SOCLIMPACT

Downscaling climate impacts and decarbonisation pathways in EU islands, and enhancing socioeconomic and non-market evaluation of Climate Change for Europe, for 2050 and beyond

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Work Package 6:

Modelling socio-economic impacts for EU islands and Blue Economy sectors, over the longer term 2030 - 2100

Deliverable 6.1. Updated Database of Islands: Methodological framework.

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	Coastal and Maritime Tourism
	Aquaculture
	Marine Energy
	Maritime transport

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Version	Date	Author	Notes
V1	24.05	Ulrike Lehr, Mark Meyer, Zoi Vrontisi, Ioannis Charalampidis	1st draft: including Malta, Cyprus, Baleares, Crete Xls appendix includes all islands.
V2	31.05	Ulrike Lehr, Mark Meyer, Zoi Vrontisi, Ioannis Charalampidis	Second version, including responses to reviewer comments and updated report. Xls appendix updated.
V3			
V4			
V5			

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1 INTRODUCTION

The European Commission fosters Blue Growth as a long term strategy to support sustainable growth in the marine and maritime sectors with a particular focus on five sectors: Blue Energy, Aquaculture, Coastal and Maritime Tourism, Blue Biotechnology, Sea Bed Mineral Resources.[1] The research project "SOCLIMPACT aims at modelling downscaled Climate Change (CC) effects and their socioeconomic impacts in European islands for 2030–2100, in the context of the EU Blue Economy sectors, and to assess corresponding decarbonization and adaptation pathways. The economic assessments of the SOCLIMPACT project consider the interrelationships between focal blue economy sectors and all remaining economic activities in selected Island regions." (http://soclimpact.org/the-project). The need to apply subnational analysis comes as consequence of spatial heterogeneity. While the aggregate effects give a sign to policy makers for the sign and the magnitude of the impacts country-wide, these effects are not evenly distributed between regions. There may be outliers in both tails (positive and negative) but policy makers should aim at alleviating extreme negative effects on regional economies.

These economic assessments in the SOCLIMPACT project will be parametrized in an integrated methodological framework which rests on two complementary modelling methodologies: the macro-econometric GINFORS model (see, for example, Distelkamp & Meyer 2019 for a recent reference) and the general equilibrium model GEM-E3 (for the model documentation please see Capros et al. 2013, for model's application see for example Vrontisi et al. 2019, Fragkos et al. 2017, Karkatsoulis et al. 2017, Capros et al. 2016). Both models feature global coverage. Originally developed to map mutual macroeconomic interdependences between countries, islands which are European Union (EU) Member States such as Cyprus and Malta already are components of either model but are nevertheless analyzed in this report as their respective databases have been updated, expanded and adjusted where necessary, so as to comply with the data requirements of the two macroeconomic models. For all other islands analyzed in this project, the data base for a thorough analysis of the economic effects of climate change on Blue growth sectors as well as adaptation needs to be specified.

Essential data work was needed in order to improve the geographical coverage of both models. Furthermore, given that the Blue Growth Strategy represents a rather novel European policy initiative, both models had not been originally developed to provide a focused representation of key Blue Growth sectors. Additional data work is therefore needed to refine the mapping of Blue Growth sectors in the respective island regions. This report documents the development of the economic islands' data sets and describes the methodology applicable to enhance these data works by inclusion of, for instance, tourist satellite accounts (TSA) to further improve the mapping of particular Blue Growth sectors. The data themselves are gathered in Excel files which attach to this report.

The next chapter contains an overview of the data needs and the data availability for the

[1] The Blue Growth Strategy was adopted by the Commission in 2012 (European Commission 2012). See European Commission (2017) for a recent report on the Blue Growth Strategy.

economic models. It details the data framework and identifies data sources. Economic data typically are available in certain classifications. While international or European standards for these classifications exist, regional statistics often deviate from these classifications due to several reasons. Chapter 2 sheds some light on this and introduces the classification shared in both economic models.

Data are on a regional level most of the times available, but often not very recent, scattered, and full of gaps. The development of a consistent up to date data set is the main task of deliverable 6.1. Chapter 3 details ow data gaps are closed and how data sets are projected to the year 2015 – the least definition of recent used in the economic modelling part of the project. Chapter 4 provides an overview of some central results, while the tables themselves are provided in an Excel based annex. The results are checked against global developments as well as developments on the mainland, if applicable (Malta and Cyprus do not have a mainland). Chapter 5 concludes.

2 DATA STRUCTURE AND AVAILABILITY

2.1 INTRODUCTORY REMARKS

The methodological framework of the SOCLIMPACT regarding the thematic focus of the project, key sectors and data availabilities for empirical assessment climate change effects in these key sectors are documented in deliverable 3.1 (Briche, Dubois et al. 2018) and 3.4 (Lehr, Meyer et al. 2018):.[2] The Blue Economy sectors analyzed more deeply in this projects have been determined in these earlier works as :

1) tourism,
2) aquaculture,
3) energy,
4) maritime transport.

As already recognized by deliverable 3.1, the SOCLIMPACT consortium integrates different science communities (e.g. biology, climate science and economics) which are working with very different data availabilities in their respective fields. Therefore, it should be understood that not all contributions from these different science disciplines can be gathered within a fully harmonized inter-disciplinary reporting system. In case of our socio-economic data work, we exceed state of the art empirical and statistical evidence towards a more focused coverage of the following sectors in integrated macroeconomic assessment studies.

1) tourism-related expenditure categories (accommodation and food services, services provided by travel agencies, tour operators etc., recreational services),
2) fishery and aquaculture activities,
3) the islands' energy sector, and
4) the maritime transport sector

Despite their different modeling philosophy, both economic models build upon Input- Output Tables and the System of National Accounts and Balances. These systems provide core information of the composition of an economy, the relations between economic sectors and the cost structures of production and services.

A brief introduction to IO-accounting schemes as commonly applied by EU Member States will be provided in the next subsection. For additional methodological introductions we refer our readers, inter alia, to the well-recognized publications of Leontief (1986), ten Raa (2006) or Miller and Blair (2009). These tables are not available for recent years and each island, however, data availability for additional economic data which help to reconstruct IO tables for islands is quite good at Eurostat's data bases on NUTS 2 level (see appendix A). The classifications have been aligned and the resulting regional coverage is almost comprehensive for all islands.

[2] These deliverables are publicly available on the project homepage at http://soclimpact.org/knowledge-library/deliverables/knowledge-library-doc-5.html

2.2 IO TABLES - ECONOMIC STRUCTURE DATA

Table 1: Basic structures of a symmetric IOT (product by product case, source: Eurostat 2008)

Products \ Products	Homogeneous units of production			Final uses			Total use
	Agricultural products	Industrial prodcts	Services	Final con-sumption	Gross capital formation	Exports	
Agricultural products Industrial products Services	Intermediate consumption by product and by homogeneous units of production			Final uses by product and by category			Total use by product
Value added	Value added by component and by homogeneous units of production						
Imports for similar products	Total imports by product						
Supply	Total supply by homogeneous units of production			Total final uses by category			

For macroeconomic assessments on Member States levels, both models rely on official statistical classifications of national statistical offices. Thus, both models have an excellent evidence base as their key underlying datasets meet the requirements for a consistent compilation of valid, objective and reliable national accounts data.[3]

In this regard, it is particularly important to note that respective statistical offices do also publish national IOTs on a regular basis. Table 1 shows a (highly simplified) systematic representation of such a table.[4] As shown in this figure, IOTs summarize, for a given economy and for a given reporting period, all monetary expenditure flows in a structured way. Whereas this figure represents a very broad classification scheme (differentiating between agricultural products, industrial products and services), it should be noted that the classification schemes actually applied by statistical offices under the harmonized European System of Accounts (ESA 2010) framework distinguish up to 88 product and goods categories.

The applied accounting structure can be basically divided into three quadrants: The first quadrant (denoted as "intermediate consumption by product and by homogenous units of production) maps industry-specific supply chains. Each column consolidates the monetary expenditures of individual sectors for their respective production inputs (which are arranged by-rows).

The second quadrant (top right area of the IOT), structures monetary expenditures for individual product groups by final demand categories. In this instructional example, the column labelled "Final consumption" aggregates consumption expenditures of private and public households. The column "Gross capital formation" provides information about investment expenditures for fixed assets. The demand for domestically produced products and goods from abroad is summarized in column "Exports".

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3 Respective data compilations feature a systematic and detailed mapping of macroeconomic developments. See, for example, ESA (2010) for a highly elaborated recent reference in this regard.

4 This illustration was taken from the "Eurostat Manual of Supply, Use and Input-Output Tables" (Eurostat 2008). While we refrain from further detailed comments on currently applied IO calculation procedures and related analyses, this source is recommended as an equally detailed and descriptive further reading in cases of any remaining detailed questions.

The third quadrant (bottom left of the IOT) reports about the total supply of goods and services (which can be subdivided into domestically produced gross output and imports) and value added (which can be understood as the basic income generated from the economic activities portrayed by the respective columns).[5]

Both models, GINFORS as well as GEM-E3, as mentioned above are essentially based on applications of such IO accounting frameworks. The availability of correspondingly structured IO information therefore proves as a central prerequisite for respective model-based mappings of economic regions. However, the concrete implementations of individual datasets vary between the respective models. In GINFORS, respective structural information have been traditionally parametrized by applications of so-called Supply and Use Tables (SUT).[6] But IO Tables can be represented as a linear transformation of the information content provided by Supply and Use Tables.[7] Hence, considering the fact that IOTs already provide a self-sufficient starting point not only for modelling studies but also for further stand-alone economic analyses and acknowledging the fact that additional efforts for the compilation of supplemental SUTs could hardly be justified in the given project context, the GINFORS modelers also decided to target their data work on the creation of updated IOTs. Respective regional model enhancement works focused on the largest Mediterranean islands and the Canary Islands region.

The basis for the calibration of a CGE model is the IOTs. Additional data sources, essential for the calibration of the CGE model, include: population and labor market statistics (employment, unemployment, labor force), investment matrices (matrices that decompose investments by sector into deliveries by branches). The latter are constructed at the country level; except for Malta and Cyprus, all investment matrices are inherited from the respective national ones (e.g. for Crete the investment matrix of Greece is used).

2.3 AVAILABILITY OF IOT FOR ISLAND REGIONS

Previous project phases aimed at identifying general (that is, not specifically economic) data sources for a quantification of (not model-related) impact chains. See Lehr, Meyer et al. (2018) in this regard. To establish the economic modeling framework outlined in the previous sections, we had to carry out a complementary, much more specific desk research. As illustrated by our previous remarks, this desk research had to provide a critical review of whether a complete and sufficiently detailed breakdown of macroeconomic expenditure flows could be achieved for the analyzed islands. While it was already assumed at the outset that these data were available for Cyprus and Malta (both islands represent EU Member States with respective statistical reporting obligations), this desk research revealed that appropriately harmonized

[5] For being more precise, gross value added figures can be sub-divided into various cost components (for the compensation of employees, the consumption of fixed capital and net taxes on production) and the net operating surplus of an industry.

[6] Overall, the IO framework of the European System of Accounts consists of three types of tables: Supply Tables, Use Tables and IO tables.

[7] See again Eurostat (2008) in this regard.

sectoral economic datasets were also available on a NUTS 2 level (which suffices to cover most focal islands of the project).[8] Overall, our desk research revealed that respective IOT data compilations are indeed available from official statistical authorities for the Azores, the Baleares, the Canary Islands, Cyprus, Madeira and Malta. For remaining island region, we have been able to consider reference datasets from other research activities.

The specific data availability, sources and gaps used for this analysis are described in detail in the respective result sections for each island. In summary, while IO tables and other essential data are available, challenges arise in terms of reporting years, sectoral disaggregation, methodological consistency and discrepancies across different statistical sources.

As summarized in more detail by Table 2, for Cyprus and Malta continuous time series information about respective datasets have been (inter alia) compiled by the WIOD project consortium for the 2000-2014 time period.[9] This feature is of outstanding relevance for the GINFORS modelers as the parametrizations of the reaction functions for the GINFORS model are generally based on econometric analyses of time series information.[10] Compared to this, the identified data availabilities at NUTS 2 level show a very heterogeneous finding. Reporting years, degrees of sectoral disaggregation as well as the handling of foreign trade data (to name only selected essential aspects) vary significantly between the Azores, the Baleares, the Canary Islands and Madeira.

For Malta and Cyprus, the primary source of data is the Eurostat database. The latter includes a dedicated section on Supply and Use tables and Symmetric Input-Output tables, in product by product or industry by industry, for all EU28 countries[11]. The latest available IOT for Malta is for the calendar year 2010, while for Cyprus is for 2015. For Malta, the construction of tailored-made IOT for SOCLIMPACT was not straightforward and required a number of assumptions and approximations based on extraneous sources as three major issues were identified, namely i) the matrix of intermediate uses is not balanced as there are missing entries due to confidentiality or non-availability of data, ii) data for the Water (sector E according to the NACE Rev.2 classification), Electricity (sector D according to the NACE Rev.2 classification), Land and Air transport services sectors (H49 and H51 respectively according to the NACE Rev.2 classification) are not available in Eurostat's IO, iii) discrepancies between the macroeconomic variables of the Input-Output data and those reported in the national accounts.

Another example of data challenges is that the available IOT of Crete does not match the sectorial disaggregation that is necessary for the SOCLIMPACT purposes. More specifically, the fishing industry and the maritime transport industry are not treated explicitly; instead, they

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8 As will also be mentioned in some more detail later in this text, the only exemption is given by the German island Fehmarn.

9 The WIOD project was funded by the European Commission as part of the 7th Framework Programme. See Timmer et al. (2016) for an overview of data sources and characteristics of the latest release. See also Timmer et al. (2015) for a demonstrative application of this database.

10 This modelling philosophy corresponds to the tradition of INFORUM-type models. See Almon (1991) as the basic reference to the fundamental features of INFORUM models.

11 https://ec.europa.eu/eurostat/web/esa-supply-use-input-tables/data/database

are part of the agricultural sector and of an aggregate service. Similarly, for Sardinia and Sicily the IOT are provided in Bosselo and Gabriele (2015), but the sectoral coverage is not in line with the SOCLIMPACT one; thus, some sectors have to be further disaggregated.

