INTERIM REPORT //
ESPON Interregional Relations in Europe

Delivery 4 // June 2021
This INTERIM REPORT is conducted within the framework of the ESPON 2020 Cooperation Programme, partly financed by the European Regional Development Fund.

The ESPON EGTC is the Single Beneficiary of the ESPON 2020 Cooperation Programme. The Single Operation within the programme is implemented by the ESPON EGTC and co-financed by the European Regional Development Fund, the EU Member States and the Partner States, Iceland, Liechtenstein, Norway, Switzerland and the United Kingdom.

This delivery does not necessarily reflect the opinions of members of the ESPON 2020 Monitoring Committee.

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Acknowledgements
The authors would like to thank the members of the ESPON IRiE consortium, the members of the Advisory Group, and the participants in the Stakeholders’ Workshop for the insightful comments and suggestions.

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The website provides the possibility to download and examine the most recent documents produced by finalised and ongoing ESPON projects.
Disclaimer

This document is an interim report.

The information contained herein is subject to change and does not commit the ESPON EGTC and the countries participating in the ESPON 2020 Cooperation Programme.

The final version of the report will be published as soon as approved.
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Abbreviations

ABSs  Asset-backed securities
B2B  Business to business
BIS  Bank of International Settlements
BD4  Benchmark Definition of Foreign Direct Investment
BPM6  Balance of Payments and International Investment Position Manual
BoP  Balance of Payment
Brexit  British exit
BvD  Bureau Van Dijk
C&DS  Communication and dissemination strategy
C2C  Country-to-country
COVID  Corona Virus Disease
DX  Delivery X
EBOPS  Extended Balance of Payments Services classification
EC  Economic Complexity
ECB  European Central Bank
EDW  European Data Warehouse
EFTA  European Free Trade Association
EPO  European Patent Office
ESA  European System of Accounts
ESPON  European Territorial Observatory Network
ESPON EGTC  ESPON European Grouping of Territorial Cooperation
EU  European Union
ERFP  European Road Freight Panel
EUROSTAT  European Statistical Office
FATS  Foreign affiliates statistics
FDI  Foreign Direct Investment
GDP  Gross Domestic Product
GHG  Greenhouse Gases
GIS  Geographical Information Systems
GPS  Global Positioning System
GSM  Global System for Mobile communications
GVA  Gross Value Added
H2020  Horizon 2020
HBS  Household Budget Survey
IATA  International Air Transport Association
ICT  Information and Communication Technologies
IMF  International Monetary Fund
INSPIRE  Infrastructure for Spatial Information in the European Community
IO  Input Output
IRiE  Interregional relations in Europe
IP  Implementation Plan
JRC  Joint Research Centre
LFS  Labor Force Surve
LP  Lead Partner
MS  Member State
NSI  National Statistics Institut
NSTR  Nomenclature uniforme des marchandises pour les Statistiques de Transport. Revisée
NUTS  Nomenclature of Territorial Units for Statistics
OECD  Organisation for Economic Co-operation and Development
OD  Origin Destination
PATSTAT  Worldwide Patent Statistical Database
PCT  Patent Cooperation Treaty
PPS  Purchasing Power Standard
PST  Project Support Team
<table>
<thead>
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<th>Acronym</th>
<th>Description</th>
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<tr>
<td>R&amp;D</td>
<td>Research and development</td>
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<td>R2R</td>
<td>Region-to-region</td>
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<tr>
<td>RCA</td>
<td>Revealed Comparative Advantages</td>
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<tr>
<td>REA</td>
<td>Regional Economic Accounts</td>
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<tr>
<td>RMBS</td>
<td>Residential mortgage-backed securities</td>
</tr>
<tr>
<td>RoW</td>
<td>Rest of the World</td>
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<tr>
<td>SAG</td>
<td>Strategic Advisory Group</td>
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<td>SAM</td>
<td>Social Accounting Matrix</td>
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<tr>
<td>SHP</td>
<td>Shapefile</td>
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<tr>
<td>SQL</td>
<td>Standard Query Language</td>
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<td>SME</td>
<td>Small and Medium Enterprises</td>
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<td>SUT</td>
<td>Supply and Use Tables</td>
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<td>TFEU</td>
<td>Treaty on the Functioning of the European Union</td>
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<td>ToR</td>
<td>Terms of Reference</td>
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<td>UK</td>
<td>United Kingdom</td>
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<td>UNCTAD</td>
<td>United Nations Conference on Trade and Development</td>
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<td>US</td>
<td>United States</td>
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<td>USPTO</td>
<td>US Patent and Trademark Office</td>
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<tr>
<td>WB</td>
<td>World Bank</td>
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<tr>
<td>WIOD</td>
<td>World Input-Output Database</td>
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<tr>
<td>WTO</td>
<td>World Trade Organisation</td>
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Summary

The main goal of the ESPON IRIE project is to generate new data and relevant evidence about the main interregional economic and social flows in Europe. The ESPON IRIE project makes an extraordinary effort, never accomplished before in Europe, to estimate, analyse and combine different types of flows at the regional level (NUTS 2) covering the whole ESPON space, that is, the EU27 plus the UK, Switzerland, Iceland, and Liechtenstein. The flows covered are: trade (goods and services), people (migration, labour and tourism), capital (FDI, remittances and loans) and knowledge (Erasmus, H2020 and patents).

This interim report aims to present to ESPON EGTC the main achievements since the completion of Task 0. Conceptual Framework. Considering the implementation plan, we can state that all activities are developing accordingly to the intended task schedule, with some minor delays and some tasks ahead of schedule. For instance, some tasks related to data acquisition are going slower than expected (e.g. Erasmus 2015-2020 data). Anyway, this delay is not compromising Task 1. Building matrixes and analysing different kinds of flows overall progress as some other T1.X subtasks are ahead of schedule.

