

Special Economic Zones Planning for Sustainable Ports: Aggregate Economic Impact of Port of Gioia Tauro

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Abstract. Special Economic Zones (SEZ) are a place-based measure to boost the economic growth adopted in several countries all-over the world. SEZs are geographic areas inside a country where tax incentives, favourable land-use policies, employment subsidies, and advantageous financial assistance encourage the settlement of domestic and foreign-invested manufacturing and services for export.

The paper concerns the ex-ante estimation of aggregate economic impact of a SEZ in Calabria region (Italy). SEZ in Calabria was conceived to operate in several existing industrial areas of the region, having its fulcrum around the transhipment hub port of Gioia Tauro, in order to propagate its benefits to the whole region in terms of export and employment. The aggregate economic impacts of the SEZ were quantified through two characteristic variables: exports and employment of industrial firms settled in Calabria. Two development scenarios are defined: a Do-Nothing scenario, in the absence of the SEZ and with the current economic policies operating in Calabria; and a SEZ scenario, assuming a full activation of SEZ (with complete availability of financial resources and decrees for simplification) at the end of 2018.

The comparison of the two scenarios shows relevant direct positive impacts in the SEZ case, both the in terms of export and employment, in the industrial sectors that benefits of the SEZ incentives.

Keywords: Special economic zone · Aggregate economic impacts · Case study · Port of Gioia Tauro

1 Introduction

Programs of governments are driven by the idea that ports development could be a key factor for the (re-)development of local economies. However, today the relations between ports and their own local economy seem to get weaker. Traffic flows increase, but port operations generate weak linkages, so that income and employment multiplier effects not only are less relevant, but they usually spread quite far from the port. Moreover, the presence of the port generates negative externalities at local level, such as pollution and

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landscape impacts. These negative externalities often make port investments opposed by local communities, which generally push for a different use of soil and environmental resources.

Economic impacts generated by existing port operations and investments may be considered as part of a more general process where a transport system and a spatial economic system interact. The transport system is represented by port infrastructures and services (supply component) and by sea and inland freight (and passenger, if any) flows. The spatial-economic system is represented by several economic actors; among which an important role is played by port stakeholders (demand component). The economic impact of the port stakeholders may be estimated with the support of the so-called economic impact models [1–3].

The paper presents an analysis of the aggregate economic impact generated by the introduction of a Special Economic Zone (SEZ) in the Calabria region, Southern of Italy [4, 5]. The fulcrum of the Calabrian SEZ is represented by the port of Gioia Tauro, whose activities rely both on physical (material) components, such as transport and logistic infrastructures, and on intangible (or immaterial) components, such as the set of SEZ measures [6–9]. The port of Gioia Tauro aims to complete its transition towards a third-generation port, by enhancing the role of the large industrial agglomeration present in its hinterland, destined to industrial, production and service activities [10, 11].

SEZs are geographic areas inside a country where tax incentives, favourable land-use policies, employment subsidies, and advantageous financial assistance encourage domestic and foreign-invested manufacturing and services for export. It was estimated that more than 5000 SEZs had been established worldwide in 2018; and that almost 4000 of them are settled in developing countries. More than 2200 SEZs had been established in China; among these, 570 operate at national-level and 1990 at provincial-level. The greater number of SEZs in China are settled in coastal provinces [12].

The objective of the paper is to quantify the extent of the benefits propagation of the SEZ in the Calabria region, in terms of export and employment. An economic impact model has been applied to ex-ante estimate the aggregate economic impact of the SEZ.

The following part of the paper is articulated into four sections. Section 2 deals with a literature review on port economic impacts studies and models. Section 3 presents the proposed economic impact model concept and specification; and reports the results of the application to the case of SEZ in Calabria region. The last section reports the conclusions and the further developments.

2 Literature Review on Economic Impact Studies

The existing literature on port economic impact studies may be considered as part of the rich literature concerning the impacts of construction and operation of large-scale transport infrastructures on local and national economies. In the case of construction, the aim is the quantification of effects of investments in infrastructure and technology on the local and national economies. In the case of operation, the aim is the definition and quantification of linkages between the operations connected with the existing transport infrastructure and the local and national economies.

Economic impacts of ports on local economies are generally measured as the contribution of the port to the level of some economic variables such as employment, value added, incomes, taxes and duties.

The literature review presented in this section reports some definitions of port economic impact and analyses the existing port impact studies and models.

The major challenge in port impact studies is the identification of the port stakeholders and of the degree of port dependency of these stakeholders with the hinterland area. In general, the total impact of a port on the local economy can be subdivided into direct (or primary) and indirect and induced (or secondary) impacts [13–16].

