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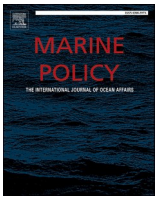

# Estimating economic impacts linked to Marine Spatial Planning with input-output techniques. Application to three case studies

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ABSTRACT

In the last four decades there has been a significant increase in experiences to implement marine spatial planning and the interest of the scientific community in evaluating the impacts of these policies. In this context, a lack of tools and techniques to be applied to the evaluation of strictly economic impacts is evident. Based on knowledge of the direct economic impacts on production in the activity sectors affected by marine planning, the aim of this study is to propose an input-output methodology to estimate total economic impacts that include indirect and induced impacts. This methodology has been applied to three case studies: The German Baltic Sea, Belgium and the North Sea and Skagerrak Strait of Norway. The positive effects derived from the application of these policies have been estimated in the three case studies, both in terms of increased production as well as value added and employment. In general, these positive impacts are concentrated in just a few marine-related sectors, although they also appear in other non-marine sectors. The results obtained offer a more complete view of the economic effects of these public planning policies and the methodology followed can be used as an applicable policy guideline to analyse other similar cases.

## 1. Introduction

Marine spatial planning (MSP), in addition to reducing conflicts of use and promoting compatibility between alternative uses of the sea and its resources, aims to have parties collaborate on sustainable use and conservation of the marine environment. Achieving this difficult balance between ecological, biological, socioeconomic and institutional aspects is one of the essential requirements of ecosystem-based management [1]. Thus, the need to balance resources provides an area in which MSP can become a useful management tool [2–7]. Since the groundbreaking experiences in Australia, China and the United States [8–10] in the 1980s, MSP has expanded throughout the world. Subsequently, around 140 MSP plans in 70 countries have been developed and implemented or are in the process of being prepared at the national, regional or local levels [11–14]. After the 2014 Community Directive on maritime spatial planning [15], the EU member states were obliged to implement their MSPs in the marine waters under their jurisdictions before 2021 [16]. To date, only a few have been fully developed and implemented, these being limited to the cases of certain regions of Germany, Belgium, the United Kingdom, the Netherlands, Latvia and Lithuania [17–19]. In other EU countries (Portugal, Poland, Malta, Sweden and Denmark), their plans are at a very advanced stage [20–25].

MSP provides clear ecological and environmental benefits, but it can also have a variety of socioeconomic effects (not necessarily positive). Previous studies have focused on how socioeconomic data, among other types of information, can inform and be integrated into MSP processes [26], as well as the ways in which an evaluation process for MSP can be designed, paying special attention to the planning [27–32], the sustainability of the governance [33–40], or transboundary aspects [41,42]. Anticipating MSP's possible impacts on economic activity would undoubtedly facilitate the work of planners and increase the chances of success of these public policies. For this reason, achieving socioeconomic analyses that facilitate greater knowledge and integration of stakeholders in this type of policy has become one of the priorities at the European level.

The more planning experiences that took place, the more policy-makers became aware of a distinct lack of applicable tools and techniques

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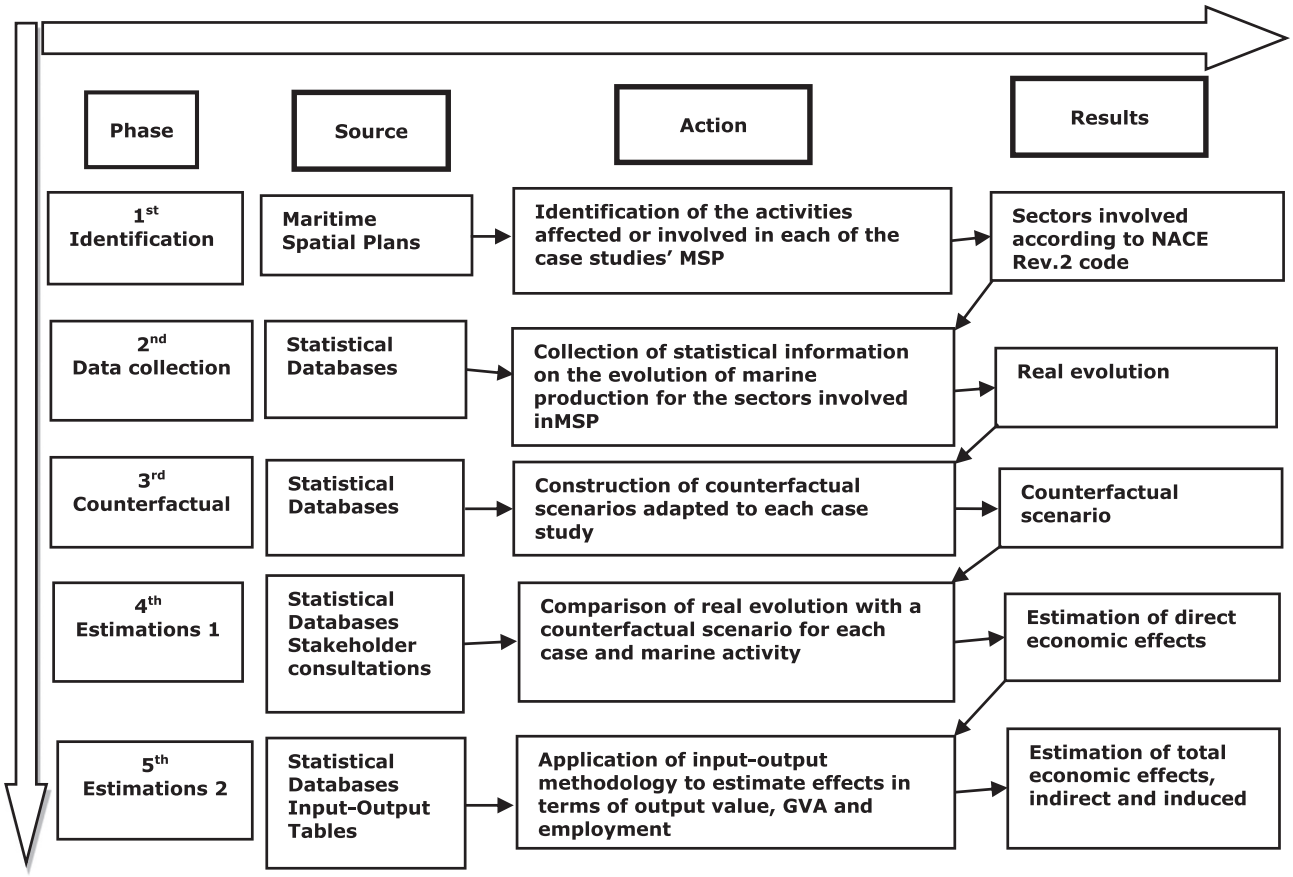


**Fig. 1.** Methodological procedure by phase.

to evaluate the economic and social impacts derived from the application of these policies [43,44]. The difficulty evaluating the economic benefits of this kind of public action is perhaps one of the elements that might explain its still limited implementation in Europe. In this context, based on the results obtained in previous studies [45–47], in 2018 the European Commission called for a study to evaluate the ways in which MSP can benefit the so-called blue economy sectors, thus attempting to provide information to the competent authorities of the European countries that favour the implementation of these policies. Recently, the European Commission published the results of the study [48], which contained a review of existing literature on the economic impacts of MSP and proposed an evaluation methodology. In addition, the researchers analysed five case studies: Rhode Island, Scotland, the German Baltic region, Belgium, and the North Sea-Skagerrak region of Norway. Based on the results obtained in the latter three case studies, [49] proposed methodological changes to obtain better estimates of the direct economic impacts derived from the implementation of MSP. This methodological proposal has been drawn up by considering the circumstances and specific determining factors of the three case studies analysed. The course followed could constitute a sound guide that would potentially be applicable to the study of other similar experiences and, undoubtedly, a good starting point from which to extend the analysis of the economic impacts of MSP.

The aim of this study is to continue to develop the methodology for estimating economic impacts associated with MSP through the study of three specific cases: The German Baltic region, Belgium, and the North Sea and Skagerrak Strait regions of Norway. In this work, the indirect and induced economic impacts on the economies that have implemented these policies are incorporated into the analysis. For this, the proposed input-output (I-O) analysis techniques are widely recognized in the academic world [50]. Other methods, such as spatial cost-benefit analysis or maritime space rent assessment, focus exclusively on marine sectors without considering interrelationships and impacts on other economic sectors. However, the I-O method quantifies the socioeconomic importance of marine sectors in the total economy of a country or region [51–53]. In addition, this proposal allows the incorporation of construction of counterfactual scenarios (alternative hypothetical scenarios) that facilitate obtaining sectoral results on the economic impact of marine activities under various scenarios (e.g., that of not implementing the MSP), providing information that can complement and enrich that obtained through other approaches.

To achieve the proposed objectives, after this introduction, the second section details the methods followed and the materials available in the three case studies. Next, the results and discussion show the impact estimates obtained for each case study in terms of production value, gross value added (GVA) and employment. It begins with the direct economic impacts of MSP and then continues with the indirect, induced and total economic impacts. Finally, the most relevant conclusions are presented.

## 2. Materials and methods

In a recent study [49], a four-phase methodology to estimate the economic impacts derived from MSP implementation was proposed. This procedure enabled researchers to estimate the direct economic impacts in terms of production value and distinguish between the economic activities involved in accordance with their NACE statistical classification code. It is now proposed to estimate the total, indirect and induced impacts with I-O methodology, being necessary to incorporate a fifth phase to the defined methodological procedure (see Fig. 1).

### 2.1. Methodology

In this methodological section, the focus of attention is on the

characteristics and development of the I-O model that will be applied to the three case studies.

I-O models are built from observed economic data of the intersectoral flows existing in a specific region (e.g., a nation or state) during a certain period (normally 1 year) [50]. To generate goods (outputs), each sector needs to consume other goods from other industries (intermediate inputs). The values of these cross-sector flows or transactions are recorded in I-O tables, providing information that can be synthesized in a system of linear equations.

An increase in the final demand for the outputs of a specific marine sector (e.g., due to an increase in internal final consumption) can have direct effects on the level of activity of the sector involved, which will see the value of its annual production increase. This effect on the value of the production of this marine sector is the direct impact linked to the initial increase in final demand. Production growth in a particular industry makes it necessary to increase the demand for the intermediate goods and services necessary to generate its output. That is, the variation in a marine sector's production level will have a carry-over effect on other sectors from the same economy that provide it with intermediate goods and services. The direct effects of economic output in a marine sector produce indirect effects on the sectors that provide to marine activity whith intermediate inputs. In turn, these changes in economic activity levels can modify the income levels of households and their final expenditure capacities for consumption of goods and services beyond the strictly marine-related goods and services. Therefore, this process will have other multiplying effects on the economy overall (the induced effects). The sum of the values of the direct impacts (of the marine sector involved), indirect impacts (of the supplier sectors) and induced impacts (of the entire sectors of the economy) will be the value of the total economic impact caused by the initial variation in final demand of the output of a marine sector.

The I-O methodology has been used frequently in economics to estimate said indirect and induced impacts [54]. From the basic assumptions of the standard I-O models, for an economy with n sectors of activity the conventional demand-driven I-O model can be formulated in matrix algebra notation [50]:

$$\mathbf{x} = \mathbf{A}\mathbf{x} + \mathbf{f} \tag{1}$$

$$(\mathbf{I} - \mathbf{A})\mathbf{x} = \mathbf{f} \tag{2}$$

where **A** and **I** are the regional input coefficients matrix and the identity matrix (square matrices of n rows and n columns), and **x** and **f** are the column vectors of total output and final demand, respectively. The matrix that results from solving (**I-A**) is known as the Leontief matrix. From expression (2), we can yield the following:

$$\mathbf{x} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{f} = \mathbf{L}\mathbf{f} \tag{3}$$

Where $\mathbf{L} = (\mathbf{I}\text{-}\mathbf{A})^{-1}$ is the Leontief inverse matrix of the total requirements ($l_{ij}$). Each element of this matrix would indicate the value of the output of sector i that is required to be able to satisfy a unit increase in the final demand of sector j.

This conventional I-O model adheres to the classic scenario where the final demand is the economy's driving force. However, in certain cases it is advisable to use models drawn up, at least partially, from the perspective of supply [55–58]. As previously mentioned, some marine sectors of the economies of the three cases analysed have been directly affected by the implementation of MSP. These direct impacts are the consequence of an exogenous factor (MSP implementation) and not a change in the final demand for their products. MSP's effect on marine sectors can be considered a supply shock, so it is necessary to change the focus towards models that consider a different perspective from the conventional one. That is, it can be assumed that part of the total output of k sectors of the economy (those directly affected by MSP) is determined exogenously ($\mathbf{x}'^{ex} = [x_1,\ldots,x_k]$) and their final demands, endogenously ($\mathbf{f}'^{en} = [f_1,\ldots,f_k]$). The remaining industries (n-k sectors) are assumed to remain exogenous in their final demands ($\mathbf{f}'^{ex} = [f_{k+1},\ldots,f_n]$) and endogenous in their outputs ($\mathbf{x}'^{en} = [x_{k+1},\ldots,x_n]$). These types of models which mix the traditional approach of demand with that of supply are known as mixed endogenous-exogenous I-O models and have been frequently used in many empirical studies, mainly those related to the evaluation of economic impacts of activity sectors linked to the use and exploitation of natural resources [59–64]. However, the application of these mixed models for the evaluation of the economic impacts associated with the implementation of public policies is not frequent, which constitutes a novel contribution of this work.