For Task 2. Pan European systemic analysis, we have tested our methodology using four region-to-region matrixes (trade of goods, air passengers, commuting and tourism), in preparation for the last calculation with the whole set of matrixes planned in D4+ (October 30th 2021). For Task 3. Testing impacts of existing/upcoming policy decisions and external shocks on interregional relations, we have made a first selection of case studies and have worked together with stakeholders through a dedicated workshop, which was useful to set the scene and aim our research in the right direction in order to address policy makers’ needs. For Task 4. Policy options, we present a first draft including policy options, using as input trade of goods, commuting and capital flows (loan, FDI and remittance). We also present results obtained from the stakeholder workshop which was carried out to support the policy option formation process.

Last but not least, for Task 5. Project management and outreach, we had the first Strategic Advisory Group (SAG) meeting in May and started developing the online tools, using as proof of concept the case study on trade of goods between Spain, France and Portugal.

During this period the project team has worked in a coordinated way, showing enthusiasm and interest in addressing the research challenges and making communication and collaboration between partners easy and productive. Rather than reportable incidents, we expect the consortium to continue working smoothly and proceeding apace to the next tasks.

As a final remark, the draft final report (D5) will have a different structure, more focused in results and usefulness for the scientific community and policy makers, instead of task-driven as this interim report.
1 Introduction

The main objective of the IRiE project is to understand interregional flows of people, capital, goods, services, and knowledge, and to identify what benefits or harms them. To reach this goal, the research team developed a description of the methods of data aggregation and modelling in Task 0. Conceptual Framework. From then on, the partners have been working on their assigned tasks following the scheme defined in the implementation plan. The present report contains the methodological aspects as well as the first results obtained.

- Section 2 represents the core of the report. It gathers the first results in the different tasks: Task 1 (flows analyses), Task 2 (pan-European systemic analysis), Task 3 (scenarios), Task 4 (policy options), and Task 5 (project management and outreach).
- Section 3 lists data (country-to-country and region-to-region) that are used in IRiE according to the proposed methodologies. The matrixes are still under validation procedures and are thus considered as preliminary versions, not ready for dissemination purposes. The final versions will be delivered in D4+/D5.
- Section 4 contains the next steps to perform for the products required in the fourth PLUS delivery (D4+), planned for October 30th, 2021. D4+ might be considered as D5, two months ahead of the schedule agreed at the beginning of the project.

At the same time, the following products are included in Delivery 4:

- Final version of T0 document and report with comments on D3 progress report, in response to feedback obtained as a result of evaluation from ESPON EGTC.
- PPT presentation with main interim results and key maps and figures.
- Current release of ESPON IRiE website, available at https://irie.espon.eu/, including first version of online tools to visualise and understand flows.
- XLS and GIS Data, region-to-region and country-to-country.

Moreover, the documents listed below have not changed since D3 and are considered still valid:

- Implementation plan.
- Dissemination and communication strategy.
- Risk management overview.
2 Results per task

During the development of each task, the look for an answer to the key policy questions in the ToR have been at the core of each methodological and organisational issue.

- What are the characteristics and intensity of interregional relations in Europe in terms of trade of goods, services, capital, people or other relevant flows? How did they evolve over the years? TASKS 1 and 2.

- How can regional interdependencies at European level be depicted? How structural/important are these interdependencies in order to better understand regional development (competitiveness, cohesion, well-being, quality of life…)? How can regions be clustered according to this relatedness? TASKS 1 and 2.

- What should be the impacts of potential political decisions or shocks (e.g. Brexit, implementation of the New Green Deal…) on interregional relations and what is the level of exposure or resilience of European Regions accordingly? TASK 3.

- More generally, what are the conditions and drivers that appear to increase interregional flows in diverse regional contexts? What are the barriers that appear to inhibit interregional relations? TASKS 1 and 2.

- What interventions may reduce/increase such barriers? For which policy purposes and potential impacts? Which EU, national or regional policies have already demonstrated efficiency in addressing interregional flows? TASK 4.

2.1 Task 1. Building matrixes and analysing different kinds of flows

The following table presents the status of each of the flows in T1, considering the four different pieces of information that are part of each flow: data matrixes (see section 3), description of methodology and results, typologies and analysis of explanatory factors (drivers and barriers). For each flow, a sub section is included in this report, containing a brief abstract, key findings relevant for outreach purposes –regarding new data, innovative methodologies and new territorial evidence-, recommendations for data providers and conclusions. The complete description for each flow is included as several Annexes to this interim report. Each Annex includes a section with key aspects derived from T1.X that should be considered specifically in T2, T3 and T4, thus making explicit the linkages between tasks and adding more value to the results.

Although the initial work plan for D4 expected full results for H2020 and Erasmus, the difficulties in getting some data in specific cases (Erasmus) and the faster than expected progress in other flows (trade of goods, commuting and loans) have introduced several changes in our schedule. This fact means overall a better than expected outcome in D4, as can be seen in the next table, which gives credit to the risk management measures in place in the project. Despite this fact, it is...
relevant to mention that most data is still under validation procedures and should be considered as preliminary at least until D4+.

