EXTENDED ABSTRAC

Title: Employment footprint of tourism in Spain. Scenarios for a sustainable postpandemic recovery

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Abstract:

Tourism is considered an engine of growth and development for the Spanish economy as it represents 12.4% of Spain's GDP and 12.7% of total employment. It is also an industry with the potential to contribute to the Sustainable Development Goals because of its great margin to reducing social inequalities and environmental damages that are currently inherent to tourism activities in Spain. In 2020, this industry was strongly affected at the global level since the COVID pandemic led to frequent restrictions on the mobility of domestic and foreign tourists and limitations on tourism-related activities, which deeply impacted the Spanish economy with social and environmental repercussions, especially in terms of employment due to the labour-intensive nature of tourism.

In this study, we aim to analyze the impacts of tourism in Spain on the generation of direct and indirect employment, both within Spain and in other regions along global value chains, and to identify the changes triggered by the COVID outbreak. Using Exiobase multi-regional input-output tables and its social satellite accounts, we will explore the employment footprint of Spanish tourism based on the 2019 and 2020 Spanish Tourism Satellite Account, which allow us to distinguish the impacts generated by resident and non-resident tourists. Exiobase labour indicators offers the possibility to obtain results with qualification (low-, medium-, and high-skilled) and gender (male and female workers) heterogeneity in order to evaluate the social implications and inequalities of the employment footprint of tourism. In addition, we explore the labour impacts of the trends arising from the tourist consumption patterns brought by the pandemic through several post-covid scenarios. Preliminary results indicate that in 2020, Spanish tourism reduced its employment footprint by 1.6 million jobs, mainly in the hotels and restaurants sectors. This reduction is equivalent to a variation of -60% compared to the 2019 employment footprint.

Keywords: *tourism, covid-19 breakdown, social footprint, employment, input-output*

JEL codes: C67, D57, F16, L83

1. Introduction

The shock of the COVID-19 pandemic was devastating for the worldwide economy, with an impact even more severe on the tourism industry. This is particularly important for Spain since tourism is a key sector responsible for 12.4% of GDP and 12.7% of total employment in 2018 (Exceltur, 2020). The acute effect of COVID-19 on the world economy was mainly due to the contraction in consumption, which was quantified at 4.2% of world GDP per capita by Lenzen et al. (2020). An important part of this drop in demand affected to tourism, although its quantification is complex. The uncertainty on the impacts of COVID-19 on tourism has resulted in a growing literature on its effects on GDP and labour (Cardenete, Delgado, & Villegas, 2022; Kitamura, Karkour, Ichisugi, & Itsubo, 2020; Mariolis, Rodousakis, & Soklis, 2021; Rodousakis & Soklis, 2022).

Due to its labour-intensive nature, the multiplier effect of changes in tourism on employment is larger than changes in other sectors (Rodousakis & Soklis, 2022). This implied a pronounced negative effect of COVID-19 on employment due to tourism fall, quantified between 2.1% and 6.4% for Greece (Mariolis et al., 2021), 1.25% for US (Rodousakis & Soklis, 2022) or 0.98% and 6.80% respectively for Spain and Germany (Rodousakis and Soklis, 2021). When going deeper into sectoral analysis Accommodation and food services is the most affected one, with effects ranging between 22.3% for Greece (Mariolis et al., 2021) to 33.4% for Germany. In this vein, we move a step further and focus on the uncertainty affecting tourism recovery and its potential effect on employment (Rodousakis & Soklis, 2022).

In the case of the Spanish economy, tourism is a vital sector. In 2019, Spain was the country with the highest number of foreign visitors globally, reaching 83 million arrival. Figini and Patuelli (2022) rank Spain as the third country in terms of participation of tourism on the GDP according to 2015 data. Despite the magnitude of the employment impacts caused by the covid breakdown, the more than 841,000 temporary lay-offs in the tourism industry covered by the Spanish government help mitigating the social dimension of the problem (Exceltur, 2020).

In the new context, the pandemic has changed population priorities and has raised concerns among tourists about travel and destination's health conditions. This unprecedented situation generates uncertainty about how tourism will adapt to changes in the pandemic characteristics, with the arrival of the end of the acute phase of the pandemic and a new scenario where the virus is expected to remain among us with its severity significantly reduced, although other scenarios are potentially possible. Changes in tourist habits sustained over time, due to sanitary restrictions, lead to some of the new patterns likely to remain for an indefinite period. For instance, the tourism recovery has been headed up by domestic tourism, while foreign visitors led Spain's tourism during pre-pandemic years. There has also been an increase in the use of private vehicles instead of public transport (Lozzi et al., 2020) and wellness tourism, which includes destinations with low tourist density (away from big cities) where tourists can spend more time and money on outdoor activities, self-care, stress relief, contact with nature, etc (Jus & Misrahi, 2021). . These new trends make it necessary to project changes in tourist consumption patterns based on foreseeable scenarios. In this work, three different scenarios are built considering recent changes in tourism and expected patterns for recovery.