To simplify the notation, a partition of the elements of matrix **A** can be assumed:

$$\mathbf{A} = \begin{pmatrix} \mathbf{A_{11}} & \mathbf{A_{12}} \\ \mathbf{A_{21}} & \mathbf{A_{22}} \end{pmatrix} \tag{4}$$

In relation to the regional input coefficients matrix (**A**), matrix $\mathbf{A_{11}}$ contains the elements of the first k rows and columns; matrix $\mathbf{A_{21}}$ contains the elements of the last n–k rows and the first k columns; matrix $\mathbf{A_{12}}$ contains the elements of the first k rows and the last n–k columns; and matrix $\mathbf{A_{22}}$ contains the elements of the last n–k rows and columns. The same notation criteria can be used for the partitioned matrices of **I** and **L**. From (2), we can express the I-O system as follows:

$$\begin{bmatrix} (\mathbf{I_{11}} - \mathbf{A_{11}}) & -\mathbf{A_{12}} \\ -\mathbf{A_{21}} & (\mathbf{I_{22}} - \mathbf{A_{22}}) \end{bmatrix} \begin{bmatrix} \mathbf{x}^{ex} \\ \mathbf{x}^{en} \end{bmatrix} = \begin{bmatrix} \mathbf{f}^{en} \\ \mathbf{f}^{ex} \end{bmatrix} \tag{5}$$

Rearranging (5) provides:

$$\begin{bmatrix} -\mathbf{I_{11}} & -\mathbf{A_{12}} \\ \mathbf{0} & (\mathbf{I_{22}} - \mathbf{A_{22}}) \end{bmatrix} \begin{bmatrix} \mathbf{f}^{en} \\ \mathbf{x}^{en} \end{bmatrix} = \begin{bmatrix} -(\mathbf{I_{11}} - \mathbf{A_{11}}) & \mathbf{0} \\ \mathbf{A_{21}} & \mathbf{I_{22}} \end{bmatrix} \begin{bmatrix} \mathbf{x}^{ex} \\ \mathbf{f}^{ex} \end{bmatrix} \tag{6}$$

From (6) is obtained:

$$\begin{bmatrix} \mathbf{f}^{en} \\ \mathbf{x}^{en} \end{bmatrix} = \begin{bmatrix} (\mathbf{I_{11}} - \mathbf{A_{11}}) - (\mathbf{A_{12}}\mathbf{L_{22}}\mathbf{A_{21}}) & -\mathbf{A_{12}}\mathbf{L_{22}} \\ \mathbf{L_{22}}\mathbf{A_{21}} & \mathbf{L_{22}} \end{bmatrix} \begin{bmatrix} \mathbf{x}^{ex} \\ \mathbf{f}^{ex} \end{bmatrix} \tag{7}$$

where $\mathbf{L_{22}} = (\mathbf{I_{22}}\text{-}\mathbf{A_{22}})^{-1}$.

If it is assumed that implementing MSP has no direct effects on the final demand of non-marine sectors ($\mathbf{f}'^{ex} = [0,\ldots,0]$), from the final direct impacts of MSP on k marine sectors ($\mathbf{x}^{ex}$), then expression (7) allows estimation of the indirect impacts on the economy as a whole. These indirect impacts will be located both in the marine sectors' final demand ($\mathbf{f}^{en}$) and in the output of the rest of the economy's non-marine sectors ($\mathbf{x}^{en}$).

To estimate the induced effects, it is common to extend the basic model expressed in Eqs. (1)–(3), endogenizing final household consumption [50]. In this closed I-O model with respect to households, there will be an extended matrix of technical coefficients ($\overline{\mathbf{A}}$), and an extended Leontief's inverse ($\overline{\mathbf{L}}$), both with n + 1 rows and n + 1 columns. The column n + 1 will be formed by the final household consumption of every good or service produced by n sectors of the economy. To calculate the elements of row n + 1, it will be assumed that the total final household consumption is distributed sectorally in accordance with each sector's contribution to the economy's total GDP. The elements of $\overline{\mathbf{L}}$ ($\bar{l}_{ij}$) incorporate the total impacts (direct, indirect and induced).

After the first impacts, a new extended final demand vector can be built ($\bar{\mathbf{f}}$) formed by n + 1 elements. The first k elements of this vector will be the new final demands estimated for the marine sectors ($\mathbf{f}^{en}$), while the remaining n-k + 1 elements will be zero. From (3), by setting this extended final demand vector ($\bar{\mathbf{f}}$) against the extended Leontief's inverse ($\overline{\mathbf{L}}$), a new extended total output vector ($\bar{\mathbf{x}}$), which will incorporate the total impacts (direct, indirect and induced), can be obtained.

$$\bar{\mathbf{x}} = \left(\mathbf{I} - \overline{\mathbf{A}}\right)^{-1}\bar{\mathbf{f}} = \overline{\mathbf{L}}\mathbf{f} \tag{8}$$

Once the process indicated is concluded, the induced impacts are obtained through the difference between the total impacts and the direct and indirect impacts. The indirect impacts are obtained from the difference between the direct and indirect impacts and the direct impacts.

$$\begin{aligned}\text{Induced Impacts} &= \text{Total Impacts–Direct and Indirect Impacts}\\ \text{Indirect Impacts} &= \text{Direct and Indirect Impacts–Direct Impacts}\end{aligned} \quad (9)$$

From these impact values estimated for each sector's output, an estimate of said impacts in terms of GVA and employment can be made. The I-O tables usually offer information on the GVA provided by every sector of the economy ($v_i$). From this information, the coefficients of GVA per unit of output generated in each sector ($v_{c\,i} = v_i / x_i$) can be calculated. If we assume these relationships are stable, for each of the n sectors of the economy, by multiplying this sectoral coefficient by the value of the estimated impacts in terms of output, an approximation of the direct, indirect and induced impacts with regard to GVA can be obtained. A similar procedure can be followed to estimate impacts in terms of employment, now using technical labour coefficients ($e_{c\,i}$), representing the number of jobs necessary in the sector i ($e_i$) to be able to generate a unit of output in said sector ($e_{c\,i} = e_i / x_i$).

### 2.2. Data

To apply this methodology to the three case studies, it is necessary to have regional I-O tables for all of the years studied and an initial estimate of the direct impacts linked to the implementation of the MSP in each case.

In relation to I-O tables, in the cases of Belgium, Germany and Norway, Eurostat provides information on the I-O framework with unified criteria on its webside. In the German case, I-O tables for its Baltic region are not available, and therefore it was necessary to resort to I-O tables for Germany as a whole (thus assuming that the sectoral technical coefficients for the Baltic region are similar to the national ones). For the seven years analyzed in this case (from 2010 to 2016), the Eurostat database has these countries' respective symmetric I-O tables at basic prices going product by product (code naio_10_cp1700). In the Belgian case, of the three years analysed after its implementation of MSP (from 2014 to 2016), only the symmetric I-O table for 2015 is available, so it is necessary to assume that the technical coefficients for 2014 and 2016 were similar to those that corresponded to 2015. The Norwegian case is somewhat similar to the German case, in that I-O tables for its North Sea and Skagerrak regions are not available, so it is necessary to operate with the national I-O tables. For the four years analysed (from 2013 to 2016), symmetric I-O tables at basic prices industry by industry (code naio_10_cp1750) for all of the years except the first one were available, which means that for 2013 the technical coefficients corresponding to 2014 will be assumed.

These I-O tables do not contain employment data for each of the sectors contemplated in each case. Therefore, to make estimates for impacts on employment, once again the information provided by Eurostat's National Accounts employment data by industry (up to NACE A*64) is used, which provides information on total sectoral employment (domestic concept) for 2008–2016.

In relation to the initial estimate of the direct impacts of MSP, the results obtained in [49] has been adopted as a starting point in the mean scenario, expressed in constant 2010 units ($€_{2010}$). These estimates of direct impacts were made only for the marine activities affected by the MSP in each case study and on which it was possible to obtain information from official sources. The stakeholders of these marine activities were consulted about the possible range of the impacts derived from the implementation of MSP on the evolution of the annual value of their sectorial productions. From these opinions, three possible scenarios were constructed, the high (considering the maximum value of each range), the low (with the minimum values) and the medium (as an average of the two previous values). In this document, the values obtained in the average scenario will be considered, although the standard deviations of the results will also be reported in each case, considering the estimated results in the other two extreme scenarios.

In [49], the marine activities involved were identified by their corresponding NACE Rev.2 code (official classification of economic sectors in the EU). However, the Eurostat I-O tables distinguish only 65 economic sectors of activity, and they do not necessarily coincide with the NACE sectors. Therefore, to use the I-O methodology, it is necessary to establish the subsequent matches between NACE activities and the sectors in Eurostat's I-O tables (see Table 1). On quite a few occasions, several activity headings are grouped together in just one I-O sector, which has implications when interpreting the results obtained.

**Table 1**
Correspondence between NACE activities and sectors of the Eurostat I-O tables.

| NACE Rev.2 Codes | Activity (Eurostat) | Input-Output industries (Eurostat) |
|---|---|---|
| A0311 | Marine fishing | A03 - Fishing and aquaculture |
| A0321 | Marine aquaculture | |
| G4638 | Wholesale of other food, including fish, crustaceans and molluscs | G46 - Wholesale trade, except of motor vehicles and motorcycles |
| C1020 | Processing and preserving of fish, crustaceans and molluscs | C10–12 - Manufacture of food products; beverages and tobacco products |
| B0610 | Extraction of crude petroleum | B - Mining and quarrying |
| B0620 | Extraction of natural gas | |
| B0910 | Support activities for petroleum and natural gas extraction | |
| B0811 | Quarrying of ornamental and building stone, limestone, gypsum, chalk and slate | |
| B0812 | Operation of gravel and sand pits: clays and kaolin | |
| B0899 | Other mining and quarrying | |
| H5010 | Sea and coastal passenger water transport | H50 - Water transport |
| H5020 | Sea and coastal freight water transport | |
| H5229 | Other transportation support activities | H52 - Warehousing and support activities for transportation |
| N7734 | Rental and leasing services of water transport equipment | N77 - Rental and leasing activities |
| H5210 | Warehousing and storage services | H52 - Warehousing and support activities for transportation |
| H5222 | Service activities incidental to water transportation | |
| H49 | Tourism: Land transport | H49 - Land transport and transport via pipelines |
| H50 | Tourism: Water transport | H50 - Water transport |
| H51 | Tourism: Air transport | H51 - Air transport |
| I55 | Tourism: Accommodation | I - Accommodation and food service activities |
| I56 | Tourism: Food and beverage service activities | |
| N77 | Tourism: Renting and leasing of motor vehicles, recreational and sports goods | N77 - Rental and leasing activities |
| N79 | Tourism: Travel agency, tour operator reservation service and related activities | N 79 - Travel agency, tour operator reservation service and related activities |
| R90–92 | Tourism: Culture and entertainment | R90–92 Creative, arts, entertainment, library, archive, museum, other cultural services; gambling and betting services |
| D3511 | Production of electricity | D - Electricity, gas, steam and air conditioning supply |
| F4291 | Construction of water projects | F – Construction |

## 3. Results and discussion

### 3.1. Direct impacts

If the sectoral correspondences reflected in Table 1 are applied to the results obtained in [49] in the mean scenario for the three case studies, then the estimates of direct impact on the value of the production of the marine I-O sectors are obtained (shown in Tables A.1–A.3 of the Appendix). These direct impacts form the column vectors that we denote as $\mathbf{x}^{ex}$ and are used later to estimate indirect impacts.

In the three case studies, the value of the direct economic impacts derived from MSP were positive for all of the years analysed. These

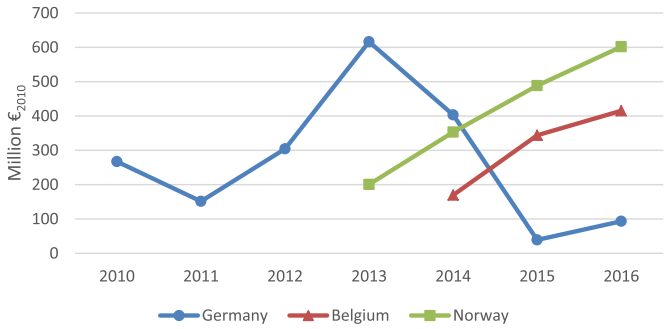


**Fig. 2.** Evolution of direct impacts on the production value of marine I-O sectors.

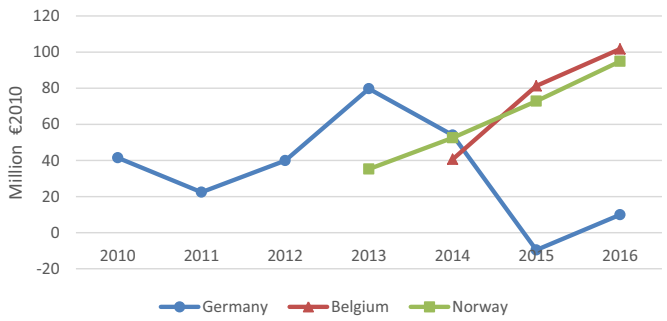


**Fig. 3.** Evolution of indirect impacts on the production value of non-marine I-O sectors.

periods differ in each case, in terms of the year in which full and effective implementation of each MSP began (see Fig. 2).

In the case of the German Baltic, during 2010–2016, the cumulative direct impacts that entail an increase of some 1875 million €$_{2010}$ with respect to the production value that would hypothetically have been reached if this policy had not been implemented were estimated. The sectors most positively affected by MSP were those linked to maritime transport and warehousing (codes H50 and H52). Sectors that suffered negative cumulative effects, such as land transport and travel agencies (codes H49 and N79), also appear (see Table A.1).

In the Belgian case, the direct impacts on marine sector production values followed an upward trend in the 3 years that MSP was applied (2014–2016), reaching a cumulative total of 929 million €$_{2010}$. The positive impacts were concentrated in the generation of electricity from the wind power sector (code D) and the construction of water projects sector (F), possibly closely linked to the development of offshore wind farms. Some tourism-related activities (sectors I and N77) have suffered negative impacts, although identifying the specific reasons that would explain such a result is difficult (see Table A.2).

In the case of Norway's North Sea and Skagerrak, the direct impacts on marine sector production value also followed an upward trend, surpassing 1644 million €$_{2010}$ accumulated in the four years of the period under analysis (2013–2016). With the exception of the warehousing sector (H52), all of the other marine sectors involved in MSP had positive impacts. Foremost among them is the increase in the maritime transport sector's (H50) production value, which accounts for just over two-thirds of the accumulated impact (see Table A.3).

From the average capacity of each marine I-O sector to generate GVA and employment per unit of output ($v_c$ and $e_c$, respectively), the value of the direct economic impacts in terms of GVA and employment can be estimated. These direct impacts for the three case studies are shown in Tables A.4–A.9.

To interpret these results properly, one must bear in mind that they are approximations, because the marine activities classified by their NACE code are now grouped together in much wider I-O sectors, which they share with other activities. For example, all of the marine activities linked to the extraction of non-living resources (extraction of oil and gas, aggregates or seabed mining) are grouped together in one I-O sector (mining and quarrying), which, furthermore, also includes onshore mining activities. That is, to calculate the direct impact on GVA and employment, the coefficients $v_c$ and $e_c$ are used, which correspond to the average of the activities that fall within said I-O sector as a whole (whether they are marine activities or otherwise). Therefore, to obtain these impact results on GVA and employment, it is assumed that the capacity of marine activity to generate GVA and employment per unit of output is similar to the average of the activities in the corresponding I-O sector in which it is included. This assumption is also applied when the indirect and induced impacts on GVA and employment are estimated.