The *direct impact* is generated by *port-required stakeholders*, which provide transportation, logistics and port services. Transportation services include terminal freight forwarding, and cargo transport by rail and road. Port services include terminal operations, stevedoring, vessel supply, pilotage, towage, launch services, container service and other functions necessary for the handling of freight inside the port.

The *indirect impact* is generated by *port-attracted stakeholders*, which are economically dependent on port-required ones. Port-attracted stakeholders are attracted in the region because of the presence of a port. They would evaluate moving from a port to another port, if facilities and operations in the destination port generate higher value added than the one generated in the current port. These stakeholders can be subdivided into two groups: exporters of commodities and importers of raw or intermediate commodities to be assembled and/or distributed. Value added, employment, and tax revenues associated to such stakeholders are linked to the port because, in the absence of port facilities, they would not locate in the region. It is worth noting that the attractiveness can be 'revealed' (or 'observed'), when it is associated with the actual incoming flows (investments, firms, workers, ….) in a geographical area; or 'perceived', when it refers to how people, perceive a geographical area in which they have a particular interest (see [17–19]).

The *induced impact* is generated by *port-induced stakeholders*, which are economically dependent on the previous ones. Port-induced stakeholders are those ones in the region which have expanded their markets by exporting through the port. For these stakeholders, the presence of the port not only let them reducing transportation costs, but it is also a generator of value added.

There are several port impact studies in literature that attempt to measure the impact of ports on a local and national economy using EIMs. They may be broadly classified into two approaches, according to level of the aggregation of the economy representation: aggregate and disaggregate (at sector level). Among *aggregate approach*, some studies estimate the economic impact of a port by means of aggregated income-expenditure multipliers (see [13–16], and the references included). As far as concerns *disaggregate approach*, studies rely on input-output models [20–25]. These models allow the estimation of the direct, indirect and the induced impacts, through the identification of linkages among the sectors of the economy. Latest developments of input-output models allow to assess the level of embeddedness of a port inside the maritime trade networks and the global supply-chains [26].

Several papers in literature investigated the impact of SEZs on national and regional economies, mainly by means of economic impact models belonging to the aggregate

approach. Some papers, among the others, focusing on SEZs establishment process in China, are recalled in the following. Wang [27] specified an aggregate economic impact model, where the outcomes are time-series yearly-based variables that include Foreign Direct Investment (FDI), domestic investment, total factor productivity growth and factor prices. Leong [28] examined the relationship between SEZs, openness and growth at the regional level for both China and India. The specified model structure put in relationship the national and regional GDP to the export, the FDI, the different periods of liberalizations, and the coastal position of the SEZ. Later, Zheng [12] analysed the employment effects of SEZs according to births, relocation, expansion, and death of firms. Firstly, he developed a logit model to predict the probability of having an SEZ for each Chines county, according to several county characteristics working as independent variables: population, population density, local economic structure, and political hierarchy of cities. Secondly, he specified aggregate economic impact models that have time-series employment in new entry firms as outcomes.

3 Aggregated Economic Impact Estimation of SEZ in Calabria

3.1 Economic Impact Model

As long as a port remains a place of transit of goods, the public (or private) governance of a port will adopt measures finalized to improve the performance of transport and to reduce costs. In order to significantly increase the value added generated, the measures adopted by the governance should be aimed to enhance the port hinterland, facilitating the settlement of industrial, production and service activities and the embeddedness of the port in the supply chains. The transition of a port from a centre of cost to a generator of value added determines his membership to the category of third-generation. These ports emerged with the world-wide diffusion of container and the changing requirements of the international trade. From the economic point of view, third-generation ports increase the value added of goods that transit through them, due also to their manipulations.

SEZs constitute the natural evolution of the third-generation ports. As matter of fact, an important element of the main existing SEZs is the physical and functional connection with ports of intercontinental level, located inside the SEZ area. Several measures, such as tax incentives, favourable land-use policies, employment subsidies, and advantageous financial assistance, may be deployed with the introduction of a SEZ.

Given a port a, Eq. (1) certifies that a is a third-generation port if transport costs, C, are lower than added value, AV (C are in absolute value):

$$C_a < AV_a \tag{1}$$

The comparison of economic variables between different ports may be executed according to the criterion of the value added maximization. Given a port a and a port b, Eq. (2) certifies that (third-generation) port b is more competitive than (third-generation) port a:

$$AV_b > AV_a \tag{2}$$

The economic impact model considered in this paper belongs to the aggregate approach, where the outcomes are the export and the employment, considered as a proxy of value added. The outcomes obtained, in both cases, are the following:

- export of firms inside ZES areas and of firms outside the ZES areas;
- employment of firms with foreign capital and of firms with domestic capital.