**Table 2.1: Status of each flow in D4 and beyond.**

<table>
<thead>
<tr>
<th>Flow</th>
<th>Matrixes</th>
<th>Description</th>
<th>Typologies</th>
<th>Analysis (with EF)</th>
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<td>T1.1. Input-Output</td>
<td>D4+</td>
<td>D4+</td>
<td>-</td>
<td>-</td>
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<tr>
<td>T1.2 Goods - trade</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>T1.2 Goods transport (by mode, incl. road)</td>
<td>Yes</td>
<td>Yes</td>
<td>D4+</td>
<td>D4+</td>
</tr>
<tr>
<td>T1.2 Services</td>
<td>Yes</td>
<td>Yes</td>
<td>D4+</td>
<td>D4+</td>
</tr>
<tr>
<td>T1.3 Migration</td>
<td>Yes</td>
<td>Yes</td>
<td>D4+</td>
<td>D4+</td>
</tr>
<tr>
<td>T1.3 Commuting</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>T1.3 Tourism</td>
<td>Yes</td>
<td>Yes</td>
<td>D4+</td>
<td>D4+</td>
</tr>
<tr>
<td>T1.3 People transport (by mode: air, rail, ship)</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>D4+</td>
</tr>
<tr>
<td>T1.4 FDI</td>
<td>Yes</td>
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<tr>
<td>T1.4 Remittances</td>
<td>Yes</td>
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**2.1.1 T1.0 Mapping and visualisation**

There are three working environments in ESPON IRIE requiring an interrelated and coordinated way to visualise flows:

- First, during the analytical phase, a set of tools, the so-called FlowMapper, has been developed for the project’s internal use. The FlowMapper enables the project partners to interactively generate the flow-specific map types and diagrams (full flow matrix maps, Sankey diagrams, chord diagrams, heat maps, spider maps, diagram maps and choropleth maps) required to display the flows of individual regions in this report. All visualisation types are set up to display the flows for a selectable year but also to present flow dynamics over time.

- Second, a central mapping facility is in development to produce other maps to be used in the project’s deliverables and other publications, not available through FlowMapper, in keeping with the common ESPON mapping guidelines.

- Finally, the ESPON IRIE online tool provide selected mapping features in an interactive (online) way. It is in development (see Task 5) as part of the project’s outreach strategy and benefit from graphical and technical developments made in the two steps described above.

In this section we will focus in describing the Flow Mapper. Its objectives are:

- To provide appropriate graphical presentations of flows between regions and between countries
- To enable project partners to generate very easily flow specific map types and diagrams
To display flows for a selectable year, but also dynamics of flows over time
To be used internally by partners during the analytical phase
To be “Inspiration” and to be (conceptually) incorporated in ESPON IRIE Online Tool

To make these objectives possible, the technical implementation of the FlowMapper (Software framework) includes:

- Browser-Client architecture with pure Javascript libraries: D3.js as base avoids proprietary representation and affords high flexibility, exposing the full capabilities of web standards such as HTML5, SVG, and CSS. D3 is fast, supporting large datasets and dynamic behaviors for interaction and animation
- For IRIE partners as (local) browser application

This development allows the following functionality:

- Simple user interface in browser window
- Selection of flow data to be displayed
- Handles C2C and R2R matrices
- Selection of map or diagram type
- Visualisation in browser window
- Mouse-over to highlight certain flows (e.g. of a specific country or region)
- Interactivity for things like class and colour definition beyond the pre-defined standards
- Export of graphics to SVG- and/or PNG-Files

Said functionality allows to visualise:

- Regional/country flow matrix visualisation
  - Full flow matrix maps
  - Bi-directional flow maps
  - Diagram maps
  - Intensity maps
  - Sankey diagrams
  - Chord diagrams
  - Heat maps
- Individual region’s/country’s flow visualisation
  - Spider maps
  - Choropleth maps
  - Diagram maps
  - Intensity maps
  - Treemaps

As a result, the maps in the reports produced as part of IRIE project are mostly created using FlowMapper. These reports are included as Annexes to this Interim Report.
2.1.2 T1.2 Goods – trade

Full report in Annex 1.

2.1.2.1 Introduction

This section describes the production and analysis of the interregional trade flows of goods (Task 1.2.a.). The database generated includes the intra-national and inter-national region-to-region flows of goods for the period 2010-2018, estimated at the NUTS2 regions, distinguishing by 5 transport modes (road, ship, train, aircraft and others), and 14 different sectors based on the NST-2007 classification. The flows are provided in monetary units (€) and volumes. The international
flows are compatible at the country-to-country level with the BACI dataset (UN-Comtrade), while the aggregation of the international and intra-national flows is compatible with the total output from the recently published FIGARO country-to-country Input-Output Tables. In conclusion, the resulting dataset is backed by the most reliable information about total output and international trade at the country-product level, while the region-to-region flows for each mode are rooted in the trade and transport statistics by mode. The flows obtained are analysed using multivariate analysis and the gravity equation. By means of a cluster analysis, we identify different regional typologies able to group regions with similar levels of centrality and connectivity. The econometric analysis based on the gravity equation complements this picture, identifying drivers and obstacles of the flows of goods within the whole ESPON space. The analysis uses aggregate, mode and sector specific flows, and discusses the results related to the most salient explanatory variables. Our results confirm the relevance of trade in goods between and within countries, offering an unknown layer corresponding to the intra and inter-regional flows in Europe. The descriptive analysis helps to illustrate the European countries and regions with the higher intensities of exports and imports of goods, are not the always the ones that have the highest rations of outflows and inflows relative to their GDP. Openness is revealed to be higher in certain small Eastern-European countries (Slovakia, Slovenia, Czechia, Hungary…), than the largest European economies (Germany, France, UK). At the country level, the intra-national flows of each country are revealed to be much larger than any inter-national bilateral flows. The main flows in the dataset correspond to the intra-national flows of Germany, France, and the UK. At the regional level, regions trade more with the ROW (all destinations apart from the ESPON countries), and the “intra-regional trade”. Such results, confirm the existence of a clear home bias, both at the national and at the regional level, suggesting that the largest part of the economic activity is supplied within each country and each region (NUTS 2).

2.1.2.2 Highlights

Data

- We estimate the first ever comprehensive dataset of region to region (Nuts 2) flows or goods between and within EU27 and ESPON countries, in totals and with sectoral detail, with a detail treatment of all transportation modes: ship, road, train, air and others.
- The international flows are consistent with the BACI at the country-to-country level, and the disaggregation for the 5 transport modes is consistent with the corresponding information by Eurostat, both for trade and for freight flows.
- The flows are available for the period 2010-2018 and split by 14 sectors based on the NST classification, the one that corresponds to the most important r2r indicator, the road freight flows from Eurostat.