2. Methods and materials

2.1. The Socially Extended Multiregional Input-Output Model

Since input-output analysis (IOA) was first introduced by Leontief (Leontief, 1936), it has been widely used to assess the consequences of economic activity at different levels. IOA assumes that the final demand for goods or services from one industry is the trigger that leads to impacts in other economic sectors. This methodology is based on the use of input-output tables (IOT), which reflect each industry's output as the sum of the interindustry flows and sales to final demand. In the latest decades, multi-regional input-output (MRIO) models have become a comprehensive tool to measure the interaction between sectors in different regions, enabling for a clear identification of domestic impacts, imported and exported ones and providing the worldwide links between different economies. The standard MRIO model (Miller and Blair, 2009a) structure is shown in expression (1)

$$\boldsymbol{F} = \hat{\boldsymbol{f}}(\boldsymbol{I}-\boldsymbol{A})^{-1}\boldsymbol{y} \tag{1}$$

where $\boldsymbol{A}$ is the matrix of technical coefficients (i.e., requirements of intermediate inputs per unit of output); $\boldsymbol{I}$ is the identity matrix and $(\boldsymbol{I}-\boldsymbol{A})^{-1}$ is the Leontief inverse. $\hat{\boldsymbol{y}}$ is the final demand matrix, which is diagonalized by regional blocks that represents the production of every industry in certain country that is consumed as final demand in other country. $\hat{\boldsymbol{f}}$ is a diagonal matrix containing the selected stressor per unit of output, while $\boldsymbol{F}$ is a matrix giving the model results as total impacts (direct and indirect) in every industry and region required to cover the final demand introduced in $\hat{\boldsymbol{y}}$. This results matrix admits two complementary lectures: by rows, it gives the industries and regions where the impacts take place (producer-based account (PBA)), while by columns it provides the industries and regions where these impacts end up embodied in the consumed final products (gives the consumer-based account (CBA) or footprint).

Regarding the stressor represented as $\hat{\boldsymbol{f}}$ in equation (1), input-output models admit a variety of indicators of different nature. The environmental extension is one of the most developed ones in the literature, as it allows tracking human pressure on the planet in different ways (Steinmann et al., 2018). Some potentialities are the assessment of carbon (Kanemoto, Moran, & Hertwich, 2016) and other emissions (Hong et al., 2022), energy (Akizu-Gardoki et al., 2018), materials (Lenzen et al., 2022), land (Bruckner et al., 2019) or water (Liao et al., 2020) footprints, among others. In parallel, socially-extended MRIO models are gaining relevance given the need to quantify and analyse social issues in the way to sustainable development (A. Alsamawi, D. McBain, J. Murray, M. Lenzen, & K.S. Wiebe, 2017; Xiao, Norris, Lenzen, Norris, & Murray, 2017). In the social extension, the stressors measure the impacts on persons and societies generated from global value chains, both those with positive connotations such as employment (Bohn, Brakman, & Dietzenbacher, 2021; Hardadi & Pizzol, 2017; Monsalve, Zafrilla, Cadarso, & García-Alaminos, 2018; Simas, Wood, & Hertwich, 2015) and those of undesirable characteristics like forced and child labour (García-Alaminos, Ortiz, Arce, & Zafrilla, 2020; Shilling, Wiedmann, & Malik, 2021; Simas, Golsteijn, Huijbregts, Wood, & Hertwich, 2014), occupational injuries and fatalities (Alsamawi, Murray, Lenzen, & Reyes, 2017; García-Alaminos, Monsalve, Zafrilla, & Cadarso, 2020) or other variables like corruption (Xiao, Lenzen, et al., 2017) or inequality (Ali Alsamawi, Darian McBain, Joy Murray, Manfred Lenzen, & Kirsten S. Wiebe, 2017). In this study, the stressors selected measure employment by gender and skill-level (low, medium and high, based on the International Standard Classification of Occupations (ILO, 2016) and the International Standard Classification of Education (UNESCO, 2012)) and have been retrieved from the Exiobase employment satellite account (Stadler et al., 2018)

