, with CGE models, can affect not only perfectly competitive markets but also other imperfect market types and structures (Kehoe & Kehoe, 1994; Piermartini & Teh, 2005). If the information necessary for the construction of multi-sector CGE models is unavailable or insufficient, the general equilibrium economic analysis can be explained using traditional models, such as input-output models, econometric models, analyses relating to Keynesian multipliers and evaluations. based on general economic equilibrium models specifically applied to the regional economy (Ciccarone, et al., 2021).

Using the CGE models it is possible to analyse the impacts of national and regional economic policy reforms on macro-variables through the circular flow of income; therefore, the model is developed to study the effects on resource allocation (Ciaschini, et al., 2013; Socci, et al., 2021), on efficiency and well-being, which exogenous shocks determine in the whole economic system, changing the prices and quantities of goods on the markets. Furthermore, the models allow analysis of the impacts on the formation and distribution of income between institutional sectors if calibrated on complex SAM-type databases (Shoven & Whalley, 1984).

2.3.3 Regional CGE model for Sicily.

The regional computable general equilibrium model presents some peculiar aspects with respect to the standard model. In the construction of the regional model, the flows of commercial transactions are modelled not only with foreign countries but also with other regions of the country; moreover, the model could present increases in the flows of geographic mobility of workers between regions belonging to the same country rather than between different countries (Gazel, 1996). The common approach to the model is the neoclassical paradigm, whereby the production and prices of the factors determine the demand for factors and the writing of the functional forms required by the model is mainly based on the functional forms such as the Cobb-Douglas and Constant Elasticity of Substitution (CES). Therefore, from the point of view of production, the transactions of intermediate

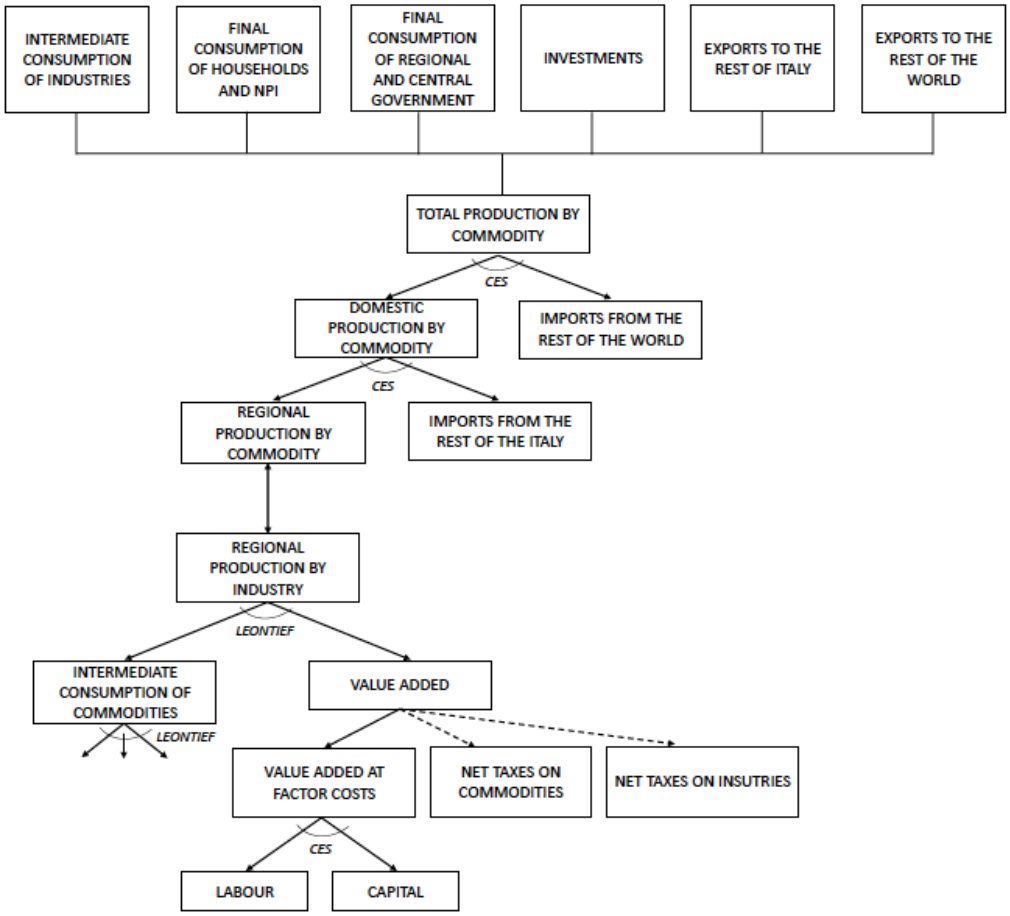
goods are diversified by purchases from within the region or from the foreign sector. Furthermore, the construction of the regional CGE model could model two levels of government; therefore, in the considered region it would be possible to model a regional and a central (federal) level of government. The choice of modelling a regional CGE model is in any case conditioned by the availability of the information and data required at the regional level, by the degree of disaggregation and by the objectives to be achieved and, therefore, presents limits for the type and validity of the analyses to be carry out (Bröcker, 1989).

The regional CGE models used and applied for regional study and analysis are classified into “region-specific models”, “bottom-up models” and “top-down models” (Cockburn, et al., 2014). The regional CGE model to which reference will be made in this research work is the "bottom-up model". The main peculiarity of this type of model compared to the other regional models is characterised by the description of the government sector and the foreign sector, as previously described. The choice of the model is determined by the opportunity to analyse the impact of a specific regional policy on other regions, and to evaluate the direct effects on the considered region and the possible interactions of the other regions.

The model is developed through the construction of a system of simultaneous linear and nonlinear equations (Scarf, 1967) configured as a series of markets for each product traded within the economic system, which incorporates the processes of optimization of the utility function of the consumer in compliance with the budget constraint given by disposable income, and the profit of the producer compatible with his production function. Equilibrium is achieved through a set of prices for which demand equals supply in all markets.

The construction and solution of a CGE model requires a process consisting of several steps (Shoven & Whalley, 1984), from the choice of the model to the functional forms of the equations, as well as to the specification of the parameters and variables, assuming a priori that the system is in equilibrium and that the solution of the model is based on this equilibrium. Consequently, the model allows to compare an initial equilibrium situation (reference equilibrium) with a counterfactual equilibrium deriving from the application of new economic policy measures, which condition the formation of prices and quantities of each aggregate, with the possibility to provide information on the effects in nominal and real terms. In particular, the model follows the structure of the SAM by reconstructing the structure of production and the behaviour of each institutional sector. The productive structure of the economic system is structured according to Figure 14.

Figure 14. Production function.



Source: Own elaboration.

In the first nesting stage, the formation of the total production and the generation of the relative prices divided by type of product are defined. Total production is obtained by combining domestic production with imports from the rest of the world, through the hypothesis of imperfect substitutability between domestic and imported goods (Armington, 1969). The dual cost function is structured in equation 1 as follows:

$$P_i = \left(\delta_i^{dom} P_{dom,i}^{(1-\sigma_{Q_{dom}})} + (1-\delta_i^{dom}) Pm_i^{(1-\sigma_{Q_{dom}})}\right)^{\frac{1}{1-\sigma_{Q_{dom}}}}$$

where P_i represents the price of goods by type of product, $P_{dom,i}$ represents the price of the domestic good, P_{mi} the price of imports from the Rest of the world, $\delta_i{}^{dom}$ the share of domestic goods, on the total production by type of product, and σ_{Qdom} the elasticity of substitution between domestic and imported goods, set at zero, thus indicating that the aggregation occurs according to a Leontief production function.

In the second nesting stage, the formation of domestic production is defined, obtained through the combination of regional production and imports from the Rest of Italy as shown in equation 2:

$$P_{dom,i} = \left(\delta_i^{int} P_{int,i}^{(1-\sigma_{Q_{int}})} + (1-\delta_i^{int}) Pit_i^{(1-\sigma_{Q_{int}})}\right)^{\frac{1}{1-\sigma_{Q_{int}}}}$$

where $P_{int,i}$ represents the prices of domestic goods, Pit_i the price of goods imported from the rest of Italy, $\delta_i{}^{int}$ represents the share of intermediate goods on total domestic production, σ_{Qint} represents the elasticity of replacement between domestic goods and goods imported from the rest of Italy.

As regards the regional production, generated in the third nesting stage, it is necessary to consider the relationship between goods and productive activities; in fact, each type of good can be produced by different types of industries, and therefore production can be seen from two different points of view. However, (internal) domestic production is obtained through the combination of intermediate goods with added value, which in the SAM are divided by type of production activity. The regional production function is structured in equation 3 as follows:

$$P_{int,j}\left(1 - t_{act_j} - t_{out_j}\right) = \left(\delta_j^D Pbi_j{}^{(1-\sigma_D)} + (1-\delta_j^D) Pva_j{}^{(1-\sigma_D)}\right)^{\frac{1}{1-\sigma_D}}$$

where Pbi_j represents the price of intermediate goods, t_act_j and t_out_j respectively represent taxes on productive activities and products, Pva_j represents the price of added value, $\delta_j{}^D$ is the share of intermediate goods over regional production and σ_D is the elasticity of substitution between intermediate goods and added value.

In the fourth nesting stage, the formation of the aggregate of intermediate goods is obtained through the combination of the individual types of intermediate goods. The formation of the aggregate of intermediate goods function is structured in equation 4 as follows:

$$Pbi_j = \sum_i \left(\delta_{i,j} P_j^{(1-\sigma_{BI})}\right)^{\frac{1}{1-\sigma_{BI}}}$$

where P_j represents the average price of goods on the market generated by the *market clearing condition*[2], $\delta_{i,j}$ represents the cost share for intermediate goods in the total cost and σ_{BI} $\overline{\sigma_{BI}}$is the elasticity of substitution among intermediate goods.

Finally, the added value is obtained through the combination of labour and capital factors of production, and the respective price is formed according to the balance between supply and demand, using an elasticity of substitution between capital and labour fixed at 0,5218 (Van der Werf, 2008). The added value function is structured in equation 5 as follows:

$$Pva_j = \left(\delta_j^v \cdot PL^{\,1-\sigma_v} + \left(1-\delta_j^v\right) \cdot PK^{\,1-\sigma_v}\right)^{\frac{1}{1-\sigma_v}}$$

where PL and PK respectively represent the price of labour and the price of capital, $\delta_j{}^v$ represents the share of labour over the total of primary factors and σv is the elasticity of substitution between labour and capital. The prices of the two production factors are obtained through the balance between supply and demand, as shows in equation 6:

$$\sum_{is} L^{is} = \sum_j L_j$$

[2] The market clearing condition is the condition for which the quantity demanded of a good is equal to the quantity produced, generating a market price that guarantees equilibrium.

$$\sum_{is} K^{is} = \sum_{j} K_j$$

where L^{is} L^{is} and K^{is} K^{is} respectively represent the endowment of labour and capital for each institutional sector; $\overline{L_i}$ L_j and K_j $\overline{K_i}$ represent the demand for labour and capital for productive activity.

Total production, which corresponds to the overall supply of the economic system, is used among the various components of demand: intermediate consumption, final consumption by the Institutional Sectors, gross investments and exports to the rest of Italy and the rest of the world.

The institutional sectors, in the primary phase of attribution of income, receive income from employees and income deriving from the gross operating result[3]; therefore, the formation of primary income can be written as shows in equation 7:

$$Y^{is} = L^{is} PL + K^{is} PK$$

From the formation of primary income, we move on to the formation of disposable income, obtained by adding to the primary income of each institutional sector the entries and exits deriving from taxes and transfers between institutional sectors, both calculated on the basis of primary income. The formation of disposable income is diversified according to the institutional sector Households (hh), Financial and non-financial corporations (corp), Public Administration (pub), Rest of Italy (rest_it) and Rest of the world (rest_w).

[3] The SAM shows that only the institutional household sector receives both types of income; on the contrary, the firms only receive income deriving from the gross operating result, while the Rest of Italy only receives income from employees.

The following formula 8 shows the formation of disposable income for the Household sector (hh):

$$Ydisp^{hh} = Y^{hh} + \sum_{is_{in}} Y^{hh} tr^{hh}_{is_{in}} + Tr^{hh}_{pub} + Tr^{hh}_{rest_{it}} + Tr^{hh}_{rest\_w} - \sum_{t\_inc} Y^{hh} ty^{hh}_{t\_inc} - \sum_{is\_out} Y^{hh} tr^{hh}_{is\_out}$$

The following formula 9 shows the formation of disposable income for the Financial and non-financial corporation (corp):

$$Ydisp^{corp} = Y^{corp} + \sum_{is_{in}} Y^{corp} tr^{corp}_{is_{in}} + Tr^{corp}_{pub} + Tr^{corp}_{rest_{it}} + Tr^{corp}_{rest_{w}} - \sum_{t\_inc} Y^{corp} ty^{corp}_{t\_inc} - \sum_{is\_out} Y^{corp} tr^{corp}_{is\_out}$$

The following formula 10 shows the formation of disposable income for the Public Administration (pub):

$$\begin{aligned} Ydisp^{pub} = {} & Y^{pub} \\ & + \gamma^{pub}_{t\_out} \sum_{j} tq_{j,t\_out} P_i Q_i \\ & + \gamma^{pub}_{t\_act} \sum_{j} tq_{j,t\_act} P_j X_j \\ & + \sum_{priv} ty^{priv}_{t\_inc} Y_{priv} + \sum_{is\_in} Y^{end} tr^{end}_{is\_in} + Tr^{in}_{row} - Tr^{out}_{row} \end{aligned}$$

The following formula 11 shows the formation of disposable income for the Rest of Italy (rest_it):

$$Ydisp^{rest\_it} = Y^{rest\_it} + \sum_{i} IT_i + \sum_{is\_in} Y^{rest\_it} tr_{is\_in}^{rest\_it} + \gamma_{t\_act}^{rest\_it} \sum_{j} tq_{j,t\_act} P_j X_j + \gamma_{t\_out}^{rest\_it} \sum_{j} tq_{j,t\_out} P_i Q_i + Tr_{pub}^{rest\_it} + Tr_{row}^{rest\_it} - \sum_{is\_out} tr_{is\_out}^{rest\_it}$$

The following formula 12 shows the formation of disposable income for the Rest of the world (rest_w):

$$Ydisp^{rest\_w} = Y^{rest\_w} + \sum_{i} M_i + \gamma_{t\_out}^{rest\_w} \sum_{i} tq_i^{t\_out} P_i Q_i + \gamma_{t\_act}^{rest\_w} \sum_{j} tq_j^{t\_act} P_j X_j + \sum_{is\_in} Y^{end} tr_{is\_in}^{end} + Tr_{pub} - \sum_{t\_inc} Y^{rest\_w} ty_{t\_inc}^{rest\_w} - \sum_{is\_out} tr_{is\_out}^{rest\_w}$$

where ty_{t_inc} represents the implicit rates of income taxes paid, $tris\_in$ and $tris\_out$ respectively represent the implicit rates of transfers collected and paid to other institutional sectors; $tq_i^{t\_out}$ represent the implicit tax rates on production; $tq_i^{t\_act}$ represent the implicit tax rates on productive activities; $\gamma^{pub}{}_{t\_out}$ and $\gamma^{pub}{}_{t\_act}$ represent the share of taxes on production and taxes on activities collected by the Public Administration; $\gamma^{rest\_w}{}_{t\_out}$ and $\gamma^{rest\_w}{}_{t\_ac}$ represent the share of production taxes and activity taxes collected by the Rest of the world. Finally, IT_i and M_i respectively represent imports from the Rest of Italy and the Rest of the World. In the transfers collected from the

institutional sectors, transfers from the Public Administration and from the rest of the world are considered exogenous, and this implies that their amount is not a function of their disposable income; therefore, they are considered to be constants. The solution of the process of maximising the household utility function allows us to determine the levels of consumption and savings compatible with disposable income according to the following relationship as shows in formula 13:

$$Ydisp^{hh} = C^{hh} + S^{hh}$$

Where C^{hh} and S^{hh} represent the level of consumption and savings, respectively.