In general, the sectoral results and trends in terms of GVA and employment have followed similar patterns to those shown in terms of production value. It is worth mentioning the exception recorded in the results of the German case for 2015. For marine sectors as a whole, positive global results were estimated, but with winning sectors and losing sectors. If the sectors that suffer negative impacts have a greater capacity to generate GVA and/or employment per unit of output than the sectors with positive impacts have, then it could result in the net annual impacts in terms of GVA and employment being negative, as occurred in the German case for 2015 (see Tables A.4 and A.7).

### 3.2. Indirect impacts

To estimate the indirect impacts, it can be assumed that the direct impacts on the production value of the 14 marine sectors are determined exogenously (associated with MSP implementation), which is why we identify them as the sectors that make up the column vectors of exogenous output ($\mathbf{x^{ex}}$). The final demands of the remaining 51 I-O sectors remain exogenous. For these I-O sectors, it is assumed that the implementation of the corresponding MSP has no direct impact on their final demands. That is, the exogenous final demand would be formed by column vectors of 51 zeros ($\mathbf{f'}^{ex} = [0,\ldots,0]$).

By rearranging the symmetric domestic matrices of each case, the corresponding regional input coefficient matrices (**A**) were calculated and partitioned in accordance with what is established in Eq. (4). The $\mathbf{A_{11}}$ matrix is made up of 14 rows and 14 columns, containing the regional input coefficients corresponding to the 14 marine I-O sectors of our case studies. The $\mathbf{A_{22}}$ matrix is made up of 51 rows and 51 columns, containing the regional input coefficients of the remaining I-O sectors (non-marine sectors). For their part, matrices $\mathbf{A_{12}}$ and $\mathbf{A_{21}}$ are 14-row x 51 column and 51-column x 14-row matrices, respectively, containing the regional input coefficients that relate the marine I-O sectors to the remaining I-O sectors.

With all of these elements, the indirect impacts on the economy as a whole, both on the final demand of the 14 marine I-O sectors ($\mathbf{f^{en}}$) as well as on the output value of the remaining 51 sectors ($\mathbf{x^{en}}$), can be estimated from Eq. (7).

In Tables A.10–A.12, these impacts on the final demand of the 14 marine I-O sectors ($\mathbf{f^{en}}$) for the three case studies are shown. For the three cases analysed, the estimated effects on the final demand of the 14 marine I-O sectors represent on average just over 75% with respect to the direct impacts on the production value of said sectors.

The increase (reduction) in marine sector production level will have a carry-over effect on the other sectors of the economy that are suppliers of intermediate inputs consumed by the marine sectors. These are the indirect impacts on the 51 non-marine I-O sectors ($\mathbf{x^{en}}$). The evolution of these indirect impacts for the three case studies is shown in Fig. 3.

In the German case, the indirect impacts on the output value of the remaining sectors vary annually within a wide range, from − 9.6 million €$_{2010}$ in 2015 to a maximum of 79.7 in 2013 (see Table A.13). If we accumulate the indirect impacts over the entire period (2010–2016) and we arrange them in order, from the highest to the lowest, then the 10 non-marine I-O sectors that appear in Table A.13 represent 73% of the

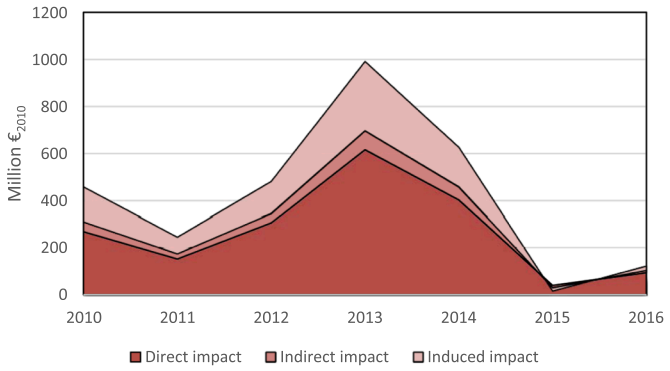


**Fig. 4.** Evolution of total impacts on the production value on German economy.

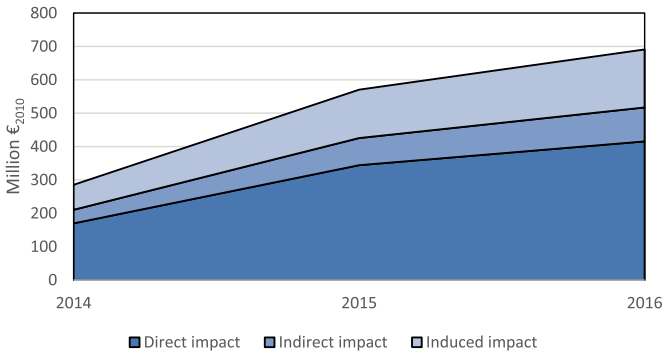


**Fig. 5.** Evolution of total impacts on the production value on Belgian economy.

total value of the indirect impacts on the output value, foremost among which are the employment services sector (N78), the real estate sector (L68B) and the petroleum refinery sector (C19). By applying the corresponding coefficients, $v_c$ and $e_c$ to these indirect impacts on the production value, an approximation of these impacts in terms of GVA and employment can be obtained. In Tables A.14 and A.15, the results obtained can be observed, specifying the 10 most affected sectors ranked in order, from the highest to the lowest impact. In general, these 10 sectors usually coincide with those in Table A.13, although slight changes in precedence can be appreciated due to the different capacity to generate GVA or employment per unit of output of each sector.

In the Belgian case, the indirect impacts on the production value of the non-marine sectors extended to 40 million €$_{2010}$ in 2014, doubled in 2015 and exceeded 101 million €$_{2010}$ in 2015 and 2016 (see Table A.16). As in the previous case, the 10 most affected non-marine sectors accumulated approximately 73% of the total indirect impacts, foremost among them the legal and accounting activities and head offices sectors (codes M69–70) as well as the financial services and insurance sectors (K64 and K66). As can be seen in Tables A.17 and A.18, the non-marine I-O sectors that see a greater indirect impact on their GVA and employment coincide quite closely with those in Table A.16, although slight changes in precedence can also be appreciated.

In the Norwegian case, the indirect impacts on the output of non-marine sectors have evolved upwards, from 35 million €$_{2010}$ in 2013 to almost 95 million €$_{2010}$ in 2016 (see Table A.19). The 10 non-marine sectors with higher indirect impacts make up almost 70% of the total cumulative impacts for the period 2013–16, the most important being the repairs and installation of machinery and equipment sector (C33), the agricultural products sector (A01) and the telecommunications services sector (J61). Similar to the previous cases, the results obtained in terms of the indirect impacts on the GVA and employment of non-marine sectors are shown in Tables A.20 and A.21.

### 3.3. Total impacts and their distribution

As was pointed out in the methodology, after the first impacts (direct and indirect), a new extended final demand vector ($\bar{\mathbf{f}}$) made up of 65 + 1 elements can be built. The first 14 elements of this vector will be the new final demands estimated for the marine sectors ($\mathbf{f}^{en}$), while the remaining 51 + 1 elements will be zeros. From Eq. (8), a valuation of the total impacts on the output value of the 65 sectors contemplated in the I-O tables can be estimated. Furthermore, from Eq. (9) the distribution of total impacts can be obtained, differentiating between types of impact.

In the German case, the distribution of the total impacts with respect to the production value by type of impact can be observed in Fig. 4. Similar evolution of the impacts in terms of GVA and employment is shown in Table A.22. As can be seen, with the exception of 2015, the total impacts were positive, in terms of both production value as well as GVA and employment. In the cumulative value for 2010–16, the total impact exceeded 2936 million €$_{2010}$ in terms of production, which entailed an increase in the total GVA of some 1088 million €$_{2010}$, generating some 13,784 jobs. It should be taken into consideration that these are results estimated in the medium scenario which could oscillate significantly, as is shown by the high standard deviation with respect to the low and high scenarios. Most of the impacts are of a direct nature in terms of production (63.8% of the total) and generation of GVA (50.2% of the total). However, in terms of employment the induced impacts are more relevant (49.9% of the total). These differences can be explained by the different capacity to generate GVA and employment of the non-marine sectors that are affected by the carry-over impacts derived from changes in marine sector production levels. Of the three case studies, German is the only one that presents significant changes in the internal distribution of the type of impacts. During 2010–2014, the relative weight of each type of impact remained stable. However, in 2015 and 2016 the direct negative impacts suffered by the storage sector (H52) caused a significant variation, increasing the relative weight of direct impacts and reducing that of indirect and induced impacts (which in 2015 were even negative in terms of the value of production). These differences are due to the different capacities of the marine sectors to generate a knock-on effect on the activity of the rest of the economic sectors. A significant change in the value of the production of a sector with a high multiplier effect (as is the case in the storage sector) causes greater economic impacts on the rest of the sectors than if the same change were produced in other sectors with less multiplier effect (as is the case in the air transport or maritime transport sectors). By sectors of activity, in the German case the total impacts are concentrated in those activities linked to maritime transport (H20 and H52), which have benefited the most from the implementation of MSP (see Tables A.23–A.25). In addition to the marine sectors directly affected by MSP, among the 20 sectors with greater total impacts are situated other non-marine sectors, such as retail trade (G47), real estate services (L68B), financial services (K64), employment services (N78), security (N80–82) or trade and repair of motor vehicles (G45). In this case, two sectors negatively affected by MSP appear; that is, travel agencies (N79) and, above all, land transport (H49), perhaps replaced by the increasing relevance of maritime transport.

In the Belgian case, the total impacts were positive and experienced an upward trend over the three years of 2014–16 (see Fig. 5 and Table A.26). The total cumulative impacts over three years (2014–16) exceeded 1546 million €$_{2010}$ in terms of production, which translated into an increase of more than 628 million €$_{2010}$ in GVA, generating almost 5500 jobs. These are estimates in the medium scenario and, though lower than in the German case, the standard deviations of these results with respect to those obtained in the low and high scenarios remain relatively high. Similar to the previous case, the greater impacts of MSP are those of a direct nature in terms of production (60.1% of the cumulative total) and GVA (52.8% of the cumulative total). However, in terms of employment, the direct impacts are exceeded by the induced impacts (36.7% as opposed to 42.0% of the cumulative total). Again, the reason for this difference is associated with the greater capacity to generate employment per unit of output of the non-marine sectors that are affected by the carry-over induced impacts. In the Belgian case, the sectors of activity that benefited the most from MSP are the electricity

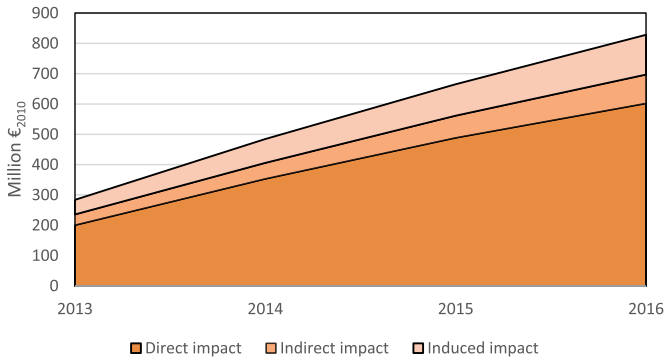


**Fig. 6.** Evolution of total impacts on the production value on Norwegian economy.

generation (D) and construction (F) sectors. Between them, they represent around 44% of the total cumulative impacts in terms of production and GVA and almost 30% in terms of employment (see Tables A.27–A.29). Foremost among the non-marine sectors with greater total positive impacts are the legal services, accounting and head offices sectors (M69–70); the retail trade sector (G47) and the financial and insurance services sectors (K64, K65 and K66). In this case, only two sectors linked to tourism activities recorded negative cumulative impacts with the implementation of MSP, those being the hotel and restaurant sector (I) and the rental and leasing services sector (N77).

In the case of Norway, the total impacts after MSP implementation were positive and experienced an upward trend during 2013–16 (see Fig. 6 and Table A.30). The total cumulative impact of production in these four years rose to 2262 million $€_{2010}$, entailing increases of almost 820 million $€_{2010}$ in GVA and the generation of 927 jobs. As in the previous cases, these results were estimated for the medium scenario, there being once again a high standard deviation with respect to the low and high scenarios. Greater direct impacts occurred, representing around 72% in terms of production, 61% in terms of GVA and 64% in terms of employment. The sectors of activity that were impacted the most positively by MSP were those related to maritime transport (H50), followed at a considerable distance by the fish-processing sector (C10–12) and the tourism activities sector (H51, N79, R90–92 and I). Foremost among the non-marine sectors are the total positive impacts of the real estate (L68A and L68B), the financial and insurance services (K64 and K65) and the retail trade (G47) sectors. For the Norwegian case, only one sector, warehousing services for transportation (H52), suffered a slight negative impact due to MSP implementation (see Tables A.31–A.33).

## 4. Conclusions

The use of tools related to the I-O methodology for studying the effects derived from the implementation of a public policy, such as MSP, can offer a more complete perspective of the impacts on the economy as a whole. It can be assumed that the changes in the production levels of the sectors directly affected by MSP (here called marine sectors) were caused by an exogenous factor, the public policy implemented. If this is the case, a suitable way to approach the estimation of economic impacts is to use a mixed endogenous-exogenous I-O model, as applied in the three case studies.

From the estimates of direct impacts on marine sector production value provided by [49], each of the three case studies was able to obtain results of the possible indirect and induced impacts on their corresponding economies. Furthermore, from the capacity to generate GVA and employment per unit of output, each study was also able to obtain approximations of the meaning of these impacts in terms of GVA and employment generated.

If the distribution of the total impacts is analysed according to their type, then the most relevant for the three case studies were the direct impacts (which involve the marine sectors regulated by MSP), followed by the induced impacts (involving all 65 sectors of the economy) and the indirect impacts (which involve the non-marine sectors that supply intermediate goods and services aimed at the marine sectors).

The results for the case of the German Baltic Sea show net positive impacts for almost all of the period analysed (2010–16). The activity sectors that clearly benefit most from MSP are those related to maritime transport (water transport services, H20, and warehousing and support services for transportation, H52), which provides clues as to the orientation and priorities of marine planning in this case. In the Belgian case, the sectors that concentrated the greatest positive impacts of their MSP (2014–16) were those related to the generation of electrical energy (sector D) and water project construction (sector F), activities linked to the possibility of developing offshore wind farms. In the case of the Norwegian North Sea and Skagerrak, the positive impacts were concentrated in the maritime transport sector (sector H50), although the fish-processing (sector C10–12) and tourism activities sectors also benefited (sectors H51, N79, R90–92 and I). In general, in the three cases analysed, the negative economic impacts were relatively low and concentrated in few sectors.