Methodology

- The construction of this novel dataset corresponds to the combination of data available at different sectoral and spatial detail. Official trade flows in monetary and physical units
at the country-to-country level (BACI and Eurostat). Official transportation flows (freight)
by transport mode for the main five modes: road, train, ship, aircraft and other.

- The flows in physical units are combined, first, with a dataset on unit-prices by product,
country and year. The corresponding flows are aggregated and harmonized with the trade
flows by transport mode from Eurostat (COMEXT), and then harmonized with the bilateral
flows from BACI in Euros and Tons. The intra-national trade totals for each country-sector-year are obtained as a residual from the comparison of the corresponding total output
(FIGARO) and the total international trade (BACI).

- The estimated flows are analysed using the gravity equation, as an attempt to test the
robustness of the procedure followed, finding very solid evidence. A cluster analysis also
allowed to group regions according to the centrality and relatedness of their trade flows.

- The gravity equation can explain a large part of the interregional flows of goods, both
when using the aggregate and the sector-specific flows. The performance of the different
models used are very robust, helping to identify the main drivers and barriers to intra-
national and inter-national trade, differentiating between factors that are related with the
geographic features of the trading partners, as well as other variables more related to the
general performance of the regions. Our analysis also find heterogeneity by sectors and
modes.

New territorial evidence

- Our results confirm the relevance of trade in goods between and within countries, offering
an unknown layer corresponding to the intra and inter-regional flows in Europe.

- Once aggregated to the country level, our flows are confronted to the most recent country-to-country Input-Output Database, the recently publish FIGARO dataset (2010-2018),
finding similarities and differences in terms of the openness level as well as the share of
the intra-national and inter-national flows. Such differences are supported by the two dif-
ferent methodologies applied by each project, each one of them emphasize different
sources and methodologies.

- The descriptive analysis helps to illustrate the European countries and regions with the
higher intensities of exports and imports of goods, are not the always the ones that have
the highest rations of outflows and inflows relative to their GDP. Openness is revealed to
be higher in certain small Eastern-European countries (Slovakia, Slovenia, Czechia, Hun-
gary…), than the largest European economies (Germany, France, UK).

- At the country level, the intra-national flows of each country are revealed to be much
larger than any inter-national bilateral flows. The main flows in the dataset correspond to
the intra-national flows of Germany, France and the UK. The largest non-intra flow corre-
sponds to the German exports to the Rest of the World (ROW), defined here as the non-
ESPON countries.
When focussing on the regional level, it is confirmed that the regions trade more with the ROW (all destinations apart from the ESPON countries), while the second higher intensity corresponds to the “intra-regional trade”. Inter-regional trade within the country is the smaller category in aggregate terms. However, when the bilateral flows are estimated using the gravity equation, the intra-regional and the inter-regional trade is consistently much higher than any equivalent bilateral international flow. Such results, confirm the existence of a clear home bias, both at the national and at the regional level, suggesting that the largest part of the economic activity is supplied within each country and each region (NUTS 2).

2.1.2.3 Recommendations for data providers to improve data quality

Several recommendations for data providers are drawn:

- The fastest way to improve the information about interregional economic relations between the EU countries is to publish the data that is already available, but not published. The datasets used in this analysis corresponds to the ones that offer a Pan-European perspective, something that imposes a certain constrain, limiting the information published by Eurostat to the maximum common level of information reported by all countries. However, some countries generate better information, more disaggregated at the spatial, temporal and sectoral level, which is hardly accessible for users from other countries. In addition to the valuable effort done by Eurostat on the generation of harmonized datasets such as the ones corresponding to the Comext Trade dataset or the ERFT, it will be nice if a common repository with access to the national complementary data will be provided. The case study analysing the trade flows of goods between Spain, France and Portugal wants to show how the estimation generated in this Task 1.2.a. can be extended and improved if other countries publish the equivalent data with more sectoral (NSTR-3 digits) and territorial detail (NUTS 3).

- In many EU countries, and in Eurostat as a whole, trade statistics do not offer any information about the region of origin or destination. Instead, country-to-country flows are published with detail at the product level by months. In some other countries, these official statistics are published at the Nuts 3 level every month. Furthermore, there are even large samples with international exports at the firm-level, which can be geo-localized at the zip code level. This is a clear paradox, knowing that in the whole EU27 trade statistics share the same Intrastat / DUA information system, so the data collected might be really the same in all countries. Thus, the harmonization and publication of these data, that is already there, will be a great improvement for researchers and the development of evidence-based policy.

- It is highly appreciated the effort done by Eurostat in the harmonization and publication of the European Road Freight Survey in the microdata format. However, as commented in several parts of this document, we think that the quality of the information can be easily improved: i) it will be desirable to expand the temporal coverage of the microdata, which now covers 2011-2019; ii) similarly, the spatial level offered is restricted to the NUTS 2 level, impeding analysis...
like the one conducted in the commented case-study, where it is shown that usually NUTS 3 level is a more homogeneous spatial unit. Moreover, we have reported in the annex certain variables that are collected but not reported by the ERFT, whose publication clearly increase the potential analysis. All the information related to the NACE of the firm producing the delivery, the nationality of the reporter or the information related to the multimodal connections are very relevant.

• Many economic phenomena are sensitive to the spatial administrative unit used, in line with the literature on the modifiable areal unit. It is important to remark that the NUTS 3 level is probably the most homogeneous spatial unit in Europe, and it is the one that better represents the economy of cities, the main protagonist on a knowledge-based economy. Thus, although the most powerful sub-national institutions correspond to the NUTS 2 level, and, therefore, this is the common denominator for most part of the European regional statistics, an extra effort on downscaling covering NUTS 3 level is also desirable.