As regards the institutional sector of the Public Administration, disposable income is obtained from the sum of the taxes collected and the transfers received, net of the transfers paid. This institutional sector does not maximise its utility function as it can make choices on the level of consumption not linked to the budget constraint, but by resorting to the deficit. The Public Administration disposable income function is structured in equation 14:

$$Ydisp^{pub} = G^{pub} + S^{pub} + def^{pub}$$

The disposable income of the firms coincides with the level of savings, as this institutional sector does not foresee the consumption of final goods, as shows equation in 15:

$$Ydisp^{corp} = S^{corp}$$

The disposable income of the rest of Italy and of the rest of the world represent the condition of closure with respect to exports and debt, as show in equations 16 and 17:

$$Ydisp^{rest\_it} = X^{rest\_it} + S^{rest\_it}$$

$$Ydisp^{rest\_w} = X^{rest\_w} + S^{rest\_w}$$

where X^{rest_it} and X^{rest_w} represent exports respectively to the rest of Italy and to the rest of the world; S^{rest_it} and S^{rest_w} represent the respective indebtedness. Furthermore, gross investment is considered to equal gross savings as shows in equation 18:

$$\sum_i I_i = \sum_{is} S^{is}$$

Total production, which corresponds to the overall supply of the economic system, is finally divided between the components of aggregate demand and intermediate goods. The total production function is structured in equation 19:

$$Q_i = \sum_j bi_{i,j} + C_i^{hh} + G_i^{pub} + I_i + E_i^{rest\_it} + E_i^{rest\_w}$$

The structural form of the CGE model is presented in Appendix 4 to this chapter, where the list of parameters, variables and equations is also presented.

Appendix 1 to chapter 2: Social accounting matrix and interaction structure between institutional sectors.

Figure 12. Social accounting matrix and interaction structure between institutional sectors.

<table>
<tr><td></td><td>Commodities (1, …, i)</td><td>Activities (1, …, j)</td><td>Primary Factors (L, K)</td><td>Net Taxes on Output</td><td>Taxes on Activity and Value Added</td><td>Private Institutional Sectors (1_,_…,_h)</td><td>Government</td><td>Rest of Italy</td><td>Rest of the world</td><td>Capital formation</td></tr>
<tr><td>Commodities (1, …, i)</td><td></td><td>Intermediate Consumption</td><td></td><td></td><td></td><td>Private Final Consumptions</td><td>Government Final Consumption</td><td>Exports</td><td>Exports</td><td>Investments</td></tr>
<tr><td>Activities (1, …, j)</td><td>Regional Output</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Primary Factors (L, K)</td><td></td><td rowspan="3">Value added at factor cost</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Net Taxes on Output</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Taxes on Activity and Value Added</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Private Institutional Sectors (1_,_…,_h)</td><td></td><td></td><td rowspan="4">Primary Incomes</td><td></td><td></td><td colspan="4" rowspan="4">Transfers</td><td></td></tr>
<tr><td>Government</td><td></td><td></td><td>Net Taxes on output</td><td>Net Indirect Taxes on activities</td><td></td></tr>
<tr><td>Rest of Italy</td><td>Imports</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Rest of the world</td><td>Imports</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Capital formation</td><td></td><td></td><td></td><td></td><td></td><td>Private savings</td><td>Public savings</td><td>(+/-) Debt</td><td>(+/-) Debt</td><td></td></tr>
</table>

Source: Own elaboration.

Appendix 2 to chapter 2: Social accounting matrix for Sicily.

Figure 13. Social Accounting Matrix for Sicily.

				Primary Factors			Institutional Sectors								
		Commodity	Activity	Compensation of employees	Mixed Income	Gross operating surplus	Firms		Government	Households	NPISH	Rest of Italy	Rest of Word	Capital Formation	Total
							Financial	Non-Financial							
	n.	1	2	3	4	5	6	7	8	9	10	11	12	13	
Commodity	1		Use						Government final consumption	Households and NPISH's final consumption		Export to ROI	Export to ROW	Gross Fixed Capital Formation, Changes in Inventories	
Activity	2	Supply													
Primary Factors: Compensation of Employees	3		Gross Value Added									Value Added from the ROI	Value Added from the ROW		
Primary Factors: Mixed Income	4														
Primary Factors: Gross operating surplus	5														
Institutional Sector: Firms: Financial	6			Allocation of Value Added to Institutional Sectors					Current taxes on income, social contribution, social benefits, other current transfers						
Institutional Sector: Firms: Non Financial	7														
Institutional Sector: Government	8														
Institutional Sector: Household	9														
Institutional Sector: NPISH	10														
Institutional Sector: Rest of the Italy	11	Import from ROI													
Institutional Sector: Rest of the World	12	Import from RoW													
Capital Formation	13						Savings								
Total															

Source: Own elaboration.

Appendix 3 to chapter 2: List of commodities and industries in the Sicily SAM.

Table 1. Classification of Commodities in SAM.

Nr.	Commodity	Nr.	Commodity
1	Agricultural and hunting products and related services	28	Wholesale and retail trade and repair services of motor vehicles and motorbikes
2	Products of forestry, logging and related services	29	Wholesale trade services, except of motor vehicles and motorbikes
3	Fish and other fisheries products; aquaculture products; fisheries support services	30	Retail trade services, except of motor vehicles and motorbikes
4	Mining and quarrying products	31	Land transport and pipeline transport services
5	Food, beverages and tobacco products	32	Maritime and water transport services
6	Textiles; clothing; leather and related products	33	Air transport services
7	Wood and wood and cork products (excluding furniture); articles of straw and plaiting materials	34	Warehousing and transport support services
8	Paper and paper products	35	Postal and courier services
9	Printing and registration services	36	Accommodation and catering services
10	Coke and refined petroleum products	37	Publishing services
11	Chemical products	38	Film, video and television programme production services; sound recording and music publishing; programming and radio and television broadcasting services
12	Basic pharmaceutical products and pharmaceutical preparations	39	Telecommunication services
13	Rubber and plastic articles	40	Computer programming, consultancy and related services; information services
14	Other non-metallic mineral processing products	41	Financial services (excluding insurance and pension funds)
15	Metals	42	Services incidental to insurance, reinsurance and pension funding, except compulsory social security
16	Metal products, excluding machines and systems	43	Services auxiliary to financial services and insurance services
17	Computer, electronic and optical products	44	Real estate services
18	Electrical equipment	45	Legal activities, accounting, management consulting, architectural firms
19	Machines and mechanical equipment n.e.c.	46	Scientific research and development services
20	Vehicles, trailers and semi-trailers	47	Other professional, scientific and technical activities
21	Other means of transport	48	Other administration and support activities
22	Furniture; other artefacts	49	Public administration and defence services; compulsory social security services
23	Repair and installation services of machinery and equipment	50	Education services
24	Electricity, gas, steam and air conditioning	51	Health and social assistance
25	Natural water; water treatment and water production and distribution services	52	Art, entertainment and fun activities
26	Waste-water disposal services; sewage sludge; waste collection, treatment and disposal services; materials recovery services; decontamination and other waste treatment services	53	Other service activities
27	Construction and civil engineering works	54	Activities of households as employers for domestic staff; production of undifferentiated goods and services for own use by households and private households

Table 2. Classification of Industries in SAM.

Nr.	Industry	Nr.	Industry
1	Agriculture, forestry	20	Water supply; sewerage networks, waste treatment activities
2	Fishing	21	Constructions
3	Mining and quarrying	22	Wholesale and retail trade, repair of motor vehicles and m
4	Food, beverage and tobacco industries	23	Transport and storage
5	Textile, clothing, leather and accessories industries	24	Accommodation and catering services
6	Wood industry	25	Publishing, audiovisual, radio and television activities
7	Paper Printing and registration	26	Telecommunications
8	Manufacture of coke and refined petroleum products	27	IT and other information services
9	Manufacture of chemical substances and products	28	Financial and insurance activities
10	Production of pharmaceutical, chemical-medical and botanical articles	29	Real estate activities
11	Manufacture of rubber and plastic products	30	Legal activities, accounting, management consulting, architectural firms
12	Other non-metallic mineral processing products	31	Scientific research and development
13	Manufacture of basic metals and processing of metal products	32	Other service activities
14	Manufacture of computers, electronic and optical equipment	33	Public administration and defence; compulsory social insurance
15	Manufacture of electrical appliances	34	Education 85
16	Manufacture of machinery and equipment n.e.c.	35	Health and social assistance
17	Manufacture of transport equipment	36	Art, entertainment and fun activities 90 to 93
18	Other manufacturing, repair and installation of machines	37	Other service activities
19	Electricity, gas, steam and air conditioning supply		

Appendix 4 to chapter 2: parameters, variables and equations.

Model parameters and variables

i	Commodities
j	Industries
is	Institutional Sectors
hh	Households
corp	Corporations
pub	Public Administration
rest_it	Rest of Italy
rest_w	Rest of the world
Q_i	Output by commodity
P_i	Price of goods
Q_j	Output by industry
δ_i^{dom}	Share of domestic goods on the total production in the cost function
d_i^{dom}	Share of domestic goods on the total production
$P_{dom,i}$	Prices of domestic goods
$Q_{dom,i}$	Quantity of domestic goods
t_out_i	Taxes on output by commodity
Pm_i	Prices of imports from the rest of the world
M_i	Quantity of imports from the rest of the world
$\sigma_{Q_{dom}}$	Elasticity of substitution between domestic and imported goods
$\rho_{Q_{dom}}$	Exponent of the CES production function linked to $\sigma_{Q_{dom}}$
$P_{int,i}$	Prices of internal goods
Pit_i	Prices of imports from the rest of Italy
IT_i	Quantity of imports from the rest of the Italy
δ_i^{int}	Share of internal production on total domestic production in the cost function
$\sigma_{Q_{int}}$	Elasticity of substitution between internal production and imports from Rest of Italy
$Q_{int,i}$	Quantities of internal goods
d_i^{int}	Share of internal production on total domestic production
$\rho_{Q_{int}}$	Exponent of the CES production function linked to $\sigma_{Q_{int}}$
Pbi_j	P rices of intermediate goods
BI_j	Quantities of intermediate goods
t_act_j	Taxes on activities
Pva_j	Prices of value added
VA_j	Quantities of value added
δ_j^D	Share of intermediate goods in total internal production
σ_D	Elasticity of substitution between intermediate goods and value added
ρ_D	Exponent of the CES production function linked to σ_D
P_j	Average price on goods market from the market clearing condition
δ_{ij}	Share of the cost by intermediate goods on the total cost
σ_{BI}	Elasticity of substitution between intermediate goods
PL	Price of labour

PK	Price of capital
δ_j^v	Share of labour in the total of primary factors
σ_v	Elasticity of substitution between labour and capital
δ_j^L	Share of labour costs on added value
L_j^d	Labour endowment
K_j^d	Capital endowment
d_{ji}^q	Share of ith product realised by industry j in the total production of j
d_{ij}^q	Share of goods supply by each activity in the total domestic supply
q_{ij}	Quantity of goods i produced by industry j
σ_q	Elasticity of substitution between primary and secondary production
δ_i^{it}	Share of internal production on total domestic production
δ_i^M	Share of domestic production on total production
pmw_i	Price of foreign goods
exr	Nominal exchange rate
Y^{is}	Primary income by Institutional Sectors
ty_{t_inc}	Implicit rates of income tax
tr_{is_out}	Implicit rates of transfers paid to other Institutional Sectors
tr_{is_in}	Implicit rates of transfers collected from others Institutional Sector
$tq_i^{t\_out}$	Implicit tax rates on output
$tq_i^{t\_act}$	Implicit tax rates on activities
$\gamma_{t\_out}^{pub}$	Share of taxes on output
$\gamma_{t\_act}^{pub}$	Share of taxes on activity
$\gamma_{t\_out}^{rest\_w}$	Share of taxes on output collected from the Rest of the world
$\gamma_{t\_act}^{rest\_w}$	Share of taxes on activity collected from the Rest of the world
U_{is}	Utility of Institutional Sectors
C_{is}	Consumption of Institutional Sectors
S_{is}	Saving of Institutional Sectors
$Ydisp$	Disposable income
Y	Primary income
Pu_{is}	Utility price
χ_{is}^U	Share of consumption on disposable income
Pc_{is}	Index price of the of consumption by Institutional Sector
PI	Price of investment
σ_U	Elasticity of substitution between consumption and saving
C_{is}	Aggregate consumption of Institutional Sectors
$\delta_{is,i}^C$	Share of consumption of the ith good in total consumption for each Institutional Sector
σ_C	Elasticity of substitution among goods in the consumption basket
$C_{is,i}$	Quantity of consumption of each good by Institutional Sector
δ_i^I	Investment share of the ith goods in total investments
σ_I	Elasticity of substitution among goods in the investment basket
I_i	Quantity of investment by goods
$e_{row,i}$	Export demand by goods from Rest of the World
$\delta_{row,i}^E$	Export share of ith goods in total exports to the rest of the World

σ_E	Elasticity of substitution among goods in the export to the rest of the World basket
π	Foreign inflation rate

Structural form of the regional CGE model for Sicily.