Table 2: Availability of IOT datasets for European island regions

Island	Data
Azores (original publication has been published in Portuguese)	**IOT 1986** ○ 14 sectors ○ IO Table **IOT2001:** ○ 25 sectors ○ IO table at basic prices ○ IO table at purchaser prices ○ Tax and subsidy matrix ○ Trade and transport margin matrix ○ Matrix of technical coefficients ○ Matrix of the Leontief-Inverses
Baleares (original publication has been published in Spanish)	**IOT 2004** ○ 62 product groups ○ IO-Tables for Balearic Islands (total), Mallorca, Menorca, Ibiza/Formentera at basic prices ○ Table of volumes and uses for the whole Balearic Islands ○ Matrix of technical coefficients (total, domestic, rest of Spain, rest of EU, rest of world) ○ Matrix of Leontief-Inverse (total, domestic rest of Spain, rest of EU, rest of world) ○ Since 2017, data has been collected for a new IO Table 2014;
Canaries Source:	**IOT 2002** ○ 61 WZ Divisions/Products ○ IO Table ○ Matrix of the Leontief-Inverses (complete and domestic) ○ Matrix of technical coefficients (total and domestic) ○ Foreign Trade by WZ Departments/Products ○ Employment by WZ Divisions/Products ○ apparent labour productivity by tool departments/products **IOT 2005** ○ 64 industries ○ IO table ○ Matrix of technical coefficients (total and domestic) ○ Matrix of Leontief inverts (total and domestic) ○ SUTs

Island	Data
Madeira Source:	**SUTs 2001** ○ extended USE table (53 WZ departments/products) ○ Matrix of technical coefficients (53 WZ departments/products) ○ Matrix of Leontief inverts (28 WZ departments/products)
Cyprus Source:	**IOTs 2000-2014 (WIOD)** ○ 56 product groups ○ IOTs ○ SUTs **IOTs 2010 (Eurostat)** ○ 65 product groups **IOTs 2011 (GTAP)** ○ 57 product groups
Malta	**IOTs 2000-2014 (WIOD)** ○ 56 product groups ○ IOTs ○ SUTs **IOTs 2010 (Eurostat)** ○ 65 product groups **IOTs 2011 (GTAP)** ○ 57 product groups
Crete	**IOT available from University of São Paulo** ○ 44 product groups
Sardinia	**IOT available from the COACCH project** ○ 57 product groups
Sicily	**IOT available from the COACCH project** ○ 57 product groups

Source: Own desk research

2.4 CLASSIFICATIONS AND COVERAGE

2.4.1 REGIONAL COVERAGE

Table 3 provides a self-contained overview of focal SOCLIMPACT regions for which our desk research identified sufficient data sources for the compilation of harmonized IOTs. Compared to the results of first (much less specific) data collections for the SOCLIMPACT project, this overview results in a rather impressive list: In large parts, the island fact sheets documented in the appendix of Lehr, Meyer et al. (2018) do refer exactly to the same list of island, i.e. all islands covered by SOCLIMPACT

The only exceptions are given by the German island Fehmarn, the Antilles and Corsica. For Fehmarn this can be directly attributed to the fact that this small Baltic island cannot even be identified on NUTS 3 levels.[12] In principle, IOTs can of course also be compiled for correspondingly small economic regions. However, since the involved complex compilation routines are usually very time-consuming, they are usually only applied to larger regions. Therefore, as the non-availability of economic structure data had to be expected in advance, we restricted our approach for the economic assessments of the SOCLIMPACT project to a consideration of (sufficiently large) NUTS 2 regions. The availability of (sufficiently detailed) economic datasets for Corsica has therefore been intensively checked by us. However, also after internal consultations with the project-specific Island Focal Point (IFP),[13] we were not able to identify a (publicly available) initial database which could provide harmonized structural economic data for Corsica with a sufficient level of sectoral details.[14]

[12] Fehmarn belongs to the NUTS 3 region DEF08 („Ostholstein").

[13] The conception of and individual responsibilities for IFPs can be looked up at Briche, Dubois et al. (2018).

[14] Please note that this does not imply that no attempts have yet been made to carry out such analyses for Corsica. We are well aware that for example Maupertuis & Vellutini (2009) already presented a SAM for the reporting year 2003 for Corsica. However, as their underlying IOT identifies only five sectors, this preparatory work could not be effectively applied by us within the scope of our project.

Table 3: Regional coverage of the updated IOT datasets compiled by the SOCLIMPACT consortium

No	Island Region
1	Azores
2	Baleares
3	Canary Islands
4	Crete
5	Madeira
6	Malta
7	Sardinia
8	Sicily

Own compilation

2.4.2 CLASSIFICATIONS

2.4.2.1 Harmonized sector structure

The only way to ensure that the results of future analyses can be compared across models and regions is given by a full harmonization of the respective source data sets in a way that allows their usage by both macroeconomic models. Hence, in order to facilitate a reasonable integration of the identified data sets into the respective models, further data transformations were initially necessary. This is not a trivial task, since not only the source data (see Table 2 in this regard), but also the two models differ in their respective data structures. The challenge was therefore to identify a data structure

1. that could be used in both model contexts,
2. which would take full account of the information content of the respective raw data,
3. and would be able to achieve a high degree of detail in the mapping of focal Blue Growth sectors but also of the main economic sectors of the islands.

After an initial screening and a joint discussion of the given data structures, the authors agreed on the 2nd General Assembly of the SOCLIMPACT project to rest all economic assessments on the classification pattern shown in Table 4. Compared to established classification schemes of European national statistical offices, this breakdown can be regarded as relatively highly aggregated. However, for the assessment studies of the SOCLIMPACT project, this classification appears remarkably efficient to us as it combines best available levels of detail for focal Blue Growth sectors with an appropriate aggregation of all other remaining economic sectors.

Table 4: Applied industry classification pattern for the SOCLIMPACT-IOTs

No	Industry	Code
1	Agriculture	AGR
2	Fishery and Aquaculture	FSH
3	Manufacturing	MNF
4	Consumer Goods	CNG
5	Electricity, gas, steam and air conditioning supply	ELE
6	Water collection, treatment and supply	WAT
7	Construction	CON
8	Water Transport	WTR
9	Other Transport	OTR
10	Accommodation and Food Services	ACC
11	Travel Agencies, Tour Operators etc.	TRA
12	Recreational Services	REC
13	Other Market Services	OSR
14	Non-Market Services	NMS

Own compilation

With reference to the results our original review of general island-specific data sources, we can state that this classification pattern facilitates the unequivocal model-based mapping for two (namely maritime transport and energy) of the four key sectors identified in Lehr, Meyer et al. (2018). On the other hand, the mapping of the remaining two key sectors (aquaculture and coastal and maritime tourism), can certainly be further improved by future research and development activities.

Our classification pattern covers relevant tourism related expenditure categories (like maritime transport but also all other remaining transport activities, accommodation and food services like hotels, restaurants or cafés, services provided by travel agencies, tour operators and other remaining recreational services) with sufficient levels of detail. And, although we cannot distinguish between individual tourism activities (like coastal or maritime tourism), this simplifying assumption is certainly acceptable for our further analyses. However, as further explained in section 3, methodologically it would be preferable to supplement this approach by the so-called Tourism Satellite Accounts (TSAs).

Considering the aquaculture sector, we have to note that all identified datasets did actually only report aggregated figures (which consolidate economic data for aquaculture activities

with, amongst others, traditional fishing activities). This is understandable as, also in most of the regions considered in our project, the overall economic relevance of aquaculture activities remained rather low until now.

This low level of detail of currently available macroeconomic statistical information does of course aggravate any economic assessments of the socio-economic effects of the Blue Growth Strategy. However, Task 6.1 was not budgeted to create an ideal modelling framework for all sectors.[15] We therefore have to rely on this aggregated, not ideal but best available, fishery and aquaculture data in our model-based assessments for the SOCLIMPACT project.

The remaining sectors probably do not require further detailed explanation. Compared to official classifications, the SOCLIMPACT sector Agriculture represents the groups "crop and animal production, hunting and related service activities" as well as "forestry and logging activities" from the European NACE classification. SOCLIMPACT sectors consumer goods and manufacturing subdivide activities from NACE section C (manufacturing) into manufacturing activities for consumer products (like "food and beverages", "textiles", "wearing apparels" and "leather products") and remaining industrial manufacturing activities. Together with "mining and quarrying activities", these remaining industrial manufacturing activities represent the SOCLIMPACT-sector Manufacturing. The sector Recreational Services consolidates large parts of NACE section "arts, entertainment and recreation" with other recreational activities (like, for example, the renting of recreational and sports goods). SOCLIMPACT-sector Other Market Services aggregates a wide variety of service activities from NACE sections G to N for which we assume that they do not necessarily have to be modelled separately in the given project context (like "wholesale and retail trade", "information and communication", "financial and insurance activities" and other service activities). The sector Non-Market Services is consistent with the similar sector in common GTAP databases and summarizes all governmental activities.

So far, this introduction to our preferred methodological framework for socio-economic impact analyses in the SOCLIMPACT considered the applied classification patterns for the mapping of inter-industry intermediate consumption expenditures (represented by the upper left part of Table 1). But the Task 6.1 data work documented in this deliverable was of course intended to generate a harmonized representation of the entire information content of available regional Input Output source data. We therefore complete this section with a brief overview of the chosen aggregation levels for the mapping of final demand, gross value-added components and imports.

[15] Such an approach would certainly quickly emerge into a separate project as, in case of this sector, individual cost structures and demand patterns would have to be identified for fishery as well as aquaculture activities in all focal islands regions.

2.4.2.2 Applied mapping of final use components

Table 5: Applied final use classification pattern for the SOCLIMPACT-IOTs

No	Final use categories
1	Final consumption of private households and NPISH
2	Government final consumption expenditures
3	Gross capital formation
4	Exports

Own compilation

Table 5 designates our applied classification pattern for final use categories. Overall, this classification distinguishes between four final use categories: Consumption expenditures of Private Households and Non-Profit Institutions Serving Households (NPISH), Government, Gross capital formation and Exports.

The consolidated view on Households' and NPISH expenditures reflects established model structures. Both models apply identical aggregation routines in this regard. In terms of content, this is well justified, as NPISH are by definition to be regarded as institutional units with close correspondence to private households but with relatively low individual macroeconomic significance.[16] Government final consumption expenditures represent an integral part of all IO accounting frameworks and do therefore not require any further explanations.

Gross capital formation essentially refers to the domestic demand for investment activities. In official statistical publications, this item is usually further subdivided into gross fixed capital formation, changes in inventories and acquisitions less disposals of valuables.[17] However, it is generally acknowledged that these individual subcategories happen to be very volatile over time. Furthermore, as negative values may occur for individual subcategories, we have made the experience that an application of our updating procedure (outlined in section 3) was often complicated by numerical instabilities caused thereby. Therefore, after an initial examination of options for a more detailed implementation of gross capital formation in the subcategories,

[16] See, for example, the following citation from the Eurostat glossary in this regard: "Non-profit institutions serving households, abbreviated as NPISH, make up an institutional sector in the context of national accounts consisting of non-profit institutions which are not mainly financed and controlled by government and which provide goods or services to households for free or at prices that are not economically significant. Examples include churches and religious societies, sports and other clubs, trade unions and political parties." (https://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Non-profit_institutions_serving_households_(NPISH)).

[17] References to more detailed methodological annotations on these statistical terms are also provided by the Eurostat glossary under https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Gross_capital_formation.

we finally decided not to report about these individual subcategories. However, typically this does not limit the analysis, since the additional stability only makes the simulation results easier to interpret.

Exports also represent an integral subcategory of all applied IO accounting frameworks. In this regard it must be noted that, for sub-national regional entities (like most of the islands considered by the SOCLIMPACT project), the estimation of respective regional trade volumes poses a major challenge. This is caused by the fact that a consistent regional accounting framework has to account also all goods and services delivered from the region in question (for example Madeira) to the homeland (Portugal in case of Madeira) as exports. Accordingly, all goods and services delivered from the homeland to the analyzed region have to be accounted for as exports. Currently established regional economic accounting frameworks, however, are usually not intended to report about respective trade flows. They are rather intended to support national statistical reports. As such, they should provide insights into transnational trade volumes. Consequently, common regional accounts do usually provide information on trade volumes of the region in question with other (non-homeland) countries. From a national perspective, this information is relevant as they provide insights into individual regional contributions to international trade flows (the sum of all corresponding regional figures sums up to total national import and export volumes). However, they are of limited use for the calculation of regional IOTs as they do not cover substantial parts of the trade volumes which have to be recorded in this accounting framework. As outlined in more detail in section 3, we therefore had to assume that, for NUTS-2 regions, the foreign trade dynamics followed identical development dynamics as those observed for the respective homelands.

2.4.2.3 Applied mapping of gross value-added components and imports

Table 6 designates our applied classification pattern for primary input categories. For a given domestic industry, gross output denotes the monetary value of all goods and services which have been supplied by this industry. The monetary value of the total amount of respective goods and services available within the analyzed island (total supply) then equals the sum of gross output from this industry and imports of similar products and services.

Gross value added is defined as the difference between the sum of all intermediate inputs (valuated at purchasers' prices) and gross output (valuated at producer prices).[18] The tables compiled by us subdivide gross valued added into the compensation of employees (which represents labor costs, defined as the sum of overall wages and salaries and social security contributions) and gross operating surplus (which, by definition, equals the difference between gross value added and the compensation of employees). As the economy-wide sum of gross value added and net taxes (the aggregated sum of total taxes less subsidies) on products equals Gross Domestic Product (GDP), we do also report about net taxes per industry.

[18] We refrain at this point from a formal discussion of the respective price concepts. To put it in a generally understandable way, it can be said that basic prices represent cost structures from a producer's perspective whereas purchasers' prices quantify amounts paid by purchasers. Detailed comments on the respective price concepts and their methodological implementation in IO accounting frameworks can again be found in Eurostat (2008).

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Table 6: Applied classification pattern for primary inputs in the SOCLIMPACT-IOTs

No	Primary input categories
1	Compensation of employees
2	Gross operating surplus
3	Taxes less subsidies
4	Gross output
5	Imports

Own compilation

The structure of the final IO reproduced by the methodology outlined in chapter 3, hence will be as depicted in Figure 1

Figure 1

in mn.€	AGR	FSH	MNF	CNG	ELE	WAT	CON	WTR	OTR	ACC	TRA	REC	OSR	NMS	Household fc	Government fc	Investments	Exports
AGR																		
FSH																		
MNF																		
CNG																		
ELE																		
WAT																		
CON																		
WTR																		
OTR																		
ACC																		
TRA																		
REC																		
OSR																		
NMS																		
Compensation of employees																		
Operating surplus																		
Taxes less subsidies																		
Imports																		

Own compilation

3 METHODOLOGY

3.1 OVERVIEW AND GENERAL APPROACH

The previous section documented the available datasets for structural economic analyses of SOCLIMPACT-islands identified by us together with the classification pattern which we derived against this data background. This section describes how the original source data were transferred into these structures and updated. We start with a general overview of our approach. This general overview is then supplemented by a precise overview of the assumptions applied in order to overcome data gaps. Subsequently, these annotations will be further exemplified by references to selected applications.

3.1.1 CONVERSION OF RAW DATA

The conversion of existing raw data into our proposed classification structure generally proved to be a straightforward work step. All identified IO datasets shown in Table 2 rested on official, internationally harmonized European (CPA/NACE) classifications. In the case of the Canary Islands, for example, the data reported in the IOT for the base year 2005 only had to be adequately aggregated.

In the remaining cases, structured IO information was not directly accessible for all of the sectors covered by our preferred SOCLIMPACT classification scheme. However, these data structures could usually be individually inferred from additionally available Supply and Use Tables.

3.1.2 PROCEDURE FOR THE UPDATING OF HISTORICAL DATASETS

3.1.2.1 Intermediate consumption

Since the reporting years of the original source data were sometimes well in the past, we have worked intensively to update all historical data as far as possible into the present. Lacking the resources to apply comprehensive survey techniques, our chosen approach has been based on the application of bi-proportional updating techniques.[19] Such techniques enable IO-practitioners to estimate non-observable developments of individual matrix elements on the basis of given marginal sums. So-called RAS procedures probably represent the most prominent approaches in this respect. With regard to their development, reference is usually made to Stone (1961, 1962). An elaborated methodological introduction to this procedure can be found, for example, in Miller & Blair (2009). Our procedure for updating the historical available IO datasets also applies the RAS-method for the task of updating the individual elements of the intermediate consumption matrix. The following subsections outline our approach for the estimation of respective marginal sums

[19] Biproportional techniques is a generic term for a multitude of different technical procedures that have been developed in the past in Input-Output Analysis for the updating of historical IOTS and SAMs. See, for example, Lahr & de Mesnard (2004) for a prominent survey in this regard.