The various results obtained in each case study are explained both by the different objectives of each country's marine management and by the size and sectoral productive structure of each economy. Thus, for example, the large size of the German economy and its sectoral diversity means that the total impacts on the GVA estimated here barely represent 0.01% of its GDP annually. In the Belgian and Norwegian cases, with smaller economies and a greater sectoral presence of marine activities, the total impacts on the GVA estimated in this work come to represent annually around 0.05% and 0.06%, respectively, of their GDPs.

All the results achieved in this work should be taken with certain caution, because they respond to the medium scenario, with a high standard deviation with respect to the estimated results in the low and high scenarios. Furthermore, the results obtained should be taken as simple approximations, given the rigidity of the assumptions of the applied model. This exercise assumes that the regional economies of the German Baltic and the Norwegian North Sea and Skagerrak have similar cross-sectoral flows as those of their respective economies as a whole. It is also assumed that marine activities grouped in mixed IO sectors (which combine marine activities with other non-marine ones), operate with the same input coefficients and with the same capacity to generate GVA and employment per unit of production as the average of the corresponding sector. Being able to have regionalized I-O tables in the future with disaggregated sectoral information for marine activities could undoubtedly improve the quality and robustness of the results obtained.

With all of these cautions and considerations, the results obtained in the analysis of the three case studies offer a more complete perspective with regard to the economic effects of these public planning policies. Moreover, the methodology followed can be used as an applicable action guide for other similar cases.

## CRediT authorship contribution statement

All the work in this document has been carried out jointly by the 4 authors.

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collaboration of the stakeholders who participated in the consultation process to carry out that study.

## Appendix A

See Tables A1–A33.

**Table A.1**
Germany: Direct impacts on the production value of marine I-O sectors ($\mathbf{x}^{ex}$).

| I-O Code | Sector | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2010–16}$ |
|---|---|---|---|---|---|---|---|---|---|
| A03 | Fish and aquaculture | 0.5 | 1.6 | 2.4 | 6.6 | 6.0 | 6.0 | 5.7 | **28.9** |
| B | Mining and quarrying | 11.0 | 2.6 | -0.3 | -1.0 | -1.0 | 2.8 | 2.6 | **16.7** |
| C10–12 | Manufacture of food, beverages | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| D | Electricity, gas, steam … | 0.0 | 0.0 | 0.0 | 1.4 | 1.0 | 11.5 | 12.3 | **26.2** |
| F | Construction | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| G46 | Wholesale trade | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| H49 | Land transport | 0.2 | -3.1 | -17.1 | -18.8 | -12.6 | 4.6 | -22.3 | **-69.0** |
| H50 | Water transport | 137.7 | 115.1 | 198.2 | 307.4 | 225.4 | 165.8 | 126.5 | **1276.2** |
| H51 | Air Transport | 9.9 | 0.4 | -1.3 | -0.2 | 15.4 | 1.6 | 15.5 | **41.3** |
| H52 | Warehousing | 112.2 | 33.2 | 130.0 | 359.4 | 179.1 | -169.8 | -57.4 | **586.7** |
| I | Accommodation and food | 2.3 | 6.7 | -1.7 | -39.8 | -6.4 | 17.7 | 18.9 | **-2.3** |
| N77 | Rental and leasing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| N79 | Travel agency, tour operator … | -6.4 | -5.1 | -5.7 | 1.4 | -3.6 | -1.5 | -8.3 | **-29.1** |
| R90–92 | Creative, arts, entertainment … | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| | **Total** | **267.4** | **151.5** | **304.6** | **616.4** | **403.4** | **39.0** | **93.5** | **1875.7** |

Medium scenario (Units, million constant Euros, $€_{2010)}$.

**Table A.2**
Belgium: Direct impacts on the production value of marine I-O sectors ($\mathbf{x}^{ex}$).

| I-O Code | Sector | 2014 | 2015 | 2016 | $\Sigma_{2014–16}$ |
|---|---|---|---|---|---|
| A03 | Fish and aquaculture | 0.1 | 0.0 | 0.0 | **0.0** |
| B | Mining and quarrying | 24.1 | 0.5 | 37.7 | **62.2** |
| C10–12 | Manufacture of food, beverages | -0.2 | 0.1 | 0.2 | **0.1** |
| D | Electricity, gas, steam … | 130.8 | 147.6 | 174.3 | **452.7** |
| F | Construction | 18.5 | 89.1 | 100.7 | **208.2** |
| G46 | Wholesale trade | 0.4 | 0.2 | -0.6 | **0.0** |
| H49 | Land transport | 0.0 | 0.0 | 0.0 | **0.0** |
| H50 | Water transport | -17.2 | 48.7 | 57.7 | **89.2** |
| H51 | Air Transport | 0.0 | 0.0 | 0.0 | **0.0** |
| H52 | Warehousing | -9.2 | 54.3 | 46.7 | **91.9** |
| I | Accommodation and food | 2.4 | -6.8 | -40.9 | **-45.3** |
| N77 | Rental and leasing | -22.2 | -19.2 | -1.3 | **-42.7** |
| N79 | Travel agency, tour operator … | 42.3 | 29.6 | 41.1 | **113.0** |
| R90–92 | Creative, arts, entertainment … | 0.0 | 0.0 | 0.0 | **0.0** |
| | **Total** | **169.8** | **344.1** | **415.4** | **929.3** |

Medium scenario (Units, million constant Euros, $€_{2010)}$.

**Table A.3**
Norway: Direct impacts on the production value of marine I-O sectors ($\mathbf{x}^{ex}$).

| I-O Code | Sector | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2013–16}$ |
|---|---|---|---|---|---|---|
| A03 | Fish and aquaculture | -8.8 | -0.1 | 4.3 | 11.1 | **6.5** |
| B | Mining and quarrying | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| C10–12 | Manufacture of food, beverages | -2.5 | 1.3 | 54.5 | 91.8 | **145.0** |
| D | Electricity, gas, steam … | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| F | Construction | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| G46 | Wholesale trade | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| H49 | Land transport | 6.8 | 8.1 | 5.8 | 6.0 | **26.7** |
| H50 | Water transport | 98.9 | 250.3 | 368.4 | 470.1 | **1187.7** |
| H51 | Air Transport | 17.0 | 27.4 | 29.5 | 25.8 | **99.7** |
| H52 | Warehousing | 1.8 | 8.7 | -4.6 | -26.9 | **-21.0** |
| I | Accommodation and food | 44.5 | 17.7 | -7.5 | -31.0 | **23.6** |
| N77 | Rental and leasing | 2.3 | 2.0 | 1.6 | 3.9 | **9.8** |
| N79 | Travel agency, tour operator … | 24.3 | 20.8 | 15.9 | 26.2 | **87.2** |
| R90–92 | Creative, arts, entertainment … | 16.2 | 17.3 | 20.6 | 25.1 | **79.2** |
| | **Total** | **200.5** | **353.3** | **488.6** | **602.1** | **1644.5** |

Medium scenario (Units, million constant Euros, $€_{2010)}$.

**Table A.4**
Germany: Direct impacts on the GVA of marine I-O sectors.

| I-O Code | Sector | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2010–16}$ |
|---|---|---|---|---|---|---|---|---|---|
| A03 | Fish and aquaculture | 0.3 | 0.9 | 1.5 | 3.8 | 3.4 | 3.3 | 3.2 | **16.4** |
| B | Mining and quarrying | 5.2 | 1.1 | -0.2 | -0.4 | -0.4 | 1.1 | 1.0 | **7.3** |
| C10–12 | Manufacture of food, beverages | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| D | Electricity, gas, steam … | 0.0 | 0.0 | 0.0 | 0.5 | 0.3 | 3.6 | 3.8 | **8.2** |
| F | Construction | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| G46 | Wholesale trade | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| H49 | Land transport | 0.1 | -1.5 | -8.4 | -9.4 | -6.5 | 2.4 | -10.8 | **-34.1** |
| H50 | Water transport | 44.1 | 32.1 | 52.4 | 91.2 | 53.3 | 35.7 | 23.4 | **332.3** |
| H51 | Air Transport | 2.6 | 0.1 | -0.3 | 0.0 | 3.0 | 0.5 | 4.7 | **10.6** |
| H52 | Warehousing | 40.4 | 11.5 | 46.2 | 131.1 | 63.4 | -60.8 | -20.0 | **211.8** |
| I | Accommodation and food | 1.1 | 3.1 | -0.8 | -18.3 | -3.0 | 8.7 | 9.1 | **-0.2** |
| N77 | Rental and leasing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| N79 | Travel agency, tour operator … | -1.7 | -1.2 | -1.3 | 0.3 | -0.9 | -0.3 | -1.6 | **-6.7** |
| R90–92 | Creative, arts, entertainment … | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| | **Total** | **92.0** | **46.1** | **89.1** | **198.8** | **112.6** | **-5.9** | **12.9** | **545.6** |

Medium scenario (Units, million constant Euros, $€_{2010)}$.

**Table A.5**
Belgium: Direct impacts on the GVA of marine I-O sectors.

| I-O Code | Sector | 2014 | 2015 | 2016 | $\Sigma_{2014–16}$ |
|---|---|---|---|---|---|
| A03 | Fish and aquaculture | 0.0 | 0.0 | 0.0 | **0.0** |
| B | Mining and quarrying | 8.0 | 0.2 | 12.6 | **20.7** |
| C10–12 | Manufacture of food, beverages | 0.0 | 0.0 | 0.0 | **0.0** |
| D | Electricity, gas, steam … | 61.4 | 69.2 | 81.7 | **212.3** |
| F | Construction | 5.2 | 25.1 | 28.4 | **58.8** |
| G46 | Wholesale trade | 0.2 | 0.1 | -0.3 | **0.0** |
| H49 | Land transport | 0.0 | 0.0 | 0.0 | **0.0** |
| H50 | Water transport | -5.1 | 14.4 | 17.0 | **26.4** |
| H51 | Air Transport | 0.0 | 0.0 | 0.0 | **0.0** |
| H52 | Warehousing | -3.5 | 20.7 | 17.8 | **35.1** |
| I | Accommodation and food | 1.0 | -2.8 | -17.1 | **-18.9** |
| N77 | Rental and leasing | -10.5 | -9.1 | -0.6 | **-20.2** |
| N79 | Travel agency, tour operator … | 6.7 | 4.7 | 6.5 | **18.0** |
| R90–92 | Creative, arts, entertainment … | 0.0 | 0.0 | 0.0 | **0.0** |
| | **Total** | **63.4** | **122.5** | **146.2** | **332.1** |

Medium scenario (Units, million constant Euros, $€_{2010)}$.

**Table A.6**
Norway: Direct impacts on the GVA of marine I-O sectors.

| I-O Code | Sector | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2013–16}$ |
|---|---|---|---|---|---|---|
| A03 | Fish and aquaculture | -3.6 | -0.1 | 1.6 | 5.2 | **3.2** |
| B | Mining and quarrying | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| C10–12 | Manufacture of food, beverages | -0.5 | 0.3 | 10.5 | 16.9 | **27.2** |
| D | Electricity, gas, steam … | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| F | Construction | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| G46 | Wholesale trade | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| H49 | Land transport | 3.6 | 4.3 | 3.2 | 3.3 | **14.3** |
| H50 | Water transport | 34.7 | 87.7 | 115.6 | 136.1 | **374.2** |
| H51 | Air Transport | 2.9 | 4.7 | 6.1 | 7.1 | **20.8** |
| H52 | Warehousing | 0.5 | 2.7 | -1.5 | -10.0 | **-8.3** |
| I | Accommodation and food | 21.1 | 8.4 | -3.5 | -14.6 | **11.3** |
| N77 | Rental and leasing | 0.9 | 0.8 | 0.6 | 1.6 | **3.9** |
| N79 | Travel agency, tour operator … | 4.1 | 3.5 | 2.8 | 4.8 | **15.3** |
| R90–92 | Creative, arts, entertainment … | 8.1 | 8.7 | 10.5 | 12.4 | **39.7** |
| | **Total** | **71.8** | **120.9** | **145.9** | **162.9** | **501.6** |

Medium scenario (Units, million constant Euros, $€_{2010)}$.

**Table A.7**
Germany: Direct impacts on employment in marine I-O sectors.

| I-O Code | Sector | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2010–16}$ |
|---|---|---|---|---|---|---|---|---|---|
| A03 | Fish and aquaculture | 6.5 | 19.9 | 34.4 | 87.4 | 75.0 | 72.7 | 64.6 | **360.5** |
| B | Mining and quarrying | 66.4 | 14.9 | -1.9 | -5.6 | -5.7 | 15.3 | 14.6 | **97.9** |
| C10–12 | Manufacture of food, beverages | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| D | Electricity, gas, steam … | 0.0 | 0.0 | 0.0 | 3.2 | 2.4 | 27.3 | 27.9 | **60.8** |
| F | Construction | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| G46 | Wholesale trade | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| H49 | Land transport | 1.7 | -29.2 | -159.7 | -174.8 | -115.2 | 41.7 | -206.4 | **-641.9** |
| H50 | Water transport | 189.2 | 145.1 | 243.3 | 370.3 | 284.3 | 169.1 | 174.5 | **1575.8** |
| H51 | Air Transport | 26.8 | 1.0 | -3.3 | -0.5 | 38.6 | 4.0 | 40.9 | **107.5** |
| H52 | Warehousing | 669.8 | 186.4 | 718.2 | 1948.6 | 920.9 | -897.0 | -305.0 | **3241.9** |
| I | Accommodation and food | 53.1 | 147.1 | -38.1 | -861.2 | -134.2 | 360.1 | 370.9 | **-102.1** |
| N77 | Rental and leasing | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| N79 | Travel agency, tour operator … | -26.5 | -19.9 | -19.9 | 5.2 | -13.2 | -5.3 | -28.2 | **-108.9** |
| R90–92 | Creative, arts, entertainment … | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| | **Total** | **987.0** | **465.4** | **772.0** | **1372.6** | **1052.9** | **-212.1** | **153.9** | **4591.6** |

Medium scenario (Units, number of jobs).