$$Q_i = \left(d_i^{dom} Q_{dom,i}^{\rho_{Q_{dom}}} + \left(1 - d_i^{dom}\right) M_i^{\rho_{Q_{dom}}}\right)^{\frac{1}{\rho_{Q_{dom}}}}$$

$$P_i(1 - t\_out_i) = \left(\delta_i^{dom} P_{dom,i}^{(1-\sigma_{Q_{dom}})} + (1 - \delta_i^{dom}) Pm_i^{(1-\sigma_{Q_{dom}})}\right)^{\frac{1}{1-\sigma_{Q_{dom}}}}$$

$$Q_{dom,i} = \left(d_i^{int} Q_{int,i}^{\rho_{Q_{int}}} + \left(1 - d_i^{int}\right) IT_i^{\rho_{Q_{int}}}\right)^{\frac{1}{\rho_{Q_{int}}}}$$

$$P_{dom,i} = \left(\delta_i^{int} P_{int,i}^{(1-\sigma_{Q_{int}})} + (1 - \delta_i^{int}) Pit_i^{(1-\sigma_{Q_{int}})}\right)^{\frac{1}{1-\sigma_{Q_{int}}}}$$

$$Q_{int,j} = \left(d_j^D BI_j^{\rho_D} + \left(1 - d_j^{\rho_D}\right) VA_j^{\rho_D}\right)^{\frac{1}{\rho_D}}$$

$$P_{int,j}\left(1 - t\_act_j\right) = \left(\delta_j^D Pbi_j^{(1-\sigma_D)} + (1 - \delta_j^D) Pva_j^{(1-\sigma_D)}\right)^{\frac{1}{1-\sigma_D}}$$

$$BI_j = \delta_j^D Q_{int,j} \left(\frac{P_{int,j}}{Pbi_j}\right)^{\sigma_D}$$

$$VA_j = \left(1 - \delta_j^D\right) Q_{int,j} \left(\frac{P_{int,j}}{Pva_j}\right)^{\sigma_D}$$

$$Pbi_j = \sum_i \left(\delta_{i,j} P_j^{(1-\sigma_{BI})}\right)^{\frac{1}{1-\sigma_{BI}}}$$

$$bi_{ij} = \delta_{ij}^{BI} Q_{int,j} \left(\frac{Pbi_j}{P_i}\right)^{\sigma_{BI}}$$

$$Pva_j = \left(\delta_j^v \cdot PL^{1-\sigma_v} + \left(1-\delta_j^v\right) \cdot PK^{1-\sigma_v}\right)^{\frac{1}{1-\sigma_v}}$$

$$L_j^d = \delta_j^L VA_j \left(\frac{Pva_j}{PL}\right)^{\sigma_v}$$

$$K_j^d = \left(1-\delta_j^L\right) VA_j \left(\frac{Pva_j}{PK}\right)^{\sigma_v}$$

$$Q_j = \left(\sum_i d_{ji}^q q_{ij}\right)^{\frac{1}{1-\sigma_q}}$$

$$Pq_{dom,i} = \left(\sum_j d_{ij}^q P_{dom,j}{}^{(1-\sigma_q)}\right)^{\frac{1}{1-\sigma_q}}$$

$$IT_i = \left(1-\delta_i^{it}\right) Q_i$$

$$Pit_i = P_{dom,i}$$

$$M_i = (1-\delta_i^M) Q_i \left(\frac{P_i}{Pm_i}\right)^{\sigma_{Qdom}}$$

$$Pm_i = pmw_i(1+\pi)/exr$$

$$Y^{is} = L^{is} PL + K^{is} PK$$

$$Ydisp^{hh} = Y^{hh} + \sum_{is\_in} Y^{hh} tr_{is\_in}^{hh} + Tr_{pub} + Tr_{row} - \sum_{t\_inc} Y^{hh} ty_{t\_inc}^{hh} - \sum_{is\_out} Y^{hh} tr_{is\_out}^{hh}$$

$$Ydisp^{corp} = Y^{corp} + \sum_{is\_in} Y^{corp} tr_{is\_in}^{corp} + Tr_{pub} + Tr_{row} - \sum_{t\_inc} Y^{corp} ty_{t\_inc}^{corp} - \sum_{is\_out} Y^{corp} tr_{is\_out}^{corp}$$

$$Ydisp^{rest\_it} = Y^{rest\_it} + \sum_i IT_i + \sum_{is\_in} Y^{rest\_it} tr_{is\_in}^{rest\_it} + \gamma_{t\_act}^{rest\_it} \sum_j tq_j^{t\_act} P_j X_j + \gamma_{t\_out}^{rest\_it} \sum_i tq_i^{t\_out} P_i Q_i + Tr_{pub} + Tr_{row} - \sum_{is\_out} Y^{rest\_it} tr_{is\_out}^{rest\_it}$$

$$Ydisp^{pub} = Y^{pub} + \gamma_{t\_out}^{pub} \sum_i tq_i^{t\_out} P_i Q_i + \gamma_{t\_act}^{pub} \sum_j tq_j^{t\_act} P_j X_j + \sum_{priv} ty_{t\_inc}^{priv} Y_{priv} + \sum_{is\_in} Y^{end} tr_{is\_in}^{end} + Tr_{row}^{in} - Tr_{row}^{out}$$

$$Ydisp^{rest\_w} = Y^{rest\_w} + \sum_i M_i + \gamma_{t\_out}^{rest\_w} \sum_i tq_i^{t\_out} P_i Q_i + \gamma_{t\_act}^{rest\_w} \sum_j tq_j^{t\_act} P_j X_j + \sum_{is\_in} Y^{end} tr_{is\_in}^{end} + Tr_{pub} - \sum_{t\_inc} Y^{rest\_w} ty_{t\_inc}^{rest\_w} - Tr_{row}^{out}$$

$$U_{is} = \left(C_{is}^{\frac{\sigma_U - 1}{\sigma_U}} + S_{is}^{\frac{\sigma_U - 1}{\sigma_U}} \right)^{\frac{\sigma_U}{\sigma_U - 1}}$$

$$Pu_{is} = \left(\chi_{is}^U Pc_{is}^{1-\sigma_U} + \left(1 - \chi_{is}^U\right) PI^{1-\sigma_U} \right)^{\frac{1}{1-\sigma_U}}$$

$$C_{is} = \chi_{is}^U U_{is} \left(\frac{Pu_{is}}{Pc_{is}} \right)^{\sigma_U}$$

$$S_{is} = \left(1 - \chi_{is}^U\right) U_{is} \left(\frac{Pu_{is}}{Pc_{is}} \right)^{\sigma_U}$$

$$Pc_{is} = \left(\sum_i \delta_{is,i}^C P_i^{1-\sigma_C} \right)^{\frac{1}{1-\sigma_C}}$$

$$C_{is,i} = \delta_{is,i}^C U_{is} \left(\frac{Pc_{is}}{P_i} \right)^{\sigma_C}$$

$$U_{pub} = G_{pub} + S_{pub} + def_{pub}$$

$$PI = \left(\sum_i \delta_i^I P_i^{1-\sigma_I} \right)^{\frac{1}{1-\sigma_I}}$$

$$I_i = \delta_i^I I \left(\frac{PI}{P_i} \right)^{\sigma_I}$$

$$e_{row,i} = \delta_{row,i}^E Y_{row} \left(\frac{pwm_i \cdot exr}{P_i} \right)^{\sigma_E}$$

$$Q_i = \sum_j bi_{i,j} + \sum_{hh} C_i^{hh} + \sum_{pub} G_i^{pub} + I_i + E_i^{rest\_it} + E_i^{rest\_w}$$

$$\sum_i M_i + \sum_{is\_in} Y^{end} tr_{is\_in}^{end} + Tr_{pub} + Y^{rest\_w} = \sum_i e_i + Tr_{row}^{out} + S_{row}$$

$$\sum_i I_i = \sum_{is} S_{is}$$

$$L_d = L_s$$

$$K_d = K_s$$

Chapter 3. Regional economic analysis: the impact of the National Plan for Resilience and Recovery for the Sicily region.

3.1 Introduction.

This chapter will analyse the impact of the intervention proposals on the regional economy contained in the proposals put forward by the Region of Sicily for the use of NPRR funds. The logic of construction of the simulated fiscal policies will be briefly described through a description of the connection made between project sheets and multi-sectoral methodology.

The cross-sectoral evaluation of Sicily's regional economic perspective describes a complex production structure; this survey measures the links between the various sectors of production and consumption and makes it possible to identify the diversified impacts at regional level following the interventions of the regional economic policy proposal in the analysis of a development perspective of the Sicily region, whose economy is strongly characterised by the presence of some key economic sectors which condition its growth.

The first step of this work was to link the project proposals of the National Recovery and Resilience Plan for Sicily region to the SAM of Sicily. A careful analysis of the project proposals was carried out which led to the elaboration of the regional proposal of the recovery and resilience plan. Therefore, all the types of proposals received were then examined and the different financial interventions were then identified, selecting the proposals according to criteria to enable the achievement of the fundamental missions. In compliance with the guidelines of the National Recovery and Resilience Plan and in consideration of the different types of project interventions, particular attention was paid to the projects relating to the creation of public goods (infrastructures, education and training, research and innovation, health, environment, social and territorial cohesion); projects that contribute to the achievement of essential performance levels; projects involving low land consumption and favouring the efficient and sustainable use of natural resources; projects with rapid positive effects on many beneficiaries and projects which for implementation and financing envisage forms of public-private partnership, or projects which envisage private capital for their implementation. These proposals, each of which includes measures for the implementation of reforms and public investment projects, structured in a coherent package, specify various positive evaluation criteria (such as, for example, the monitorability of the project in terms of specification of the expected outputs, of the intermediate and final goals, as well as the link between these achievements

and the strategic objectives of the National Recovery and Resilience Plan) and negative (e.g. infrastructures that do not have a sufficient level of project preparation, given the average implementation times and the size of the project) which determined their respective approval. In this context, the proposals were reclassified considering the products and sectors concerned following the intervention of the programme, the overall estimated economic resources and the expected duration for the implementation of the interventions.

Our work, in a first phase, was therefore determined by studying and analysing each of the regional sheets, identifying the total value expressed in millions of euros and the respective implementation times. Following this analysis, the products and economic activities mainly affected by each programme intervention were hypothesised, in order to reconcile the amounts of each project in terms of SAM, considering both the demand and supply sides. On the basis of the different fiscal policies adopted by the region (increase in public expenditure, increase in investment expenditure, transfers to enterprises, subsidies commodities) the estimated financial value of each project was reclassified in terms of SAM: a major share of the total economic resource of the intervention was then reallocated and linked to the economic sector and the main product identified, and a smaller share was allocated to secondary economic products and activities.

A complex examination of all the interventions examined was carried out which required a complex reworking of all the project sheets. And it is therefore understandable that the greatest difficulty was found in organising the information deriving from the estimated project economic resources to re-process them in an accounting scheme of data in matrix terms. By way of example, considering a project proposal from the Regional Department of Infrastructures, Mobility and Transport "Completion of infrastructural axes between Gela, Agrigento and Castelvetrano", for a total amount of 6.200 million euros, it was attributed, based on the time period of reference, the higher financial value, on the demand side, of product p27 "Construction works and civil building works" and product p31 "Land transport services and transport via pipelines"; while the most affected economic sector, of course, is the b21 "Construction" sector.

The objective of this work is to verify and evaluate whether the implementation of financial interventions, resulting from the regional proposals of the recovery and resilience plan, have the "expected" key role for the development of the Sicilian regional economy, estimating the direct effects , indirect and induced deriving from any variation in the final demand referring to each type of good produced, from variations deriving from taxes on products and production activities and from those deriving from transfers made to firms.

On the basis of national accounting principles, a coherent database (SAM) has been built and organised, which detects the production and income structure, necessary so that all the information and data required for the construction of the CGE model can be provided, making it possible to describe the behaviour of the operators of the economic system taken into consideration (households, businesses, public administration and the rest of the world), highlighting and quantifying the economic interdependence relationships between the productive and institutional sectors, in the various phases of production, distribution and use of the income, showing the entire circular flow of income for the time period analysed. To have this type of accounting scheme means to represent the region's economic and social situation in an articulate manner.

In this way, CGE model makes it possible to describe the existing relationships between the economic operators present in the regional territory, on the basis of the economic flows described by the national accounts, defining the choices of the functional forms and the calibration parameters, through the modelling of the production, consumption and accumulation functions, of the agents and institutional sectors present in the considered economic system. In the model, each operator is represented on the basis of its own function of behaviour based on the hypothesis of maximising profits for productive activities and maximising the utility function for institutional sectors, respecting for each operator the constraint of the given production capacity and exogenously determined resources. The equilibrium of all markets is ensured by determining the set of equilibrium prices which guarantees the equilibrium between total supply and total demand (Felici, et al., 2020). The direct and indirect effects of the manoeuvre are analysed in terms of the circular flow of income and evaluated by examining the main macroeconomic variables; they are broken down by product, by economic activity and by institutional sector.

3.2. The NPRR scenarios for the Sicily region: policy design.

The attempt to analyse the impact of the NPRR on the economy of the Sicilian region was made through a set of partial analyses (Regione Sicilia et University of Catania, Department of Political and Social Sciences (DSPS), 2021). This type of approach has the disadvantage that it fails to take into account the composite nature of the effects of the fiscal measures put in place. For this reason, a study of this type can achieve a higher quality of results if conducted using a general equilibrium methodology such as CGE models (Ghait, et al., 2021). The strong degree of integration between production and use of the financial resources of the proposal therefore makes it possible to identify

the key sectors of production of goods and services most affected by the interventions of the manoeuvre. However, these interventions generate an increase in regional production, and make it possible to pinpoint the highly positive effects and, in general, the direct, indirect and induced effects that follow, also determining an increase in the final demand inside and outside the region.

In this thesis, a standardised general economic equilibrium model was applied in order to carry out a series of simulation exercises on the economy of the Sicilian region (Deriu et al, 2021).

The regional CGE model relating to the Sicilian economic system was used to simulate the impact of the economic policies of territorial intervention (Partridge & Rickman, 1998) considering the planning proposals of the Sicilian region and the SAM of Sicily. The economic data adapted with the regional CGE model made it possible to capture the structure of the Sicilian economy and the behavioural response of agents (firms, households, government), providing the framework for simulating the changes due to the various economic policy interventions and determining their impact on the key economic variables for Sicily. The project proposals relating to the various administrative competences were considered in detail; in addition, the types of intervention such as reform or investment, the priorities indicated in the project, the objectives to be achieved, the estimated overall costs and the expected duration for carrying out each project have been specified. In general, the amount of economic resources assigned to each project proposal has been assigned to the main macro variable components (e.g., investments) and was also broken down assigning lower quotas considering secondary components. In particular, on the basis of the analysis of the project proposals of the regional plan and the respective financial resources, and the calibration and simulation of the computational model carried out on the actual data of the regional economy, the new scenarios following the regional policy interventions were identified.

Figure 15 shows the Sicilian policy design considering the estimated value of the amount of the proposals equal to 26,410 million euro and the total percentage of change on the initial level. The figure indicates that the highest percentage of interventions affects investments for a value equal to 23,608 million euro (89.38%) and the most important areas of intervention, such as motorway axes and the railway network; maintenance and strengthening of aqueducts; installation of renewable system, 5G. Government consumption indicates a percentage of 3.54% equal to 931 million euros; the most important areas of intervention concern digital innovation mainly pertaining to public services. Product subsidies indicate a percentage of 1.94% equal to 512 million euros; the most important areas of intervention concern incentives for sustainable agriculture, reforestation interventions, interventions for the production of renewable sources. Transfers to firms indicate a percentage of 5.14% equal to 1,359 million euros; the most important areas of intervention concern

support to enterprises and interventions aimed at promoting the design, implementation and development of social innovation projects. The duration for the implementation envisaged for each intervention is subject to the realisation of the proposed interventions and, specifically, reference will be made to the 2021–2026-time scenario; for some types of intervention, reference was made to a five-year period given the times for the implementation and conclusion of the projects.