Given the increasing interest on the sustainability of tourism, environmentally extended MRIO models have emerged as a new macro level approach to compile tourism carbon footprint inventories (Sun, Cadarso, & Driml, 2020). Several works have calculated the environmental pressures derived from this activity using input-output techniques (Cadarso et al., 2022; Cazcarro, Hoekstra, & Chóliz, 2014; Lee, Wang, & Zuo, 2021; Lenzen et al., 2018; Sun, 2014). In contrast, the assessment of employment impacts triggered by tourism has raised less attention among the input-output community although it is an issue of high relevance given the uncertainty brought to the sector by the covid crisis, with exceptions regarding air transport (Dimitrios & Maria, 2018). Some papers characterise direct employment dynamics within the Spanish touristic sectors (Alarcón & Cole, 2019; Cañada, 2018; Melián-González & Bulchand-Gidumal, 2020), but they do not account for indirect effects in other industries and regions. Some other studies analyse the impact of covid-19 in the Spanish tourism industry (Duro, Perez-Laborda, Turrion-Prats, & Fernández-Fernández, 2021; Moreno-Luna, Robina-Ramírez, Sánchez, & Castro-Serrano, 2021; Perles-Ribes, Ramón-Rodríguez, Jesús-Such-Devesa, & Aranda-Cuéllar, 2021), but they have a domestic perspective and they are not based in the data provided by the Tourist Satellite Account (TSA) (INE, 2022b). Therefore, main contribution of this work is the extension of a TSA perspective into a MRIO model to calculate the worldwide employment generated directly or indirectly, domestically or abroad to satisfy the tourism consumption in the Spanish territory.

For this study's purposes, to calculate the carbon footprint of tourism in one country (Spain), the final demand matrix ($\boldsymbol{y}$) only contains the final consumption of tourists within the Spanish territory, distinguishing the origin country and industry that provide the finished products. Thus, for $q = \{Spain\}$, the diagonalized vectors $\hat{\boldsymbol{y}}^{pq}$ include data of finished products from country p consumed by tourists in Spain. Otherwise, for $q \neq \{Spain\}$, all the elements in $\hat{\boldsymbol{y}}^{pq}$ will be zero. Assuming that Spain is located in position 1 on the input-output tables, for the shake of simplicity, the equation used for our tourism carbon footprint in Spain estimations is represented by expression (6):

$$\boldsymbol{F_t^{SPA}} = \begin{bmatrix} F^{11} & 0 & \dots & 0 \\ F^{21} & 0 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ F^{n1} & 0 & \dots & 0 \end{bmatrix} = \begin{bmatrix} \hat{e}^1 & 0 & \dots & 0 \\ 0 & \hat{e}^2 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & \hat{e}^n \end{bmatrix} \begin{bmatrix} L^{11} & L^{12} & \dots & L^{1n} \\ L^{21} & L^{22} & \dots & L^{2n} \\ \vdots & \vdots & \ddots & \vdots \\ L^{n1} & L^{n2} & \dots & L^{nn} \end{bmatrix} \begin{bmatrix} \hat{y}^{11} & 0 & \dots & 0 \\ \hat{y}^{21} & 0 & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ \hat{y}^{n1} & 0 & \dots & 0 \end{bmatrix} \quad (6)$$

where $\boldsymbol{L} = (\boldsymbol{I} - \boldsymbol{A})^{-1}$ is the Leontief inverse and the resulting matrix $\boldsymbol{F_t^{SPA}}$ covers the direct and indirect emissions released all over the world to produce the goods and services consumed by tourists in Spain, distinguishing the country and industry where those emissions are directly released, the source or emitting industry (PBA emissions, by rows) and the type of finished products that embodied those emissions and are ultimately consumed by tourists in Spain (CBA emissions, by columns).

2.2. *Data sources and data preparation*

This works relies in a MRIO model, which is built from the Exiobase industry by industry input-output table (IOT), version 3.8 (Stadler et al., 2018) for the years 2019 and 2020. Exiobase is built for 49 regions (44 countries and 5 rest of the world regions) and 163 sectors and provides several satellite accounts with multiple indicators. However, the MRIO model is built for 49 regions and 59 industries as detailed in this section. The stressors selected in this assessment are extracted from the socioeconomic extension, measuring total employment by skill level and gender (high-skilled male, high-skilled female, medium-skilled male, medium-skilled female, low-skilled male and low-skilled female) in each industry. Total employment refers to the number of persons engaged in each industry, covering both employees and self-employed persons, even if they are in temporarily occupations.