The models adopted to estimate the above variables rely on models developed in [27] and [28], in terms of specification and calibrated parameters. The infrastructural and economic conditions of the municipalities, and regions, that lie inside the ZESs analysed in [27] and [28], could be compared with the ones existing in Calabria region.

3.2 SEZ and Port of Gioia Tauro

SEZ in Calabria has been conceived to integrate several existing nodal transport infrastructures (ports and airports) and industrial areas of the region in physical and functional terms (Fig. 1). The ports of Calabria included in the SEZ are: Gioia Tauro, Reggio Calabria, Villa S. Giovanni, Crotone, Vibo Valentia, Corigliano Calabro. The industrial areas are: Gioia Tauro-San Ferdinando-Rosarno, Crotone, Vibo Valentia, Schiavonea-Corigliano. The three airports of the region are also included: Lamezia Terme, Reggio Calabria and Crotone.

The centre of the SEZ is the port of Gioia Tauro, which is one of the biggest container transhipment ports of the Mediterranean Sea. The port handled 3,14 million of TEUs in 2020. Some forecasts indicate for 2025 a number of containers handled between 78 and 84 million TEU in the Mediterranean Sea [29, 30]. Mediterranean container ports will increase their traffic in the next years at an annual average of 3.6%.

The port of Gioia Tauro aims to enhance the role of the large industrial agglomeration present in its hinterland (see Fig. 2), destined to industrial, production and service activities; and, therefore to complete the full transition towards a third-generation port. The strategic development plan of SEZ, defined in [4, 5], should support the development and the integration of existing supply chains, to enhance the Gioia Tauro hinterland in order to attract mechanical and agri-food factories, operators, transport and logistics companies, encourage mechanical and agri-food production in the Calabria region for the local and the international markets. A detailed description of the current structural factors and of the development strategies of port of Gioia Tauro is presented in several publications (see [31–37]).

3.3 ZES Scenarios Definition

The aggregate economic impacts of the SEZ were quantified through two characteristic variables:

- export of goods and services produced by firms settled in Calabria operating in the industrial sectors and exported abroad;
- employees in firms settled in Calabria operating in the industrial sector with foreign capital (total or partial) and with domestic capital.

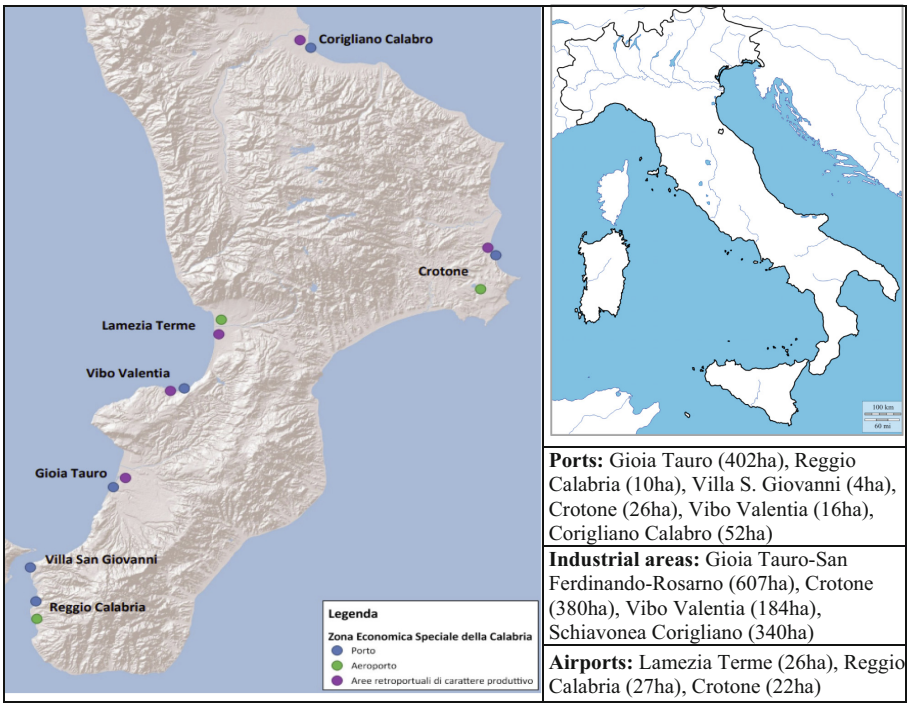

Fig. 1. Map of Calabria region with location of ZES areas (source: [5, 6]).