Figure 15. Regional Recovery and Resilience Plan resources in Sicily

3.54% GOVERNMENT CONSUMPTION, 2021 -2025 (931 millions of euros)	Digital innovation mainly pertaining public services
89.38% INVESTMENTS, 2021 -2026 (23,608 millions of euros)	Motorway axes and the railway network, Maintenance and strengthening of aqueducts, Installation of renewable energy system, 5G
1.94% PRODUCT SUBSIDIES, 2021 -2026 (512 millions of euros)	Incentives for sustainable agriculture, Reforestation interventions, Interventions for the production of renewable sources
5.14% TRANSFERS TO FIRMS, 2021 -2025 (1,359 millions of euros)	Support to enterprises and interventions aimed at promoting the design, implementation and development of social innovation projects

Source: Own elaboration.

Therefore, having acquired the information and in relation to the objectives set, four exercises are developed. The simulations for each scenario are presented in terms of percentage changes compared to the benchmark consisting of the economy described in the SAM for Sicily.

The first scenario analyses the effect of an increase in public spending by the regional government. The results obtained from interventions on public administration expenditure identifies six main products that have undergone a greater increase among the 54 products making up the SAM for Sicily. The simulations of the interventions obtained following the reallocation in terms of SAM show interesting variations with respect to the initial real data. The disaggregated effects of the first scenario are reported in percentage change in Table 12 relating the best performance associated to the commodities. In particular, there is an important contribution to the GDP performance relating to "P50. Educational services" (+0.49), "P27. Construction and civil engineering works (+33%), "P49 Public administration and defence services; mandatory social security benefits" (+0.31), "P40. Computer programming, consultancy and related services; information services (+0.04), "P39.

Telecommunication services (+0.02) and “P45. Legal activities, accounting, management consultancy, architectural firms" (+0.01).

Table 12. Policy simulation: Government consumption.

Commodities	2021	2022	2023	2024	2025	Tot
Education services	0.04	0.16	0.16	0.12	0.00	**0.49**
Construction and civil engineering works	0.02	0.08	0.08	0.08	0.06	**0.33**
Public administration and defence services; compulsory social security services	0.03	0.10	0.10	0.08	0.00	**0.31**
Computer programming, consultancy and related services; information services	0.00	0.01	0.01	0.01	0.01	**0.04**
Telecommunication services	0.00	0.00	0.00	0.00	0.00	**0.02**
Legal activities, accounting, management consulting, architectural firms	0.00	0.00	0.00	0.00	0.00	**0.01**

Source: Own elaboration.

The second scenario analyses the effect of an increase in increase in final demand for investments. Relating to the results obtained by policy simulation on investments, the shock is distributed among the various commodities in consideration of the information contained in the supply and use tables regarding the structure of the investments, identifying the four best performing products that have undergone a greater increase among the 54 products that make up the SAM for Sicily. The policy simulations obtained show an interesting favourably percentage change with respect to the estimated values on the regional GDP. The investments, in the reworking of the regional plan proposals, in fact, have a considerable dimension as they represent 89.38% of the total economic resources of the regional plan; the estimate of public expenditure for investments is mostly destined for construction and civil engineering works (equal to 29.46%) and, in particular, for the railway and motorway networks. The disaggregated effects of this shock are reported in Table 13. The best performing commodity in percentage change which mainly contributes to the performance of GDP is "P27. Construction and civil engineering works" (+29.47).

Table 13. Policy simulation: Investments.

Commodities	2021	2022	2023	2024	2025	2026	Tot
Computer, electronic and optical products	0.02	0.06	0.06	0.06	0.06	0.05	**0.31**
Construction and civil engineering works	1.47	5.89	5.89	5.89	5.89	4.42	**29.47**
Computer programming, consultancy and related services; information services	0.02	0.06	0.06	0.05	0.00	0.00	**0.19**
Public administration and defence services; compulsory social security services	0.05	0.15	0.00	0.00	0.00	0.00	**0.20**

Source: Own elaboration.

The third scenario implies the adoption of appropriate incentive policies to improve and increase regional economic growth and production. The analysis is aimed at evaluating the impact that these types of policies generate within the economic and social structure of the region through the introduction of production subsidies (Moosavian, et al., 2022). The best performing main products were also identified for this simulation. The impact in disaggregated terms is shown in Table 14. The table shows positive percentage changes compared to the initial real figure even if the changes for each product in the table are lower than (+5.0). The best performance is recorded by "P17. Computers, electronic and optical products" (+0.44).

Table 14. Policy simulation: Subsidies.

Commodities	2021	2022	2023	2024	2025	2026	Tot
Agricultural and hunting products and related services	0.01	0.02	0.00	0.00	0.00	0.00	**0.03**
Products of forestry, logging and related services	0.01	0.03	0.02	0.00	0.00	0.00	**0.06**
Computer, electronic and optical products	0.03	0.11	0.11	0.11	0.08	0.00	**0.44**
Electricity, gas, steam and air conditioning	0.01	0.02	0.02	0.02	0.02	0.02	**0.12**

Source: Own elaboration.

The fourth and last scenario implies transfers to firms. The transfers to businesses are a useful measure to support firms with slow development in the various areas of the regional territory, trying to reduce economic inequalities compared to other Italian regions. In particular, the regional government, with the recovery and resilience manoeuvre, intends to support the economic activities of firms, reduce business costs and stimulate job creation. The assessment of the impact of this intervention presents, also for this fourth scenario, positive percentages relating commodities. Table 15 shows the percentages.

Table 15. Policy simulation: Transfers to firms.

Transfers	2021	2022	2023	2024	2025	Tot
Transfers	0.109	0.434	0.434	0.434	0.326	**1.736**

Source: Own elaboration

3.3 Simulations and results.

In this section, the main results of the simulations are presented. It was decided to present the main results for the four categories of fiscal policies: Government consumption, Investments, Subsidies on commodities and Transfer to firms. The results are shown by the type of variable that experienced the shock: value added, total production, disposable income and macroeconomic variables.

3.3.1 Value added.

In this paragraph, we consider an increase in final demand in government consumption and investments, and also, the subsidies on commodities and the transfer to firms, presenting the results considering the value-added variable that suffered the shock.

In relation to government consumption, the disaggregated effects of this scenario are summarised in Table 16. Table 16 shows an important contribution to the GDP performance related to "34. Education", "33. Public administration and defence; compulsory social insurance" and "29. Real estate activities".

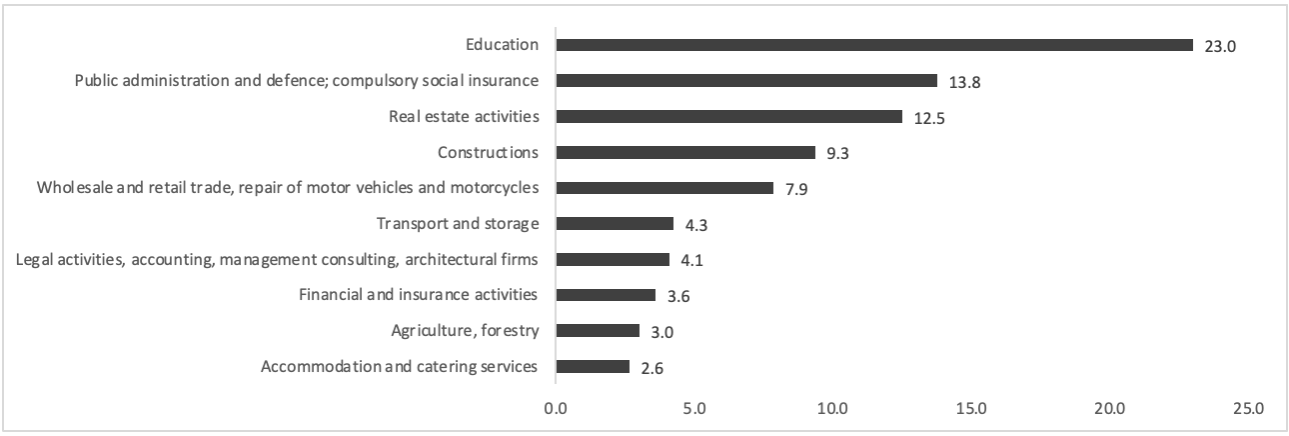
Table 16. Government consumption - Disaggregated impact on value added.

Activities	2021	2022	2023	2024	2025	TOT
Agriculture, forestry	2.9	2.9	2.9	3.0	4.2	3.0
Fishing	0.2	0.2	0.2	0.2	0.3	0.2
Mining and quarrying	0.2	0.2	0.2	0.2	0.3	0.2
Food, beverage and tobacco industries	1.0	1.0	1.0	1.0	1.3	1.0
Textile, clothing, leather and accessories industries	0.1	0.1	0.1	0.1	0.2	0.1
Wood industry	0.2	0.2	0.2	0.2	0.4	0.2
Paper Printing and registration	0.1	0.1	0.1	0.1	0.1	0.1
Manufacture of coke and refined petroleum products	-0.2	-0.2	-0.2	-0.2	-0.3	-0.2
Manufacture of chemical substances and products	0.1	0.1	0.1	0.1	0.2	0.1
Production of pharmaceutical, chemical-medical and botanical articles	0.0	0.0	0.0	0.0	0.0	0.0
Manufacture of rubber and plastic products	0.1	0.1	0.1	0.1	0.2	0.1
Other non-metallic mineral processing products	0.4	0.4	0.4	0.5	0.9	0.5
Manufacture of basic metals and processing of metal products	0.4	0.4	0.4	0.5	0.8	0.5
Manufacture of computers, electronic and optical equipment	0.3	0.3	0.3	0.3	0.4	0.3
Manufacture of electrical appliances	0.1	0.1	0.1	0.1	0.1	0.1
Manufacture of machinery and equipment n.e.c.	0.2	0.2	0.2	0.2	0.3	0.2
Manufacture of transport equipment	0.1	0.1	0.1	0.1	0.2	0.1
Other manufacturing, repair and installation of machines	0.5	0.5	0.5	0.5	0.9	0.5
Electricity, gas, steam and air conditioning supply	1.2	1.2	1.2	1.2	1.4	1.2
Water supply; sewerage networks, waste treatment activities	1.0	1.0	1.0	1.1	1.4	1.1
Constructions	8.0	8.0	8.0	9.3	27.4	9.3
Wholesale and retail trade, repair of motor vehicles and motorcycles	7.7	7.7	7.7	7.9	9.4	7.9
Transport and storage	4.1	4.1	4.1	4.3	5.9	4.3
Accommodation and catering services	2.6	2.6	2.6	2.6	3.1	2.6
Publishing, audiovisual, radio and television activities	0.2	0.2	0.2	0.2	0.2	0.2
Telecommunications	1.3	1.3	1.3	1.4	2.6	1.4
IT and other information services	1.1	1.1	1.1	1.2	2.6	1.2
Financial and insurance activities	3.5	3.5	3.5	3.6	4.8	3.6
Real estate activities	12.3	12.3	12.3	12.5	14.4	12.5
Legal activities, accounting, management consulting, architectural firms	4.0	4.0	4.0	4.1	5.1	4.1
Scientific research and development	0.4	0.4	0.4	0.5	0.6	0.5
Other service activities	1.9	1.9	1.9	1.9	2.8	1.9
Public administration and defence; compulsory social insurance	14.6	14.6	14.6	13.8	2.1	13.8
Education	24.7	24.7	24.7	23.0	0.8	23.0
Health and social assistance	1.4	1.4	1.4	1.4	1.3	1.4
Art, entertainment and fun activities	0.8	0.8	0.8	0.8	1.0	0.8
Other service activities	2.4	2.4	2.4	2.4	2.6	2.4
TOT	100	100	100	100	100	100

Source: Own elaboration.

Furthermore, Figure 16 displays the ten activities most affected by government consumption.

Figure 16. Government consumption - Disaggregated impact on value added (best ten performances).



Source: Own elaboration.

In relation to investments, the disaggregated effects of this scenario are summarised in Table 17. Table 17 shows an important contribution to the GDP performance related to "21. Constructions", "29. Real estate activities" and "22. Wholesale and retail trade, repair of motor vehicles and motorcycles".

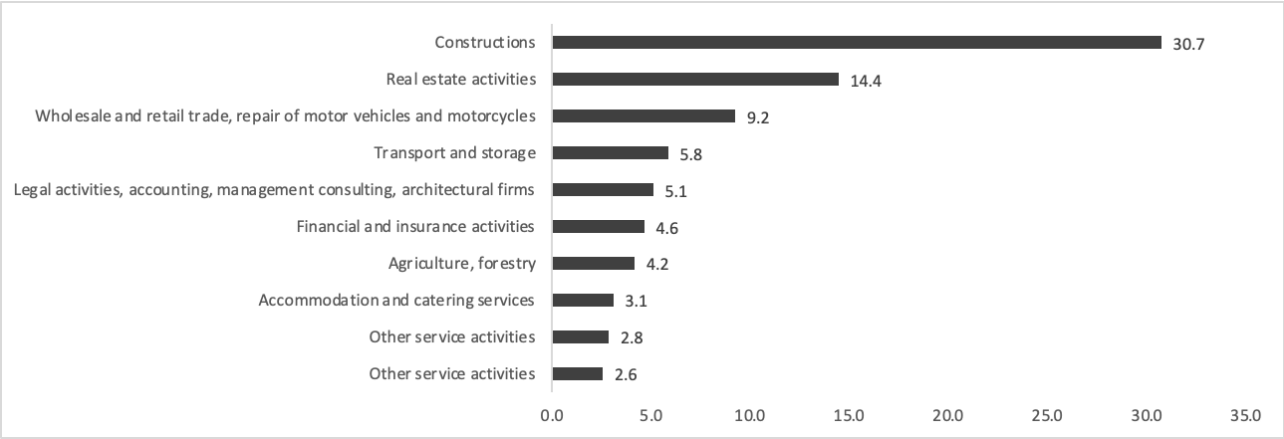
Table 17. Investment - Disaggregated impact on value added.

Activities	2021	2022	2023	2024	2025	2026	TOT
Agriculture, forestry	4.1	4.1	4.2	4.2	4.2	4.2	4.2
Fishing	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Mining and quarrying	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Food, beverage and tobacco industries	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Textile, clothing, leather and accessories industries	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Wood industry	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Paper Printing and registration	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Manufacture of coke and refined petroleum products	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Manufacture of chemical substances and products	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Production of pharmaceutical, chemical-medical and botanical articles	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Manufacture of rubber and plastic products	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Other non-metallic mineral processing products	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Manufacture of basic metals and processing of metal products	0.8	0.8	0.9	0.9	0.9	0.9	0.8
Manufacture of computers, electronic and optical equipment	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Manufacture of electrical appliances	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Manufacture of machinery and equipment n.e.c.	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Manufacture of transport equipment	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Other manufacturing, repair and installation of machines	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Electricity, gas, steam and air conditioning supply	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Water supply; sewerage networks, waste treatment activities	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Constructions	29.8	30.0	30.8	30.9	31.1	31.1	30.7
Wholesale and retail trade, repair of motor vehicles and motorcycles	9.2	9.2	9.3	9.3	9.3	9.3	9.2
Transport and storage	5.8	5.8	5.9	5.9	5.9	5.9	5.8
Accommodation and catering services	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Publishing, audiovisual, radio and television activities	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Telecommunications	1.3	1.3	1.3	1.3	1.3	1.3	1.3
IT and other information services	0.9	0.9	0.9	0.8	0.7	0.7	0.8
Financial and insurance activities	4.6	4.6	4.7	4.7	4.6	4.6	4.6
Real estate activities	14.4	14.4	14.4	14.4	14.4	14.4	14.4
Legal activities, accounting, management consulting, architectural firms	5.0	5.1	5.1	5.1	5.1	5.1	5.1
Scientific research and development	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Other service activities	2.8	2.8	2.9	2.9	2.9	2.9	2.8
Public administration and defence; compulsory social insurance	3.8	3.4	2.1	2.1	2.1	2.1	2.4
Education	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Health and social assistance	1.3	1.3	1.3	1.2	1.2	1.2	1.2
Art, entertainment and fun activities	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Other service activities	2.5	2.5	2.6	2.6	2.6	2.6	2.6
TOT	100	100	100	100	100	100	100

Source: Own elaboration.