• Another paradox is that the data regarding the transport mode that are more concentrated in very few actors (train, air, and ship), are the ones with the worst statistical information, and with the less transparent policy for publication and use. The lack of sectoral information about the region-to-region freight flows for these modes diverge from the information available for road, where, in principle, the higher level of atomization raises the cost of data collection. An extra effort on the generation of sectoral origin-destination flows for these modes is needed. Noticeable, such effort is needed for train and ship if we really want to promote these modes within the European Green Deal, as a more sustainable alternative to the road mode.

• All in all, the collection of data about trade and freight flows in each country, and for the whole Europe, can be clearly improved if each statistical exercise is defined with a spatial perspective and a holistic approach. For example, it will be reasonable that transport and trade statistics will be, somehow, more comparable, both in terms of the product classifications and their correspondence, the coverage of the spatial unit of reference, or the units of measurement used. Moreover, with focus in the transport statistics, it will be desirable that each transport mode will not be considered in isolation, including fields related with multimodality and intermediation. This aspect is critical in the context of “the last mile revolution” and the political interest on tracking the environmental footprint of the flows generated. Furthermore, we should have the additional difficulties introduced by the e-commerce, where transactions are arranged over non-located digital platforms, while the complex logistic network that serves the deliveries (e.g., Amazon, Alibaba…), which might increase the number of transit locations from the producer to the final destination.

• Finally, the true statistical revolution regarding the spatial tracking of economic flows will come from unveiling the fiscal information, always with full respect of firms and individual information rights. Assuming that the VAT is the most homogeneous and European tax of all, wouldn’t be possible that its information will be also used for the public good of knowing the
origin-destination of the flows in Europe. Some exploratory analyses are being conducted in certain countries, but they are completely disconnected to the rest of the statistical system.

2.1.2.4 Conclusions

This section describes the methodology followed to generate the most updated series of intra and inter-regional flows of goods in Europe, and to the best of our knowledge, one of the widest available worldwide using a common methodology of estimation.

The database generated and analysed in this report includes the intra-national and inter-national region-to-region flows of goods for the period 2010-2018, estimated at the NUTS2 regions, distinguishing by 5 transport modes (road, ship, train, aircraft, and others), and 14 different sectors based on the NST classification. The flows are provided in monetary units (€) and volumes (Tons).

The flows are estimated departing from the region-to-region statistics about transport mode in tons published by Eurostat. Such dataset is transformed into raw monetary terms using country-HS-year unit value dataset derived from BACI (UN-Comtrade/CEPII). Then, the resulting dataset is confronted with the information about international trade by transport mode published by Eurostat (Comext), as well as the BACI international trade dataset. At the end, the resulting region-to-region flows between countries are compatible at the country-to-country-product level with the BACI dataset (UN-Comtrade), while the aggregation of the international and intra-national flows is compatible with the total output from the recently published FIGARO country-to-country Input-Output Tables.

The results obtained are analysed using cluster analysis and different specifications of the gravity equation, fed with the aggregate flows as well as sector specific flows. The gravity equation can explain a large part of the interregional flows of goods. The performance of the different models used are very robust, helping to identify the main drivers and barriers to the interregional trade of goods, differentiating between geographic features and economic and institutional factors characterizing the trading partners.

The results confirms that the tradability of goods between the European countries is very high. But even with that, our analysis has also verified that, despite the great openness and interconnection of the European regions, the largest part of the flows still takes place in the shortest distance, remaining within the national and regional boundaries. This result is reflected in the simultaneous estimation of the intra-national and intra-regional home bias, which with the corresponding cautious, might be interpreted along with the presence of endogenous factors (e.g., economic geography forces; economics of scale related to metropolitan areas; etc.) but also potential non-tariff barriers to trade.

As always, the analysis is partial, and allows several extensions and improvements, that we expect to cover in the other parts of the IRIE project, as well as in future academic papers to be publish in this regard.
2.1.3 T1.2 Goods transport by mode

Full report in Annex 2.

2.1.3.1 Introduction

This section contains the methodology and first descriptive results of an analysis of freight transport flows by mode between NUTS 2 regions and between countries in Europe as part of the IRIE project.

The main purpose of the research conducted is first to establish a homogeneous flow database for the years 2010 – 2018. This database should contain flow matrixes at the country to country level and at the region to region level for the part of the European territory that is part of the ESPON 2020 Programme (EU27 plus UK plus CH, IS, LI, NO). Matrixes should be generated for four freight transport modes, i.e. for road, rail, maritime and air. The generation of the matrixes should be as data-driven as possible, i.e. modelling techniques should only come into operation if data are not available. The further purposes of the research are to present and analyses the different freight transport flow matrixes obtained, to develop regional typologies following a common approach in the IRIE project and to identify explanatory factors (drivers and barriers) for the freight transport flows.

Results available already are the freight transport flow matrixes for the four modes road, rail, maritime and air. First territorial evidence has been elaborated as part of the analysis done for this version of the report. One of the main issues here are the different spatial orientations of the different transport modes involved in freight transport within Europe. Intra-European freight transport flows by road and by rail are rather domestic, only a low portion of freight flows using these two transport modes are international, i.e. between regions of different countries. On the other hand, intra-European maritime freight and air freight transport flows are much more than land modes internationally oriented. Only a low portion of freight flows with these modes are intra-national, i.e. most high-tonnage flows are between regions of different countries.

Major conclusions will be elaborated once the full analytical spectrum foreseen for the report has been implemented and will be reported in the complete version of the report to be submitted as part of D4+.

2.1.3.2 Highlights

Data

- Different datasets provided by Eurostat for the same freight transport flows are not necessarily congruent when it comes to the volume of flows reported. This is valid for both, within a certain dataset and between the datasets.
- Freight transport matrixes have been generated at the country to country level as well as for the region to region level (NUTS 2) for four main transport modes (road, rail, maritime, air). Maritime matrixes are also available for further disaggregation by commodity type;
Air matrixes are available for different Eurostat approaches to count air freight volumes between spatial entities.