**Tablee A.8**
Belgium: Direct impacts on employment in marine I-O sectors.

| I-O Code | Sector | 2014 | 2015 | 2016 | $\Sigma_{2014–16}$ |
|---|---|---|---|---|---|
| A03 | Fish and aquaculture | 0.3 | 0.0 | -0.2 | **0.1** |
| B | Mining and quarrying | 54.6 | 1.1 | 85.5 | **141.2** |
| C10–12 | Manufacture of food, beverages | -0.5 | 0.2 | 0.5 | **0.2** |
| D | Electricity, gas, steam … | 214.4 | 241.9 | 285.7 | **742.0** |
| F | Construction | 75.3 | 363.3 | 410.5 | **849.0** |
| G46 | Wholesale trade | 1.4 | 0.7 | -2.2 | **-0.1** |
| H49 | Land transport | 0.0 | 0.0 | 0.0 | **0.0** |
| H50 | Water transport | -21.4 | 60.8 | 72.0 | **111.4** |
| H51 | Air Transport | 0.0 | 0.0 | 0.0 | **0.0** |
| H52 | Warehousing | -30.9 | 182.6 | 157.0 | **308.7** |
| I | Accommodation and food | 21.5 | -60.1 | -361.0 | **-399.6** |
| N77 | Rental and leasing | -19.4 | -16.8 | -1.2 | **-37.3** |
| N79 | Travel agency, tour operator … | 113.5 | 79.6 | 110.5 | **303.6** |
| R90–92 | Creative, arts, entertainment … | 0.0 | 0.0 | 0.0 | **0.0** |
| | **Total** | **408.8** | **853.3** | **757.2** | **2019.3** |

Medium scenario (Units, number of jobs).

**Table A.9**
Norway: Direct impacts on employment in marine I-O sectors.

| I-O Code | Sector | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2013–16}$ |
|---|---|---|---|---|---|---|
| A03 | Fish and aquaculture | -2.2 | 0.0 | 1.1 | 2.3 | **1.2** |
| B | Mining and quarrying | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| C10–12 | Manufacture of food, beverages | -0.7 | 0.4 | 13.8 | 21.0 | **34.5** |
| D | Electricity, gas, steam … | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| F | Construction | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| G46 | Wholesale trade | 0.0 | 0.0 | 0.0 | 0.0 | **0.0** |
| H49 | Land transport | 4.6 | 5.4 | 4.0 | 4.0 | **18.0** |
| H50 | Water transport | 33.2 | 85.7 | 119.3 | 159.0 | **397.3** |
| H51 | Air Transport | 3.6 | 5.8 | 5.3 | 5.3 | **20.0** |
| H52 | Warehousing | 0.5 | 2.4 | -1.2 | -7.6 | **-5.9** |
| I | Accommodation and food | 48.7 | 20.0 | -8.3 | -33.8 | **26.7** |
| N77 | Rental and leasing | 0.4 | 0.4 | 0.3 | 0.6 | **1.6** |
| N79 | Travel agency, tour operator … | 7.6 | 6.5 | 5.1 | 8.2 | **27.5** |
| R90–92 | Creative, arts, entertainment … | 16.1 | 17.2 | 19.3 | 23.2 | **75.8** |
| | **Total** | **111.9** | **143.9** | **158.6** | **182.2** | **596.6** |

Medium scenario (Units, number of jobs).

**Table A.10**
Germany: Impacts on the final demand of marine I-O sectors ($\mathbf{f^{en}}$).

| I-O Code | Sector | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|
| A03 | Fish and aquaculture | 0.5 | 1.6 | 2.4 | 6.5 | 5.9 | 5.9 | 5.6 |
| B | Mining and quarrying | 10.6 | 2.5 | -0.4 | -1.1 | -1.0 | 2.6 | 2.3 |
| C10–12 | Manufacture of food, beverages | -0.8 | -1.2 | -0.9 | 2.3 | -0.5 | -2.2 | -3.2 |
| D | Electricity, gas, steam … | -1.3 | -0.5 | -0.4 | 0.6 | 0.0 | 9.2 | 9.6 |
| F | Construction | -3.0 | -1.1 | -2.9 | -7.1 | -4.2 | 2.9 | 0.4 |
| G46 | Wholesale trade | -2.9 | -2.2 | -2.7 | -3.3 | -3.4 | -1.7 | -3.1 |
| H49 | Land transport | -13.0 | -6.8 | -31.4 | -58.0 | -32.3 | 23.2 | -14.3 |
| H50 | Water transport | 136.2 | 112.4 | 193.9 | 299.5 | 223.1 | 161.1 | 125.4 |
| H51 | Air Transport | 9.7 | 0.4 | -1.3 | -0.3 | 15.2 | 1.6 | 15.1 |
| H52 | Warehousing | 76.6 | 13.1 | 85.0 | 248.2 | 101.1 | -162.1 | -64.1 |
| I | Accommodation and food | 2.1 | 6.5 | -2.0 | -40.5 | -7.1 | 17.9 | 18.6 |
| N77 | Rental and leasing | -5.4 | -3.2 | -5.2 | -9.2 | -6.4 | -1.4 | -2.8 |
| N79 | Travel agency, tour operator … | -4.6 | -3.0 | -3.5 | -1.2 | -4.4 | -2.1 | -8.5 |
| R90–92 | Creative, arts, entertainment … | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | **Total** | **204.8** | **118.3** | **230.5** | **436.5** | **286.1** | **54.8** | **81.1** |

Medium scenario (Units, million constant Euros, $€_{2010)}$.

**Table A.11**
Belgium: Impacts on the final demand of marine I-O sectors ($\mathbf{f^{en}}$).

| I-O Code | Sector | 2014 | 2015 | 2016 |
|---|---|---|---|---|
| A03 | Fish and aquaculture | 0.1 | 0.0 | 0.1 |
| B | Mining and quarrying | 23.3 | -0.2 | 35.8 |
| C10–12 | Manufacture of food, beverages | -0.8 | 0.8 | 6.3 |
| D | Electricity, gas, steam … | 116.3 | 132.1 | 154.3 |
| F | Construction | 2.1 | 48.5 | 53.6 |
| G46 | Wholesale trade | -2.2 | -5.9 | -6.1 |
| H49 | Land transport | -3.6 | -3.8 | -6.9 |
| H50 | Water transport | -17.1 | 48.7 | 57.6 |
| H51 | Air Transport | -0.5 | -1.0 | -1.2 |
| H52 | Warehousing | -6.3 | 41.6 | 33.4 |
| I | Accommodation and food | -3.3 | -12.2 | -47.7 |
| N77 | Rental and leasing | -21.5 | -21.0 | -5.2 |
| N79 | Travel agency, tour operator … | 42.1 | 29.4 | 40.8 |
| R90–92 | Creative, arts, entertainment … | 0.0 | 0.0 | 0.0 |
| | **Total** | **128.7** | **256.8** | **314.9** |

Medium scenario (Units, million constant Euros, $€_{2010)}$.

**Table A.12**
Norway: Impacts on the final demand of marine I-O sectors ($\mathbf{f^{en}}$).

| I-O Code | Sector | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|
| A03 | Fish and aquaculture | -8.2 | -0.5 | -3.1 | -3.4 |
| B | Mining and quarrying | -2.1 | -4.5 | -13.3 | -10.3 |
| C10–12 | Manufacture of food, beverages | -3.7 | -1.1 | 40.9 | 71.0 |
| D | Electricity, gas, steam … | -1.0 | -1.0 | -1.2 | -1.5 |
| F | Construction | -2.1 | -2.0 | -2.3 | -2.4 |
| G46 | Wholesale trade | -2.9 | -4.6 | -7.0 | -7.4 |
| H49 | Land transport | 5.2 | 6.1 | 2.9 | 2.0 |
| H50 | Water transport | 92.4 | 234.6 | 335.6 | 440.3 |
| H51 | Air Transport | 11.5 | 22.4 | 25.5 | 19.8 |
| H52 | Warehousing | -4.5 | -3.6 | -24.6 | -54.4 |
| I | Accommodation and food | 41.6 | 15.3 | -9.2 | -32.1 |
| N77 | Rental and leasing | -0.8 | -2.9 | -4.7 | -6.6 |
| N79 | Travel agency, tour operator … | 24.1 | 20.5 | 15.7 | 25.7 |
| R90–92 | Creative, arts, entertainment … | 16.1 | 17.2 | 20.4 | 24.9 |
| | **Total** | **165.5** | **295.8** | **375.7** | **465.6** |

Medium scenario (Units, million constant Euros, $€_{2010)}$.

**Table A.13**
Germany: Indirect impacts on the production value of non-marine I-O sectors ($\mathbf{x^{en}}$).

| I-O Code | Sector | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2010–16}$ |
|---|---|---|---|---|---|---|---|---|---|
| N78 | Employment services | 3.7 | 3.0 | 5.6 | 11.7 | 7.6 | -0.6 | 1.2 | **32.3** |
| C19 | Coke and refined petroleum products | 5.2 | 3.8 | 6.5 | 8.4 | 5.8 | -0.4 | 1.9 | **31.2** |
| C33 | Repair, installation of machinery and equipment | 2.8 | 2.0 | 2.5 | 3.6 | 3.5 | 2.7 | 3.9 | **21.0** |
| L68B | Real estate services excluding imputed rents | 3.6 | 2.1 | 3.3 | 4.9 | 3.9 | -1.1 | 0.7 | **17.4** |
| G45 | Wholesale and retail trade of motor vehicles | 3.5 | 1.0 | 3.4 | 10.1 | 5.3 | -4.8 | -1.6 | **17.0** |
| K64 | Financial services, except insurance … | 3.1 | 1.2 | 2.3 | 4.6 | 3.1 | -0.2 | 0.8 | **14.9** |
| J62–63 | Computer programming, consultancy … | 2.0 | 0.7 | 2.7 | 7.9 | 4.3 | -3.1 | -1.0 | **13.4** |
| M71 | Architectural and engineering services … | 1.9 | 0.7 | 1.8 | 5.2 | 2.8 | -1.6 | -0.3 | **10.5** |
| N80–82 | Security and investigation services … | 1.6 | 0.7 | 1.5 | 3.5 | 2.4 | -0.9 | 2.1 | **8.9** |
| G47 | Retail trade services, except of motor vehicles | 0.7 | 1.2 | 1.3 | 0.7 | 1.5 | 1.5 | -0.3 | **8.5** |
| | Other sectors | 13.5 | 6.1 | 9.0 | 19.1 | 13.9 | -1.3 | 2.5 | **62.8** |
| | **Total indirect** | **41.5** | **22.4** | **39.9** | **79.7** | **54.0** | **-9.6** | **9.9** | **237.9** |

Medium scenario (Units, million constant Euros, $€_{2010)}$.

**Table A.14**
Germany: Indirect impacts on the GVA of non-marine I-O sectors.

| I-O Code | Sector | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2010–16}$ |
|---|---|---|---|---|---|---|---|---|---|
| N78 | Employment services | 2.7 | 2.1 | 4.3 | 9.5 | 6.4 | -0.5 | 1.0 | **25.4** |
| L68B | Real estate services | 2.6 | 1.5 | 2.4 | 3.7 | 2.9 | -0.8 | 0.5 | **12.8** |
| G45 | Wholesale and retail trade of motor vehicles | 2.2 | 0.7 | 2.3 | 6.8 | 3.6 | -3.3 | -1.1 | **11.3** |
| J62–63 | Computer programming, consultancy … | 1.1 | 0.4 | 1.5 | 4.7 | 2.5 | -1.8 | 1.4 | **8.0** |
| C33 | Repair, installation of machinery-equipment | 1.1 | 0.7 | 1.0 | 1.4 | 1.3 | 1.1 | -0.6 | **7.9** |
| K64 | Financial services, except insurance … | 1.5 | 0.6 | 1.1 | 2.2 | 1.5 | -0.1 | 0.4 | **7.1** |
| M71 | Architectural and engineering services … | 1.0 | 0.4 | 1.0 | 3.1 | 1.7 | -1.0 | -0.1 | **6.0** |
| N80–82 | Security and investigation services … | 0.9 | 0.4 | 0.9 | 2.1 | 1.4 | -0.5 | -0.1 | **5.0** |
| G47 | Retail trade services, except of motor vehicles | 0.4 | 0.6 | 0.6 | 0.4 | 0.8 | 0.8 | 1.1 | **4.7** |
| M69–70 | Legal and accounting; services of head offices | 1.0 | 0.4 | 0.7 | 1.6 | 1.0 | -0.3 | 0.0 | **4.4** |
| | Other sectors | 5.3 | 2.4 | 3.5 | 7.3 | 5.4 | -0.1 | 1.5 | **25.3** |
| | **Total indirect** | **19.9** | **10.2** | **19.4** | **42.7** | **28.5** | **-6.6** | **3.9** | **118.1** |

Medium scenario (Units, million constant Euros, $€_{2010)}$.

**Table A.15**
Germany: Indirect impacts on employment in non-marine I-O sectors.

| I-O Code | Sector | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2010–16}$ |
|---|---|---|---|---|---|---|---|---|---|
| N78 | Employment services | 114.9 | 82.5 | 162.7 | 309.1 | 199.3 | -15.2 | 34.4 | **887.8** |
| N80–82 | Security and investigation services … | 38.4 | 16.3 | 33.0 | 75.9 | 47.3 | -16.7 | -4.6 | **189.7** |
| G45 | Wholesale and retail trade of motor vehicles | 38.3 | 9.8 | 37.1 | 110.9 | 54.9 | -48.2 | -15.8 | **187.0** |
| G47 | Retail trade services, … | 14.0 | 24.6 | 25.5 | 13.8 | 27.0 | 26.0 | 35.0 | **165.9** |
| M71 | Architectural and engineering services … | 18.7 | 6.5 | 17.7 | 52.3 | 28.0 | -15.4 | -2.5 | **105.4** |
| C33 | Repair, installation of machinery-equipment | 15.2 | 10.2 | 13.2 | 18.1 | 16.9 | 13.1 | 18.0 | **104.8** |
| J62–63 | Computer programming, consultancy … | 15.1 | 4.7 | 18.3 | 51.2 | 27.2 | -19.5 | -6.5 | **90.5** |
| M69–70 | Legal,accounting; services of head offices … | 16.6 | 6.6 | 12.2 | 28.8 | 17.8 | -5.5 | -0.3 | **76.1** |
| K64 | Financial services … | 14.9 | 6.0 | 11.2 | 21.7 | 14.3 | -0.7 | 3.3 | **70.7** |
| O | Public administration and defence … | 10.8 | 5.1 | 6.8 | 14.8 | 10.1 | 8.2 | 10.5 | **66.2** |
| | Other sectors | 86.1 | 38.1 | 58.4 | 115.8 | 83.8 | -11.3 | 13.3 | **383.9** |
| | **Total indirect** | **383.1** | **210.3** | **396.1** | **812.3** | **526.8** | **-85.2** | **84.9** | **2328.2** |

Medium scenario (Units, number of jobs).