Two development scenarios have been defined:

- Do-Nothing scenario, in which the two variables are estimated over a period of 2019–2028, starting from the base year 2018, in the absence of the SEZ and with the current economic policies operating in Calabria;
- SEZ scenario, in which the two variables are estimated over a period 2019–2028, starting from the base year 2018, in the hypothesis of a full activation of the SEZ (with complete availability of financial resources and decrees for simplification) at the end of 2018.

3.4 Export

The historical series of exports of firms settled in Calabria operating in the industrial sector for years 2008–2017 was obtained from Italian Institute of Statistics [38].

The Do-Nothing and ZES scenarios were estimated considering two classes of firms:

1. industrial firms currently settled inside SEZ areas, named “Firms inside ZES”;
2. industrial firms currently settled outside the SEZ areas, named “Firms outside ZES”.

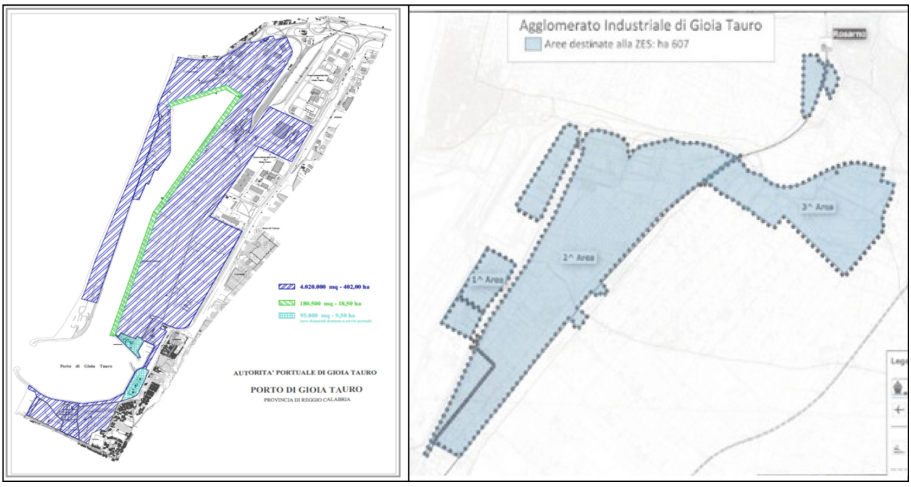

Fig. 2. Port of Gioia Tauro and related ZES area (source: [5, 6])

The two scenarios, Do-Nothing and ZES, and the two classes of firms, "firms inside ZES" and "firms outside ZES", generate four combination of forecasts.

The Do-nothing scenario for "firms inside ZES" was estimated over the period 2019–2028, starting from the base year 2018, assuming a constant rate of change in exports equal to the average of the rate of change in exports in Calabria registered in the years 2009–2017 (+2.0%).

The Do-nothing and ZES scenarios for "firms outside ZES" are identical and have been estimated over the period 2019–2028, starting from the base year 2018, assuming the same constant rate of change in exports as in the previous scenario (+2.0%).

The SEZ scenario for "firms inside ZES" was estimated over the period 2019–2028, starting from the base year 2018, assuming a growth rate equal to the average growth rate of exports observed in some international SEZs in the six years after their activation [27, 28].

Some brief considerations are reported below (see Table 1).

Export in the Do-nothing scenario for "firms inside ZES" increases from 230 M€ in 2017 to 273 M€ at the end of the years considered, while it increases from 209 M€ to 929 M€ in the SEZ scenario. In the Do-Nothing scenario export increases by 60 M€, assuming a growth rate equal to the one observed in the last 8 years. Export increases of four times in the hypothesis of a full activation of the SEZ in 2018, with its effects starting from 2019.

The export of industrial firms settled in Calabria (see 'Firms in Calabria' in Table 1) in the Do-nothing scenario increase from 418 M€ in 2017 to 496 M€ at the end of the reference decade, while it increases from 418 M€ to 1152 M€ in the SEZ scenario.

Table 1. Forecasted export for the four combinations of scenarios and classes of firms defined.

	Scenario	N. firms inside ZES	N. firms outside ZES	N. firms in Calabria
Export 2017 [M€]		230	189	418
Δ year [%]	Do-nothing	0,02	0,02	0,02
	ZES	v.c.(*)	0,02	v.c.(*)
Export 2024 [M€]	Do-nothing	273	223	496
	ZES	929	223	1152

(*)v.c., variable coefficient on year-base (see [27, 28]).

3.5 Employment

Employment in industrial firms located in SEZ areas remained constant around 10,000 units in the three-years 2015–2017 [39].