3.1.2.2 Primary inputs

Starting with reporting year 2000, full time series information about the compensation of employees is available for NUTS-2 regions from Eurostat's Structural Business Statistics (SBS) nama_10r_2coe database. These figures report on (rather high) statistical aggregation levels. However, they can be merged with more detailed information about industrial wages and salaries, which are available for NUTS 2 regions from 2008 onwards from the sbs_r_nuts06_r2 database. As this database does not report about agriculture and fishing activities, the aggregated SBS information about total compensation of employees for agriculture, forestry and fishing activities had to be subdivided by an application of respective national shares. These weights have been derived from national IOTs of the WIOD database.

For NUTS 3 regions, complete information about gross value added is also provided by Eurostat [nama_10r_3gva]. But this information is again only available at high aggregation levels. To achieve a sufficient break down of these aggregated gross value added figures to sectoral details, we assume a stable relationship between sectoral gross value added and (previously calculated) sectoral compensation of employees.

Regional sectoral gross output at basic prices is calculated by the assumption that labor input coefficients of a given product are identical in the region and the entire country. Eurostat information about regional sectoral employment allows then to calculate regional sectoral gross output. The basic reference for our estimates of employment figures is given by Eurostat's nama_10r_3empers database. This database reports about total employment for Nuts 3 regions and provides also a broader breakdown of these figures to NACE sections. For a more accurate mapping of relevant individual industry and service sectors, these data were further disaggregated by information available from Eurostat's SBS database sbs_r_nuts06_r2. Aggregated information about total employment from agriculture, forestry and fishing activities has been subdivided under the assumption that respective employment shares which can be observed from national IOTs do also apply for the selected island regions.

Total intermediate consumption at purchaser's prices is then given as the difference between sectoral gross output at basic prices and gross value added. With given (net-)tax shares, these values can then be straightforwardly converted to total intermediate consumption at basic prices (which represents the marginal column sums of the intermediate consumption matrix). In absence of any further statistical information about sectoral (net-)tax shares, our calculations do initially assume constant tax shares over time. However, if further information about the evolution of net-taxes (or, with already pre-determined gross value-added figures corresponding GDP values) were available from regional statistical offices, these tax shares were adjusted in an iterative procedure in order to ensure that the sum of gross value added of all industries plus net-taxes equals regional GDP.

3.1.2.3 Total supply

The sum of gross output and imports of the same kind of goods or services equals total regional supply. As data on regional exports and imports are not available from Eurostat, respective import figures have to be derived from national statistical information. We assume that, for a given product group, the respective regional import share exhibits identical growth patterns

compared to the country level. We refer to the WIOD database for the computation of respective national import shares. If the initial data set distinguishes between imported inputs and imported final demand, we also retain a corresponding distinction.

3.1.2.4 Final demand

The marginal row sums of the intermediate consumption matrix equal the difference between final demand per product group from corresponding total supply values. As regional data for sectoral final demand is also only partially available, our update of regional final demand figures again has to be derived from national observations. In this regard, we assume that total regional final demand per product group exhibits identical growth dynamics compared to the mother country. The shares of private consumption expenditure are then further scaled using available COICOP information.

3.1.2.5 Further adjustments

As the individual approaches followed for updating the row and column totals of the intermediate consumption matrix will usually not result in identical total sums, an adjustment rule has to be established in order to harmonize these estimates. As indicated by the previous remarks, our extrapolation of marginal column sums relies on more detailed regional information compared to the extrapolation of marginal row sums. Therefore, before applying the RAS-procedure, the row sums calculated as described above are scaled to the corresponding column sums.

3.2 TREATMENT OF DATA GAPS

In general, data at NUTS 2 level are sufficient to cover the European islands statistically. But for the indicators wages and salaries, employment and number of firms (sbs_r_nuts03 and sbs_r_nuts06_r2), some data gaps for certain years and sectors occur regularly. Here, we provide an illustrative overview on respective challenges by using Malta as an example.[20]

As mentioned above, a combination of economic statistics provided by Eurostat on the NUTS-2 level together with national statistical time series information provides a suitable starting point for our analyses. But this should in no way be perceived in terms of a sufficient coverage of all economic activities at regional levels for all remaining sectors. On the contrary, our experience has shown that, even though comprehensive regional economic accounting frameworks have already been established for many European regions,[21] these statistics are usually intended to provide assistance for regular national reporting requirements. This issue can be best

[20] Further additional regional details are of course available upon request by the authors.

[21] To name just one example in this regard, we can refer to the Spanish Regional Accounts which provide many time series information for economic activities in individual Spanish regions. However, even if these rather comprehensive datasets are supplemented by information provided by individual regional statistical institutions like Instituto Canario de Estadística (ISTAC) or Institut d'Estadística de les Illes Balears (IBESTAT), the fundamental data gaps mentioned above cannot be directly overcome.

illustrated with references to the task of estimating regional trade volumes.

For Malta, data gaps were treated by complementing Eurostat's IO data with information drawn from the GTAP v9 database. The latter includes all the necessary information for the construction of national IOTs: value added, taxes, imports, transport margins from the supply side and final demand by category from the consumption side. However, the GTAP database was deliberately not chosen as the primary data source due to its sectoral detail. The sectoral aggregation in SOCLIMPACT doesn't match well with that of the GTAP; this eventually requires to disaggregate the GTAP database. This is a data intensive process which, given the lack of available statistics, implies the application of a greater number of assumptions and approximations than following the opposite methodology (i.e. to use the GTAP to fill the missing entries of the Eurostat's IOT). In summary, our methodology makes use of the following information extracted from the GTAP data:

- The production and the supply structure for the Water and Electricity sectors
- The final demand structure for the Water and Electricity sectors
- The relative size of the Water and Electricity sectors in the Maltese economy
- The structure of intermediate demand and supply for the Manufacturing sector, the Land transport services and Air transport services.

These data allowed us to: i) to introduce the Water and Electricity sectors to the Eurostat's IO structure, ii) to balance the matrix of intermediate uses by allocating the excessive demand/supply to the missing manufacturing and transport industries. Finally, the value added, imports and taxes entries were modified according to data from Eurostat's national and production accounts (the final matrix was balanced using a RAS method). This allowed us the consistent calculation of GDP and trade surplus for the reference year. The final table was projected to the year 2015 by using data for the aggregate categories from Eurostat's national accounts and balancing the matrix of intermediate used by applying the RAS technique.

For Crete, the Input-Output table was constructed by combining the following data sources: i) an initial IOT provided by Haddad et al. (2018) for the year 2013 and ii) the Hellenic statistical authority (ELSTAT)[22]. The former publication includes IOT consisting of forty-four (44) sectors according to the NACE Rev.2 classification for the NUTS2 regions of Greece. The process of constructing an IOT for the island of Crete at the SOCLIMPACT aggregation level revealed the following problem: the fishing industry and the maritime transport industry are not treated explicitly in the initial set of data; instead, they are part of the agricultural sector and of an aggregate sector consisting of wholesale and retail trade, transportation and storage services. To disaggregate these sectors in the initial matrix we have used data from the Structural Business Statistics compiled by ELSTAT; the statistics includes information for the level of output and the number of employees for two-digit NACE Rev.2 at the NUTS2 level. The output statistics were used to approximate the production level of the fishing and maritime sector with respect to their aggregate categories, while the number of employees was used to approximate the value added attributed to labor. The production and the demand structure of these sectors are

[22] http://www.statistics.gr/en/home/

inherited from the initial aggregate categories. Finally, the produced table was projected to year 2015 by using the GDP and value-added growth factors as calculated for the ELSTAT regional accounts. The balancing of the intermediate use table in 2015 was performed by applying the RAS technique.

3.3 A SPECIAL CASE – TOURISM AND TSA

Although it cannot be the aim of the Soclimpact project to provide satellite accounts for each island, the University of Bologna has vast experience in the analysis of these accounts. The following description of data availability relies heavily on the inputs from Anastasia Arabadzhyan and Paolo Figini (UNIBO). Tourism is a relevant sector on each of the islands analysed and among the Blue Economy sectors. Changes in tourists' demand for goods and services due to climate change can create severe distortions in the respective economies. A better understanding of the demands for goods and services from tourism is therefore highly beneficial for the economic simulations.

Table 7: List of products reported in TSA

Eurostat classification	UNWTO classification
A. Specific products	A. Consumption products
A.1 Characteristic products	A.1 Characteristic products
1. Accommodation services	1. Accommodation services
1.1 Hotels and similar	1.1 Hotels and similar
1.2 Second homes - own account or free	1.2 Second homes - own account or free
2. Food and Beverage serving	2. Food and Beverage serving
3. Passenger transports	
3.1 Interurban railway transport	3 Interurban railway transport
3.2 Long distance road transport	4 Long distance road transport
3.3 Water transport	5 Water transport
3.4 Air transport	6 Air transport
3.5 Transport supporting services	
3.6 Transport equipment rental services	7 Transport equipment rental services
3.7 Maintenance and repair of transportation equipment	
4. Travel agencies and other reservation	8. Travel agencies and other reservation services

Eurostat classification	UNWTO classification
services	
5. Cultural services	9. Cultural services
6. Recreation and other entertainment services	10. Recreation and other entertainment services
7. Miscellaneous / Other tourism services	11. Country specific characteristic goods
	12. Country specific characteristic services
A.2 Connected products	A.2 Other consumption products
B. Non-specific products	B. Non-consumption products
	B.1 Valuables
	B.2 Other non-consumption products

Source: Arabadzhyan and Figini (2019) from Eurostat (2014) and UNWTO (2010).

Tourism Satellite Accounts (TSA) have data on inbound tourism expenditure, domestic expenditure and other tourism consumption (mainly including the imputed value of services provided by second homes to owners and the value of services provided by the public administration, plus domestic business tourism) (Table 7):

Experts on TSA warn that the production of TSA is not in the legal framework of Eurostat and thus results can differ across countries by means of sectoral specification, disaggregation or the avoidance of double counting. Moreover, the Group A.2 "Connected / Other consumption products" is related to general shopping (also including, for example, fuel for motor vehicles). This group roughly accounts for 25-40% of total expenditure, hence it is quite relevant, but it is not directly related to any economic sector.

Ideally, regional TSA should be available and linked to regional I-O tables. Unfortunately, regional TSA are not computed on a regular basis, hence information has to be extracted from national TSA (when available) and local tourism departments. When national TSA are not available, other assumptions have to be made. To complement TSA data, islands should provide annual arrivals and overnight stays (with a monthly disaggregation, if possible) distinguishing between inbound and domestic tourism Data on overnight stays are key to the analysis because they are the most closely related to tourism expenditure. It shows that islands can be grouped according to data availability and possibility of estimation.

Table 8

Group	Islands	Data availability
A	Malta	TSA are available at the island level
B	Azores and Madeira (Portugal); Balearic Islands and Canary Islands (Spain); Sardinia and Sicily (Italy)	TSA are available at the national level
C	Baltic Islands (Germany), Corse and West Indies (France)	TSA are not directly available (but could be inquired from NSOs)
D	Crete (Greece), Cyprus	TSA are not available

Source: Arabadzhyan and Figini (2019)

Most likely, estimation is impossible for Group D (although Arabadzhyan and Figini (2019) propose a back-of-the-envelope procedure also for this group), while no elaboration is needed for Group A.

As regards Group C, TSA the data are not available online, but TSA reports are produced. Hence, a direct contact with the statistics office could provide TSA.The main issue to tackle is how to "extract" regional TSA from national TSA for islands belonging to groups B and C. We propose the following procedure:

A. There are sectors where all (or almost all) the supply is due to tourism. In this case, the regional output, extracted from regional (island-level) I-O can be fully attributed to the tourism sector, hence being equal to tourism consumption. This is possible for Sector 1.1 (Accommodation in hotels or similar structures) and Sector 4 (Travel Agencies and Reservation Services).

B. For other sectors, where production is shared between tourists and residents, we propose two alternative procedures: procedure under 1) below estimates the absolute value of tourism consumption, and consequently compute the tourism ratio by dividing total output (provided by the regional I-O) with the tourism consumption estimation at the island level. Procedure under 2) below computes the regional tourism ratio by adjusting the national tourism ratio according to the different "density" of tourists and hence computing tourism consumption by multiplying the "adjusted ratio" times total output (provided by the regional I-O).

1. Imputation based on national average tourism expenditure

    a. From national TSA compute per-day expenditure of tourists for each product by dividing tourism consumption with the number of overnight stays.

    b. Multiply the value computed in a. by the number of overnight stays in the island, to obtain tourism consumption for the island and the category in question.

    c. Compute the tourism ratio by dividing the above estimated tourism consumption

by total output of the product (obtained from the island-level I-O).

d. Perform a validity check: from national I-O compute per-day expenditure of residents for each product, and multiply by the number of resident populations in the island. Sum up the resulting value with the one obtained in b. The sum should roughly be equal to regional output, although differences in prices might play an important role. If price corrections have to be made, we suggest to use Numbeo.com, which provides country and city level price data for some basic everyday-life categories.

e. In case the validity check in d. provides unsatisfactory results, adopt the approach described below in II.

2. Imputation based on national level tourism share correction

As in islands (important tourism destinations) arrivals and overnight stays per resident are different (likely to be higher or lower according to the degree of seasonality) than at the national level, this procedure implies correcting the share of tourism consumption according to the different ratio of overnights to local population:

a. Calculate the value of the saturation index on both national and island level.
b. Correct the national level tourism ratio, multiplying by the ratio of saturation indices obtained in a.
c. Calculate tourism consumption for the island, multiplying the tourism ratio, obtained in b., by the total output of the product (obtained from the island-level I-O).

Independently from whether the first procedure provides satisfactory results, the application of 2) should be used as a robustness check.

Finally, Arabadzhyan and Figini (2019) propose an algorithm to impute TSA for islands of Group D. Our approach is largely driven by types of data available for these islands, and hinges upon an assumption of a functional relationship between the structure of these islands' TSA and those of other islands, for which TSA are readily available or would be imputed from national-level TSA.

I. For each of the islands where TSA are available or had been imputed, normalize the values of tourism ratios by the island saturation index.

II. Calculate weights for each of these islands, based on economic (e.g. differences in GDP per capita) and, if reasonable, geographic distance from the island in question (Crete / Cyprus).

III. Using these weights, calculate the weighted value of normalized tourism ratio.

IV. Adjust the obtained values, multiplying by the saturation index of the island in question.

V. Calculate tourism consumption for the island, multiplying the tourism ratio, obtained in III., by the total output of the product (exported from the island-level I-O).

4 RESULTS

The IO tables in the sectoral classification as described above can be found in the Appendix (Excel map: D6.1_20190531_Appendix_V1.xlss). Below, the IOT are reported as estimated from the explicit update using structural data and input from the literature or national/regional/European statistical sources. It is noted that for the Azores the IOT thus far only has been updated using GDP growth rates. As such, this preliminary table should rather be understood as an illustrative example of the information content that will later be available in the model simulations.[23] For Madeira, Supply and Use Table information are available. These tables will be converted to industry by industry („Model D") IOTs and updated in the near future.