**Table A.16**
Belgium: Indirect impacts on the production value of non-marine I-O sectors ($\mathbf{x^{en}}$).

| I-O Code | Sector | 2014 | 2015 | 2016 | $\Sigma_{2014–16}$ |
|---|---|---|---|---|---|
| M69–70 | Legal and accounting, services of head offices … | 11.7 | 19.2 | 23.2 | **54.1** |
| K66 | Services auxiliary to financial services and insurance services | 6.6 | 8.2 | 11.3 | **26.1** |
| K64 | Financial services, except insurance and pension funding | 3.6 | 5.6 | 7.4 | **16.6** |
| C33 | Repair and installation services of machinery and equipment | 2.0 | 4.7 | 6.9 | **13.6** |
| J62–63 | Computer programming; Information services … | 2.5 | 3.4 | 4.4 | **10.3** |
| C23 | Other non-metallic mineral products | 1.1 | 4.1 | 5.0 | **10.2** |
| L68B | Real estate services excluding imputed rents | 1.2 | 4.3 | 3.2 | **8.7** |
| C20 | Chemicals and chemical products | 2.0 | 2.6 | 3.7 | **8.3** |
| N80–82 | Security and investigation services … | 1.1 | 3.4 | 3.7 | **8.2** |
| N78 | Employment services | 0.7 | 3.5 | 3.4 | **7.6** |
| | Other sectors | 7.9 | 22.3 | 29.5 | **59.7** |
| | **Total indirect** | **40.6** | **81.3** | **101.7** | **223.6** |

Medium scenario (Units, million constant Euros, $€_{2010)}$.

**Table A.17**
Belgium: Indirect impacts on the GVA of non-marine I-O sectors.

| I-O Code | Sector | 2014 | 2015 | 2016 | $\Sigma_{2014–16}$ |
|---|---|---|---|---|---|
| M69–70 | Legal and accounting; services of head offices … | 6.4 | 10.4 | 12.6 | **29.4** |
| K66 | Services auxiliary to financial services and insurance services | 3.0 | 3.7 | 5.1 | **11.8** |
| K64 | Financial services, except insurance and pension funding | 2.1 | 3.2 | 4.3 | **9.6** |
| N78 | Employment services | 0.5 | 2.9 | 2.8 | **6.2** |
| L68B | Real estate services excluding imputed rents | 0.8 | 2.8 | 2.1 | **5.7** |
| C33 | Repair and installation services of machinery and equipment | 0.7 | 1.7 | 2.5 | **4.9** |
| J62–63 | Computer programming; Information services … | 1.2 | 1.6 | 2.1 | **4.9** |
| N80–82 | Security and investigation services … | 0.5 | 1.6 | 1.7 | **3.8** |
| C23 | Other non-metallic mineral products | 0.4 | 1.4 | 1.7 | **3.5** |
| C25 | Fabricated metal products, except machinery and equipment | 0.3 | 1.0 | 1.3 | **2.6** |
| | Other sectors | 3.2 | 6.8 | 9.1 | **19.1** |
| | **Total indirect** | **19.1** | **37.1** | **45.2** | **101.4** |

Medium scenario (Units, million constant Euros, $€_{2010)}$.

**Table A.18**
Belgium: Indirect impacts on employment in non-marine I-O sectors.

| I-O Code | Sector | 2014 | 2015 | 2016 | $\Sigma_{2014–16}$ |
|---|---|---|---|---|---|
| M69–70 | Legal and accounting; services of head offices … | 78.7 | 128.4 | 155.4 | **362.5** |
| N78 | Employment services | 15.7 | 83.6 | 79.9 | **179.2** |
| N80–82 | Security and investigation services … | 15.6 | 48.2 | 51.9 | **115.7** |
| K64 | Financial services, except insurance and pension funding | 12.9 | 20.2 | 26.7 | **59.8** |
| K66 | Services auxiliary to financial services and insurance services | 13.1 | 16.2 | 22.4 | **51.7** |
| C25 | Fabricated metal products, except machinery and equipment | 5.1 | 17.9 | 22.1 | **45.1** |
| C23 | Other non-metallic mineral products | 4.9 | 18.0 | 22.2 | **45.1** |
| C33 | Repair and installation services of machinery and equipment | 5.4 | 12.5 | 18.4 | **36.3** |
| J62–63 | Computer programming;Information services … | 8.6 | 11.5 | 14.8 | **34.9** |
| O | Public administration and defence services; … | 6.5 | 9.2 | 12.2 | **27.9** |
| | Other sectors | 33.3 | 79.1 | 99.3 | **211.7** |
| | **Total indirect** | **199.9** | **444.8** | **525.4** | **1170.1** |

Medium scenario (Units, number of jobs).

**Table A.19**
Norway: Indirect impacts on the production value of non-marine I-O sectors ($\mathbf{x}^{\mathbf{en}}$).

| I-O Code | Sector | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2013–16}$ |
|---|---|---|---|---|---|---|
| C33 | Repair and installation services of machinery and equipment | 2.8 | 6.5 | 8.0 | 11.5 | **28.8** |
| A01 | Products of agriculture, hunting and related services | -0.2 | 0.4 | 9.6 | 14.1 | **23.9** |
| J61 | Telecommunications services | 2.1 | 4.2 | 6.9 | 9.2 | **22.4** |
| K64 | Financial services, except insurance and pension funding | 2.5 | 4.3 | 5.8 | 7.1 | **19.7** |
| G47 | Retail trade services, except of motor vehicles | 2.1 | 3.4 | 5.5 | 5.8 | **16.8** |
| L68B | Real estate services excluding imputed rents | 6.2 | 4.4 | 2.7 | 2.8 | **16.1** |
| N80–82 | Security and investigation services … | 2.5 | 3.4 | 4.4 | 5.7 | **16.0** |
| K65 | Insurance, reinsurance and pension funding services | 1.0 | 2.1 | 3.2 | 5.4 | **11.7** |
| O | Public administration and defence; compulsory social security | 1.3 | 2.5 | 3.8 | 3.3 | **10.9** |
| C30 | Other transport equipment | 0.8 | 2.0 | 1.0 | 4.8 | **8.6** |
| | Other sectors | 14.1 | 19.3 | 21.9 | 25.5 | **80.8** |
| | **Total indirect** | **35.2** | **52.5** | **72.8** | **94.9** | **255.4** |

Medium scenario (Units, million constant Euros, $€_{2010)}$.

**Table A.20**
Norway: Indirect impacts on the GVA of non-marine I-O sectors.

| I-O Code | Sector | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2013–16}$ |
|---|---|---|---|---|---|---|
| K64 | Financial services, except insurance and pension funding | 1.7 | 2.9 | 3.9 | 4.9 | **13.4** |
| C33 | Repair and installation services of machinery and equipment | 1.1 | 2.6 | 3.2 | 4.7 | **11.6** |
| L68B | Real estate services excluding imputed rents | 4.1 | 2.9 | 1.8 | 1.8 | **10.6** |
| A01 | Products of agriculture, hunting and related services | -0.1 | 0.2 | 4.0 | 6.0 | **10.1** |
| J61 | Telecommunications services | 0.9 | 1.8 | 3.0 | 4.2 | **9.9** |
| G47 | Retail trade services, except of motor vehicles | 1.2 | 1.8 | 3.0 | 3.3 | **9.3** |
| K65 | Insurance, reinsurance and pension funding services | 0.8 | 1.6 | 2.3 | 4.1 | **8.8** |
| N80–82 | Security and investigation services … | 1.3 | 1.8 | 2.3 | 3.0 | **8.4** |
| O | Public administration and defence services; … | 0.8 | 1.6 | 2.3 | 2.1 | **6.8** |
| M69–70 | Legal and accounting; services of head offices … | 1.2 | 1.4 | 1.4 | 1.9 | **5.9** |
| | Other sectors | 5.7 | 8.0 | 8.9 | 11.7 | **34.3** |
| | **Total indirect** | **18.7** | **26.6** | **36.3** | **47.7** | **129.3** |

Medium scenario (Units, million constant Euros, $€_{2010)}$.

**Table A.21**
Norway: Indirect impacts on employment in non-marine I-O sectors.

| I-O Code | Sector | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2013–16}$ |
|---|---|---|---|---|---|---|
| A01 | Products of agriculture, hunting and related services | -0.3 | 0.5 | 11.6 | 16.3 | **28.1** |
| G47 | Retail trade services, except of motor vehicles | 3.2 | 5.2 | 8.1 | 8.0 | **24.5** |
| N80–82 | Security and investigation services … | 2.6 | 3.5 | 4.5 | 5.8 | **16.4** |
| C33 | Repair and installation services of machinery and equipment | 1.3 | 3.2 | 3.8 | 5.6 | **13.9** |
| O | Public administration and defence; compulsory social security | 0.9 | 1.8 | 2.6 | 2.2 | **7.5** |
| N78 | Employment services | 1.4 | 1.6 | 1.5 | 1.1 | **5.6** |
| M69–70 | Legal and accounting; services of head offices … | 1.2 | 1.3 | 1.4 | 1.8 | **5.7** |
| J62–63 | Computer programming; Information services … | 0.7 | 1.0 | 1.2 | 1.1 | **4.0** |
| J61 | Telecommunications services | 0.4 | 0.8 | 1.2 | 1.7 | **4.1** |
| K64 | Financial services, except insurance and pension funding | 0.5 | 0.9 | 1.2 | 1.4 | **4.0** |
| | Other sectors | 6.5 | 8.9 | 9.6 | 13.9 | **38.9** |
| | **Total indirect** | **18.5** | **28.9** | **46.6** | **59.0** | **153.0** |

Medium scenario (Units, number of jobs).

**Table A.22**
Germany: Distribution of total impacts according to type of impact.

| On production value | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2010–16}$ |
|---|---|---|---|---|---|---|---|---|
| Direct impact | 267.4 | 151.5 | 304.6 | 616.4 | 403.4 | 39.0 | 93.5 | **1875.7** |
| Indirect impact | 41.5 | 22.4 | 39.9 | 79.7 | 54.0 | -9.6 | 9.9 | **237.9** |
| Induced impact | 148.6 | 71.5 | 136.2 | 295.8 | 169.1 | -14.4 | 19.0 | **825.9** |
| TOTAL IMPACT | **457.6** | **245.4** | **480.7** | **991.9** | **626.5** | **14.9** | **122.4** | **2939.5** |
| Standard deviation | 437.69 | 240.68 | 481.27 | 991.88 | 627.02 | 4.03 | 102.89 | |
| **On GVA** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | $\Sigma_{2010–16}$ |
| Direct impact | 92.0 | 46.1 | 89.1 | 198.8 | 112.6 | -5.9 | 12.9 | **545.6** |
| Indirect impact | 19.9 | 10.2 | 19.4 | 42.7 | 28.5 | -6.6 | 3.9 | **118.1** |
| Induced impact | 75.9 | 36.0 | 69.2 | 151.9 | 87.3 | -7.6 | 9.8 | **422.6** |
| TOTAL IMPACT | **187.9** | **92.3** | **177.7** | **393.5** | **228.3** | **-20.0** | **26.6** | **1086.3** |
| Standard deviation | 178.26 | 90.17 | 178.01 | 393.52 | 228.61 | 28.03 | 18.49 | |
| **On employment** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | $\Sigma_{2010–16}$ |
| Direct impact | 987.0 | 465.4 | 772.0 | 1372.6 | 1052.9 | -212.1 | 153.9 | **4591.6** |
| Indirect impact | 383.1 | 210.3 | 396.1 | 812.3 | 526.8 | -85.2 | 84.9 | **2328.2** |
| Induced impact | 1295.2 | 599.1 | 1142.3 | 2456.5 | 1377.6 | -115.4 | 149.6 | **6905.0** |
| TOTAL IMPACT | **2665.2** | **1274.8** | **2310.4** | **4641.3** | **2957.3** | **-412.7** | **388.4** | **13,824.7** |
| Standard deviation | 2516.97 | 1241.67 | 2314.62 | 4644.22 | 2962.80 | 515.81 | 284.68 | |

Medium scenario (Units, million constant Euros, $€_{2010,}$ and number of jobs).

**Table A.23**
Germany: Total impacts on the production value of I-O sectors.

| I-O Code | Sector | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2010–16}$ |
|---|---|---|---|---|---|---|---|---|---|
| H50 | Water transport services | 137.8 | 115.2 | 198.4 | 307.7 | 225.7 | 165.8 | 126.5 | **1277.1** |
| H52 | Warehousing … | 115.4 | 34.9 | 133.3 | 366.6 | 183.4 | -170.1 | -57.0 | **606.4** |
| L68B | Real estate services | 17.6 | 8.9 | 15.7 | 32.1 | 19.2 | -2.4 | 2.4 | **93.7** |
| G47 | Retail trade services, | 11.3 | 5.9 | 10.2 | 20.7 | 13.1 | 0.4 | 3.4 | **65.1** |
| L68A | Imputed rents of owner … | 10.6 | 5.1 | 9.8 | 21.8 | 12.6 | -1.1 | 1.5 | **60.3** |
| D | Electricity, gas, …. | 5.7 | 2.6 | 5.1 | 12.7 | 7.0 | 11.0 | 12.9 | **57.0** |
| K64 | Financial services | 10.3 | 4.5 | 8.6 | 18.2 | 10.8 | -0.8 | 1.6 | **53.1** |
| H51 | Air transport services | 11.0 | 0.9 | -0.2 | 2.2 | 16.8 | 1.5 | 15.6 | **47.8** |
| C10–12 | Food, beverages … | 7.7 | 3.8 | 7.4 | 16.6 | 9.3 | -0.8 | 1.0 | **45.0** |
| C19 | Coke and refined petroleum | 7.1 | 4.9 | 8.8 | 13.0 | 8.1 | -0.6 | 2.0 | **43.4** |
| G46 | Wholesale trade services | 6.9 | 3.4 | 5.9 | 12.8 | 7.6 | -0.6 | 0.9 | **36.8** |
| N78 | Employment services | 4.3 | 3.3 | 6.2 | 13.1 | 8.5 | -0.6 | 1.3 | **36.1** |
| G45 | Trade and repair of motor vehicles | 6.9 | 2.6 | 6.0 | 15.4 | 8.6 | -5.1 | -1.3 | **33.3** |
| A03 | Fish and other fishing products … | 0.5 | 1.6 | 2.4 | 6.6 | 6.0 | 6.0 | 5.8 | **29.0** |
| I | Accommodation and food services | 7.7 | 9.3 | 3.3 | -28.6 | 0.2 | 17.2 | 19.6 | **28.6** |
| M69_70 | Legal and accounting; head offices … | 5.6 | 2.4 | 4.6 | 9.7 | 5.5 | -0.8 | 0.5 | **27.4** |
| K65 | Insurance, reinsurance … | 5.4 | 2.2 | 4.6 | 10.4 | 6.2 | -1.7 | -0.3 | **26.9** |
| C29 | Motor vehicles, trailers and semi-trailers | 4.7 | 2.2 | 4.4 | 9.3 | 5.3 | -1.0 | 0.0 | **24.9** |
| N80–82 | Security and investigation services … | 4.2 | 1.9 | 3.9 | 9.0 | 5.7 | -1.1 | 3.9 | **24.4** |
| J61 | Telecommunications services | 4.8 | 2.3 | 3.8 | 8.0 | 4.8 | -0.4 | 0.4 | **23.8** |
| | Other sectors | 73.3 | 33.0 | 56.0 | 120.3 | 71.6 | -2.4 | 11.4 | **366.1** |
| N79 | Travel agency, tour operator …. | -5.0 | -4.4 | -4.3 | 4.5 | -1.8 | -1.7 | -8.0 | **-20.7** |
| H49 | Land transport services … | 3.7 | -1.1 | -13.2 | -10.2 | -7.7 | 4.2 | -21.8 | **-45.9** |
| | **Total impacts (1…n)** | **457.6** | **245.4** | **480.7** | **991.9** | **626.5** | **14.9** | **122.4** | **2939.5** |

Medium scenario (Units, million constant Euros, $€_{2010)}$.