Figure 17 displays the ten activities most affected by investments.

Figure 17. Investments - Disaggregated impact on value added (best ten performances).



Source: Own elaboration.

Considering the subsidies on commodities, the disaggregated effects of this scenario are summarised in Table 18. Table 18 shows an important contribution to the GDP performance related to "14. Manufacture of computers, electronic and optical equipment", "19. Electricity, gas, steam and air conditioning supply" and "1. Agriculture, forestry".

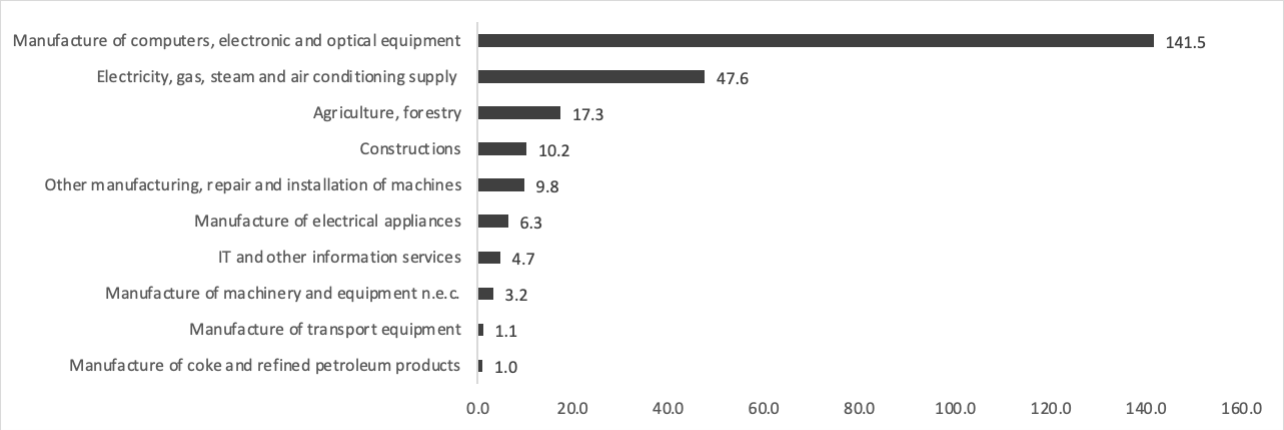
Table 18. Subsidies - Disaggregated impact on value added.

Activities	2021	2022	2023	2024	2025	2026	TOT
Agriculture, forestry	78.8	66.0	16.9	-8.8	-9.9	15.8	17.3
Fishing	-1.7	-1.6	-1.0	-0.7	-0.7	1.0	-1.1
Mining and quarrying	-1.5	-1.4	-0.9	-0.6	-0.6	1.0	-0.9
Food, beverage and tobacco industries	-5.4	-5.1	-3.4	-2.5	-2.8	4.1	-3.7
Textile, clothing, leather and accessories industries	-0.8	-0.7	-0.4	-0.3	-0.3	0.5	-0.5
Wood industry	-1.2	-1.1	-0.6	-0.4	-0.5	0.8	-0.7
Paper Printing and registration	-0.5	-0.5	-0.3	-0.2	-0.2	0.3	-0.3
Manufacture of coke and refined petroleum products	1.6	1.5	0.9	0.7	0.7	-1.3	1.0
Manufacture of chemical substances and products	-1.2	-1.1	-0.7	-0.4	-0.5	0.4	-0.7
Production of pharmaceutical, chemical-medical and botanical articles	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Manufacture of rubber and plastic products	-0.6	-0.6	-0.3	-0.2	-0.2	0.4	-0.3
Other non-metallic mineral processing products	-2.6	-2.4	-1.4	-0.9	-1.0	1.6	-1.5
Manufacture of basic metals and processing of metal products	-1.8	-1.6	-0.7	-0.3	-0.4	1.7	-0.8
Manufacture of computers, electronic and optical equipment	179.0	171.0	140.4	124.4	124.7	119.4	141.5
Manufacture of electrical appliances	7.6	7.4	6.1	5.5	5.6	0.8	6.3
Manufacture of machinery and equipment n.e.c.	3.6	3.6	3.2	2.9	3.0	0.8	3.2
Manufacture of transport equipment	1.2	1.2	1.1	1.0	1.0	0.5	1.1
Other manufacturing, repair and installation of machines	10.9	10.9	9.5	8.8	8.9	2.3	9.8
Electricity, gas, steam and air conditioning supply	42.7	42.4	36.1	32.8	45.5	-250.0	47.6
Water supply; sewerage networks, waste treatment activities	-5.3	-4.8	-2.7	-1.7	-1.8	0.6	-2.9
Constructions	11.1	10.9	10.3	10.0	9.8	13.6	10.2
Wholesale and retail trade, repair of motor vehicles and motorcycles	-30.9	-27.5	-14.1	-6.9	-8.9	34.5	-16.1
Transport and storage	-28.6	-26.2	-16.0	-10.7	-12.1	20.5	-17.6
Accommodation and catering services	-14.0	-12.9	-8.1	-5.5	-6.3	10.7	-8.8
Publishing, audiovisual, radio and television activities	-0.7	-0.7	-0.4	-0.2	-0.3	0.7	-0.4
Telecommunications	-1.2	-0.8	0.5	1.1	0.9	5.2	0.3
IT and other information services	5.2	5.2	4.6	4.4	4.4	2.4	4.7
Financial and insurance activities	-16.8	-15.3	-9.3	-6.2	-7.0	13.5	-10.3
Real estate activities	-69.3	-63.6	-39.1	-26.3	-29.7	51.7	-42.9
Legal activities, accounting, management consulting, architectural firms	-16.6	-15.2	-9.1	-6.0	-6.8	12.3	-10.0
Scientific research and development	-0.5	-0.4	0.0	0.2	0.2	2.0	-0.1
Other service activities	-7.9	-7.2	-4.2	-2.6	-3.0	7.1	-4.6
Public administration and defence; compulsory social insurance	-10.5	-9.5	-5.7	-3.6	-4.0	5.0	-6.1
Education	-3.1	-2.8	-1.5	-0.8	-1.0	2.9	-1.7
Health and social assistance	-4.8	-4.4	-2.4	-1.4	-1.6	4.5	-2.7
Art, entertainment and fun activities	-3.7	-3.4	-2.0	-1.2	-1.4	3.5	-2.2
Other service activities	-10.6	-9.6	-5.5	-3.3	-3.9	8.9	-6.1
TOT	100	100	100	100	100	100	100

Source: Own elaboration.

Furthermore, Figure 18 displays the ten activities most affected by subsidies on commodities.

Figure 18. Subsidies on commodities - Disaggregated impact on value added (best ten performances).



Source: Own elaboration.

Finally, in relation to the transfer to firms, the disaggregated effects of this scenario are summarised in Table 19. Table 19 shows an important contribution to the GDP performance related to "21. Constructions", "29. Real estate activities" and "22. Wholesale and retail trade, repair of motor vehicles and motorcycles".

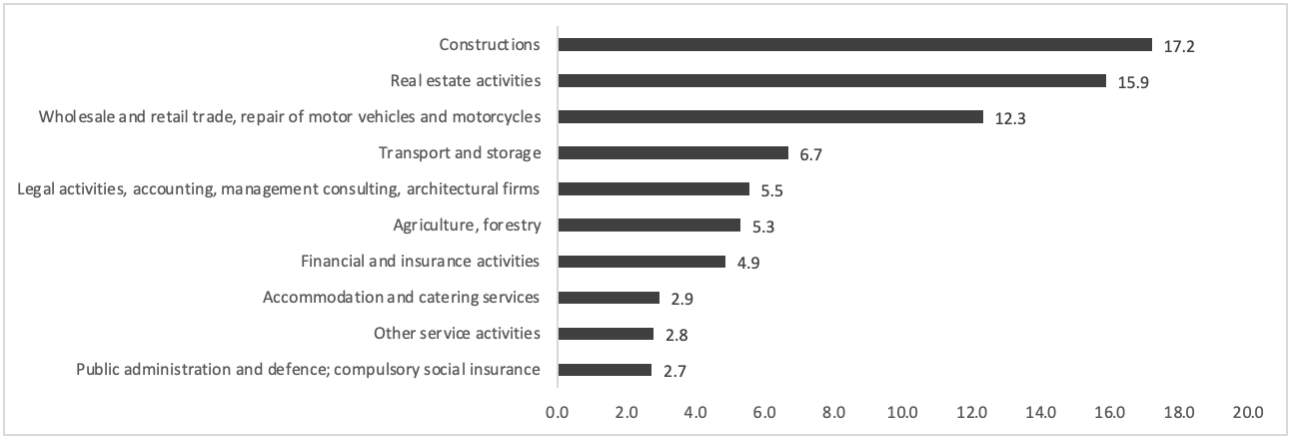
Table 19. Transfers to firms - Disaggregated impact on value added.

Activities	2021	2022	2023	2024	2025	TOT
Agriculture, forestry	5.3	5.3	5.3	5.3	5.3	5.3
Fishing	0.4	0.4	0.4	0.4	0.4	0.4
Mining and quarrying	0.3	0.3	0.3	0.3	0.3	0.3
Food, beverage and tobacco industries	1.5	1.5	1.5	1.5	1.5	1.5
Textile, clothing, leather and accessories industries	0.2	0.2	0.2	0.2	0.2	0.2
Wood industry	0.4	0.4	0.4	0.4	0.4	0.4
Paper Printing and registration	0.1	0.1	0.1	0.1	0.1	0.1
Manufacture of coke and refined petroleum products	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3
Manufacture of chemical substances and products	0.3	0.3	0.3	0.3	0.3	0.3
Production of pharmaceutical, chemical-medical and botanical articles	0.0	0.0	0.0	0.0	0.0	0.0
Manufacture of rubber and plastic products	0.2	0.2	0.2	0.2	0.2	0.2
Other non-metallic mineral processing products	0.9	0.9	0.9	0.9	0.9	0.9
Manufacture of basic metals and processing of metal products	1.0	1.0	1.0	1.0	1.0	1.0
Manufacture of computers, electronic and optical equipment	0.8	0.8	0.8	0.8	0.8	0.8
Manufacture of electrical appliances	0.2	0.2	0.2	0.2	0.2	0.2
Manufacture of machinery and equipment n.e.c.	0.6	0.6	0.6	0.6	0.6	0.6
Manufacture of transport equipment	0.2	0.2	0.2	0.2	0.2	0.2
Other manufacturing, repair and installation of machines	1.5	1.5	1.5	1.5	1.5	1.5
Electricity, gas, steam and air conditioning supply	1.6	1.6	1.6	1.6	1.6	1.6
Water supply; sewerage networks, waste treatment activities	1.4	1.4	1.4	1.4	1.4	1.4
Constructions	17.2	17.2	17.2	17.2	17.2	17.2
Wholesale and retail trade, repair of motor vehicles and motorcycles	12.3	12.3	12.3	12.3	12.3	12.3
Transport and storage	6.7	6.7	6.7	6.7	6.7	6.7
Accommodation and catering services	2.9	2.9	2.9	2.9	2.9	2.9
Publishing, audiovisual, radio and television activities	0.3	0.3	0.3	0.3	0.3	0.3
Telecommunications	1.4	1.4	1.4	1.4	1.4	1.4
IT and other information services	2.5	2.5	2.5	2.5	2.5	2.5
Financial and insurance activities	4.9	4.9	4.9	4.9	4.9	4.9
Real estate activities	15.9	15.9	15.9	15.9	15.9	15.9
Legal activities, accounting, management consulting, architectural firms	5.5	5.5	5.5	5.5	5.5	5.5
Scientific research and development	1.8	1.8	1.8	1.8	1.8	1.8
Other service activities	2.8	2.8	2.8	2.8	2.8	2.8
Public administration and defence; compulsory social insurance	2.7	2.7	2.7	2.7	2.7	2.7
Education	0.8	0.8	0.8	0.8	0.8	0.8
Health and social assistance	1.9	1.9	1.9	1.9	1.9	1.9
Art, entertainment and fun activities	1.1	1.1	1.1	1.1	1.1	1.1
Other service activities	2.6	2.6	2.6	2.6	2.6	2.6
TOT	100	100	100	100	100	100

Source: Own elaboration.

Furthermore, Figure 19 displays the ten activities most affected by transfer to firms.

Figure 19. Transfer to firms - Disaggregated impact on value added (best ten performances).



Source: Own elaboration.

3.3.2 Total production.

In this paragraph, we consider an increase in final demand in government consumption and investments, and also, the subsidies on commodities and the transfer to firms, presenting the results considering the total production variable that suffered the shock.

In relation to government consumption, the disaggregated effects of this scenario are summarised in Table 20. Table 20 shows an important contribution to the GDP performance related to “21. Constructions”, “34. Education” and “33. Public administration and defence; compulsory social insurance”.

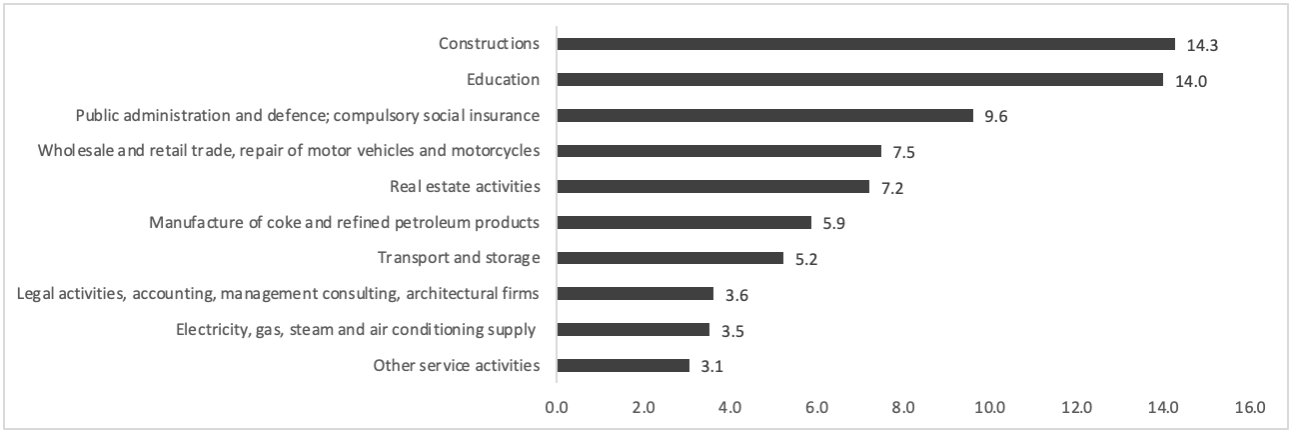
Table 20. Government consumption - Disaggregated impact on total production.