- Freight transport matrixes have been generated for all years (2010-2018) considered in the IRiE project.

**Methodology**

- The generation of the different freight transport matrixes respects as closely as possible the available data from Eurostat. However, several steps of data clearance with consistency and plausibility routines had to be performed. In case no regionalised freight transport data was available, appropriate disaggregation procedures were developed and implemented.

- The description and analysis of the different freight transport flows in Europe at national and at regional scale makes particularly use of the FlowMapper, a tool developed in the IRiE project to specifically visualise different kinds of regional flows in Europe by a wide range of appropriate flow maps and flow diagrams.

- The deeper analysis of the freight transport flows regards typologies and explanatory factors will follow the common guidelines developed in the IRiE project for all flows considered.

**New territorial evidence**

- The freight transport flow matrixes by mode (C2C and R2R) covering the years 2010-2018 created in the IRiE project is a unique and consistent flow database for all 32 countries of the ESPON Programme as base for new territorial evidence on interregional relationships in Europe.

- Intra-European freight transport flows by road and by rail are rather domestic, only a low portion of freight flows using these two transport modes are international, i.e. between regions of different countries. Nevertheless, international road and rail freight transport has not to be neglected as the total tonnage transported between regions of different countries is significant. In Germany for instance, the country with the highest rail freight transport volume, there are 303 million tons transported in total of which about 235 million tons are domestic and 68 million tons are international rail freight loaded or unloaded in other countries.

- Intra-European maritime freight and air freight transport flows are much more than land modes internationally oriented. Only a low portion of freight flows with these modes are intra-national, i.e. most high-tonnage flows are between regions of different countries. However, substantial domestic maritime freight transport occurs in particular in Mediterranean countries. But, substantial domestic air transport occurs only in some of the larger countries, such as for instance France or Germany.
• The 100 top road freight flows with highest tonnage between two regions are occurring in wider capital regions of mostly larger countries and in the larger agglomerations of Rhine-Ruhr in Germany and Northern Italy. Considering 1,000 highest flows, more regional road freight clusters become visible, this is particular obvious in Poland, Germany, the Netherlands, Belgium, France and Spain, but also to some degree in the UK and some smaller or less populated countries.

• Highest rail freight flow volumes do not necessarily occur on short to medium distances but on longer domestic routes. Highest rail freight volumes between pairs of regions do exist between Nord-Norge in Norway and Övre Norland in Sweden, between the two Lithuanian NUTS 2 regions and between Malopolski and Slaskie in Poland, i.e. in all cases rail freight transport of bulk goods. In several cases, there is some indication of higher volumes of freight transport by rail crossing country borders. This is particularly true for relationships across the Alps between Italian regions on the one hand and regions in Germany, Belgium and the Netherlands on the other. Rail freight flow volumes between regions in several parts of southern, eastern and northern countries are rather small.

• Highest maritime flow volumes between individual regions are across the Channel between Nord-Pas-de-Calais in France and Kent in the UK and between Zuid-Holland in the Netherlands and East Yorkshire and Northern Lincolnshire in the UK. This is followed by other international short-distance maritime links between regions in Ireland and the UK, Germany and Sweden, and Estonia and Finland.

Substantial amounts of freight transport by air are concentrated on a few NUTS 2 regions serving as main air freight transport hubs for Europe. The regions of Leipzig in Germany, Köln in Germany, Leicestershire in the UK and the Ile de France have the highest air transport volumes in Europe, followed by Darmstadt in Germany, West-Brabant and Liege in Belgium, Essex and Outer London in the UK, Lombardia in Italy and Comunidad de Madrid in Spain. Those regions are the major logistic distribution centres for air freight and mail and host the largest carriers.

2.1.3.3 Recommendations for data providers to improve data quality
The input data for the freight transport flow matrixes generated is provided by Eurostat which as usual is dependent on data provision of EU member states and other countries. So, Eurostat and the national statistical agencies delivering transport flow data to Eurostat are the main addressees of the recommendations.

The point of departure is that the different datasets provided are not necessarily congruent when it comes to the volume of flows reported. This is valid for both, within a certain dataset and between the datasets. Main problem to be addressed is that the flow value a reporting unit (e.g. country or port or airport) states to be sent to another reporting unit is often not stated as flow of the same magnitude by the receiving reporting unit. Other problems are gaps in time series or provision of regionalised flow data only every five years as it is the case for rail, non-matching aggregations to larger reporting units, data for regions in non-updated NUTS systematic (NUTS
2013 or even NUTS 2014), outdated codes for ports and airports, non-data provision because of claimed confidentially issues etc. So, basically what has to be done to establish a freight transport flow database that matches research user demand?

- It is to be expected that also in future different national reporting entities are reporting different numerical values for the same flow. Eurostat might go beyond a data collecting role and might become a data clearing house, i.e. tries to wipe out any inconsistencies in the datasets provided.

- Inconsistency checks have also to be performed across the different aggregation levels at which data is provided, i.e. from individual ports or airports via regional data up to national data.

- Gaps in time series have to be prevented by introducing a strict control system for data provision of the national agencies involved.

- Whereas maritime and air flow data are reported at the level of ports or airports even on a monthly or a quarterly base, regionalised rail flows are reported only every five years. This has to be overcome by introducing mechanism that rail freight flow data is provided to Eurostat at least on an annual base.

- For many kinds of research it is necessary to have time series spanning a decade or even longer. Here, it is not helpful that for instance regionalised rail freight flow data for the years 2005, 2010 and 2015 is reported only for the NUTS system valid at that time. A similar problem exists also for many other categories of regional data (population, economy etc.). It is not acceptable that officially approved historical time series are not available and that Eurostat reports "not available" in the different datasets. Eurostat might take over an important service by recalculating historical data to the current NUTS system. This would benefit a wide range of spatial research in Europe.