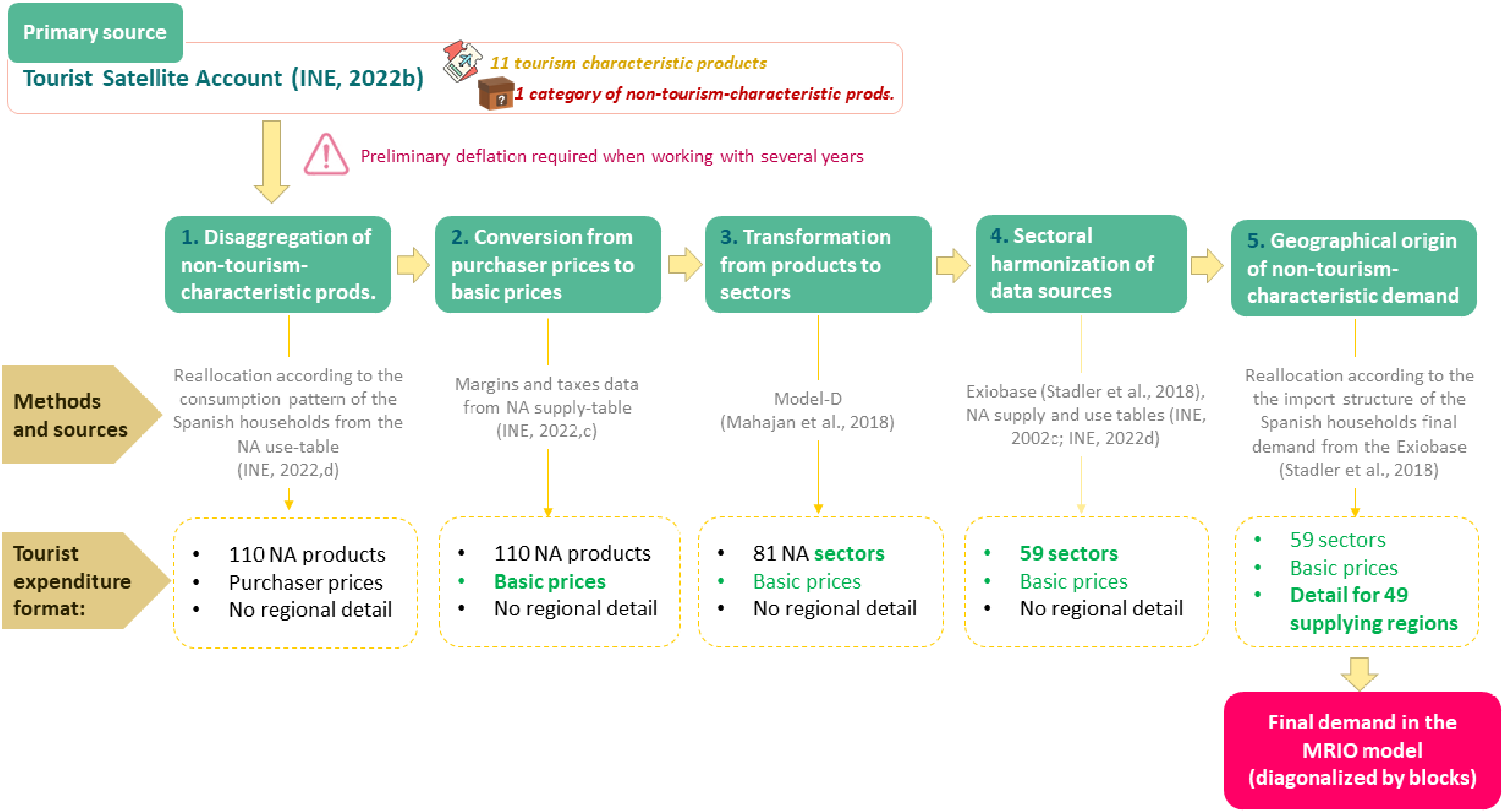
The quantification of the labour footprint of the tourism in Spain requires the construction of a final demand matrix that captures the features of the touristic consumption in Spain. The data source used to obtain this information is the National Tourism Satellite Account (TSA) (INE, 2022c). This dataset provides the interior tourist expenditure in Spain, which is defined as the expenditure in any tourism activity occurring in the territory, including services linked to own-account holiday accommodation, regardless of the territory of residence of the tourists. In addition, this dataset provides the disaggregation of this expenditure into its three components: internal tourism – made by residents in the same territory of reference–, receiving tourism -made by foreigner tourists-, and other components of tourist consumption - in-kind tourist social transfers and other imputed consumption. Given this dataset, we have extracted the data for 2019 and 2020, and we have deflated 2020 data to express it into 2019 prices using the consumer price indexes for the Spanish economy (INE, 2022a). In this way, we have ruled out the effect of prices from our analysis, enabling us to compare the footprint of different years.

The TSA provides the interior tourist expenditure detailed in 11 tourism characteristic products such as hotels, restaurants, road transport and so on. In addition, it gathers the remanent of the tourist expenditure into a general category called "other non-characteristic products". As this information lacks of sectoral and regional detail and does not have the required structure to be introduced as the final demand matrix of our MRIO model, it is necessary to transform it as detailed in Cadarso et al. (2022). The procedure is detailed in the following lines and summarized in Figure 1.

First step is the allocation of the expenditure in the products structure of the Spanish national accounts (NA). Each of the tourism-characteristic products is allocated into its corresponding category, while the total expenditure in non-tourism-characteristic products is reallocated into the products structure. This distribution is done by following the consumption pattern of the Spanish households, extracted from the use table in the NA (INE, 2022e). Notice that those products corresponding to tourist-characteristics ones were excluded from the percentage calculation. In addition, some products' weight was reduced or increased depending on how often tourist may demand them as compared to the average domestic household. For instance, chemical products' weight was reduced, while boats' participation was increased.