Activities	2021	2022	2023	2024	2025	TOT
Agriculture, forestry	2.5	2.5	2.5	2.5	2.8	2.5
Fishing	0.2	0.2	0.2	0.2	0.2	0.2
Mining and quarrying	0.3	0.3	0.3	0.3	0.4	0.3
Food, beverage and tobacco industries	2.6	2.6	2.6	2.6	2.6	2.6
Textile, clothing, leather and accessories industries	0.3	0.3	0.3	0.3	0.3	0.3
Wood industry	0.2	0.2	0.2	0.3	0.4	0.3
Paper Printing and registration	0.2	0.2	0.2	0.2	0.2	0.2
Manufacture of coke and refined petroleum products	5.7	5.7	5.7	5.9	7.0	5.9
Manufacture of chemical substances and products	0.9	0.9	0.9	0.9	1.1	0.9
Production of pharmaceutical, chemical-medical and botanical articles	0.0	0.0	0.0	0.0	0.0	0.0
Manufacture of rubber and plastic products	0.3	0.3	0.3	0.3	0.4	0.3
Other non-metallic mineral processing products	0.8	0.8	0.8	0.9	1.3	0.9
Manufacture of basic metals and processing of metal products	0.9	0.9	0.9	1.0	1.3	1.0
Manufacture of computers, electronic and optical equipment	0.4	0.4	0.4	0.4	0.5	0.4
Manufacture of electrical appliances	0.1	0.1	0.1	0.2	0.2	0.2
Manufacture of machinery and equipment n.e.c.	0.4	0.4	0.4	0.4	0.5	0.4
Manufacture of transport equipment	0.3	0.3	0.3	0.3	0.4	0.3
Other manufacturing, repair and installation of machines	0.6	0.6	0.6	0.6	0.7	0.6
Electricity, gas, steam and air conditioning supply	3.6	3.6	3.6	3.5	3.1	3.5
Water supply; sewerage networks, waste treatment activities	1.6	1.6	1.6	1.6	1.6	1.6
Constructions	12.4	12.4	12.4	14.3	32.8	14.3
Wholesale and retail trade, repair of motor vehicles and motorcycles	7.5	7.5	7.5	7.5	7.0	7.5
Transport and storage	5.2	5.2	5.2	5.2	5.7	5.2
Accommodation and catering services	2.6	2.6	2.6	2.5	2.3	2.5
Publishing, audiovisual, radio and television activities	0.2	0.2	0.2	0.2	0.3	0.2
Telecommunications	1.6	1.6	1.6	1.7	2.4	1.7
IT and other information services	1.1	1.1	1.1	1.2	2.2	1.2
Financial and insurance activities	3.0	3.0	3.0	3.0	3.2	3.0
Real estate activities	7.3	7.3	7.3	7.2	6.5	7.2
Legal activities, accounting, management consulting, architectural firms	3.6	3.6	3.6	3.6	3.6	3.6
Scientific research and development	0.5	0.5	0.5	0.5	0.5	0.5
Other service activities	3.0	3.0	3.0	3.1	3.5	3.1
Public administration and defence; compulsory social insurance	10.4	10.4	10.4	9.6	1.2	9.6
Education	15.4	15.4	15.4	14.0	0.4	14.0
Health and social assistance	1.2	1.2	1.2	1.1	0.8	1.1
Art, entertainment and fun activities	1.1	1.1	1.1	1.1	1.1	1.1
Other service activities	1.8	1.8	1.8	1.8	1.5	1.8
TOT	100	100	100	100	100	100

Source: Own elaboration.

Furthermore, Figure 20 displays the ten activities most affected by government consumption.

Figure 20. Government consumption -Disaggregated impact on total production (best ten performances).



Source: Own elaboration.

In relation to investments, the disaggregated effects of this scenario are summarised in Table 21. Table 21 shows an important contribution to the GDP performance related to "21. Constructions", "8. Manufacture of coke and refined petroleum products" and "22. Wholesale and retail trade, repair of motor vehicles and motorcycles".

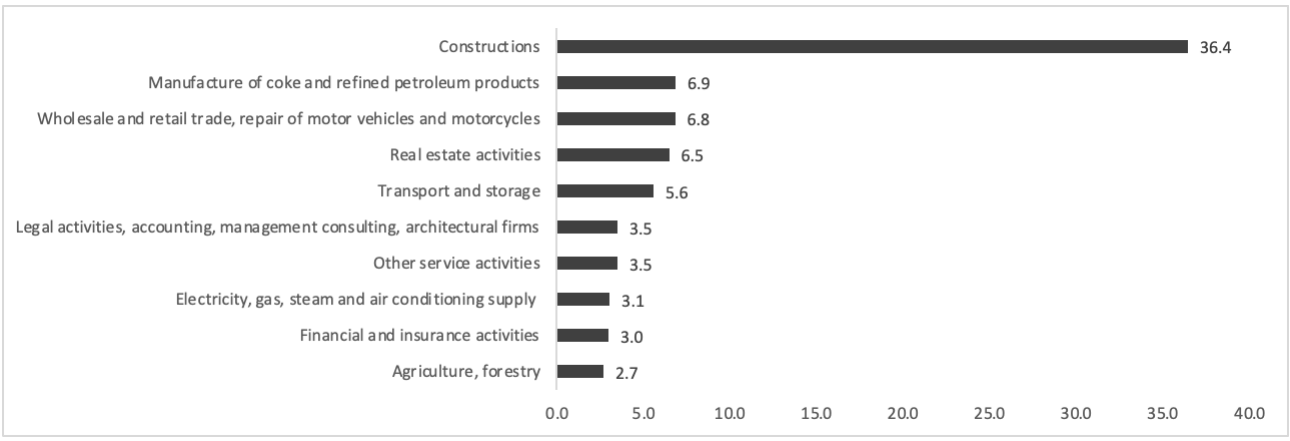
Table 21. Investment - Disaggregated impact on total production.

Activities	2021	2022	2023	2024	2025	2026	TOT
Agriculture, forestry	2.7	2.7	2.7	2.7	2.7	2.7	2.7
Fishing	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Mining and quarrying	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Food, beverage and tobacco industries	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Textile, clothing, leather and accessories industries	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Wood industry	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Paper Printing and registration	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Manufacture of coke and refined petroleum products	6.8	6.9	6.9	6.9	6.9	6.9	6.9
Manufacture of chemical substances and products	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Production of pharmaceutical, chemical-medical and botanical articles	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Manufacture of rubber and plastic products	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Other non-metallic mineral processing products	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Manufacture of basic metals and processing of metal products	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Manufacture of computers, electronic and optical equipment	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Manufacture of electrical appliances	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Manufacture of machinery and equipment n.e.c.	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Manufacture of transport equipment	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Other manufacturing, repair and installation of machines	0.7	0.7	0.8	0.8	0.8	0.8	0.8
Electricity, gas, steam and air conditioning supply	3.1	3.1	3.1	3.1	3.1	3.1	3.1
Water supply; sewerage networks, waste treatment activities	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Constructions	35.6	35.8	36.5	36.6	36.8	36.8	36.4
Wholesale and retail trade, repair of motor vehicles and motorcycles	6.9	6.9	6.8	6.8	6.8	6.8	6.8
Transport and storage	5.6	5.6	5.6	5.6	5.6	5.6	5.6
Accommodation and catering services	2.3	2.3	2.3	2.3	2.3	2.3	2.3
Publishing, audiovisual, radio and television activities	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Telecommunications	1.2	1.2	1.2	1.2	1.2	1.2	1.2
IT and other information services	0.7	0.7	0.7	0.7	0.5	0.5	0.7
Financial and insurance activities	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Real estate activities	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Legal activities, accounting, management consulting, architectural firms	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Scientific research and development	0.4	0.4	0.5	0.5	0.4	0.4	0.4
Other service activities	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Public administration and defence; compulsory social insurance	2.1	1.8	1.1	1.1	1.1	1.1	1.3
Education	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Health and social assistance	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Art, entertainment and fun activities	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Other service activities	1.5	1.5	1.5	1.5	1.5	1.5	1.5
TOT	100	100	100	100	100	100	100

Source: Own elaboration.

Furthermore, Figure 21 displays the ten activities most affected by investments.

Figure 21. Investments -Disaggregated impact on total production (best ten performances).



Source: Own elaboration.

Considering the subsidies on commodities, the disaggregated effects of this scenario are summarised in Table 22. Table 22 shows an important contribution to the GDP performance related to "8. Manufacture of coke and refined petroleum products", "29. Real estate activities" and "23. Transport and storage".

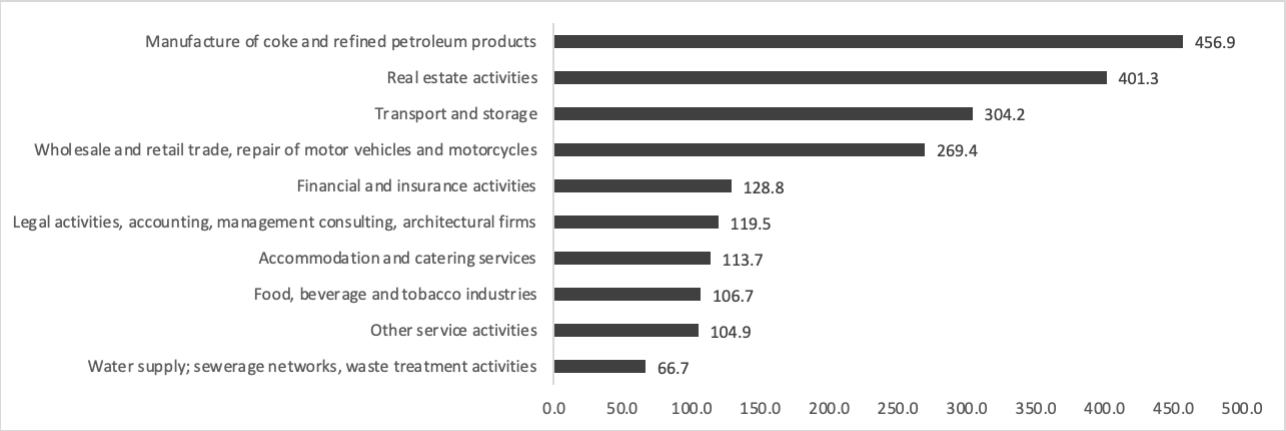
Table 22. Subsidies - Disaggregated impact on total production.

Activities	2021	2022	2023	2024	2025	2026	TOT
Agriculture, forestry	-42.9	-43.4	-883.0	-22.7	-29.5	8.5	-67.9
Fishing	2.2	2.5	176.5	-1.8	-2.4	0.8	15.3
Mining and quarrying	2.9	3.2	226.9	-2.3	-3.1	0.9	19.6
Food, beverage and tobacco industries	8.3	10.4	1224.9	-19.8	-25.6	6.8	106.7
Textile, clothing, leather and accessories industries	2.9	3.3	238.3	-2.6	-3.4	1.0	20.6
Wood industry	1.7	2.0	137.1	-1.4	-1.8	0.6	11.9
Paper Printing and registration	1.5	1.7	112.5	-1.1	-1.4	0.2	9.5
Manufacture of coke and refined petroleum products	64.9	73.4	5324.3	-57.2	-73.8	19.0	456.9
Manufacture of chemical substances and products	9.6	10.7	751.9	-7.7	-9.6	1.0	63.1
Production of pharmaceutical, chemical-medical and botanical articles	0.3	0.3	21.4	-0.2	-0.3	0.1	1.8
Manufacture of rubber and plastic products	1.8	2.0	137.8	-1.3	-1.7	0.5	11.9
Other non-metallic mineral processing products	6.0	6.7	448.2	-4.3	-5.5	1.3	38.2
Manufacture of basic metals and processing of metal products	6.6	7.3	480.5	-4.4	-5.9	2.2	41.7
Manufacture of computers, electronic and optical equipment	-131.2	-154.8	-15306.1	221.9	259.3	49.5	-1220.9
Manufacture of electrical appliances	-5.0	-6.1	-629.0	9.4	11.1	0.7	-51.1
Manufacture of machinery and equipment n.e.c.	-1.7	-2.2	-302.0	5.2	6.0	1.3	-23.6
Manufacture of transport equipment	-0.2	-0.4	-104.0	2.1	2.3	1.1	-7.5
Other manufacturing, repair and installation of machines	-6.8	-8.5	-965.0	15.3	17.9	1.6	-77.8
Electricity, gas, steam and air conditioning supply	-25.6	-33.1	-4053.7	66.9	110.1	-121.5	-439.4
Water supply; sewerage networks, waste treatment activities	10.4	11.6	781.8	-7.5	-9.6	2.2	66.7
Constructions	-33.5	-40.4	-4383.8	67.6	78.4	17.2	-346.7
Wholesale and retail trade, repair of motor vehicles and motorcycles	42.3	46.9	3029.3	-26.9	-38.0	21.8	269.4
Transport and storage	44.0	49.6	3505.5	-36.4	-47.9	16.3	304.2
Accommodation and catering services	15.1	17.2	1310.8	-14.9	-19.6	6.1	113.7
Publishing, audiovisual, radio and television activities	1.2	1.4	86.2	-0.8	-1.1	0.7	7.8
Telecommunications	4.7	4.9	201.8	0.0	-1.2	5.1	21.4
IT and other information services	-5.6	-6.9	-766.9	12.0	13.9	2.6	-60.8
Financial and insurance activities	18.4	20.7	1467.3	-15.3	-20.5	8.5	128.8
Real estate activities	55.6	63.0	4609.2	-50.1	-66.2	23.0	401.3
Legal activities, accounting, management consulting, architectural firms	17.8	20.0	1358.3	-13.3	-18.1	8.2	119.5
Scientific research and development	0.0	-0.1	-88.8	2.1	2.2	1.6	-5.9
Other service activities	15.6	17.4	1181.3	-11.5	-15.9	8.2	104.9
Public administration and defence; compulsory social insurance	2.9	2.8	-18.9	3.3	5.3	-5.1	-5.8
Education	1.1	1.1	15.7	0.8	0.9	0.2	1.6
Health and social assistance	0.6	0.4	-150.8	4.1	4.7	1.6	-10.9
Art, entertainment and fun activities	5.0	5.5	312.7	-2.1	-3.5	3.9	29.3
Other service activities	9.0	10.0	611.9	-5.0	-6.6	2.1	52.6
TOT	100	100	100	100	100	100	100

Source: Own elaboration.

Furthermore, Figure 22 displays the ten activities most affected by subsidies on commodities.