4.1 BALEARIC ISLANDS

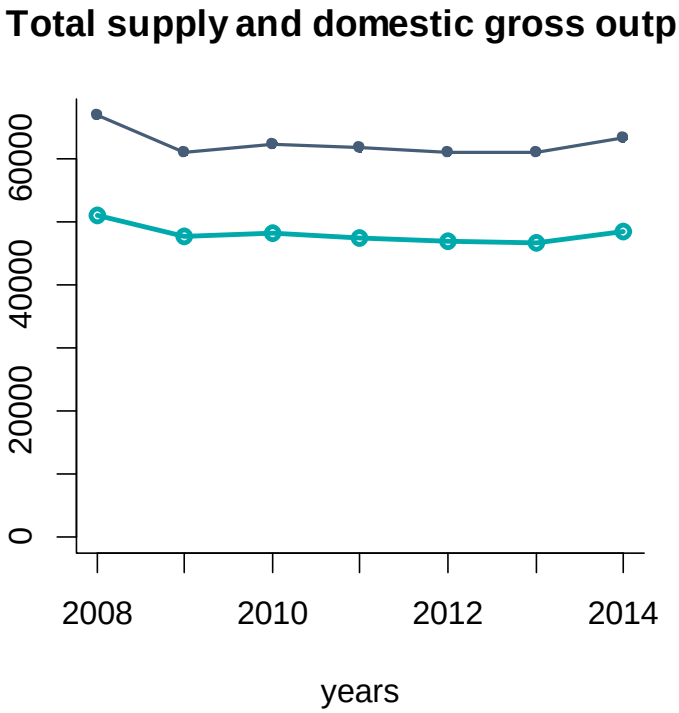
4.1.1 MACROECONOMIC AGGREGATES

As shown in Figure 2, our calculations result in very stable developments for aggregated domestic gross output (green line in Figure 2) and total supply (dark line) of goods and services to the Baleares region since the year 2008. For both time series, the observed stagnating trend patterns reflect the sluggish development of final demand in Spain in the wake of the global financial crisis. However, compared to the initial reference year gross output and total supply rise considerably. According to the official IOT, aggregated total supply equalled approximately 47 billion € in 2004. According to our calculations, this figure rose by more than a third by 2014. This development cannot be identified from the emerging trend patterns of Figure 2, as complete time series information for an application of our updating algorithm are only available from the year 2008.

It is also interesting to note that both time series, gross output as well as total supply, exhibit almost identical growth dynamics over time. Ranging slightly above three quarters, the share of aggregated gross output in aggregated total supply therefore remained almost unchanged since 2004.

[23] At the time of finalization of this text, the data work for updating the historical Azores table had not yet been completed. But this will not have any effects on the further course of the project. Following our methodological approach outlined in this deliverable, outstanding calculation steps can be completed in parallel to the further WP6 activities.

Figure 2: Estimated time series for aggregated total regional supply and domestic output



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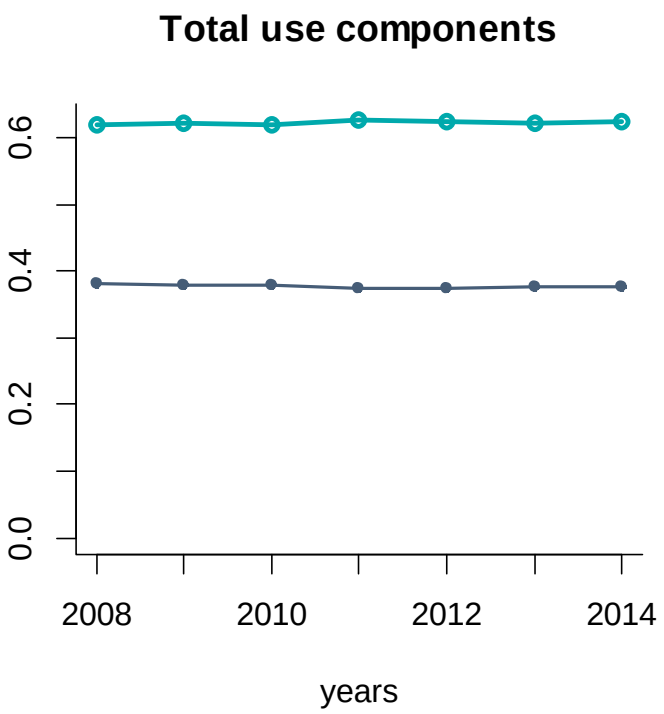
Economy-wide, total use equals total supply. The previously described development dynamics for total aggregated supply hence apply analogously to total aggregated use. Figure 3 illustrates the resulting breakdown of aggregated total use into aggregated final demand and aggregated intermediate use. As can be seen, our calculations result in a very stable development of respective shares with aggregated final demand (the green line in Figure 3) representing continuously more than 60% of aggregated total use of products and services in the Baleares. This corresponds to respective figures from the initial year 2004 IOT.

Figure 3: Aggregated total regional use, shares of intermediate and final demand



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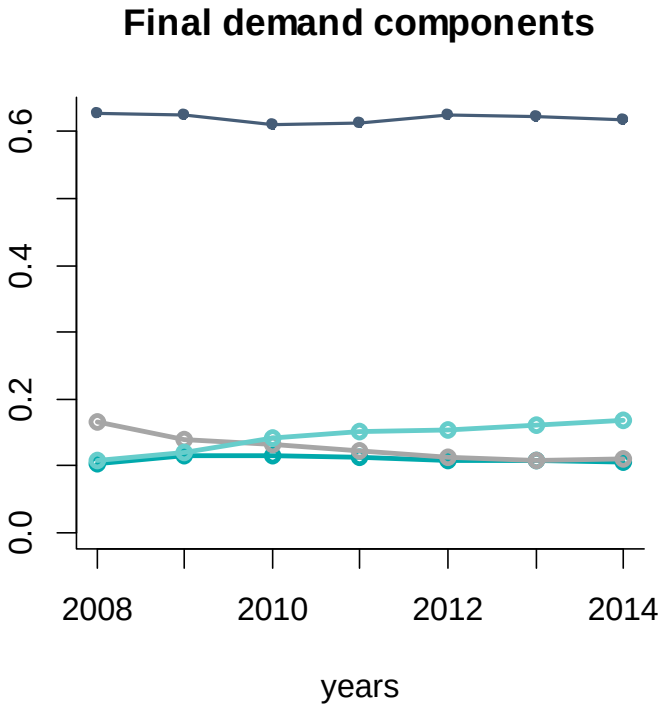
A breakdown of final demand into private households' and NPISH final consumption expenditures (dark line), government final consumption expenditures (green line), investments (light grey line) and exports (light green line) is illustrated in Figure 4. From this figure it can be inferred that the aggregated final consumption expenditures of private households' and NPISHs represented the dominant share of final demand throughout the estimation period. Their share in total final demand remains steadily above 60%. Government final consumption expenditures also exhibit stable contributions to aggregated total final demand. However, with a long-term share of around 10 per cent, this category represents relatively small proportions of total final demand. Nevertheless, at the end of our estimation period, this share more or less equals the respective shares of aggregated investment expenditures, which, in 2004, still contributed slightly more than 16% to total final demand. This decline in the share of investment expenditures is accompanied by an increase in respective export shares (which, according to our calculations, contributed slightly less than 17% to total final demand in 2014).

Figure 4: Total final demand, shares private consumption, government consumption, investments and exports



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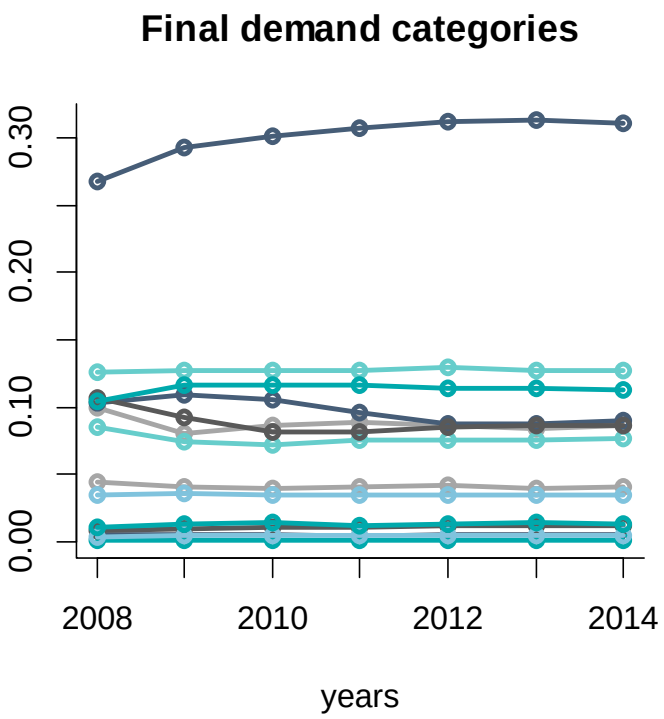
4.1.2 SECTORAL DETAILS

Our estimates for the sectoral breakdown of total final demand are illustrated in Figure 5. The largest block of expenditures results from total final demand for other market services. The respective share slightly increases over time to more than 31% of all year 2014 final demand expenditures. The next two main categories of expenditure, accommodation and food service activities and non-market services, account for significantly lower shares.

Over time, these categories can be observed to exhibit relatively constant percentage shares slightly above 10%. The final demand expenditures shares for products from manufacturing activities, construction activities and services provided by travel agencies, tour operators and related activities are slightly decreasing over time. In 2014, the corresponding shares are approximately nine percent each. Consumer goods account for less than eight percent of total final demand expenditures in 2014. The smallest final demand expenditure shares can be observed for products and services from the sectors agriculture, fishery and water. Their respective values all remain below one percent.

Figure 5: Sectoral breakdown of total final demand



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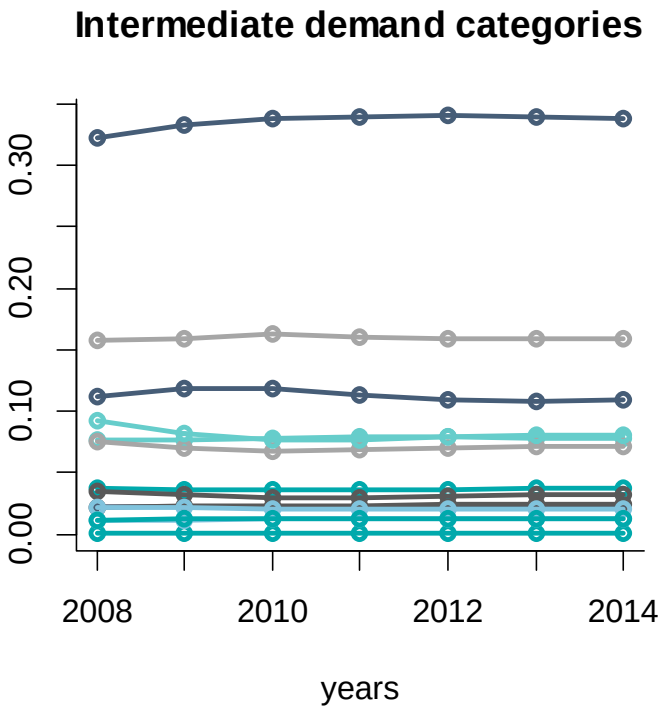
Our estimates for the sectoral breakdown of total intermediate demand are illustrated in Figure 6. Again, the largest block of expenditures refers to intermediate demand for other market services. The respective shares slightly increase over time to almost 34% of total year 2014 intermediate demand. Manufacturing and construction represent the next two main intermediate demand categories. Their respective shares remain virtually unchanged throughout the reporting period (approximate long-term average: manufacturing 16%, construction 11%). For consumer goods, other transport activities and accommodation and food service activities, respective intermediate demand expenditures share also experience constant developments over time. In 2014, shares of seven to eight percent can be observed for each of these intermediate demand categories. The smallest intermediate demand shares can be observed for products and services from the fisher sector, water and non-market services. Their respective values all remain below two percent throughout the reporting period.

Figure 6: Sectoral breakdown of total intermediate demand



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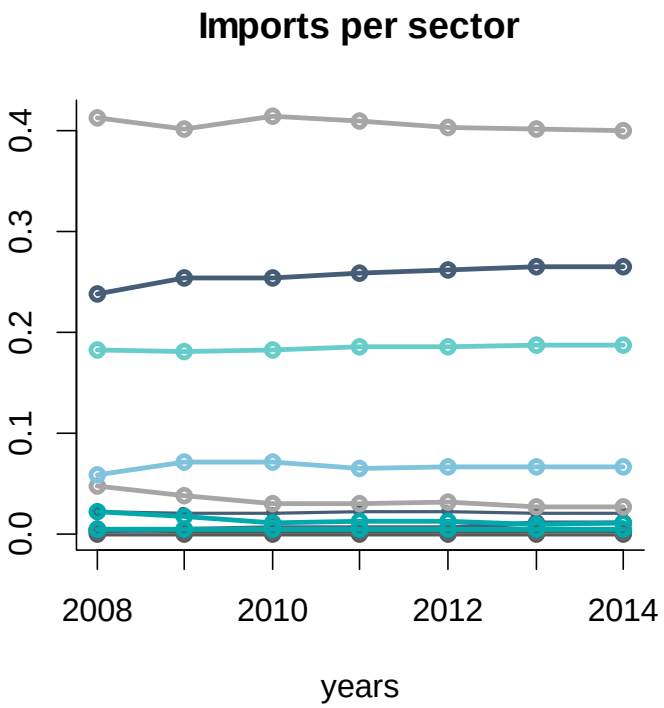
A sectoral breakdown of total imports is shown in Figure 7. A predominant share of all imports refers to the demand for manufacturing products. Throughout the reporting period, expenditures for imported manufacturing products represent more than 40% of all imported products and services. The demand for other market services also contributes significantly to total import developments. Respective import shares slightly rise from almost 24% in 2008 to more than 26% in 2014. The import shares of consumer goods remain more or less constant between 18% and 19% in the observation period. Also, for recreational services, no long-term trend development can be identified. In 2014, the respective import shares amount to less than 7%. For all other product and service categories, the individual import shares all remain below three percent.

Figure 7: Sectoral breakdown of total imports



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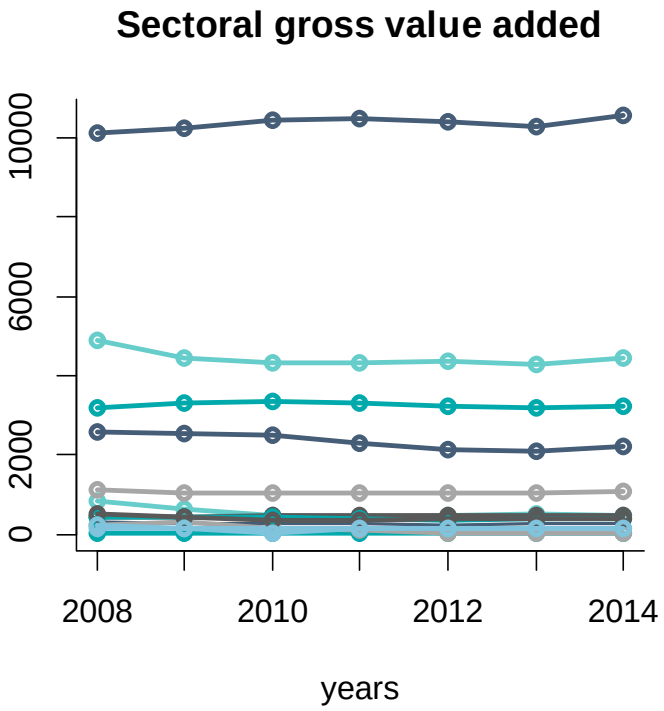
Finally, Figure 8 provides an overview of our estimated developments for sectoral gross value added. As can be seen from the graph, these figures do not feature any strong variations over the shown estimation period. With values of more than ten billion € per year, the other market services sector can be identified as the essential source of total gross value added. In descending order, accommodation and food service activities (between four and five billion € per year), non-market services (slightly above three billion € per year) and construction activities (between two and three billion € per year) provide further significant contributions to total gross value added. Other transport activities contribute about one billion € per year to total gross value added. Compared to these figures, the contribution of other sectors to total gross value added remains rather low.