The employment scenarios Do-Nothing and ZES were estimated considering two classes of companies:

1. industrial firms currently settled in SEZ areas with foreign capital (partial or total), equal to about 12% of the total of firms;
2. industrial firms currently settled in SEZ areas with domestic capital, equal to approximately 88% of the total of firms.

Foreign-capital firms are Italian firms owned by other foreign-based investors, which invest to acquire control or in any case maintain lasting interests, which require some degree of involvement of the investor in the management of the activities.

In particular, the two scenarios (Do-Nothing and SEZ) and the two classes of firms (foreign and domestic capital) generate to four combination of forecasts.

The Do-Nothing scenario for foreign-capital firms was estimated over the decade 2019–2028, starting from the base year 2018, assuming a constant rate of change in employment equal to the average rate of change observed in years 2009–2015 (−1.2%) [39].

The SEZ scenario for foreign-capital firms was estimated for the decade 2019–2028, starting from the base year 2018, assuming a growth rate equal to the average growth rate of FDI observed in some international SEZs in the six years after their activation [27, 28].

The Do-nothing scenario for domestic-capital companies was estimated for the period 2019–2028, starting from the base year 2018, assuming a constant employment growth rate of +2.0%.

The SEZ scenario for domestic-capital companies was estimated for the decade 2019–2028, starting from the base year 2018, assuming a constant employment growth rate of +6.0%.

Some brief considerations are reported below (see Table 2).

Employment of foreign-capital firms settled in SEZ areas in the Do-nothing scenario decreases from 1,315 units in year 2017 to 1,225 units at the end of the decade under consideration, while it increases from 1,315 units to 4,095 units in the SEZ scenario. In the Do-nothing scenario it slightly decreases, if the rates observed in recent years remain unchanged; while it increases three times in the hypothesis of full activation of the SEZ at the end of the base year.

Table 2. Forecasted employment for the combinations of scenarios and classes of firms defined.

	Scenario	N. of foreign-capital firms	N. of domestic-capital firms	N. firms in Calabria
Employment 2017		1315	8798	10113
Δ year [%]	Do-nothing	−0,012	0,02	0,005
	ZES	v.c.(*)	v.c.(*)	v.c.(*)
Employment 2024	Do-nothing	1225	10106	11332
	ZES	4095	13256	17351

(*)v.c., variable coefficient on year-base (see [27, 28]).

Employment of domestic-capital firms settled inside ZES areas in the Do-Nothing scenario increases from 8,798 units in 2017 to 10,106 units at the end of the decade under consideration, while it increases from 8,798 units to 13,256 units in the SEZ scenario. In the SEZ scenario employment grows of about 3,000 units compared to the Do-Nothing scenario. In other words, domestic-capital firms also benefit from the introduction of the SEZ, albeit to lower extent.

The overall employment of firms established in SEZ areas of Calabria increases from 10,113 units in 2017 to 11,332 units in 2028 in the Do-Nothing scenario and to 17,351 units in the SEZ scenario. In the SEZ scenario, employment of industrial firms located in SEZ areas, grows of about 6,000 units compared to the Do-Nothing scenario.

4 Conclusions

SEZs have been widely adopted as a place-based program, in order to attract foreign capitals, boost exports and absorb advanced technology. The impact of SEZs on national and regional economies has been widely studied mainly with aggregated economic impact models.

The paper presented an analysis of the aggregate economic impact generated by the introduction of a Special Economic Zone (SEZ) in the Calabria region, Southern of Italy. The centre of the SEZ is the port of Gioia Tauro, which is one of the most important transhipment container ports in the Mediterranean Sea. The strategic development plan of SEZ, proposed by Regional Government of Calabria in 2018 [4, 5], aimed to the enhancement of the hinterland of the port of Gioia Tauro and of other areas inside Calabria region, by facilitating the settlement of industrial firms, operators, transport and

logistics companies. The SEZ should attract firms that actively participate to the process of generating added value, according to the paradigm of the sustainable development of ports [40, 41].

The aggregate economic impacts of the SEZ were quantified through two variables: exports and employment of industrial firms settled in Calabria. Two SEZ scenarios are defined: Do-Nothing scenario, in the absence of the SEZ; and SEZ scenario, assuming a full activation of the SEZ at the end of 2018.

The comparison of the two scenarios shows direct positive impacts in the SEZ case, both the in terms of export and employment, in the industrial sectors that benefit of the SEZ measure.

Future developments of this research regard two directions. Firstly, the criteria for the selection of international ZESs to be used as a reference for the estimation of impacts engendered by the introduction of the ZES in the Calabria region will be further clarified. Secondly, the disaggregated impacts of the SEZs on specific sectors of Calabrian economy, concerning general transport, mechanical and agro-food will be investigated.

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