- A minor issue in this context is that some countries, mainly for air transport, are using airport codes for reporting current flows that are not valid any longer. Eurostat might introduce checking routines to avoid this.

- Some reporting countries explicitly declare some freight flow data as confidential, as it is the case for rail transport of Belgium. It is hardly to accept that apparently commercial interests of rail carriers rule over public interest about data needs although rail transport is in most countries heavily subsidised by the public. Eurostat might initiate a strategy that such kinds of data will become open data available for research and other purposes.

The recommendations for data providers to improve data quality will be further elaborated in the complete version of the report to be submitted as part of D4+.
2.1.3.4 Conclusions

The conclusions will be elaborated in the complete version of the report to be submitted as part of D4+. These conclusions will be worked out in a way that answers to the key policy questions of the project will be given based on the analysis of freight transport flows by mode:

- (1) What are the characteristics and intensity of interregional relations in Europe in terms of trade of goods, services, capital, people or other relevant flows? How did they evolve over the years?
- (2) How can regional interdependencies at European level be depicted? How structural/important are these interdependencies in order to better understand regional development (competitiveness, cohesion, well-being, quality of life…)? How can regions be clustered according to this relatedness?
- (4) More generally, what are the conditions and drivers that appear to increase interregional flows in diverse regional contexts? What are the barriers that appear to inhibit interregional relations?

In addition, the added value of the research and the new territorial evidence obtained will be discussed. Future research needs will be addressed as well.

2.1.4 T1.2 Services

Full report in Annex 3.

2.1.4.1 Introduction

This section contains the methodology and main results with regards to the Task 1.2.b. of the IRIE project, centred in the estimation and analysis of the interregional trade of services in Europe. The point of departure is the official data about country-to-country flows of services differentiated by sectors (EBOPS-2010) and years published by the WTO-UNCTAD, in collaboration with other international organizations such as the OECD and Eurostat. This source is the widest available with respect to the number of years, countries, and sectors. Then, we develop a methodology able to split the region-to-region equivalent flows, following the theoretical discussion related to the four alternative modes of delivery of services. Next, we deploy a set of indicators available at the region-to-region level, used as a proxy of each of the three modes considered in the BOP statistics, namely, mode 1, 2 and 4. This approach is tailored for the inter-national flows. Since the intra-national flows, lack of an equivalent dataset of reference, we obtain a prediction for the intra and interregional flows within each country, using the estimated elasticities between the observed flows and the indicators (one for each mode) in the observed international flows, knowing that the indicators used cover both the inter-national and the intra-national flows. Then, the raw prediction is corrected adding an additional constrain coming from the recently published country-to-country FIGARIO Input-Output Tables, whose national total output for each year and service sector is used as a restriction. Thus, the intra-national trade for each service sector and country-year is obtained as a residual from the comparison of the corresponding total output and the total inter-national exports to the world from the WTO-UNCTAD dataset. Then, the dataset generated is analysed, showing the coherence between the flows obtained and the reference figures at the national level. Finally, the report concludes with the analysis of the region-to-region flows...
flows obtained, using the gravity equation as benchmark, with the aim of identifying the main drivers of trade. Such analysis is provisional and will be completed in the following months, including a specific section devoted to the creation of typologies using cluster analysis (D4+).

2.1.4.2 Highlights

Data

- We estimate the widest comprehensive dataset of region-to-region (NUTS 2) flows or services between and within EU27 and EEE countries using a common methodology.
- The international flows are consistent with the WTO-UNCTAD-OECD (BaTiS) flows at the country-to-country-sector-year level. The intra-national trade for each service sector and country-year is also coherent with the corresponding total output (FIGARO IO Tables) and the inter-national trade from the WTO-UNCTAD dataset.
- The flows are available for the period 2010-2018 and split by 12 commercial service sectors based on the EBOPS-2010 classification.

Methodology

- The regionalization of the intra and international flows is based on the combination of different indicators at the region-to-region level, conceptualized as proxies of the three modes of service delivery corresponding to the BOP statistics (mode 1, 2 and 4), and weighted by sector-country specific shares based on TiSMoS database, also developed by the WTO-UNCTAD and OECD.
- The estimated flows are analyzed using the gravity equation, as an attempt to test the robustness of the procedure followed, finding very solid evidence.

New territorial evidence

- Our results confirm the relevance of trade in service between and within countries, offering an unknown layer corresponding to the intra and inter-regional flows in Europe.
- With few exceptions, the service sectors show a clear “intra-national home bias”, suggesting that, after controlling for all explanatory variables (observable and non-observable), the largest part of the output generated by each service sector is usually consumed within each country, with also a significant “intra-regional” home bias. Having said that, very intense international flows are also identified, some of which interconnect the UK and Germany. Other important flows are found between UK, Germany, France, and Switzerland. This finding is relevant, since takes place between countries belonging to the Euro-zone and non-EU countries. Moreover, these flows are specially exposed to BREXIT and the future regulation of the financial sector and other service sectors.
- However, we find a wide heterogeneity of results regarding the tradability of services within and between countries.
The top-20 R2R flows of services in Europe in 2018 ( Millions of Euros) combines an interesting list of intra-national and inter-national flows. Non-inter-national flows are included in the top-20 flows. All are intra-national. Between them, there is a predominance of intra-regional in Germany, France, UK and Italy. In this list, the main inter-regional flows are: DE23 (Oberpfalz) > DE21 (Oberbayern); FRB0 (Centre — Val de Loire)> FRK2 (Rhône-Alpes); UKL2 (East Wales) > UKF3 (Lincolnshire); FRI1 (Aquitaine) > FRK2 (Rhône-Alpes); DEA5 (Arnsberg) > DEA2 (Köln); UKC2 (Northumberland and Tyne and Wear) > UKD3 (Greater Manchester). And the main intra-regional flows are: FRB0 (Centre — Val de Loire); DEA1 (Düsseldorf); FRF1 (Alsace); ITC4 (Lombardia).