Second step is to express the interior tourist expenditure in basic prices as TSA data is provided in purchaser prices, but EXIOBASE IOT are expressed in basic prices (Stadler et al., 2018). To do so, margins and taxis percentages are calculated for each product with information from the supply table in the NA (INE, 2022d). After that, and following the proposal in Gueddari-Aourir et al. (2022) and García-Alaminos et al. (2022), taxes are subtracted from the purchaser prices as they should not be included in the MRIO model. Then, transport and trade margins are extracted for each product's expenditure, so it is now expressed in basic prices. These margins must be reallocated into the transport and trade services, as they generate the corresponding employment effects to be accounted in our MRIO model. This step ends with a vector of interior touristic expenditure expressed in basic prices and disaggregated into 110 products.

Figure 1. Process to convert the data from the tourist satellite account into a final demand matrix



Source: own elaboration

Third step is to move from the NA 81 products structure to an industry classification aligned with Exiobase. First, the expenditure is reallocated from products to industries assuming technology constant by product as proposed in the model D (Mahajan et al., 2018). We use data from the supply table in the NA (INE, 2022d), retrieving information about which industries produced each good, considering that the correspondence is not 1 by 1 as some industries participate in more than one type of good or service, and each good may be produced by more than one industry. In this way, we convert expenditure form 110 products into expenditure in the 81 industries detailed in the NA. Second, the sectoral structure for the two databases employed (NA, with 81 industries, and Exiobase with 163) is homogenized into 59 sectors.

In this point, we reach a vector of interior touristic expenditure expressed in basic prices and disaggregated into 59 industries for each year, but with no detail about the place of production of the goods and services demanded by the tourists in Spain. It can be assumed that the tourism-characteristic activities (mainly services linked to the destination) are provided by industries in Spain, but this cannot be applied to the non-tourism-characteristic goods and services. Therefore, the last step is to endow this expenditure with regional detail according to our MRIO model. The distribution into the 49 regions in the model is done according to the import structure of the Spanish households final demand provided by Exiobase for 2019 (Stadler et al., 2018). Finally, the process ends up with a vector of 2891 elements (59 industries x 49 regions) that can be introduced in expression (1) after the diagonalization by regional blocks described in expression (2).

Results are presented aggregated into 10 regions (Spain, Germany, France, United Kingdom, Italy, Rest of Europe, China, United States, BRIIAT -which contains Brazil, Russia, India, Indonesia, Turkey and Australia- and Rest of the World) and 14 sectors (Agriculture and mining; Manufactures; Electricity, water gas and waste; Construction; Wholesale trade; Retail trade; Land transport; Air transport; Other transports; Accommodation and food services activities; Professional services; Real state and rental activities and Other services and Leisure). The vector of tourism consumption (aggregated to 14 sectors) with no geographical detail about the origin of the goods or services is shown in Table 1. In both years, more than the half of the distribution of expenditures of tourism consumption shows a clear cut between

Accommodation and food services activities (38%) and Real estate (22%), and then at a distance, Leisure (9%), Air transport (9%) and Retail trade (7%), that altogether account for 85% of total tourism consumption in Spain. It is important to note that we are including imputed rents of owner-occupied dwellings in Real estate, which explains that high share.

Table 1. Tourism expenditure in Spain (million euros)

	2019			2020		
	Internal tourism	**Receiving tourism**	**Interior tourism**	**Internal tourism**	**Receiving tourism**	**Interior tourism**
Agriculture and Mining	481.2	1256.7	**1814.9**	292.3	380.5	732.7
Manufactures	2637.6	7157.7	**9929.8**	1845.3	2384.8	4278.0
Electricity, water, gas and waste	477.3	1283.7	**1770.7**	331.4	427.8	763.3
Construction	286.1	819.7	**3117.6**	184.9	144.6	1029.8
Wholesale trade	385.5	1011.5	**1664.7**	259.5	316.5	672.7
Retail trade	288.2	536.3	**952.7**	142.0	146.6	335.4
Land transport	3150.9	4650.4	**8128.6**	1364.4	1253.7	2957.1
Air transport	3699.0	6907.6	**11281.4**	1423.8	1814.7	3968.2
Other transports	491.9	671.0	**1360.9**	354.9	159.3	698.9
Accomodation and food services activities	26482.3	28785.9	**55661.1**	12967.7	7126.2	20351.8
Professional services	893.4	2437.6	**3693.9**	625.2	793.1	1545.1
Real estate and rental activities	2810.7	8265.3	**24451.5**	2001.4	1971.6	8625.1
Leisure	3176.8	11463.8	**15580.4**	1363.7	2731.0	5046.5
Other activities	7132.6	5343.7	**12952.0**	4330.1	1348.1	5987.8
Total	**52393.5**	**80590.8**	**152360.2**	**27486.5**	**20998.3**	**56992.5**