Figure 8: Sectoral breakdown of gross value added



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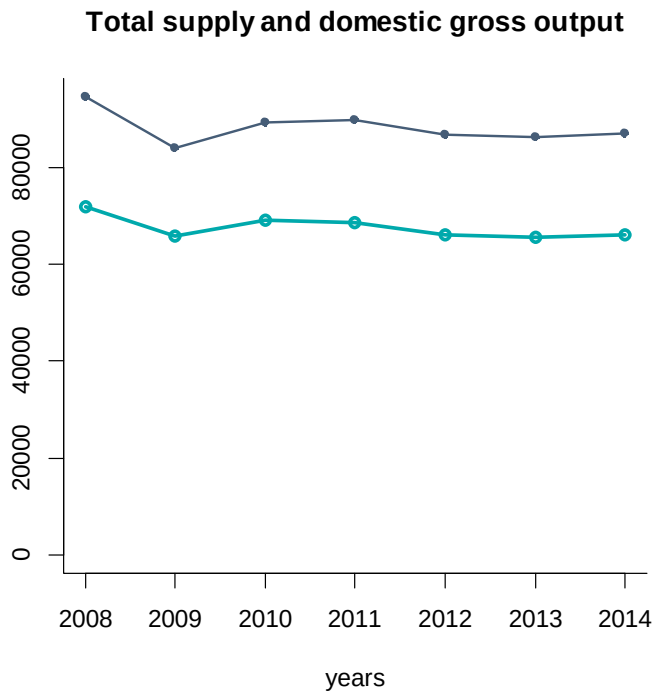
4.2 CANARY ISLANDS

4.2.1 MACROECONOMIC AGGREGATES

Figure 9: Estimated time series for aggregated total regional supply and domestic output



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As shown in Figure 9, our calculations result in very stable developments for aggregated domestic gross output (green line in Figure 9) and total supply (dark line) of goods and services for the year 2008 to 2014 period. As already noted in the case of the Balearic Islands, stagnating trend patterns can be attributeed to the weak growth dynamics of final demand in Spain in the wake of the global financial crisis. With absolute volumes levelling below 90 billion €, our estimates of aggregated total supply imply also only modest annual growth rates compared to historical reference values from the year 2005 IOT (which reports total supply to level slightly above 80 billion €).

Figure 10: Aggregated total regional use, shares of intermediate and final demand

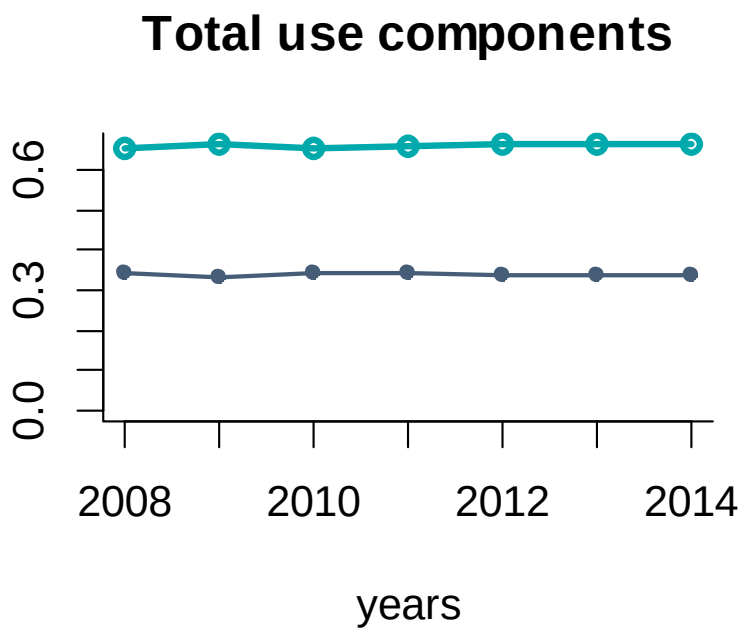

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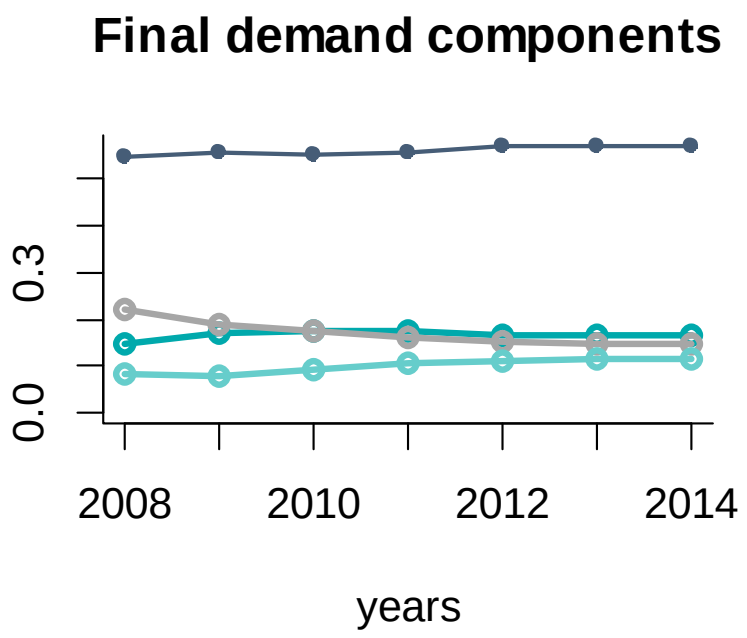
Figure 10 illustrates the resulting breakdown of aggregated total use into aggregated final demand and aggregated intermediate use. As can be seen, our calculations result in a very stable development of respective shares with aggregated final demand (the green line in Figure 10) representing continuously more than 60% of aggregated total use of products and services. This corresponds to respective figures from the reference IOT.

A breakdown of final demand into private households' and NPISH final consumption expenditures (dark line), government final consumption expenditures (green line), investments (light grey line) and exports (light green line) is provided by Figure 11. As could be expected, aggregated final consumption expenditures of private households' and NPISHs do again represent dominant final demand shares. Their share in total final demand remains steadily above 50%. The shares of government final consumption expenditures as well as of investment expenditures range around 15% at the end of the estimation period. The smallest final demand shares are estimated for exports. Our estimates imply that exports contributed slightly more than 11% to total final demand in 2014.

Figure 11: Total final demand, shares private consumption, government consumption, investments and exports



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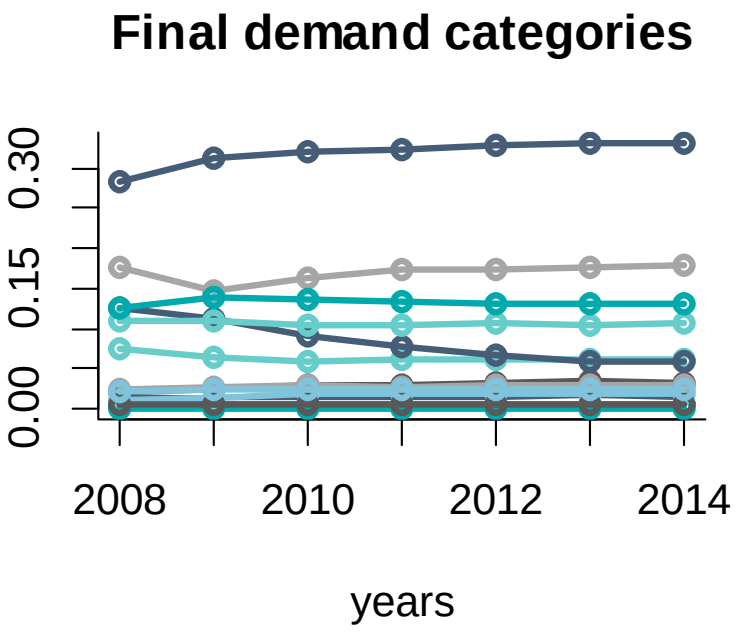
4.2.2 SECTORAL DETAILS

Our estimates for the sectoral breakdown of total final demand are illustrated in Figure 12. The largest block of expenditures results from total final demand for other market services. According to our estimates, respective shares amount to more than 33% of all year 2014 final demand expenditures. The next two main categories of expenditure, manufacturing and non-market services, account for significantly lower shares. Over time, these categories contribute around 17% (in case of manufacturing products) to 13% (in case of non-market services) to total final demand. Accommodation and food service activities also feature rather stable contribution to total final demand, however, at slightly lower levels. In 2014, the expenditures for accommodation and food service are estimated to represent approximately 10% of total final demand. For construction activities, our estimates imply a sharp decline to approximately 6% of total final demand in 2014.

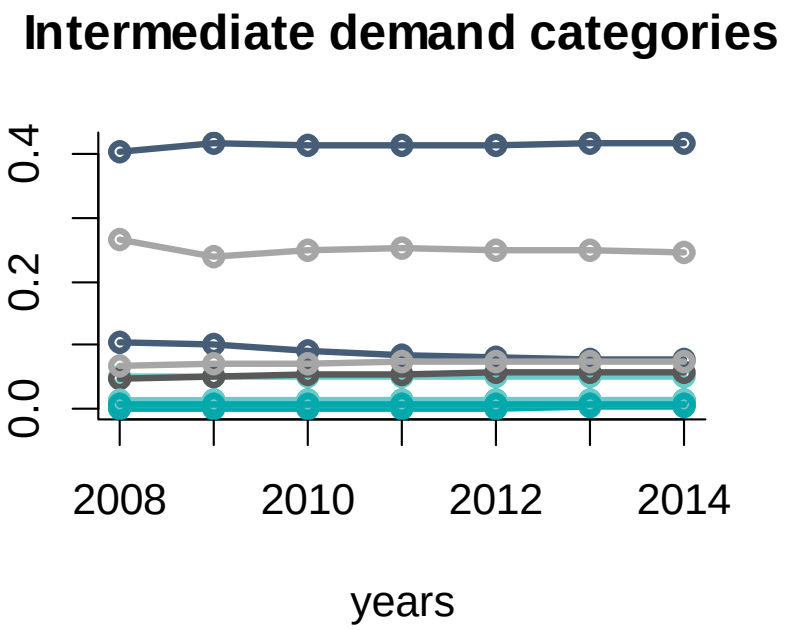
Figure 12: Sectoral breakdown of total final demand



own illustration

Our estimates for the sectoral breakdown of total intermediate demand are illustrated in Figure 13. Again, the largest block of expenditures refers to intermediate demand for other market services. Throughout the estimation period, their respective shares remain relatively stable slightly above 40% of total regional intermediate demand. Manufacturing represents the next main intermediate demand category. Throughout the estimation period, this product category regularly accounts for approximately 25% of total intermediate demand. Compared to this, all remaining product categories account for significantly lower shares of intermediate demand. Among these product groups, significant contributions can be identified for construction services (gradually declining to less than 8% of total intermediate demand in 2014), other transport activities (slightly increasing over time to almost 8% of total intermediate demand in 2014), electricity supply and consumer goods (both gradually increasing to more than 5% in 2014). Smallest intermediate demand shares can be observed for agricultural products and fish products, services provided by travel agencies, recreational services and non-market services. Their respective values all remain below one percent throughout the reporting period.

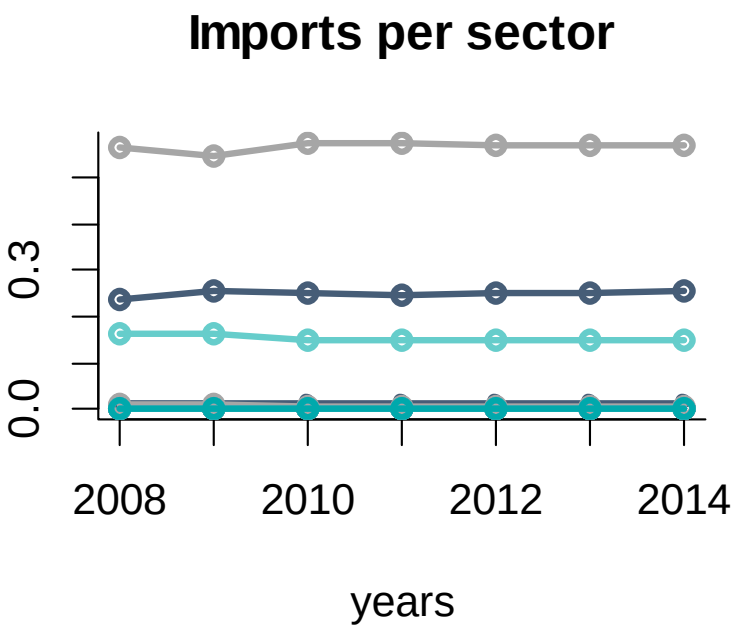
Figure 13: Sectoral breakdown of total intermediate demand



own illustration

A sectoral breakdown of total imports is shown in Figure 14. As had already been noted in case of the Baleares region, the predominant share of all imports refers to the demand for manufacturing products. Throughout the reporting period, expenditures for imported manufacturing products represent more than 50% of the total value of all imported products and services. The same applies to other market services, which account for slightly more than 25% of the total value of all imported products and services of the year 2014. The import shares of consumer goods range relatively constant around 15% throughout the observation period. All remaining product and service categories only represent rather low import shares.

Figure 14: Sectoral breakdown of total imports

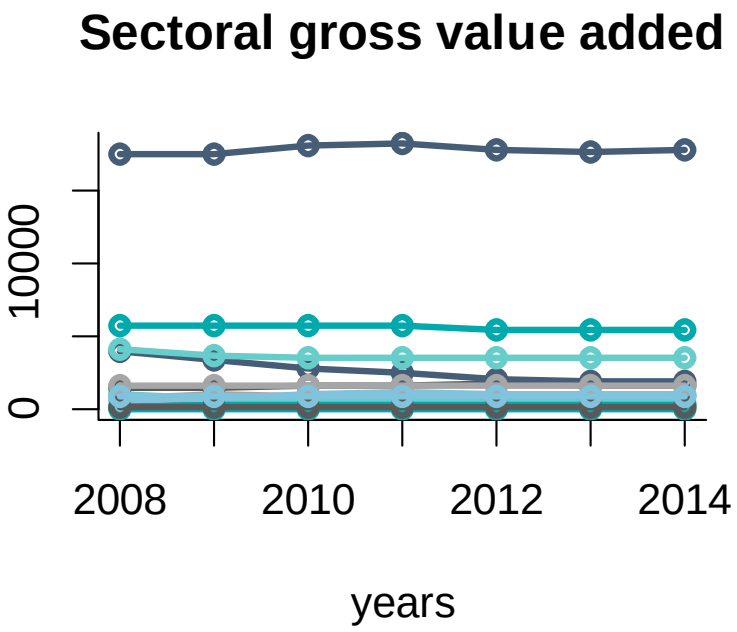


own illustration

An overview on our sectoral gross value-added estimates for the Canary Islands is provided by Figure 15. Comparable to previous findings for the Baleares region, other market services sector can be identified as the essential source of total gross value added. For the Canary Islands, we estimate this sector to contribute approximately 18 billion € per year to total gross value added.