Figure 22. Subsidies - Disaggregated impact on total production (best ten performances).



Source: Own elaboration.

In relation to the transfer to firms, the disaggregated effects of this scenario are summarised in Table 23. Table 23 shows an important contribution to the GDP performance related to "21. Constructions", "22. Wholesale and retail trade, repair of motor vehicles and motorcycles" and "8. Manufacture of coke and refined petroleum products".

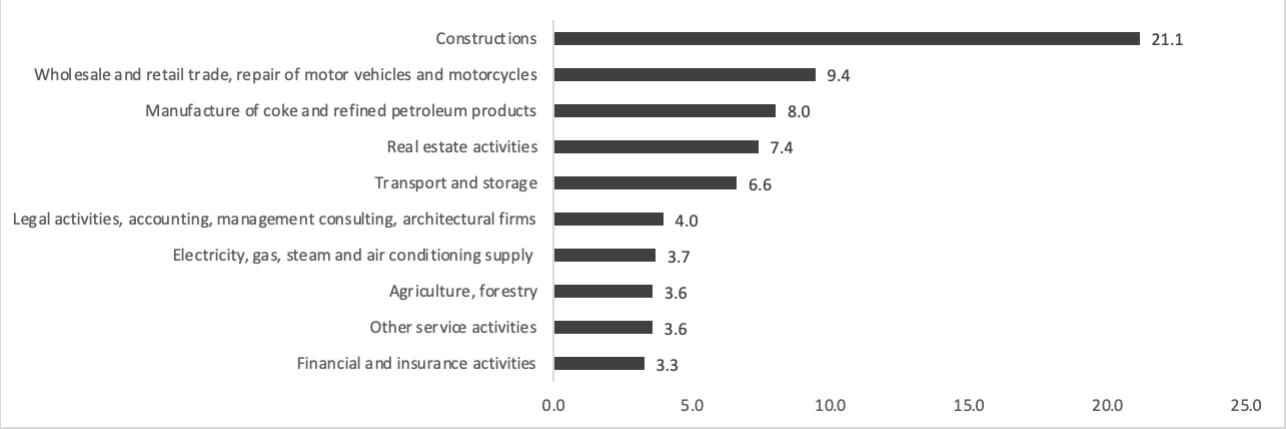
Table 23. Transfers to firms - Disaggregated impact on total production.

Activities	2021	2022	2023	2024	2025	TOT
Agriculture, forestry	3.6	3.6	3.6	3.6	3.6	3.6
Fishing	0.3	0.3	0.3	0.3	0.3	0.3
Mining and quarrying	0.4	0.4	0.4	0.4	0.4	0.4
Food, beverage and tobacco industries	3.2	3.2	3.2	3.2	3.2	3.2
Textile, clothing, leather and accessories industries	0.4	0.4	0.4	0.4	0.4	0.4
Wood industry	0.4	0.4	0.4	0.4	0.4	0.4
Paper Printing and registration	0.3	0.3	0.3	0.3	0.3	0.3
Manufacture of coke and refined petroleum products	8.0	8.0	8.0	8.0	8.0	8.0
Manufacture of chemical substances and products	1.3	1.3	1.3	1.3	1.3	1.3
Production of pharmaceutical, chemical-medical and botanical articles	0.0	0.0	0.0	0.0	0.0	0.0
Manufacture of rubber and plastic products	0.4	0.4	0.4	0.4	0.4	0.4
Other non-metallic mineral processing products	1.3	1.3	1.3	1.3	1.3	1.3
Manufacture of basic metals and processing of metal products	1.7	1.7	1.7	1.7	1.7	1.7
Manufacture of computers, electronic and optical equipment	1.0	1.0	1.0	1.0	1.0	1.0
Manufacture of electrical appliances	0.3	0.3	0.3	0.3	0.3	0.3
Manufacture of machinery and equipment n.e.c.	1.1	1.1	1.1	1.1	1.1	1.1
Manufacture of transport equipment	0.6	0.6	0.6	0.6	0.6	0.6
Other manufacturing, repair and installation of machines	1.3	1.3	1.3	1.3	1.3	1.3
Electricity, gas, steam and air conditioning supply	3.7	3.7	3.7	3.7	3.7	3.7
Water supply; sewerage networks, waste treatment activities	1.7	1.7	1.7	1.7	1.7	1.7
Constructions	21.1	21.1	21.1	21.1	21.1	21.1
Wholesale and retail trade, repair of motor vehicles and motorcycles	9.4	9.4	9.4	9.4	9.4	9.4
Transport and storage	6.6	6.6	6.6	6.6	6.6	6.6
Accommodation and catering services	2.3	2.3	2.3	2.3	2.3	2.3
Publishing, audiovisual, radio and television activities	0.4	0.4	0.4	0.4	0.4	0.4
Telecommunications	1.4	1.4	1.4	1.4	1.4	1.4
IT and other information services	2.1	2.1	2.1	2.1	2.1	2.1
Financial and insurance activities	3.3	3.3	3.3	3.3	3.3	3.3
Real estate activities	7.4	7.4	7.4	7.4	7.4	7.4
Legal activities, accounting, management consulting, architectural firms	4.0	4.0	4.0	4.0	4.0	4.0
Scientific research and development	1.5	1.5	1.5	1.5	1.5	1.5
Other service activities	3.6	3.6	3.6	3.6	3.6	3.6
Public administration and defence; compulsory social insurance	1.5	1.5	1.5	1.5	1.5	1.5
Education	0.4	0.4	0.4	0.4	0.4	0.4
Health and social assistance	1.3	1.3	1.3	1.3	1.3	1.3
Art, entertainment and fun activities	1.2	1.2	1.2	1.2	1.2	1.2
Other service activities	1.6	1.6	1.6	1.6	1.6	1.6
TOT	100	100	100	100	100	100

Source: Own elaboration.

Furthermore, Figure 23 displays the ten activities most affected by transfer to firms.

Figure 23. Transfers to firms - Disaggregated impact on total production (best ten performances).



Source: Own elaboration.

3.3.3 Disposable income.

The results presented in this paragraph, in an analysis of the distribution of income generated by the main internal operators, allow us to highlight another aspect of particular importance. For each type of fiscal policy instrument considered, variations in line with the increase observed for GDP were recorded for the institutional sectors considered (households and corporations). The variations in percentage terms are reported in Tables 24, 25, 26, 27.

Table 24. Government consumption - Disaggregated impact on available income in institutional sectors.

Disposable income	2021	2022	2023	2024	2025	Tot
Corporations	0.09	0.36	0.36	0.28	0.04	**1.14**
Households	0.10	0.41	0.41	0.33	0.07	**1.34**

Table 25. Investment - Disaggregated impact on available income in institutional sectors.

Disposable income	2021	2022	2023	2024	2025	2026	Tot
Corporations	0.82	3.23	3.09	3.08	3.06	2.30	**15.57**
Households	1.57	6.26	6.09	6.08	6.03	4.54	**30.57**

Table 26. Subsidies - Disaggregated impact on available income in institutional sectors.

Disposable income	2021	2022	2023	2024	2025	2026	Tot
Corporations	0.01	0.04	0.03	0.02	0.02	0.00	**0.12**
Households	0.03	0.10	0.07	0.05	0.04	0.01	**0.30**

Table 27. Transfers to firms - Disaggregated impact on available income in institutional sectors.

Disposable income	2021	2022	2023	2024	2025	Tot
Corporations	1.81	7.22	7.22	7.22	5.42	**28.89**
Households	0.10	0.39	0.39	0.39	0.29	**1.57**

Source: Own elaboration.

3.3.4 Macro Variables.

In this paragraph, we analyse the disaggregated impact on GDP and its components, considering the four types of fiscal policies. A first interpretation of the results on the main macroeconomic aggressors allows us to illustrate the positive effects of the interventions of the regional manoeuvre of the national plan.

Government consumption. The behaviour of the public institutional sector (government) can be defined and analysed according to several aspects. The expenditure of the public administration can be directed to the purchase of goods and services which can be transformed into collective services and, in this case, the government assumes the role of producer; but the activity of the public administration can also be considered from the point of view of the final consumer, since it can purchase collective services to be made available to consumers free of charge (Fossati, 1991). Furthermore, the activity of this institutional sector is characterised by investment operations and redistribution of resources through current and capital account transfers made and withdrawn from the other institutional sectors (Cavalletti, 2009). With reference to the main regional macroeconomic variables, favourably positive percentage values are recorded, as regards, in particular, consumption by the public administration with a percentage of (+3.20) and for household consumption with a change of (+1.34); non-profit institutions consumption recorded a positive percentage equal to (+1.11); net exports with the rest of Italy and with the rest of the world both recorded a negative variation, respectively equal to (-0.36) and (-3.04). In this scenario, we consider an increase in final demand of government consumption corresponding to 1.87% of real GDP. The GDP multiplier stands at around 1.61. This figure explains that due to the direct, indirect and induced effects generated by the increase in the government's final demand for consumption, for every euro spent, the regional economic system generates an increase in GDP equal to 1.45 euro. The impact of this shock on macroeconomic variables is reported in Table 28.

Table 28. Impact of the shock to Government consumption on macroeconomic variables (percent change from benchmark).

Variables	2021	2022	2023	2024	2025	Tot
GDP	0.14	0.58	0.58	0.47	0.10	1.87
Hosueholds consumption	0.10	0.41	0.41	0.33	0.07	1.34
NPI consumption	0.09	0.35	0.35	0.28	0.05	1.11
Government consumption	0.25	0.98	0.98	0.80	0.19	3.20
Investments	0.03	0.12	0.12	0.09	0.01	0.37
Net exports to the Rest of Italy	-0.03	-0.11	-0.11	-0.09	-0.01	-0.36
Net exports to the Rest of the world	-0.23	-0.90	-0.90	-0.76	-0.24	-3.04
Multiplier	1.59	1.59	1.59	1.66	1.63	

Source: Own elaboration.

Investment. The analysis of the distributive and generative effects of the impact of the regional manoeuvre, in relation to the investment sector, allows to identify important variations in the distribution of specific economic activities of the regional economic fabric; furthermore, this analysis makes it possible to describe, in disaggregated terms, the short-term and long-term effects, typical of the construction phase and the operational phase of the project, to which a stimulus of final demand and the production of goods and services correspond respectively (Kim & Hewings, 2009). So long as, in the model, the flows relating to investments are attributed to a productive sector that produces the investment good, this good is demanded by the other institutional sectors; in detail, as a share of depreciation from other productive sectors, as savings from households and used to model the deficit of institutional sectors and the imbalances of the balance of payments of the region with the rest of the world. Proceeding with the elaboration of the evaluation of the impact of this vector of expenditure on the regional macroeconomic variables, we notice favourably positive percentage changes, in particular, as regards the investment sector with an average percentage variation of 34.70% for the entire period considered. The increase in investments determines an increase in domestic production; this increase by stimulating domestic production also causes an increase in imports needed to meet the increase in domestic production resulting from the increase in final demand. Household consumption recorded an overall change of (+30.57); non-profit institutions consumption recorded a positive percentage equal to (+21.79); net exports with the rest of Italy and with the rest of the world both recorded a negative variation, respectively equal to (-5.04) and (-101.13); these latest figures are explained by the strong increase in investments which determines an increase in aggregate production but also the level of imports necessary to satisfy the increase in production related to the higher level of final demand. In this scenario, we consider an increase in final demand of investment

corresponding to 42.39% of real GDP. The GDP multiplier stands at around 1.42. The impact of this shock on macroeconomic variables is reported in Table 29.

Table 29. Impact of the shock to Investment on macroeconomic variables (percent change from benchmark).

Variables	2021	2022	2023	2024	2025	2026	Tot
GDP	2.18	8.69	8.44	8.42	8.36	6.28	42.39
Hosueholds consumption	1.57	6.26	6.09	6.08	6.03	4.54	30.57
NPI consumption	1.13	4.48	4.34	4.33	4.30	3.23	21.79
Government consumption	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Investments	10.68	42.63	41.53	41.42	41.10	30.87	208.23
Net exports to the Rest of Italy	-0.26	-1.04	-1.00	-1.00	-0.99	-0.74	-5.04
Net exports to the Rest of the world	-5.15	-20.56	-20.22	-20.17	-19.99	-15.03	-101.13
Multiplier	1.40	1.41	1.68	1.30	1.30	1.40	

Source: Own elaboration.

Subsidies on commodities. By means of production subsidies, the government intends to transfer economic resources to resident units in order to influence the level of production or prices or to allow sufficient remuneration for the factors of production; the type of these unilateral current transfers creates a favourable incentive for the production of marketable goods and services or the production of goods and services for own final use. The impact of the shock on the macroeconomic variables is shown in Table 30 and shows positive percentage changes with the exception of the investment sector. The increase in subsidies disbursed for the production of goods and services led to a slight increase in the demand for goods and services by households (+0.59), in non-profit institutions consumption (+0.28) and an increase in the level of net exports to the rest of Italy (+1.41) while net exports to the rest of world recorded a negative variation (- 1.19). The final impact on the GDP is 0.42% and the GDP multiplier stands at around 0.82. The impact of this shock on macroeconomic variables is reported in Table 30.

Table 30. Impact of the shock of Subsidies on commodities on macroeconomic variables (percent change from benchmark).

Variables	2021	2022	2023	2024	2025	2026	Tot
GDP	0.04	0.14	0.10	0.07	0.06	0.02	0.42
Hosueholds consumption	0.05	0.18	0.14	0.11	0.09	0.02	0.59
NPI consumption	0.02	0.09	0.06	0.05	0.04	0.02	0.28
Government consumption	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Investments	-0.06	-0.24	-0.24	-0.24	-0.18	0.02	-0.96
Net exports to the Rest of Italy	0.12	0.45	0.34	0.26	0.21	0.02	1.41
Net exports to the Rest of the world	-0.10	-0.38	-0.28	-0.21	-0.17	-0.05	-1.19
Multiplier	0.75	0.72	1.25	1.25	0.42	0.47	

Source: Own elaboration.

Transfers to firms. Public administrations can transfer economic resources to enterprises in various forms: subsidies, production or investment grants, low-interest loans, guarantee funds, allocations to cover tax credits, etc. In this way, public transfers by central and local governments or other supranational authorities (e.g., European Regional Development Fund) help to stimulate the development of certain activities or economic sectors deserving of support (incentives) or to activate counter-performances, such as the provision of goods and services, by beneficiary enterprises (subsidies). Table 31 shows the results of the impact of the shock on macroeconomic variables with respect to the benchmark. The final impact on the GDP is a remarkable 2.18%. The GDP multiplier stands at around 1.25. In this scenario, transfers to firms by stimulating economic growth increase domestic production; this effect generates an increase in investments (+11.48), in the demand for goods and services by households (+1.57) and in consumption by the non-profit institutions (+1.12). The increase in production stimulates final demand and this also implies an increase in the level of net exports to the rest of Italy (-0.29) and net exports to the rest of world (- 6.25). The impact of this shock on macroeconomic variables is reported in Table 31.

Table 31. Impact of the shock of Transfers to firms on macroeconomic variables (percent change from benchmark).