Source: own elaboration from INE (2022c)

2.3. Scenario setting

COVID-19 induced changes in tourism pattern will be of indeterminate and uncertain duration. Observable tourism recovery could be developed along different paths depending on whether these induced changes are maintained or modified. We propose 6 different foreseeable scenarios depending on potential patterns of change for tourism during the recovery phase. In short, there are four scenarios that predict the same level of expenditure in 2021 than in 2019: the first scenario (SC1), which assumes the pre-covid patterns and a recovery lead by resident tourism as international travels experimented a higher breakdown due to the strictest and prolonged restrictions on mobility between countries; scenario 4 (SC4), which implements the post-covid patterns; scenario 5 (SC5), which modifies the consumption patterns according to a higher participation of the sun and beach tourism and its consequent trends; and scenario 6 (SC6), which is based on a more environmentally-sustainable tourism in which flights are substituted by train displacements (40% of them in the case of residents, and 6.5% of them for non.-resident tourists). In addition, two more scenarios predict a partial recovery in 2021 that does not reach the levels of 2019: scenario 2 (SC2), which assumes that post-covid expenditure patterns persist in 2021; and scenario 3 (SC3), which considers that the reduction in the virus severity and the relaxation of health measures result in a return to previous tourism patterns, even though total of visitors does not achieve 2019 figures. These scenarios are summarized in Table 2 below.

Table 2. Scenarios Overview

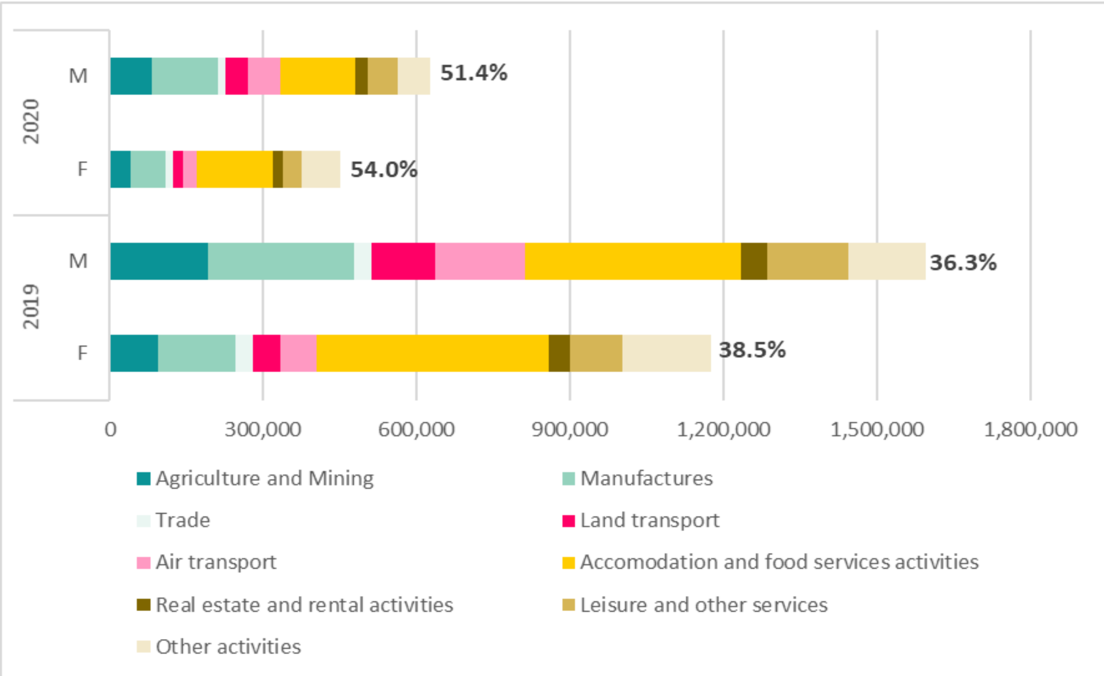
	Short description	Resident tourist Consumption pattern	Non-resident tourist consumption pattern	Level of tourist expenditure
Scenario 1 (SC1)	Recovery lead by resident tourism	Pre-Covid pattern (year 2019)	Pre-covid pattern (year 2019)	2019 (total recovery)
Scenario 2 (SC2)	Partial recovery with post-covid consumption changes persistence	Post-Covid pattern (2020)	Post-Covid pattern (2020)	2021 (partial recovery)
Scenario 3 (SC3)	Partial recovery with return to pre-covid patterns	Pre-Covid pattern (2019)	Pre-covid pattern (2019)	2021 (partial recovery)
Scenario 4 (SC4)	Total recovery with post-covid consumption changes persistence	Post-Covid pattern (2020)	Post-Covid pattern (2020)	2019 (total recovery)