In descending order, non-market services (between five and six billion € per year), accommodation and food service activities (contributing around four billion € per year), and construction activities (with respective gross value added figures falling from approximately four billion € in 2008 to less than two billion € in 2014) can be identified as further relevant sectors of the island's economy. Electricity supply and other transport activities each contribute also between one billion € and two billion €per year to total gross value added. The contributions of other sectors remain rather low.

Figure 15: Sectoral breakdown of gross value added



own illustration

4.3 MALTA

4.3.1 DATA SOURCES

The IOT for Malta is based on the Eurostat available IOT while extraneous sources (e.g. GTAP v9) have been utilized in order to address inconsistencies and data gaps. This is a data intensive process which, given the lack of available statistics, implies the application of a greater number of assumptions and approximations than following the opposite methodology (i.e. to use the GTAP to fill the missing entries of the Eurostat's IOT). The combination of the two databases allowed to address the issues identified and presented in section 2.3 (missing entries Eurostat's IOT, etc.).

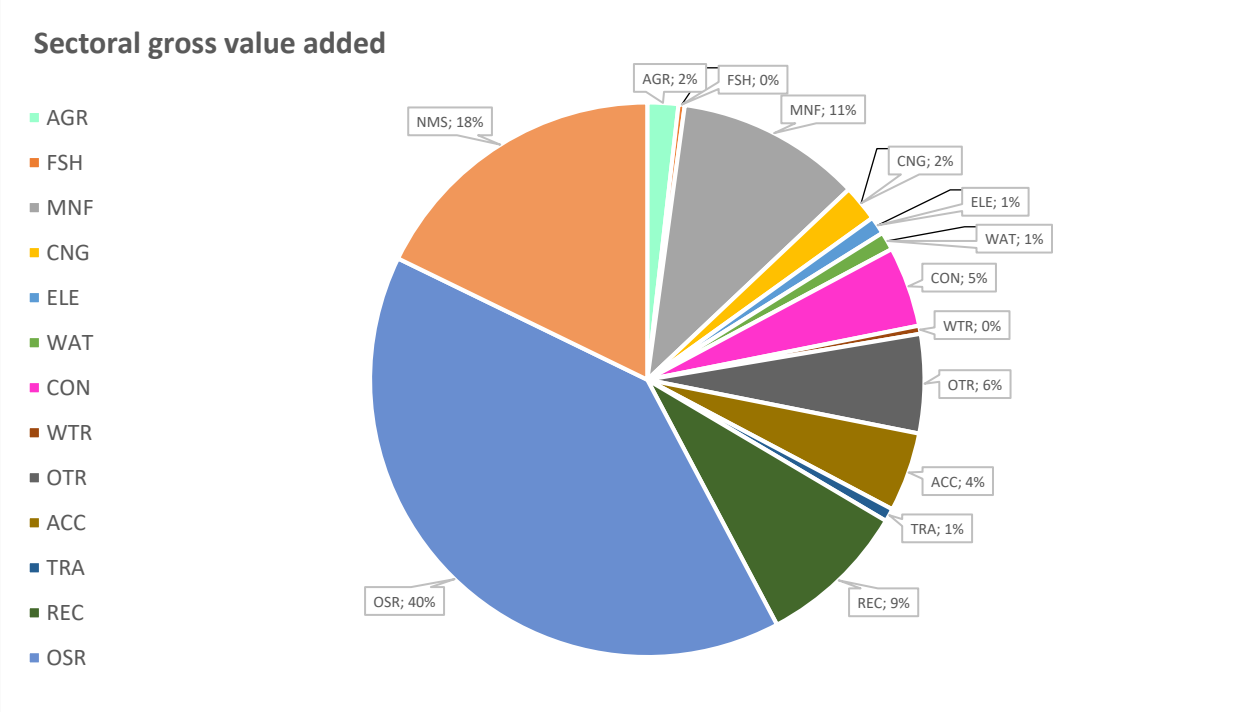
Eurostat provides a sufficiently detailed sectoral disaggregation, although certain caveats have been identified. These include the following issues that have been addressed with the use of the GTAP v9 database, namely i) structure of intermediate demand and supply for certain sectors has been used to address the missing entries in the matrix of intermediate uses, ii) data for the Water (sector E according to the NACE Rev.2 classification), Electricity (sector D according to the NACE Rev.2 classification), Land and Air transport services sectors (H49 and H51 respectively according to the NACE Rev.2 classification) have been used to fill in the data gaps in the respective Eurostat entries, iii) various data have been used to address the discrepancies between the macroeconomic variables of the Input-Output data and those reported in the national accounts. Finally, the value added, imports and taxes entries were modified

according to data from Eurostat's national and production accounts (the final matrix was balanced using a RAS method). This allowed us the consistent calculation of GDP and trade surplus for the reference year. The final table was projected to the year 2015 by using data for the aggregate categories from Eurostat's national accounts and balancing the matrix of intermediate used by applying the RAS technique.

4.3.2 CURRENT STRUCTURE OF THE ECONOMY

Malta is a service-oriented economy. Aggregate services count for approximately 78% of the national gross value added with a major share, approximately 40%, attributed to sectors such as the financial, ICT services etc. The tourism industry is an important source of income for the Maltese economy which welcomes more than 1.5 million, approximately, of tourists per year. The contribution of the manufacturing sector to the economy has been shirking over the past decades; maritime transport services are only a minor part in total transport services and only few people rely on the fish-related activities.

Figure 16: Malta, sectoral gross value added



4.3.3 LABOR MARKET STATISTICS

Employment statistics are drawn from the Eurostat database (nama_10_a64_e) for 64 industries. The dataset displays the same kind of problems as the IOT provided by Eurostat; while total employment is readily available for consecutive time periods the disaggregation by industry is incomplete. Filling the missing elements requires that we complement our primary dataset with additional statistics. For this purpose, we have used Eurostat's Labor Force Survey (LFS) which provides information on the employment by country for 21 aggregate industries (lfsa_egan2); while for the transport sector data on employment are provided in the Transport

statistics publication provided by the Maltese National Statistical Office (NSO). Furthermore, LFS is used to draw data regarding the labor force and unemployment rate which are necessary for the calibration of the wage curve in GEM-E3. The table below includes the estimated[24] employment by broad economic sector, as defined in SOCLIMPACT, for 2015:

Table 9: Malta, sectoral employment

In th. persons		2015
Agriculture	AGR	2.4
Fishery	FSH	0.7
Manufacturing	MNF	17.8
Consumer goods	CNG	4.5
Electricity	ELE	0.8
Water	WAT	2.1
Construction	CON	11.9
Water transport	WTR	0.6
Other transport	OTR	11.3
Accommodation and food service activities	ACC	11.7
Travel agency, tour operator reservation service and related activities	TRA	1.2
Recreational services (arts and entertainment activities; libraries, museums and other cultural activities; gambling)	REC	5.8
Other market services	OSR	76.1
Non-market services	NMS	50.4

4.4 CRETE

4.4.1 DATA SOURCES

The Input-Output table of Crete was constructed by combining the following data sources: i) an initial IOT provided by Haddad et al. (2018) for the year 2013 and ii) the Hellenic statistical authority (ELSTAT)[25]. The former publication includes IOT consisting of forty-four (44) sectors according to the NACE Rev.2 classification for the NUTS2 regions of Greece. The process of

[24] Since it is the result of the combination of more than one dataset

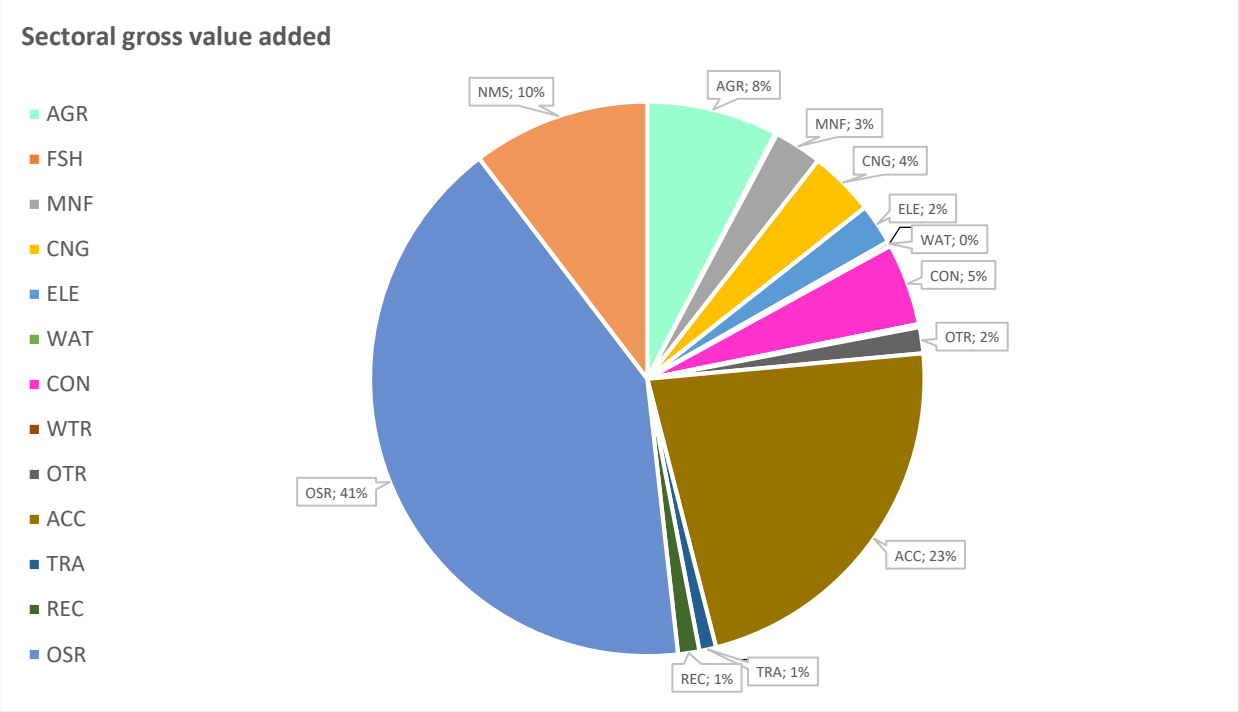
[25] http://www.statistics.gr/en/home/

constructing an IOT for the island of Crete at the SOCLIMPACT aggregation level revealed the following problem: the fishing industry and the maritime transport industry are not treated explicitly in the initial set of data; instead, they are part of the agricultural sector and of an aggregate sector consisting of wholesale and retail trade, transportation and storage services. To disaggregate these sectors in the initial matrix we have used data from the Structural Business Statistics compiled by ELSTAT; the statistics includes information for the level of output and the number of employees for two-digit NACE Rev.2 at the NUTS2 level. The output statistics were used to approximate the production level of the fishing and maritime sector with respect to their aggregate categories, while the number of employees was used to approximate the value added attributed to labor. The production and the demand structure of these sectors are inherited from the initial aggregate categories. Finally, the produced table was projected to year 2015 by using the GDP and value-added growth factors as calculated for the ELSTAT regional accounts. The balancing of the intermediate use table in 2015 was performed by applying the RAS technique.

4.4.2 CURRENT STRUCTURE OF THE ECONOMY

The Cretan economy is also a service-oriented economy, with the aggregate service sector being responsible almost for 78% of the generated value added. Another notable aspect of the Cretan economy is the relatively high activity of agriculture and consumer goods industries in the local economy as well as the performance of the accommodation sector (23%) which unveils its position as a tourism attractor.

Figure 17: Crete, sectoral gross value added



4.4.3 LABOR MARKET STATISTICS

Regarding the calculation of employment by sector we have combined two different datasets, both published by the Hellenic Statistical Authority: i) from the statistical business register[26] (82 categories) and ii) the regional accounts[27] (10 categories). Usually, the methodology for compiling these datasets is different (e.g. business vs individual questionnaires); thus, the cannot be directly compared. To make use of all the available information we have used the structure of the first dataset to disaggregate employment as reported in the regional accounts. The latter are chosen as the main data source as they are compatible with the main macro-economic variables used for the calibration of the Cretan economy (GDP, value added etc.). The table below presents employment levels in Crete for 2015:

Table 10: Crete, sectoral employment

In th. persons		2015
Agriculture	AGR	39.74
Fishery	FSH	0.27
Manufacturing	MNF	11.82
Consumer goods	CNG	2.64
Electricity	ELE	1.98
Water	WAT	1.42
Construction	CON	15.02
Water transport	WTR	1.55
Other transport	OTR	6.91
Accommodation and food service activities	ACC	44.58
Travel agency, tour operator reservation service and related activities	TRA	1.86
Recreational services (arts and entertainment activities; libraries, museums and other cultural activities; gambling)	REC	5.02
Other market services	OSR	69.27
Non-market services	NMS	42.19

Data regarding the unemployment rate (24.2%) and the labor force (276 thousands of persons) are also drawn from ELSTAT[28].

[26] http://www.statistics.gr/el/statistics/-/publication/SBR01/2015

[27] http://www.statistics.gr/el/statistics/-/publication/SEL54/-

[28]https://www.statistics.gr/el/statistics/-/publication/SJO03/-

4.5 SARDINIA AND SICILY

4.5.1 DATA SOURCES

The matrices for Sardinia and Sicily are based on inputs received by the COACCH project[29]. The initial IOT dimensions is that of the GTAP database. One shortcoming for our analysis is that the GTAP database does not differentiate accommodation and food related activities from other market services (OMS) as well as the activity of travel agencies from transport services (OTR). To tackle this issue, we have used data from the Italian Statistical Office (ISTAT)[30] where gross value added is reported for 34 sectors at the NUTS2 level and the Eurostat's structural business statistics at the NUTS2 level. The first dataset is used to disaggregate the OMS sector, while the second one to disaggregate OTR. The reference year for the dataset is 2007 and we have projected the IOT to 2015 using GDP and GVA growth rates as reported from ISTAT. The balancing of the IOT is accomplished via the intermediate consumption matrix using the RAS technique.