**Table A.24**
Germany: Total impacts on the GVA of I-O sectors.

| I-O Code | Sector | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2010–16}$ |
|---|---|---|---|---|---|---|---|---|---|
| H50 | Water transport services | 44.2 | 32.2 | 52.4 | 91.3 | 53.3 | 35.6 | 23.4 | **332.5** |
| H52 | Warehousing … | 41.5 | 12.1 | 47.4 | 133.8 | 64.9 | -60.9 | -19.8 | **218.9** |
| L68B | Real estate services | 12.8 | 6.5 | 11.6 | 24.1 | 14.3 | -1.8 | 1.8 | **69.3** |
| L68A | Imputed rents of owner … | 8.3 | 4.0 | 7.8 | 17.7 | 10.2 | -0.9 | 1.2 | **48.2** |
| G47 | Retail trade services | 6.1 | 3.0 | 5.2 | 10.8 | 7.0 | 0.2 | 1.8 | **34.2** |
| N78 | Employment services | 3.2 | 2.4 | 4.7 | 10.6 | 7.0 | -0.5 | 1.0 | **28.4** |
| K64 | Financial services | 5.0 | 2.0 | 4.1 | 8.6 | 5.1 | -0.4 | 0.8 | **25.2** |
| G45 | Trade and repair of motor vehicles | 4.4 | 1.8 | 4.0 | 10.4 | 5.9 | -3.5 | -0.9 | **22.1** |
| G46 | Wholesale trade services | 3.6 | 1.8 | 3.4 | 7.3 | 4.3 | -0.4 | 0.5 | **20.6** |
| D | Electricity, gas, … | 2.1 | 0.8 | 1.9 | 4.4 | 2.4 | 3.5 | 4.0 | **19.1** |
| A03 | Fish and other fishing products … | 0.3 | 0.9 | 1.5 | 3.8 | 3.4 | 3.3 | 3.2 | **16.5** |
| M69_70 | Legal and accounting; head offices … | 3.1 | 1.3 | 2.6 | 5.6 | 3.2 | -0.5 | 0.2 | **15.6** |
| I | Accommodation and food services | 3.6 | 4.4 | 1.6 | -13.1 | 0.1 | 8.4 | 0.4 | **14.3** |
| S96 | Other personal services | 2.7 | 1.2 | 2.3 | 5.0 | 2.9 | -0.2 | 9.4 | **14.3** |
| N80–82 | Security and investigation services … | 2.4 | 1.1 | 2.3 | 5.4 | 3.4 | -0.7 | 0.1 | **14.1** |
| Q86 | Human health services | 2.5 | 1.2 | 2.3 | 5.0 | 3.0 | -0.3 | 0.3 | **14.0** |
| J62_63 | Computer programming, … | 1.9 | 0.8 | 2.5 | 7.1 | 3.9 | -2.0 | -0.5 | **13.8** |
| H51 | Air transport services | 2.9 | 0.2 | 0.0 | 0.5 | 3.2 | 0.5 | 4.8 | **12.0** |
| O | Public administration … | 1.7 | 0.8 | 1.4 | 3.0 | 1.9 | 0.4 | 0.9 | **10.1** |
| C10–12 | Food, beverages and tobacco products | 1.7 | 0.8 | 1.5 | 3.4 | 2.0 | -0.2 | 0.2 | **9.5** |
| | Other sectors | 33.3 | 14.5 | 24.2 | 52.9 | 31.5 | -1.6 | 5.7 | **161.0** |
| N79 | Travel agency, tour operator …. | -1,3 | -1,1 | -1,0 | 1,0 | -0,4 | -0,4 | -1.5 | **-4.7** |
| H49 | Land transport services … | 1,8 | -0,5 | -6,5 | -5,1 | -3,9 | 2,1 | -10.5 | **-22.6** |
| | **Total impacts (1…n)** | **187.9** | **92.3** | **177.7** | **393.5** | **228.3** | **-20.0** | **26.6** | **1086.3** |

Medium scenario (Units, million constant Euros, $€_{2010)}$.

**Table A.25**
Germany: Total impacts on employment in I-O sectors.

| I-O Code | Sector | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2010–16}$ |
|---|---|---|---|---|---|---|---|---|---|
| H52 | Warehousing … | 688.9 | 195.6 | 736.5 | 1987.6 | 942.8 | -898.8 | -302.6 | **3350.0** |
| H50 | Water transport services | 189.3 | 145.2 | 243.5 | 370.6 | 284.6 | 169.0 | 174.6 | **1576.9** |
| G47 | Retail trade services | 222.0 | 117.6 | 203.9 | 398.6 | 243.5 | 7.8 | 57.9 | **1251.4** |
| N78 | Employment services | 134.0 | 91.9 | 180.2 | 346.3 | 220.6 | -17.0 | 36.8 | **992.9** |
| I | Accommodation and food services | 175.2 | 204.9 | 73.0 | -618.7 | 3.3 | 348.5 | 385.3 | **571.5** |
| N80–82 | Security and investigation … | 101.3 | 45.1 | 87.7 | 195.9 | 113.5 | -22.3 | 2.7 | **524.0** |
| A03 | Fish and other fishing products … | 6.8 | 20.0 | 34.6 | 87.8 | 75.2 | 72.7 | 64.6 | **361.8** |
| G45 | Trade and repair of motor vehicles | 75.7 | 25.2 | 64.9 | 168.9 | 88.6 | -51.0 | -12.2 | **360.1** |
| T | Households as employers … | 64.1 | 30.8 | 56.1 | 125.7 | 69.6 | -6.1 | 7.9 | **348.1** |
| Q86 | Human health services | 57.2 | 27.3 | 52.4 | 110.4 | 64.0 | -5.4 | 7.3 | **313.3** |
| S96 | Other personal services | 56.7 | 26.7 | 49.5 | 104.1 | 58.2 | -3.8 | 7.6 | **299.0** |
| G46 | Wholesale trade services … | 56.6 | 26.3 | 48.9 | 106.7 | 57.5 | -4.6 | 6.0 | **297.4** |
| M69_70 | Legal, accounting,head offices … | 52.8 | 23.0 | 43.9 | 97.6 | 56.3 | -8.8 | 3.9 | **268.8** |
| K64 | Financial services | 49.4 | 21.7 | 41.1 | 86.4 | 50.1 | -3.7 | 7.0 | **252.1** |
| C10–12 | Food, beverages and tobacco | 45.9 | 20.9 | 39.9 | 87.2 | 49.2 | -4.3 | 5.2 | **243.9** |
| F | Constructions … | 37.7 | 16.7 | 30.9 | 65.6 | 37.4 | -3.0 | 4.1 | **189.4** |
| Q87_88 | Residential care services … | 29.9 | 14.8 | 29.8 | 62.7 | 39.1 | -3.2 | 5.4 | **178.6** |
| L68B | Real estate services … | 32.7 | 15.5 | 28.9 | 57.3 | 34.4 | -4.2 | 13.2 | **168.8** |
| O | Public administration … | 32.4 | 14.8 | 23.0 | 49.3 | 29.5 | 6.6 | 4.1 | **168.7** |
| M71 | Architectural and engineering … | 28.5 | 11.3 | 27.4 | 74.0 | 40.0 | -16.4 | -1.1 | **163.7** |
| | Other sectors | 512.6 | 206.7 | 353.3 | 755.4 | 476.8 | 3.3 | 139.7 | **2447.4** |
| N79 | Travel agency, tour operator …. | -20.7 | -17.1 | -16.0 | 16.9 | -6.8 | -5.8 | -27.3 | **-76.8** |
| H49 | Land transport services … | 36.2 | -10.3 | -123.0 | -95.0 | -70.2 | 37.9 | -201.7 | **-426.1** |
| | **Total impacts (1…n)** | **2665.2** | **1274.8** | **2310.4** | **4641.3** | **2957.3** | **-412.7** | **388.4** | **13824.7** |

Medium scenario (Units, number of jobs).

**Table A.26**
Belgium: Distribution of total impacts according to type of impact.

| On production value | 2014 | 2015 | 2016 | $\Sigma_{2014–16}$ |
|---|---|---|---|---|
| Direct impact | 169.8 | 344.1 | 415.4 | **929.3** |
| Indirect impact | 40.6 | 81.3 | 101.7 | **223.6** |
| Induced impact | 74.9 | 145.0 | 173.8 | **393.7** |
| TOTAL IMPACT | **285.3** | **570.4** | **690.9** | **1546.6** |
| Standard deviation | 48.27 | 344.32 | 366.54 | |
| **On GVA** | **2014** | **2015** | **2016** | $\Sigma_{2014–16}$ |
| Direct impact | 63.4 | 122.5 | 146.2 | **332.1** |
| Indirect impact | 19.1 | 37.1 | 45.2 | **101.4** |
| Induced impact | 37.1 | 71.9 | 86.1 | **195.1** |
| TOTAL IMPACT | **119.6** | **231.5** | **277.5** | **628.7** |
| Standard deviation | 9.35 | 123.28 | 127.14 | |
| **On employment** | **2014** | **2015** | **2016** | $\Sigma_{2014–16}$ |
| Direct impact | 408.8 | 853.4 | 757.2 | **2019.3** |
| Indirect impact | 199.9 | 444.8 | 525.4 | **1170.0** |
| Induced impact | 439.4 | 850.2 | 1018.8 | **2308.4** |
| TOTAL IMPACT | **1048.0** | **2148.4** | **2301.4** | **5497.8** |
| Standard deviation | 239.35 | 1388.37 | 1192.31 | |

Medium scenario (Units, million constant Euros, $€_{2010,\text{ and number of jobs}}$).

**Table A.27**
Belgium: Total impacts on the production value of I-O sectors.

| I-O Code | Sector | 2014 | 2015 | 2016 | $\Sigma_{2014–16}$ |
|---|---|---|---|---|---|
| D | Electricity, gas, steam and air conditioning | 132.7 | 151.3 | 178.7 | **462.7** |
| F | Constructions and construction works | 20.1 | 92.2 | 104.4 | **216.7** |
| N79 | Travel agency, tour operator … | 43.2 | 31.4 | 43.3 | **117.9** |
| H52 | Warehousing and support services for transportation | -8.3 | 56.1 | 48.8 | **96.7** |
| H50 | Water transport services | -17.2 | 48.7 | 57.7 | **89.2** |
| M69_70 | Legal and accounting; services of head offices … | 15.0 | 25.5 | 30.8 | **71.3** |
| B | Mining and quarrying | 24.1 | 0.6 | 37.8 | **62.4** |
| L68A | Imputed rents of owner-occupied dwellings | 7.4 | 14.4 | 17.3 | **39.1** |
| G47 | Retail trade services … | 7.3 | 14.1 | 17.0 | **38.4** |
| K66 | Services auxiliary to financial services and insurance | 8.7 | 12.3 | 16.3 | **37.3** |
| L68B | Real estate services excluding imputed rents | 6.3 | 14.2 | 15.1 | **35.7** |
| K64 | Financial services, except insurance and pension funding | 6.5 | 11.3 | 14.3 | **32.1** |
| C10–12 | Food, beverages and tobacco products | 4.2 | 8.6 | 10.4 | **23.2** |
| G46 | Wholesale trade services … | 4.2 | 7.5 | 8.2 | **19.9** |
| C33 | Repair and installation of machinery and equipment | 2.5 | 5.6 | 8.1 | **16.2** |
| N80–82 | Security and investigation services … | 2.6 | 6.3 | 7.2 | **16.1** |
| K65 | Insurance, reinsurance and pension funding … | 2.8 | 4.9 | 6.7 | **14.4** |
| J62_63 | Computer programming, consultancy … | 3.2 | 4.6 | 5.9 | **13.7** |
| J61 | Telecommunications services | 2.8 | 4.9 | 5.9 | **13.6** |
| C19 | Coke and refined petroleum products | 1.1 | 4.7 | 6.7 | **12.6** |
| | Other sectors | 30.1 | 66.3 | 80.1 | **176.4** |
| I | Accommodation and food services | 6.5 | 1.1 | -31.4 | **-23.8** |
| N77 | Rental and leasing services | -20.8 | -16.5 | 1.9 | **-35.4** |
| | **Total impacts (1…n)** | **285.3** | **570.4** | **690.9** | **1546.6** |

Medium scenario (Units, million constant Euros, $€_{2010}$).