Scenario 5 (SC5)	Total recovery with more sun and beach type tourism	Sun and beach pattern	Sun and beach pattern	2019 (total recovery)
Scenario 6 (SC6)	Total recovery with shift from air transport to railway transport	Pre-Covid pattern (2019) with changes in transportation expenditure	Pre-Covid pattern (2019) with changes in transportation expenditure for tourist from France and Portugal	2019 (total recovery)

Source: own elaboration

3. Preliminary results

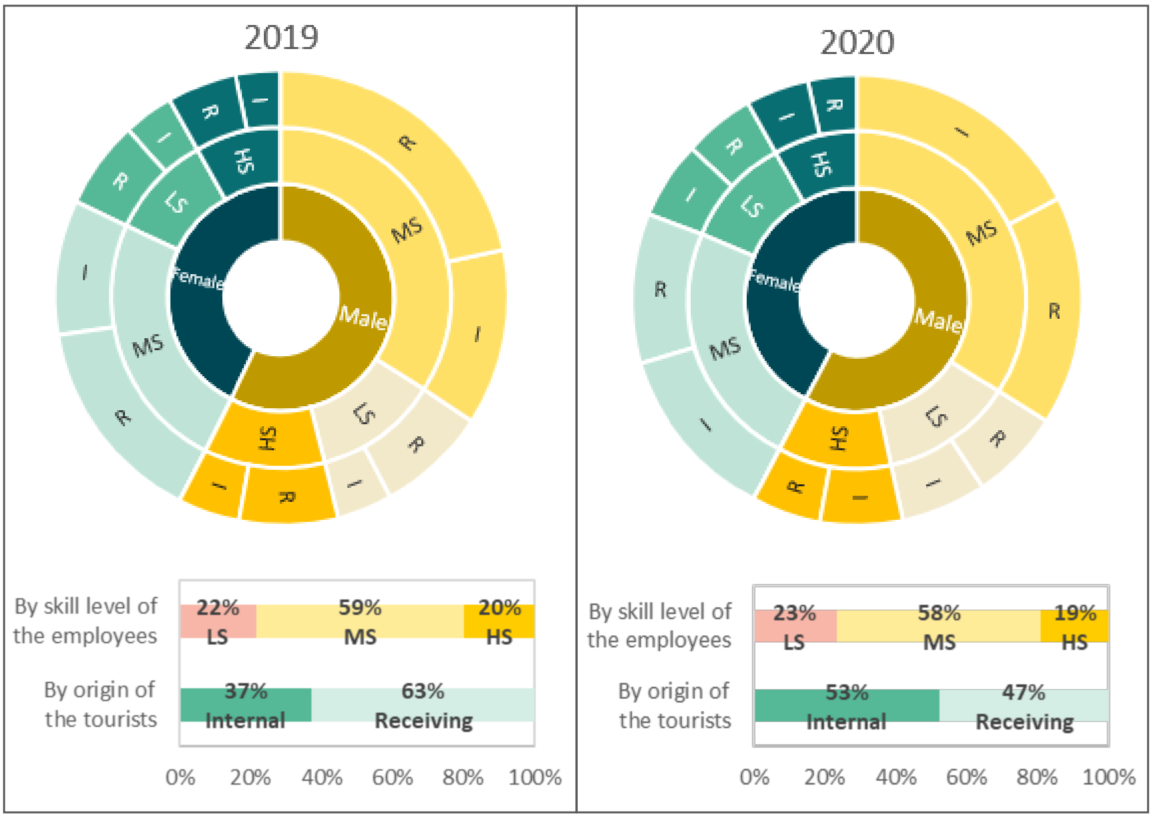
Figure 1. Female and Male employment footprint by sector of final demand. 2019 and 2020



Source: own elaboration based on Stadler et al. (2018) and INE (2022c)

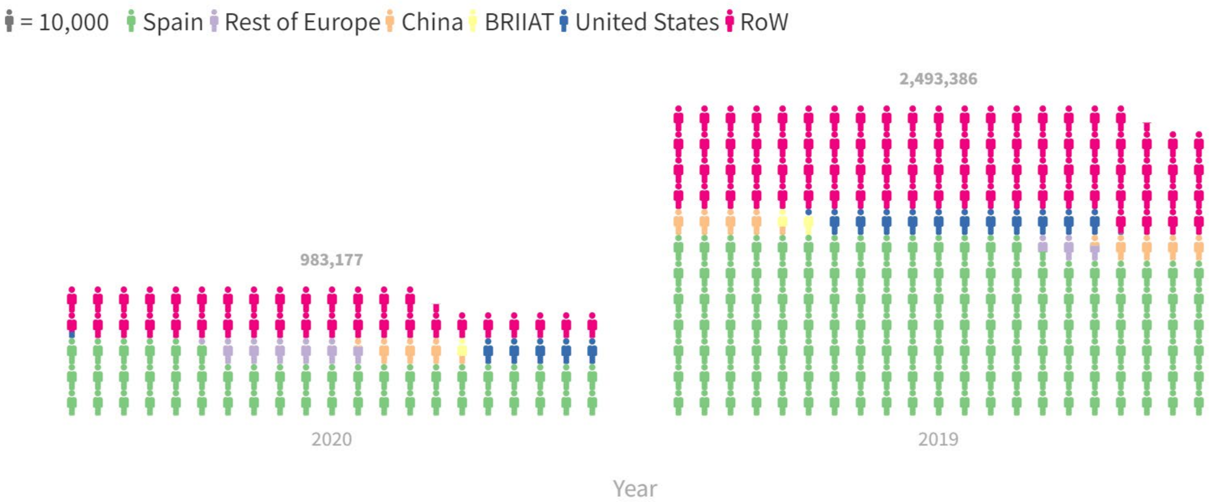
Note to Figure 1. The percentage besides each bar shows the contribution of the internal tourism demand in the total employment footprint per gender and year.