4.5.2 CURRENT STRUCTURE OF THE ECONOMY

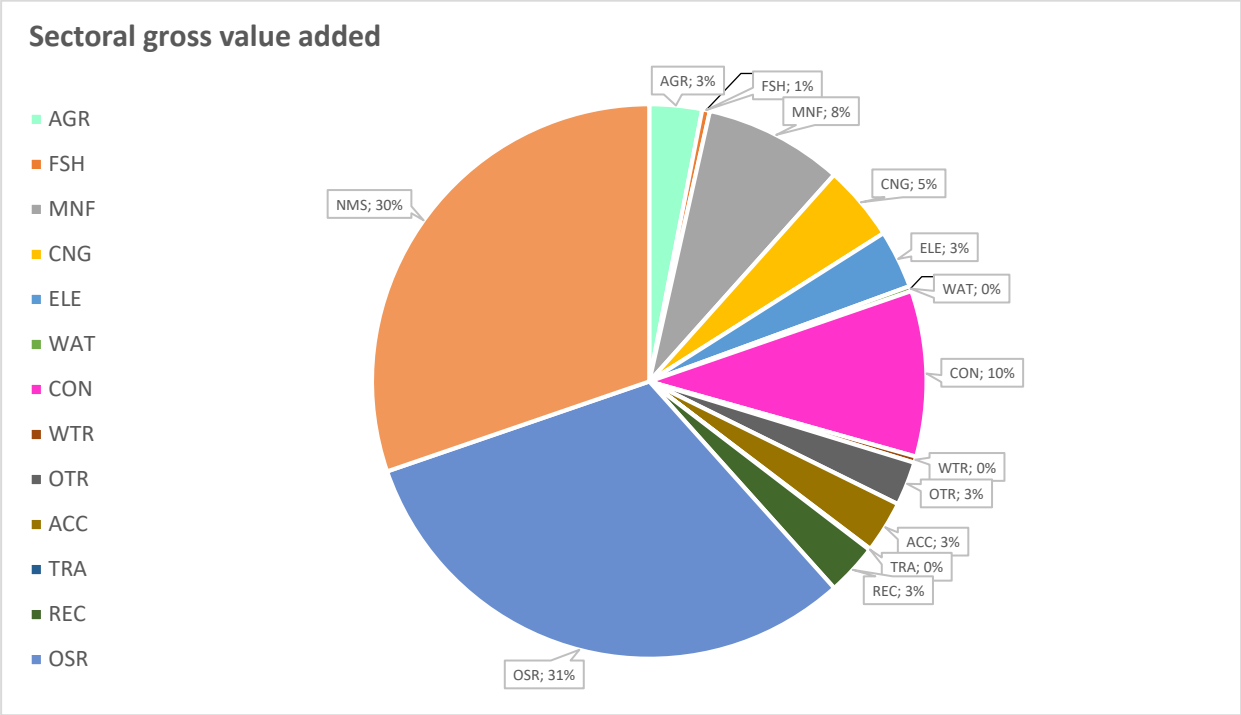
Sardinian economy depends mainly on services, with market services account for approximately 31% of the regional value added. Activities of travel agencies account for 3% while the overall share of tourism and travel in the economy is estimated to 9.6%[31] :

[29] https://www.coacch.eu/ (European Union's Horizon 2020 research and innovation programme under grant agreement No 776479)

[30] http://dati.istat.it/Index.aspx?QueryId=11455&lang=en#

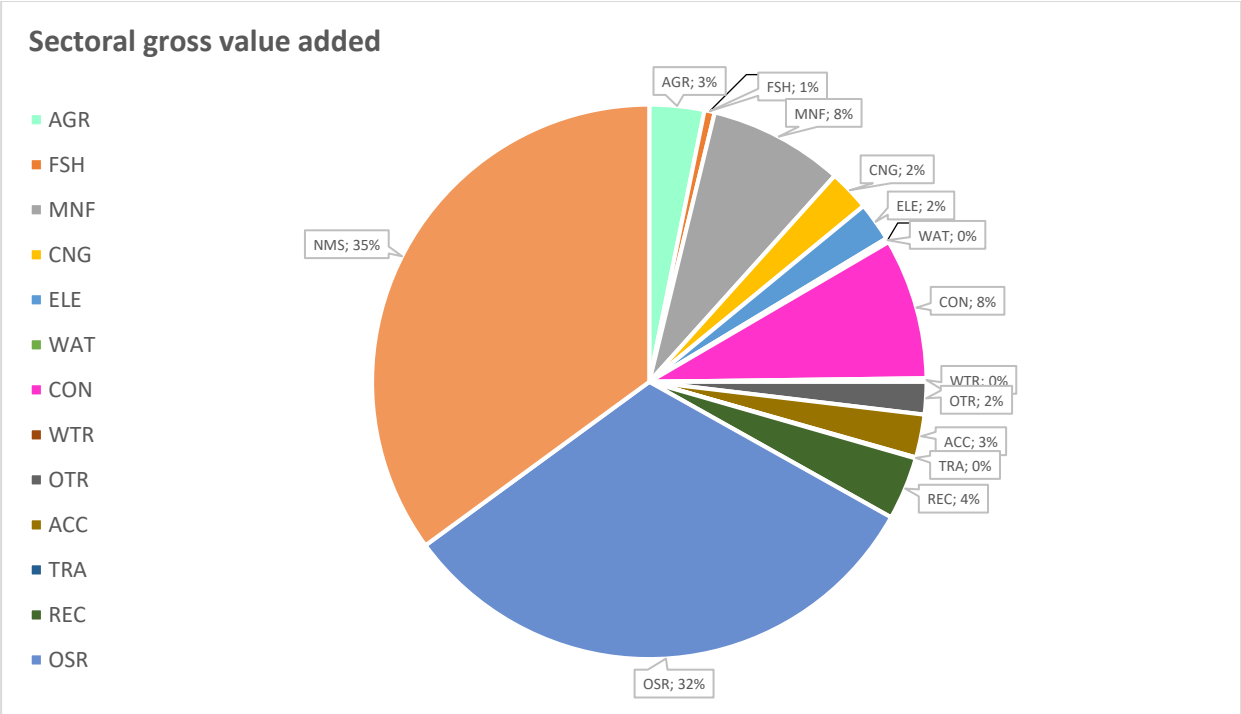
[31] https://www.sr-m.it/wp-content/uploads/2016/10/TUR_sardegna.pdf

Figure 18: Sardinia, sectoral gross value added



The Sicilian economy also depends heavily on services (75%) and to a smaller extend on manufacturing (total 21%) and primary activities (total 4%):

Figure 19: Sicily, sectoral gross value added



4.5.3 LABOR MARKET STATISTICS

Labor market statistics are based on Eurostat's SBS at the regional level and on ISTAT data. The labor force in 2015 is presented in the table below:

Table 11: Actual labor force data for Sicily and Sardinia

In th. persons	2015
Sicilia	1721
Sardegna	684

Employment in Sardinia by sector in 2015 is presented below:

Table 12: Sardinia, sectoral employment

In th. persons		2015
Agriculture	AGR	42.9
Fishery	FSH	39.9
Manufacturing	MNF	26.9
Consumer goods	CNG	11.8
Electricity	ELE	3.1
Water	WAT	7.4
Construction	CON	38.3
Water transport	WTR	0.8
Other transport	OTR	23.3
Accommodation and food service activities	ACC	42.7
Travel agency, tour operator reservation service and related activities	TRA	1.4
Recreational services (arts and entertainment activities; libraries, museums and other cultural activities; gambling)	REC	6.6
Other market services	OSR	206.5
Non-market services	NMS	141.0

Employment in Sicily by sector in 2015 is presented below:

Table 13: Sicily, sectoral employment

In th. persons		2015
Agriculture	AGR	42.9
Fishery	FSH	39.9
Manufacturing	MNF	69.3
Consumer goods	CNG	33.6
Electricity	ELE	5.0
Water	WAT	20.9
Construction	CON	92.1
Water transport	WTR	1.9
Other transport	OTR	57.1
Accommodation and food service activities	ACC	77.3
Travel agency, tour operator reservation service and related activities	TRA	4.6
Recreational services (arts and entertainment activities; libraries, museums and other cultural activities; gambling)	REC	22.9
Other market services	OSR	652.0
Non-market services	NMS	399.0

Unemployment rates are drawn from the ISTAT's labor and wages section:

Table 14: Unemployment rates for Sicily and Sardinia

	2015
Sicilia	21.4%
Sardegna	17.4%

4.6 CYPRUS

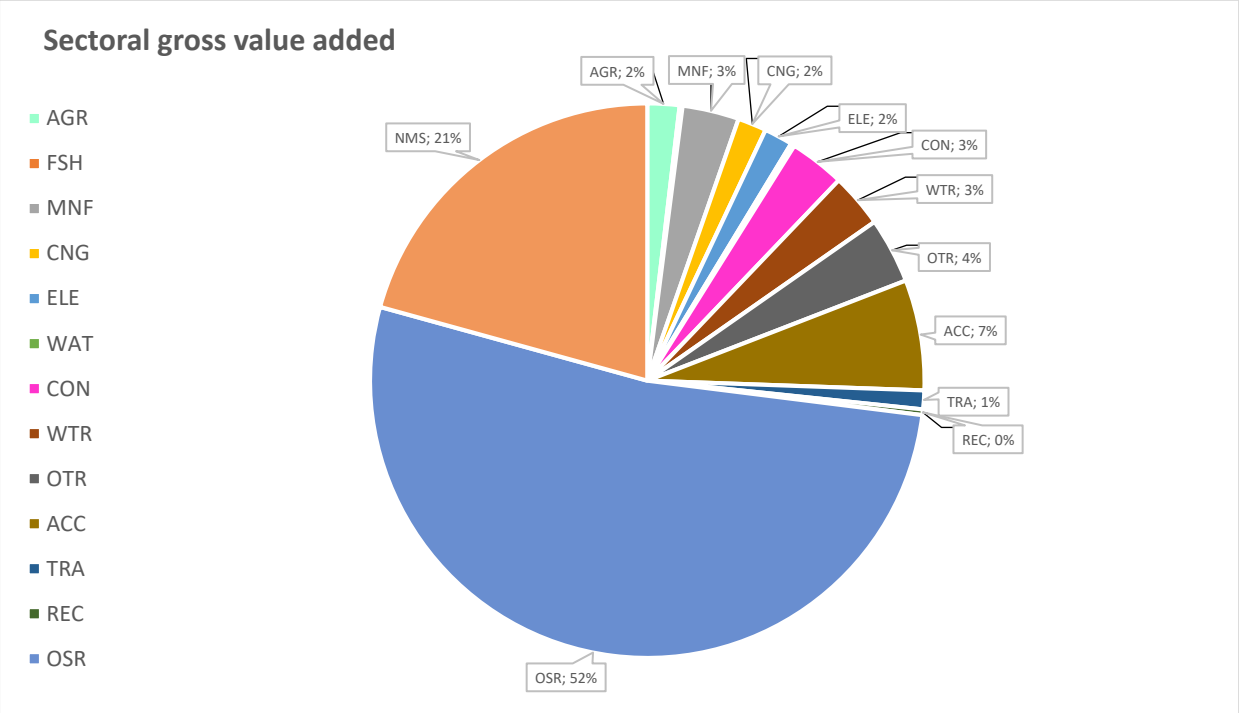
4.6.1 DATA SOURCES

For Cyprus no data gaps was identified. The quality of the IOT provided by Eurostat is considered satisfactory for the causes of the SOCLIMPACT.

4.6.2 CURRENT STRUCTURE OF THE ECONOMY

Cyprus is a service-oriented developed European economy. With a relatively small manufacturing and primary sector (12.1% in total), market services are the largest sector in the economy with a strong presence of financial and real estate activities.

Figure 20: Cyprus, sectoral gross value added



4.6.3 LABOR MARKET STATISTICS

Employment statistics are drawn from the Eurostat's national accounts; employment by sector

in 2015 is depicted in the following table:

Table 15: Cyprus, sectoral employment

In th. persons		2015
Agriculture	AGR	14.4
Fishery	FSH	0.7
Manufacturing	MNF	16.5
Consumer goods	CNG	12.6
Electricity	ELE	1.4
Water	WAT	0.4
Construction	CON	25.4
Water transport	WTR	0.2
Other transport	OTR	14.6
Accommodation and food service activities	ACC	40.5
Travel agency, tour operator reservation service and related activities	TRA	1.7
Recreational services (arts and entertainment activities; libraries, museums and other cultural activities; gambling)	REC	5.6
Other market services	OSR	154.3
Non-market services	NMS	80.0

The unemployment rate according to Eurostat's LFS in 2015 was 15% (lfsa_unempl); total population and labor force are provided by lfsa_pop and lfas_act (activity rates) respectively.

5 CONCLUSION

A sufficiently detailed breakdown of the economic interrelationships could be achieved on the basis of best available historical regional datasets. Therefore, the tables developed and described in this report provide a valuable input for further analysis. The Blue Economy sectors, however, will receive more detailed analysis and treatment in the process of further research. The main remaining data gap are centered around fishing and aquaculture activities. For coastal and maritime tourism, first suggestions have been made in this report.

For fishing and aquaculture activities, all identified datasets did actually only report aggregated figures. This is understandable as, also in most of the regions considered in our project, the overall economic relevance of aquaculture activities remained rather low until now. However, In order to provide the Commission with reliable information on the economic significance of aquaculture activities, it would certainly be useful to encourage appropriate adaptations of contemporarily applied European economic statistical classification patterns in the course of regular revision work. While it remains for future research activities to establish a detailed statistical mapping of the economic activities in the aquaculture sector, all of the other relevant sectors selected by us could be well identified on the basis of available statistical information.

Apart from Malta and Cyprus,[32] the absence of a European obligation to deliver regional trade statistics on a regular basis made it necessary for us to carry out a time-consuming analysis of further available regional trade data for all islands to be examined. Apart from Malta and Cyprus: The non-availability of regionalized trade data thus calls any attempt to infer regional IOTs into question.

In the process of modelling the climate change impacts on the selected islands' blue economy sectors, the data base developed here will be increasingly refined. Therefore, the work reported here can be thought of a snapshot, which illustrates the difficulties encountered and first results but not yet the full picture.

[32] For Malta and Cyprus, data availabilities are apparently not affected by these issues as both Islands represent national EU Member States (which do of course report frequently about national trade developments).

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SOCLIMPACT

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7 APPENDIX A: SUPPORTING DATASETS AVAILABLE FOR IO-UPDATING PROCEDURES

Quantity	Time	Source
Azores		
GDP	2000-2015	Eurostat: nama_10r_2gdp
gross value added	2000-2014	Eurostat: nama_10r_3gva
gross fixed capital formation	2006-2014	Eurostat: nama_10r_2gfcf
compensation of employees	2000-2014	Eurostat: nama_10r_2coe
wages and salaries	1996-2015	Eurostat: sbs_r_nuts03 and sbs_r_nuts06_r2
employment	1996-2015	Eurostat: sbs_r_nuts03 and sbs_r_nuts06_r2
Number of companies	1996-2015	Eurostat: sbs_r_nuts03 and sbs_r_nuts06_r2
unemployment rate	2011-2016	Eurostat: lfst_r_lfu3rt
population	1991-2017	Eurostat: demo_r_pjangroup
Disposable income HH	2000-2014	Eurostat: nama_10r_2hhinc
Consumption expenditure Government	2011-2016	Statistics Portugal: https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_indicadores&indOcorrCod=0009481&contexto=bd&selTab=tab2
Import/Export	2011-2017	Statistics Portugal: https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_indicadores&indOcorrCod=0008075&contexto=bd&selTab=tab2
Input-Output Table	1986; 2001	Statistics Azores (1986) "Quadro Input-Output": srea.azores.gov.pt/Conteudos/Media/file.aspx?ida=1944 Statistics Azores (2001) "Quadro Empregos Alargados": srea.azores.gov.pt/Conteudos/Media/file.aspx?ida=607
Mainland (Portugal)		
Consumer spending HH	n. a.	n. a.