**Table A.28**
Belgium: Total impacts on the GVA of I-O sectors.

| I-O Code | Sector | 2014 | 2015 | 2016 | $\Sigma_{2014–16}$ |
|---|---|---|---|---|---|
| D | Electricity, gas, steam and air conditioning | 62.3 | 70.9 | 83.8 | **217.0** |
| F | Constructions and construction works | 5.7 | 26.0 | 29.5 | **61.2** |
| M69_70 | Legal and accounting; services of head offices … | 8.1 | 13.8 | 16.7 | **38.6** |
| H52 | Warehousing and support services for transportation | -3.2 | 21.4 | 18.6 | **36.9** |
| L68A | Imputed rents of owner-occupied dwellings | 5.8 | 11.1 | 13.4 | **30.3** |
| H50 | Water transport services | -5.1 | 14.4 | 17.0 | **26.4** |
| G47 | Retail trade services … | 4.5 | 8.7 | 10.5 | **23.7** |
| L68B | Real estate services excluding imputed rents | 4.2 | 9.3 | 9.9 | **23.4** |
| B | Mining and quarrying | 8.0 | 0.2 | 12.6 | **20.8** |
| N79 | Travel agency, tour operator … | 6.9 | 5.0 | 6.9 | **18.8** |
| K64 | Financial services, except insurance and pension funding | 3.7 | 6.5 | 8.2 | **18.4** |
| K66 | Services auxiliary to financial services and insurance | 3.9 | 5.5 | 7.3 | **16.8** |
| N78 | Employment services | 1.1 | 3.9 | 4.0 | **8.9** |
| G46 | Wholesale trade services … | 1.8 | 3.3 | 3.6 | **8.8** |
| Q87_88 | Residential care services; social work services … | 1.6 | 3.1 | 3.7 | **8.5** |
| N80–82 | Security and investigation services … | 1.2 | 2.9 | 3.3 | **7.4** |
| J62_63 | Computer programming, consultancy … | 1.5 | 2.2 | 2.8 | **6.5** |
| Q86 | Human health services | 1.2 | 2.2 | 2.7 | **6.1** |
| J61 | Telecommunications services | 1.2 | 2.2 | 2.6 | **6.1** |
| C33 | Repair and installation services of machinery and equipment | 0.9 | 2.1 | 3.0 | **6.0** |
| | Other sectors | 11.4 | 23.9 | 29.6 | **64.8** |
| I | Accommodation and food services | 2.7 | 0.5 | -13.1 | **-10.0** |
| N77 | Rental and leasing services | -9.8 | -7.8 | 0.9 | **-16.8** |
| | **Total impacts (1…n)** | **119.7** | **231.5** | **277.5** | **628.7** |

Medium scenario (Units, million constant Euros, $€_{2010}$).

**Table A.29**
Belgium: Total impacts on employment in I-O sectors.

| I-O Code | Sector | 2014 | 2015 | 2016 | $\Sigma_{2014–16}$ |
|---|---|---|---|---|---|
| F | Constructions and construction works | 81.9 | 376.1 | 425.9 | **883.8** |
| D | Electricity, gas, steam and air conditioning | 217.6 | 247.9 | 292.9 | **758.4** |
| G47 | Retail trade services … | 95.4 | 184.6 | 221.2 | **501.1** |
| M69_70 | Legal and accounting services; services of head offices … | 100.6 | 170.8 | 206.2 | **477.7** |
| H52 | Warehousing and support services for transportation | -27.8 | 188.5 | 164.1 | **324.8** |
| N79 | Travel agency, tour operator … | 116.1 | 84.5 | 116.3 | **316.8** |
| N78 | Employment services | 30.1 | 111.4 | 113.2 | **254.6** |
| N80–82 | Security and investigation services … | 36.7 | 89.0 | 100.8 | **226.4** |
| Q87_88 | Residential care services; social work services | 39.8 | 77.0 | 92.2 | **208.9** |
| B | Mining and quarrying | 54.7 | 1.3 | 85.7 | **141.7** |
| K64 | Financial services, except insurance and pension funding | 23.4 | 40.6 | 51.1 | **115.1** |
| Q86 | Human health services | 21.6 | 42.0 | 50.3 | **114.0** |
| H50 | Water transport services | -21.4 | 60.9 | 72.0 | **111.5** |
| S96 | Other personal services | 19.9 | 39.0 | 45.8 | **104.7** |
| O | Public administration … | 18.8 | 33.0 | 40.7 | **92.6** |
| K66 | Services auxiliary to financial and insurance services | 17.3 | 24.4 | 32.2 | **73.9** |
| G46 | Wholesale trade services … | 15.4 | 27.7 | 30.3 | **73.4** |
| T | Services of households as employers … | 11.6 | 22.4 | 26.8 | **60.8** |
| C10–12 | Food, beverages and tobacco products | 10.7 | 22.1 | 26.7 | **59.5** |
| C23 | Other non-metallic mineral products | 6.2 | 20.3 | 25.0 | **51.5** |
| | Other sectors | 140.2 | 289.7 | 357.7 | **787.6** |
| N77 | Rental and leasing services | -18.2 | -14.4 | 1.6 | **-31.0** |
| I | Accommodation and food services | 57.5 | 9.8 | -277.3 | **-210.0** |
| | **Total impacts (1…n)** | **1048.0** | **2148.4** | **2301.4** | **5497.8** |

Medium scenario (Units, number of jobs).

**Table A.30**
Norway: Distribution of total impacts according to type of impact.

| On production value | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2013–16}$ |
|---|---|---|---|---|---|
| Direct impact | 200.5 | 353.3 | 488.6 | 602.1 | **1644.5** |
| Indirect impact | 35.2 | 52.5 | 72.8 | 94.9 | **255.5** |
| Induced impact | 48.3 | 78.7 | 103.8 | 131.2 | **362.0** |
| TOTAL IMPACT | **284.0** | **484.6** | **665.2** | **828.3** | **2262.0** |
| Standard deviation | 284.02 | 484.57 | 665.18 | 828.26 | |
| **On GVA** | **2013** | **2014** | **2015** | **2016** | $\Sigma_{2013–16}$ |
| Direct impact | 71.8 | 120.9 | 145.9 | 162.9 | **501.6** |
| Indirect impact | 18.7 | 26.6 | 36.3 | 47.7 | **129.3** |
| Induced impact | 25.0 | 40.8 | 53.9 | 69.1 | **188.8** |
| TOTAL IMPACT | **115.5** | **188.3** | **236.2** | **279.7** | **819.6** |
| Standard deviation | 115.53 | 188.28 | 236.15 | 279.68 | |
| **On employment** | **2013** | **2014** | **2015** | **2016** | $\Sigma_{2013–16}$ |
| Direct impact | 111.9 | 143.9 | 158.6 | 182.2 | **596.6** |
| Indirect impact | 18.5 | 28.9 | 46.6 | 59.1 | **153.1** |
| Induced impact | 24.4 | 40.0 | 50.9 | 62.9 | **178.2** |
| TOTAL IMPACT | **154.8** | **212.8** | **256.1** | **304.2** | **927.8** |
| Standard deviation | 154.78 | 212.79 | 256.09 | 304.17 | |

Medium scenario (Units, million constant Euros, $€_{2010,}$ and number of jobs).

**Table A.31**
Norway: Total impacts on the production value of I-O sectors.

| I-O Code | Sector | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2014–16}$ |
|---|---|---|---|---|---|---|
| H50 | Water transport services | 99.4 | 251.1 | 369.6 | 471.6 | **1191.7** |
| C10–12 | Food, beverages and tobacco products | 1.0 | 7.1 | 62.5 | 101.9 | **172.4** |
| H51 | Air transport services | 17.6 | 28.3 | 30.7 | 27.3 | **103.9** |
| N79 | Travel agency, tour operator … | 25.0 | 22.0 | 17.4 | 28.0 | **92.4** |
| R90–92 | Creative, arts, entertainment, … | 16.7 | 18.2 | 21.7 | 26.5 | **83.0** |
| L68A | Imputed rents of owner-occupied dwellings | 6.2 | 10.1 | 13.7 | 16.9 | **46.9** |
| K64 | Financial services … | 6.2 | 10.3 | 13.4 | 16.1 | **46.1** |
| L68B | Real estate services excluding imputed rents | 9.1 | 9.2 | 9.1 | 10.9 | **38.2** |
| H49 | Land transport services and transport services via pipelines | 8.1 | 10.3 | 8.8 | 9.9 | **37.0** |
| G47 | Retail trade services … | 4.6 | 7.4 | 10.7 | 13.3 | **36.0** |
| J61 | Telecommunications services | 3.5 | 6.5 | 9.8 | 12.9 | **32.7** |
| I | Accommodation and food services | 45.7 | 19.6 | -5.1 | -28.1 | **32.0** |
| A01 | Products of agriculture, hunting and related services | 0.8 | 2.0 | 11.8 | 16.6 | **31.2** |
| C33 | Repair and installation services of machinery and equipment | 3.0 | 6.9 | 8.5 | 12.0 | **30.4** |
| G46 | Wholesale trade services … | 3.1 | 5.0 | 6.2 | 9.1 | **23.5** |
| N80–82 | Security and investigation services … | 3.0 | 4.3 | 5.6 | 7.3 | **20.1** |
| K65 | Insurance, reinsurance and pension funding services … | 2.0 | 3.8 | 5.2 | 8.1 | **19.1** |
| O | Public administration and defence … | 1.9 | 3.5 | 5.2 | 5.1 | **15.7** |
| G45 | Trade and repair services of motor vehicles | 2.1 | 3.2 | 4.0 | 4.4 | **13.7** |
| J62_63 | Computer programming, consultancy … | 2.2 | 3.1 | 3.7 | 3.9 | **12.8** |
| | Other sectors | 19.7 | 42.2 | 54.4 | 78.2 | **194.6** |
| H52 | Warehousing and support services for transportation | 3.1 | 10.9 | -1.7 | -23.4 | **-11.1** |
| | **Total impacts (1…n)** | **284.0** | **484.6** | **665.2** | **828.3** | **2262.0** |

Medium scenario (Units, million constant Euros, $€_{2010)}$.

**Table A.32**
Norway: Total impacts on the GVA of I-O sectors.

| I-O Code | Sector | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2014–16}$ |
|---|---|---|---|---|---|---|
| H50 | Water transport services | 34.8 | 88.0 | 116.0 | 136.6 | **375.4** |
| R90–92 | Creative, arts, entertainment, … | 8.3 | 9.1 | 11.1 | 13.1 | **41.6** |
| C10–12 | Food, beverages and tobacco products | 0.2 | 1.5 | 12.1 | 18.8 | **32.5** |
| K64 | Financial services, except insurance and pension funding | 4.2 | 6.9 | 9.1 | 11.2 | **31.3** |
| L68A | Imputed rents of owner-occupied dwellings | 3.8 | 6.2 | 8.7 | 10.8 | **29.5** |
| L68B | Real estate services excluding imputed rents | 6.0 | 6.1 | 6.0 | 7.1 | **25.2** |
| H51 | Air transport services | 3.0 | 4.8 | 6.3 | 7.5 | **21.7** |
| G47 | Retail trade services … | 2.5 | 4.0 | 5.9 | 7.5 | **19.9** |
| H49 | Land transport services and transport services via pipelines | 4.3 | 5.4 | 4.8 | 5.4 | **19.8** |
| N79 | Travel agency, tour operator … | 4.2 | 3.7 | 3.0 | 5.2 | **16.2** |
| I | Accommodation and food services | 21.6 | 9.3 | -2.4 | -13.2 | **15.3** |
| K65 | Insurance, reinsurance and pension funding services … | 1.5 | 2.8 | 3.8 | 6.2 | **14.4** |
| J61 | Telecommunications services | 1.5 | 2.8 | 4.3 | 5.9 | **14.4** |
| A01 | Products of agriculture, hunting and related services | 0.3 | 0.8 | 5.0 | 7.1 | **13.1** |
| G46 | Wholesale trade services, … | 1.6 | 2.7 | 3.3 | 5.0 | **12.6** |
| C33 | Repair and installation services of machinery and equipment | 1.2 | 2.8 | 3.4 | 5.0 | **12.3** |
| N80–82 | Security and investigation services … | 1.6 | 2.3 | 2.9 | 3.8 | **10.6** |
| O | Public administration and defence … | 1.2 | 2.2 | 3.2 | 3.2 | **9.8** |
| M69_70 | Legal and accounting services; services of head offices … | 1.6 | 1.9 | 2.2 | 3.0 | **8.6** |
| D | Electricity, gas, steam and air conditioning | 1.0 | 1.6 | 2.0 | 2.8 | **7.4** |
| | Other sectors | 10.0 | 20.1 | 26.0 | 36.8 | **92.9** |
| H52 | Warehousing and support services for transportation | 1.0 | 3.3 | -0.5 | -8.7 | **-5.0** |
| | **Total impacts (1…n)** | **115.5** | **188.3** | **236.2** | **279.7** | **819.6** |

Medium scenario (Units, million constant Euros, $€_{2010)}$.

**Table A.33**
Norway: Total impacts on employment in I-O sectors.

| I-O Code | Sector | 2013 | 2014 | 2015 | 2016 | $\Sigma_{2014-16}$ |
|---|---|---|---|---|---|---|
| H50 | Water transport services | 33.4 | 86.0 | 119.7 | 159.5 | **398.6** |
| R90–92 | Creative, arts, entertainment, … | 16.6 | 18.0 | 20.4 | 24.4 | **79.4** |
| G47 | Retail trade services … | 6.9 | 11.3 | 15.7 | 18.6 | **52.5** |
| C10–12 | Food, beverages and tobacco products | 0.3 | 2.0 | 15.8 | 23.3 | **41.4** |
| A01 | Products of agriculture, hunting and related services | 1.0 | 2.7 | 14.3 | 19.3 | **37.3** |
| I | Accommodation and food services | 50.0 | 22.2 | -5.6 | -30.6 | **36.0** |
| N79 | Travel agency, tour operator … | 7.9 | 6.9 | 5.6 | 8.7 | **29.1** |
| H49 | Land transport services and transport services via pipelines | 5.5 | 6.9 | 5.9 | 6.6 | **24.9** |
| H51 | Air transport services | 3.7 | 6.0 | 5.5 | 5.6 | **20.8** |
| N80–82 | Security and investigation services … | 3.1 | 4.5 | 5.7 | 7.4 | **20.7** |
| C33 | Repair and installation services of machinery and equipment | 1.4 | 3.4 | 4.1 | 5.9 | **14.8** |
| Q87_88 | Residential care services; social work services … | 2.0 | 3.3 | 4.2 | 4.6 | **14.1** |
| G46 | Wholesale trade services, … | 1.8 | 3.0 | 3.7 | 5.1 | **13.6** |
| O | Public administration and defence … | 1.4 | 2.5 | 3.6 | 3.4 | **10.9** |
| K64 | Financial services, except insurance and pension funding | 1.3 | 2.1 | 2.7 | 3.1 | **9.2** |
| G45 | Trade and repair services of motor vehicles … | 1.5 | 2.2 | 2.7 | 2.8 | **9.2** |
| N78 | Employment services | 1.8 | 2.3 | 2.3 | 2.0 | **8.4** |
| M69_70 | Legal and accounting services; services of head offices … | 1.5 | 1.9 | 2.1 | 2.8 | **8.3** |
| Q86 | Human health services | 0.9 | 1.5 | 2.0 | 2.4 | **6.9** |
| J62_63 | Computer programming, consultancy … | 1.0 | 1.6 | 1.8 | 1.8 | **6.3** |
| | Other sectors | 10.8 | 19.5 | 24.4 | 34.0 | **88.8** |
| H52 | Warehousing and support services for transportation | 0.9 | 3.0 | -0.4 | -6.6 | **-3.2** |
| | **Total impacts (1…n)** | **154.8** | **212.8** | **256.1** | **304.2** | **927.8** |

Medium scenario (Units, number of jobs).

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