Figure 2. Employment footprint by gender and skill level of the employees and kind of touristic demand (internal or receiving) triggering the footprint. 2019 and 2020



Source: own elaboration based on Stadler et al. (2018) and INE (2022c)

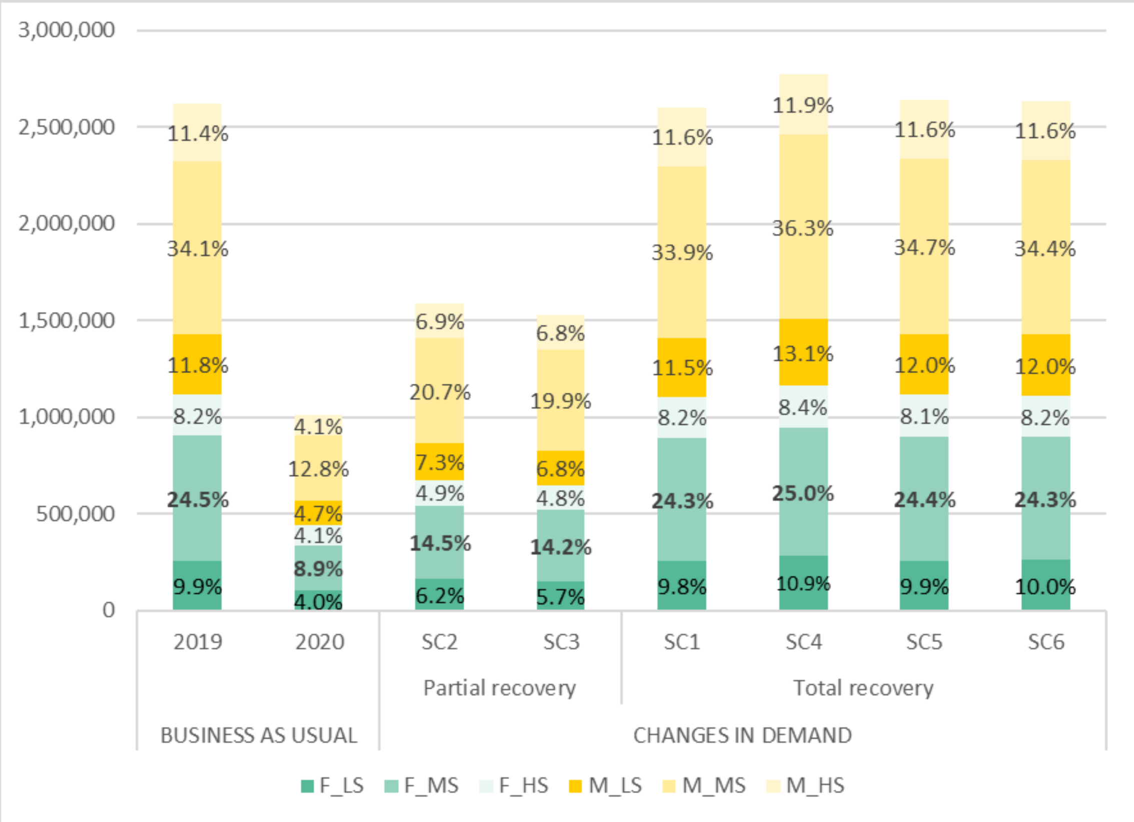
Figure 3. Employment footprint of the Spanish Interior Tourism Consumption by region where the employment is generated. 2019 and 2020.



Source: own elaboration based on Stadler et al. (2018) and INE (2022c).

Note to Figure 3. BRIIAT stands for Brazil, Rusia, India, Indonesia, Australia and Turkey. RoW refers to rest of the World.

Figure 4. BAU results (2019 and 2020) and scenarios 1-6 for 2021 by gender and skill level.



Source: own elaboration based on Stadler et al. (2018) and INE (2022c)

< Discussion yet to be developed >

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