Variables	2021	2022	2023	2024	2025	Tot
GDP	0.14	0.54	0.54	0.54	0.41	2.18
Hosueholds consumption	0.10	0.39	0.39	0.39	0.29	1.57
NPI consumption	0.07	0.28	0.28	0.28	0.21	1.12
Government consumption	0.00	0.00	0.00	0.00	0.00	0.00
Investments	0.72	2.87	2.87	2.87	2.15	11.48
Net exports to the Rest of Italy	-0.02	-0.07	-0.07	-0.07	-0.05	-0.29
Net exports to the Rest of the world	-0.39	-1.56	-1.56	-1.56	-1.17	-6.25
Multiplier	1.25	1.25	1.25	1.25	1.25	

Source: Own elaboration.

3.3.5 Results on macroeconomic variables.

This paragraph presents a summary of the impact of the Regional Recovery and Resilience Plan impact on macroeconomic variables.

The results obtained from the analysis of the impacts of the interventions of the regional proposal of the recovery and resilience plan, applying the regional CGE model on the SAM database for Sicily, identify results and scenarios that illustrate the positive effects following the interventions carried out on the Sicilian regional economy. On the demand side, data relating to final consumption by the public administration and investments were examined; on the supply side, those relating to subsidies on commodities and relating to the income redistribution phase, transfers to firms were analysed. These results can be interpreted as the response of the economy to the shocks of the interventions of the manoeuvre after the model has reproduced the new equilibrium once the variables have adjusted to the new level and the effects of the policy interventions have manifested themselves (Felici, et al., 2020). The disaggregate effects of this scenario on the main macroeconomic variables are shown in Table 32. The table registers that percentage change of GDP, compared with the benchmark, are in line with the hypothesised analyses by the Sicilian regional government. GDP records positive percentage values for the whole-time horizon; in particular, in 2022, GDP is 10.2% percentage points higher than in the baseline scenario. The interventions of the regional manoeuvre produced positive percentage changes in the time horizon of the GDP for the plan. This result is

mainly due, in the short term, to the effect of a higher demand connected above all to the expenses for construction and civil engineering works and, in the long term, to the effect of the increase in the capital stock with positive effects on the GDP, due to the investment increases.

Table 32. Regional Recovery and Resilience Plan impact on macroeconomic variables (Percent change from benchmark).

	2021	2022	2023	2024	2025	2026
GDP	2.5	10.2	9.9	9.8	9.2	7.0
Households consumption	1.9	7.4	7.2	7.1	6.7	5.1
NIPs consumption	1.3	5.3	5.2	5.1	4.7	3.6
Government consumption	0.2	1.0	1.0	0.8	0.2	0.2
Investments	11.6	46.7	45.7	45.5	44.5	34.4
Exports to the Rest of Italy	4.0	16.1	15.7	15.5	14.7	11.3
Exports to the Rest of the world	0.0	0.1	0.1	0.1	0.1	0.0
Imports from the Rest of Italy	2.9	11.8	11.6	11.4	10.9	8.4
Imports from the Rest of the world	2.5	10.2	10.0	9.9	9.4	7.3

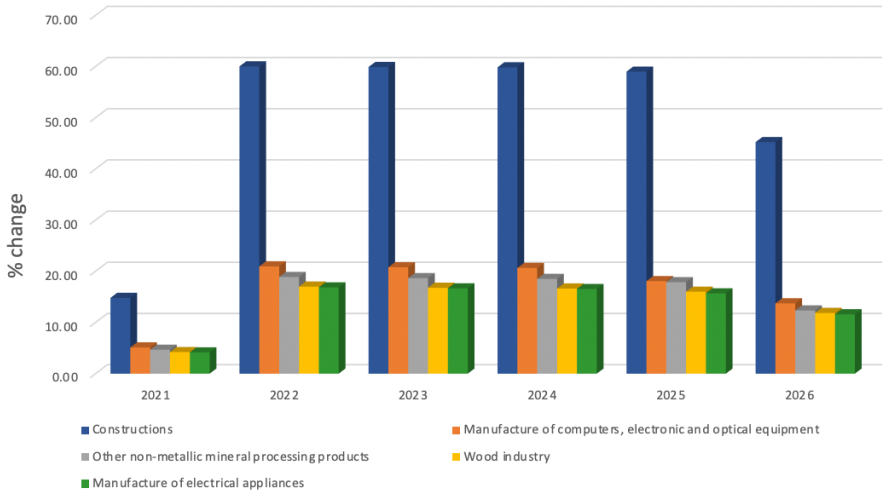
Source: Own elaboration

In fact, the analysis of the economic impact of the economic manoeuvre on the regional GDP for the entire period of time considered shows a significant increase in the demand for investments with fairly significant percentage rates, in particular of 46.7% and 45.7% for 2022 and 2023, to then decrease by a few percentage points in the years following the implementation and conclusion of the various regional project proposals. Another indicative and positive shock of the effects of the manoeuvre is identified in the growth of exports with the rest of Italy, for the entire period considered, with growth rates of 16.1% for 2022 and 15.7% for 2023 up to 11.3% for the last year of 2026, contributing positively to the growth of the regional GDP. The increase in demand for investment leads to an increase in domestic production and also in imports. Note the increase in imports from the rest of Italy and the rest of the world, even if these percentage increases are lower than those identified for exports (11.8% for imports with the rest of Italy and 10.2% % for imports to the rest of the world, both for 2022). The effects of the regional manoeuvre also record an increase in final domestic demand for goods and services for households with appreciable percentage rates (7.4% for 2022). The Sicilian regional proposal of the recovery and resilience plan makes it possible to detect a positive economic impact on the regional GDP of Sicily, recording for each year considered, different positive percentage rates ranging from 10.2% for 2022 up to 7% for the last year of the manoeuvre (2026).

The final impact on the GDP is 48.6% and the GDP multiplier stands at around 1.44. The percentage increases of the regional GDP are particularly linked and justified, as previously represented, by the increases in infrastructure investments. Furthermore, by advancing the analysis in detail for the main macroeconomic variables, the main products that have been most influenced by the interventions of competence and contributed to the increase in percentage terms of the regional GDP have been identified.

Finally, in order for the policy results on commodities, Figure 24, we can say that the proposed regional resources have a significant impact on some specific and important manufacturing sectors for the Sicilian economy. In particular, the percentage changes of industrial production concern expenditure on construction investments, such as interventions on hydrogeological instability and on the management of water resources, construction of plants relating to the ecological transition, enhancement and restoration works of cultural and archaeological sites; the significant effect of the intervention is achieved in the year 2022 with a percentage equal to 60.02%. Significant digitization and computerization interventions influence the sectors of manufacture of computers, electronic and optical equipment; the best percentage change occurs in 2022 and is equal to 20.95%. The other significant changes contribute, for the year 2002, to the growth of the sectors other non-metallic mineral processing products (18.89%), Wood industry (17.00%) and Manufacture of electrical appliances (16.85%).

Figure 24. Policy results on commodities.



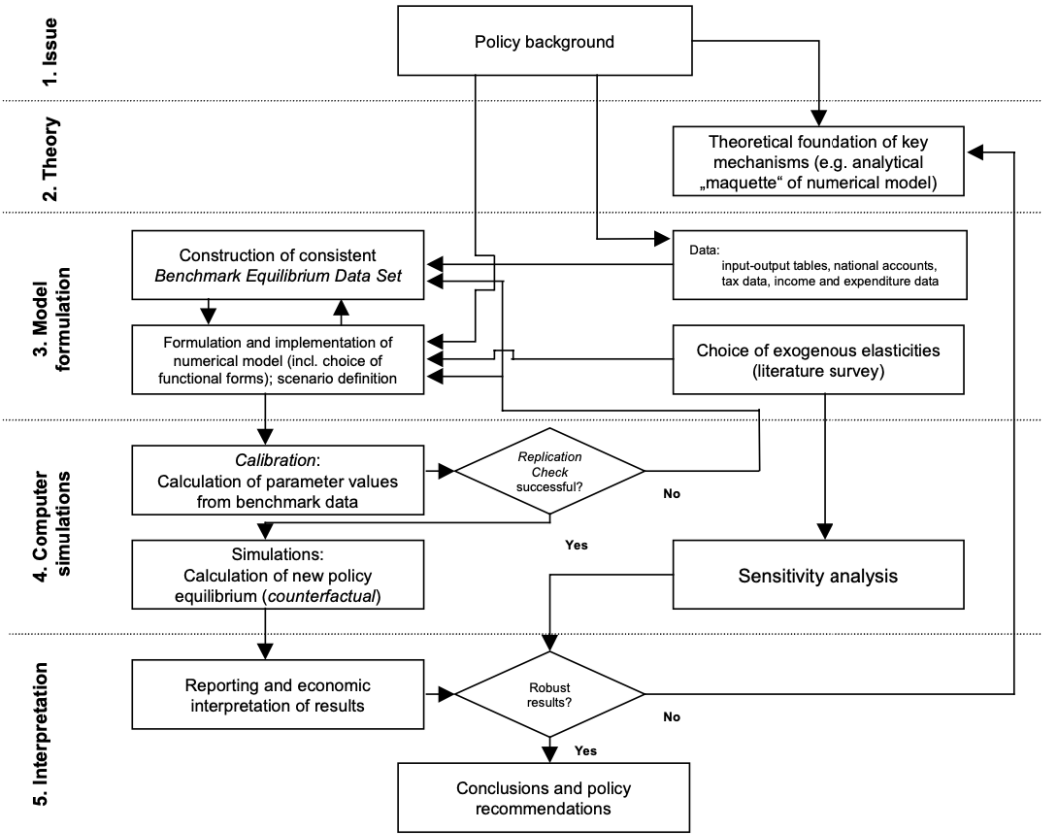
	2021	2022	2023	2024	2025	2026
Constructions	14,80	60,02	59,90	59,84	59,00	45,23
Manufacture of computers, electronic and optical equipment	5,12	20,95	20,78	20,65	18,07	13,73
Other non-metallic mineral processing products	4,67	18,89	18,66	18,51	17,87	12,34
Wood industry	4,21	17,00	16,77	16,63	16,01	11,86
Manufacture of electrical appliances	4,16	16,85	16,66	16,54	15,68	11,59

% from benchmark

Source: Own elaboration.

The analysis carried out shows how the project proposals of the Sicilian region relating to the National Recovery and Resilience Plan and the related interventions should ensure the economic relaunch of the Sicily region, for the entire time horizon of the Plan, determining a positive economic impact on the whole regional territory and affecting all the relevant economic activities of the region. Investment spending will be the component of final demand that will determine the greatest contribution to this significant impact. Furthermore, in addition to a natural growth in imports and exports, there will also be an increase in the level of employment.

Appendix 1 to chapter 3: Steps in computable general equilibrium analysis (Bohringer, 2004).



General consideration.

The analysis and evaluation of regional policies assumes particular importance in a perspective of regional decentralisation, in which the role of the actors in the policy process requires accurate and responsible knowledge and expertise to understand the complexity of the economic and social dynamics of the territory and evaluate the opportunity or need to launch structural reform plans aimed at achieving objectives converging on the improvement and economic growth of the region in question.

The responsibility of each regional government body in finding and allocating economic resources for the planning and adoption of the respective economic manoeuvres requires the availability of increasingly disaggregated, multi-sectoral and multi-regional databases and information and interpretative tools suitable for the description and evaluation of the direct and indirect effects that such manoeuvres produce on the entire economic system. The disaggregation of information and multi-sectoral analysis make it possible to represent the network of sectoral interdependencies in production processes and the links between institutional sectors (households, businesses, public administration). Furthermore, the preparation of increasingly detailed information at the regional level, not always present in economic accounting, allows for a careful analysis of socio-economic development and for representing the entire economy, from the production phase to that of income distribution. The use of this information by the regional administration should make it possible to plan economic policy manoeuvres oriented towards the search for those policy variables, which both in the short term (stabilisation) and in the long term (development) are able to elaborate interventions aimed at achieving the set objectives and to evaluate their impact on the main macroeconomic variables ex-ante and ex-post. From this point of view, the objective of this work is to analyse the effects of the manoeuvre of the regional recovery and resilience plan for Sicily, planned by the regional government to stimulate economic recovery following the effects of the lockdown and evaluate the impacts of the various proposals on the Sicilian economy. The organisation and reprocessing of information and data required some necessary and preparatory phases of particular interest and importance for carrying out the research.

For the presentation of the socio-economic structure of Sicily and for the survey of the aggregates of the institutional sectors, not present in the economic accounting, it was necessary to build a multi-regional accounting scheme integrated by the information disaggregated at the regional level. The accounting scheme used is the economic and social accounting matrix (SAM) which allows for the representation, through a multi-sectoral structure, of the intra-regional and inter-regional

interrelationships between economic operators. Being an extension of the input-output table, the social accounting matrix allows a link between production accounting, in intersectoral terms, and income accounting; due to this last typical feature of the matrix, it is also possible to describe the relationships between the operators in the various phases of the circular flow of income. The information presented in the SAM, in the description of the process of formation of disposable income, therefore makes it possible to evaluate the impact of economic intervention policies on the diffusion of the well-being of families with particular socio-economic characteristics as well as on the wealth produced by the region. Since the structure of the SAM is very close to the representation of a general economic equilibrium, the choice of the social accounting matrix finds its application as a conceptual framework of reference for the construction and simulation of CGE models. Therefore, the construction of a computational model of static general economic equilibrium was proposed, in order to evaluate the impact of the regional proposal of the recovery and resilience plan on the whole territory of the region. The CGE model calibrated on the SAM database built for Sicily makes it possible to quantify ex-ante the effects of the interventions of the regional government manoeuvre on the main macroeconomic variables, such as GDP and its components, while maintaining consistency with the macroeconomic framework.

In this work, the simulations presented on the basis of an appreciable level of disaggregation of the production process identify the structures of policy intervention on production, final demand and disposable income carried out by institutional sectors. The analysis of the direct, indirect and induced effects shows how the policy interventions of the regional manoeuvre are a stimulus for the economic growth of the regional economy; recording a significant increase in real gross domestic product, and in general of all its components. For each variable, the results of the simulations are reported in terms of percentage variation with respect to the trend scenario. In this respect, in fact, the interventions of the regional implementation policy, by stimulating public administration consumption and investment incentives, facilitating production growth through transfers and contributions to businesses, generate a positive multiplier effect on the regional GDP for the whole period considered. The multiplicative effects elaborated by the various hypotheses of regional policy intervention show the optimization of the economic resources envisaged by the manoeuvre and its effectiveness, understood as the adequacy between the planned objectives and the constraints established in the decision and planning phase. In particular, the results of the analysis of the impact of the investment plan show a positive change on all macroeconomic variables; they show how this intervention, due to its size and composition of resources, generates a significant effect on regional economic growth. The proposed reform makes it possible to achieve a positive change in overall

production and suggests positive changes in all the components of the macroeconomic variables; the positive evaluation of the results obtained as a result of the interventions of the manoeuvre allows us to affirm how this regional development policy improves the deficit context conditions and favours the economic growth of the region's territory.

For research purposes, the static CGE model therefore appears to be a useful tool for simulating and evaluating the effects of regional economic policy interventions.

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