Quantity	Time	Source
population projection	2015-2100	UN: https://esa.un.org/unpd/wpp/DVD/Files/1_Indicators%20(Standard)/EXCEL_FILES/1_Population/WPP2017_POP_F01_1_TOTAL_POPULATION_BOTH_SEXES.xlsx
annual average price index	1996-2017	Eurostat: prc_hicp_aind
exchange rates	2000-2014	WIOD: www.wiod.org/protected3/data16/EXR_WIOD_Nov16.xlsx
		Baleares
gross domestic product	2000-2015	Eurostat: nama_10r_2gdp
gross value added	2000-2015	Eurostat: nama_10r_3gva
gross fixed capital formation	2000-2007	Spanish Statistical Office: http://www.ine.es/jaxi/Tabla.htm?path=/t35/p010/fbcf/l0/&file=01001.px&L=0
compensation of employees	2000-2015	Eurostat: nama_10r_2coe
wages and salaries	1995-2015	Eurostat: sbs_r_nuts03 and sbs_r_nuts06_r2
employment	1995-2015	Eurostat: sbs_r_nuts03 and sbs_r_nuts06_r2
Number of companies	1995-2015	Eurostat: sbs_r_nuts03 and sbs_r_nuts06_r2
unemployment rate	1999-2016	Eurostat: lfst_r_lfu3rt
population	1990-2017	Eurostat: demo_r_pjangroup
Disposable income HH	2000-2014	Eurostat: nama_10r_2hhinc
Consumption expenditure Government	2000-2011	Institut d'Estadistica de les Illes Balears (2000-2008): https://ibestat.caib.es/ibestat/estadistiques/15ab915e-055d-4c37-bc24-0e06fce366d0/03cd0414-1ad1-46f6-ba79-09ffd5316fe7/es/E31128_20006.px Institut d'Estadistica de les Illes Balears (2005-2011): https://ibestat.caib.es/ibestat/estadistiques/15ab915e-055d-4c37-bc24-

Quantity	Time	Source
		0e06fce366d0/edf0595a-d65f-42f1-9c54-4c37be10b71b/es/E31128_08006.px
Import/Export	2000-2017	Institut d'Estadistica de les Illes Balears: https://ibestat.caib.es/ibestat/estadistiques/96fc2a7c-fd08-4820-a020-a04f6608f0e7/4df0fac3-9199-43b3-b96a-daba7dbdb70c/es/I211001_9003.px
Input-Output Table	2004	Govern de les Illes Balears: www.caib.es/sites/inputoutput/es/marco_input-output-134/archivo-pub.do?ctrl=MCRST24ZI1805&id=1805
Consumer spending Households	2000-2013	Spanish Statistical Office (2000-2007): www.ine.es/daco/daco42/cre_rh/gasto_cons_00_07.xls Spanish Statistical Office (2008-2010): www.ine.es/daco/daco42/cre_rh/gasto_cons_08_10.xlsx Spanish Statistical Office (2010-2013): www.ine.es/daco/daco42/cre_rh/gasto_cons_10_13.xlsx
Mainland (Spain)		
population projection	2015-2100	UN: https://esa.un.org/unpd/wpp/DVD/Files/1_Indicators%20(Standard)/EXCEL_FILES/1_Population/WPP2017_POP_F01_1_TOTAL_POPULATION_BOTH_SEXES.xlsx
annual average price index	1996-2017	Eurostat: prc_hicp_aind
exchange rates	2000-2014	WIOD: www.wiod.org/protected3/data16/EXR_WIOD_Nov16.xlsx
Canaries		
gross domestic product	2000-2015	Eurostat: nama_10r_2gdp
gross value added	2000-2015	Eurostat: nama_10r_3gva

Quantity	Time	Source
gross fixed capital formation	2000-2007	Spanish Statistical Office: http://www.ine.es/jaxi/Tabla.htm?path=/t35/p010/fbcf/l0/&file=01001.px&L=0
compensation of employees	2000-2015	Eurostat: nama_10r_2coe
wages and salaries	1995-2015	Eurostat: sbs_r_nuts03 und sbs_r_nuts06_r2
employment	1995-2015 1999-2017	Eurostat: sbs_r_nuts03 und sbs_r_nuts06_r2 Instituto Canario de Estadistica: http://www.gobiernodecanarias.org/istac/jaxi-istac/menu.do?uripub=urn:uuid:b3b279af-26af-41f7-9292-745ccd8184e6
Number of companies	1995-2015	Eurostat: sbs_r_nuts03 und sbs_r_nuts06_r2
unemployment rate	1999-2016	Eurostat: lfst_r_lfu3rt
population	1990-2017	Eurostat: demo_r_pjangroup
Disposable income HH	2000-2014	Eurostat: nama_10r_2hhinc
Consumption expenditure Government	1999-2015	Instituto Canario de Estadistica: http://www.gobiernodecanarias.org/istac/jaxi-istac/tabla.do?uripx=urn:uuid:4d73f596-f76a-4464-842d-35770a2d9533&uripub=urn:uuid:39e5ca4e-f2a0-4f39-bd5e-0883b888c846
Import/Export	2000-2017	Instituto Canario de Estadistica: http://www.gobiernodecanarias.org/istac/jaxi-istac/tabla.do?uripx=urn:uuid:751266f5-5c7d-42ae-8976-deddd8626466&uripub=urn:uuid:d28d967b-4a97-4abd-a6cc-1a79abcf4c7d
Input-Output Table	2002; 2005	Instituto Canario de Estadistica (2002): http://www.gobiernodecanarias.org/istac/galerias/documentos/C00019A/P0001/index.html Instituto Canario de Estadistica (2005): http://www.gobiernodecanarias.org/istac/galerias/documentos/C00019A/P0002/index.html

Quantity	Time	Source
Consumer spending Households	2000-2013	Spanish Statistical Office (2000-2007): www.ine.es/daco/daco42/cre_rh/gasto_cons_00_07.xls Spanish Statistical Office (2008-2010): www.ine.es/daco/daco42/cre_rh/gasto_cons_08_10.xlsx Spanish Statistical Office (2010-2013): www.ine.es/daco/daco42/cre_rh/gasto_cons_10_13.xlsx
Mainland (Spain)		
population projection	2015-2100	UN: https://esa.un.org/unpd/wpp/DVD/Files/1_Indicators%20(Standard)/EXCEL_FILES/1_Population/WPP2017_POP_F01_1_TOTAL_POPULATION_BOTH_SEXES.xlsx
annual average price index	1996-2017	Eurostat: prc_hicp_aind
exchange rates	2000-2014	WIOD: www.wiod.org/protected3/data16/EXR_WIOD_Nov16.xlsx
Madeira		
gross domestic product	2000-2015	Eurostat: nama_10r_2gdp
gross value added	2000-2014	Eurostat: nama_10r_3gva
gross fixed capital formation	2006-2014	Eurostat: nama_10r_2gfcf
compensation of employees	2000-2014	Eurostat: nama_10r_2coe
wages and salaries	1996-2015	Eurostat: sbs_r_nuts03 und sbs_r_nuts06_r2
employment	1996-2015	Eurostat: sbs_r_nuts03 und sbs_r_nuts06_r2
Number of companies	1996-2015	Eurostat: sbs_r_nuts03 und sbs_r_nuts06_r2
unemployment rate	2005-2016	Eurostat: lfst_r_lfu3rt
population	1991-2017	Eurostat: demo_r_pjangroup

Quantity	Time	Source
Disposable income HH	2000-2014	Eurostat: nama_10r_2hhinc
Consumption expenditure Government	2011-2016	Statistics Portugal: https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_indicadores&indOcorrCod=0009481&contexto=bd&selTab=tab2
Import/Export	2011-2017 1988-2015	Statistics Portugal: https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_indicadores&indOcorrCod=0008075&contexto=bd&selTab=tab2 Direção Regional de Estatística da Madeira: https://estatistica.madeira.gov.pt/en/download-now-3/economic/comercio-gb/comercio-internacional-gb/comerciointernacional-quadros-gb/complete.html
Input-Output Table	2001	Direção Regional de Estatística da Madeira: https://estatistica.madeira.gov.pt/en/download-now-3/economic/contaseconomicas-gb/contaseconomicas-qea-gb/contaseconomicas-qea-quadros-gb.html
Consumer spending HH	n. a.	n. a.
Mainland (Portugal)		
population projection	2015-2100	UN: https://esa.un.org/unpd/wpp/DVD/Files/1_Indicators%20(Standard)/EXCEL_FILES/1_Population/WPP2017_POP_F01_1_TOTAL_POPULATION_BOTH_SEXES.xlsx
annual average price index	1996-2017	Eurostat: prc_hicp_aind
exchange rates	2000-2014	WIOD: www.wiod.org/protected3/data16/EXR_WIOD_Nov16.xlsx
Quantity	Time	Source
Malta		
GDP	2000-2015	Eurostat: nama_10_gdp
gross value added	2000-	Eurostat: nama_10_gdp nama_10_a64

Quantity	Time	Source
	2015	GTAP database v9
gross fixed capital formation	2006-2015	Eurostat: nama_10_gdp
compensation of employees	2000-2015	Eurostat: nama_10_gdp nama_10_a64 GTAP database v9
wages and salaries	2000-2015	Eurostat: nama_10_gdp nama_10_a64
employment	2000-2015	Eurostat: nama_10_a64_e lfsa_egan2 NSO: Transport Statistics 2016
Number of companies	1996-2015	
unemployment rate	2011-2016	Eurostat: une_rt_a
population	1991-2018	Eurostat: demo_pjan
Disposable income HH	2000-2014	Eurostat: nasa_10
Consumption expenditure Government	2000-2015	Eurostat: nama_10_gdp
Import/Export	2011-2017	Eurostat: nama_10_gdp
Input-Output Table	2010	Eurostat: naio_10_cp1750
Cyprus		
GDP	2000-2015	Eurostat: nama_10_gdp
gross value added	2000-2015	Eurostat: nama_10_gdp nama_10_a64
gross fixed capital formation	2006-2015	Eurostat: nama_10_gdp
compensation of employees	2000-2015	Eurostat: nama_10_gdp nama_10_a64

Quantity	Time	Source
wages and salaries	2000-2015	Eurostat: nama_10_gdp nama_10_a64
employment	2000-2015	Eurostat: nama_10_a64_e lfsa_egan2
Number of companies	1996-2015	
unemployment rate	2011-2016	Eurostat: une_rt_a
population	1991-2018	Eurostat: demo_pjan
Disposable income HH	2000-2014	Eurostat: nasa_10
Consumption expenditure Government	2000-2015	Eurostat: nama_10_gdp
Import/Export	2011-2017	Eurostat: nama_10_gdp
Input-Output Table	2010	Eurostat: naio_10_cp1750
		Crete
GDP	2000-2015	Eurostat: nama_10r_2gdp ELSTAT: http://www.statistics.gr/en/statistics/-/publication/SEL48/-
gross value added	2000-2015	Eurostat: nama_10r_3gva
gross fixed capital formation	2006-2015	Eurostat: nama_10r_2gfcf
compensation of employees	2000-2015	Eurostat: nama_10r_2coe
wages and salaries	2000-2015	Eurostat: sbs_r_nuts06_r2
employment	2000-2015	Eurostat: nama_10r_3empers sbs_r_nuts06_r2

Quantity	Time	Source
Number of companies	1996-2015	Eurostat: sbs_r_nuts06_r2
unemployment rate	2011-2016	Eurostat: lfst_r_lfu3rt ELSTAT: https://www.statistics.gr/el/statistics/-/publication/SJO03/-
population	1991-2018	Eurostat: demo_r_pjangroup
Disposable income HH	2000-2014	Eurostat: nama_10r_2hhinc
Consumption expenditure Government	2000-2015	-
Import/Export	2011-2017	-
Input-Output Table	2013	Haddad, E. A., Cotarelli, N., Simonato, T., Vale, V.A. and Visentin, J. (2018). Estimation of NUTS2 Interregional Input-Output Systems for Greece, 2010 and 2013, TD NEREUS 03-2018, The University of São Paulo Regional and Urban Economics Lab (NEREUS).
		Sardinia
GDP	1995-2016	Eurostat: nama_10r_2gdp ISTAT: http://dati.istat.it (National Accounts\Regional Accounts\Sequence of accounts)
gross value added	2000-2015	Eurostat: nama_10r_3gva ISTAT: http://dati.istat.it (National Accounts\Regional Accounts\Sequence of accounts)
gross fixed capital formation	2006-2015	Eurostat: nama_10r_2gfcf ISTAT: http://dati.istat.it (National Accounts\Regional Accounts\Sequence of accounts)
compensation of employees	2000-2015	Eurostat: nama_10r_2coe ISTAT: http://dati.istat.it (National Accounts\Regional Accounts\Sequence of accounts)

Quantity	Time	Source
wages and salaries	2000-2015	Eurostat: sbs_r_nuts06_r2
employment	2000-2015	Eurostat: nama_10r_3empers sbs_r_nuts06_r2 ISTAT: ISTAT: http://dati.istat.it (National Accounts\ Regular, irregular employment and population\Employment -regions)
Number of companies	1996-2015	Eurostat: sbs_r_nuts03 and sbs_r_nuts06_r2
unemployment rate	2011-2016	Eurostat: lfst_r_lfu3rt ISTAT: http://dati.istat.it (National Accounts\Labour and Wages\Unemployment)
population	1991-2018	Eurostat: demo_r_pjangroup
Disposable income HH	2000-2014	Eurostat: nama_10r_2hhinc
Consumption expenditure Government	2000-2015	ISTAT: http://dati.istat.it (National Accounts\Regional Accounts\Sequence of accounts)
Import/Export	2007	Bosselo F., Gabriele S., (2015), "A Sub-national CGE model for the European Mediterranean Countries", Research Paper, CMCC.
Input-Output Table	2007	Bosselo F., Gabriele S., (2015), "A Sub-national CGE model for the European Mediterranean Countries", Research Paper, CMCC.
Sicily		
GDP	1995-2016	Eurostat: nama_10r_2gdp ISTAT: http://dati.istat.it (National Accounts\Regional Accounts\Sequence of accounts)
gross value added	1995-2015	Eurostat: nama_10r_3gva ISTAT: http://dati.istat.it (National Accounts\Regional Accounts\Sequence of accounts)
gross fixed capital	1995-	Eurostat: nama_10r_2gfcf

Quantity	Time	Source
formation	2015	ISTAT: http://dati.istat.it (National Accounts\Regional Accounts\Sequence of accounts)
compensation of employees	1995-2015	Eurostat: nama_10r_2coe ISTAT: http://dati.istat.it (National Accounts\Regional Accounts\Sequence of accounts)
wages and salaries	2000-2015	Eurostat: sbs_r_nuts06_r2
employment	2000-2015	Eurostat: nama_10r_3empers sbs_r_nuts06_r2 ISTAT: ISTAT: http://dati.istat.it (National Accounts\ Regular, irregular employment and population\Employment -regions)
Number of companies	1996-2015	Eurostat: sbs_r_nuts03 and sbs_r_nuts06_r2
unemployment rate	2011-2016	Eurostat: lfst_r_lfu3rt ISTAT: http://dati.istat.it (National Accounts\Labour and Wages\Unemployment)
population	1991-2018	Eurostat: demo_r_pjangroup
Disposable income HH	2000-2014	Eurostat: nama_10r_2hhinc
Consumption expenditure Government	2000-2015	ISTAT: http://dati.istat.it (National Accounts\Regional Accounts\Sequence of accounts)
Import/Export	2007	Bosselo F., Gabriele S., (2015), "A Sub-national CGE model for the European Mediterranean Countries", Research Paper, CMCC.
Input-Output Table	2007	Bosselo F., Gabriele S., (2015), "A Sub-national CGE model for the European Mediterranean Countries", Research Paper, CMCC.

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