2.1.4.3 Recommendations for data providers to improve data quality

To be completed for D4+.

Several recommendations for data providers are drawn:

- First, it is necessary to reckon the effort done by several international organizations with respect to the production of new data about international trade of commercial services (WTO-UNCTAD; OECD, Eurostat, JRC). As we have seen in this report, the combination of such information with alternative sources (IO tables, indicators of mobility and connectivity, etc.) clearly open new fields of analysis, fundamental for filling the gap of knowledge about the service sector. Consolidating this effort and promoting the development of equivalent input source at the country and regional level seems to be essential.

- An extra effort on the clarification of the link between the trade of services and the performance of multinationals (mode 3) in each economy seems also to be relevant, not just to really address the inter-linkage of national and regional economies, but also to put in value the role played by these institutions, sometimes reviled in the certain social and political views.

- As commented in other reports, it is highly appreciated the effort done by Eurostat in the harmonization and publication of the European Road Freight Survey in the microdata format. If the variable of “reporting” country will not be censored, as it is now, we might have an additional layer of information to distinguish between the origin-destination of the trips and the origin-destination of the monetary flows (exports and imports of the freight services embodied). Similarly, the information related to the NACE of the firm producing the delivery, might allow the discussion about the share of freight services conducted by each sector, or subcontracted to logistics. Something similar will be applicable to the nationality of the transporters operating in the other modes of transport (ship, air, train). Now, the point of origin of the freight flow must be identified with the country/region exporting the transportation service. But this is not necessarily true, and the data for relaxing this assumption is (in general) known, but not published.

- The sectoral correspondence between the ISIC/NACE classifications and the EBOPS could be clearly improved. The interlinkage of the input-output framework (NACE/ISIC) and the datasets on international trade of services (EBOPS) is not-straightforward, having to sacrifice
sectoral detail or accuracy when splitting or comparing sources. An extra effort on bridging these two worlds of output and trade is necessary, mainly if the former is the only source for intra-national trade.

- Our analysis has also found limited information to proxy certain modes of delivery. This is the case of mode 1 and mode 4. Regarding mode 1, it is hard to believe that, in the current times, a single matrix of Facebook connectivity is all we can have about R2R telecommunications or internet connections in Europe. The main digital platforms know in real time almost everything about individual behaviour and connectivity. The abundance of private owned information dwarfs the complete lack of data for the public good on this field. Similarly, the information about labour mobility, temporal workers and commuting can also be improved to really create the basis for the correct identification of the mode 4 of supply.

- A true statistical revolution regarding the spatial tracking of economic flows of services depend on unveiling the fiscal information, always with full respect of firms and individual information rights. Assuming that the VAT is the most homogeneous and European tax of all, wouldn’t be possible that its information will be also used for the public good of knowing the origin-destination of the flows of services in Europe?

2.1.4.4 Conclusions

To be completed for D4+.

This section describes the methodology followed to generate the most updated series of intra and inter-regional flows of services in Europe, and to the best of our knowledge, the widest available worldwide using a common methodology of estimation.

The database generated and analysed in this report includes the intra-national and inter-national region-to-region flows of services for the period 2010-2018, estimated at the NUTS2 regions, using 14 different sectors based on the EBOPS classification.

The point of departure is the official data about country-to-country flows of services differentiated by sectors and years published by the WTO-UNCTAD, in collaboration with other international organizations such as the Eurostat and the OCDE. These sources are the widest available with respect to the number of years, countries, and sectors. Next, we develop a methodology able to split the region-to-region equivalent flows, following the theoretical discussion related to the four alternative modes of delivery of services. Then, we deploy a wide set of indicators available at the region-to-region level, used as a proxy of each of these four modes.

This approach is tailored for the inter-national flows. Since the intra-national one’s lack of an equivalent dataset of reference, we obtain a prediction using the estimated elasticities between the observed flows and the indicators (one for each mode) in the observed international flows, knowing that the indicators used cover both the inter-national and the intra-national flows.

Then, this raw prediction is corrected with the national total output from the recent published country-to-country FIGARIO Input-Output Tables. Thus, the intra-national trade for each service
sector and country-year is coherent with the total output (FIGARO) not exported abroad (WTO-UNCTAD).

Then, the dataset generated is analysed, showing the coherence between the flows obtained and the reference figures at the national level. Finally, the report concludes with the analysis of the region-to-region flows obtained, using the gravity equation as benchmark, with the aim of identifying the main drivers of trade.

As always, the analysis is partial, and allows several extensions and improvements, that we expect to cover in future extensions of the IRIE project, as well as in future academic papers to be developed.

2.1.5 T1.3 Migration


2.1.5.1 Introduction

This section contains the methodology (see Annex 4) with regards to the Task 1.3B of the IRIE project, focused on interregional migrant flows.

The methodology chapter describes in detail the entire data acquisition procedure and the methodological procedures that were used in case of data gaps in the C2C and R2R matrices. The biggest challenge at this stage was to create a complete matrix of regional flows, especially in terms of intra-country flows. There are still blanks in the current version of the R2R matrix but these will be filled in and the matrix will be available in D4+.

The results will be finalised once the analysis is completed and presented in D4+.

2.1.5.2 Highlights

Data

- Available data on migration flows are inconsistent between countries of origin and destination even when counting migrants according to the common EUROSTAT definition of a migrant.

- Two comprehensive sources providing data on migration flows within the ESPON space at national and regional level (EUROSTAT and NSI) have been used, but both are incomplete.

- The gaps in migration flows were filled on the basis of estimation measures based on migrant stock, population and GPD.

Methodology

- To gain a complex information on spatial and temporal allocation of tourism flows within ESPON Space at national level (C2C) a procedure including the following steps was applied: Base Data, Stock Gain estimation, In-Out-Cross estimation.
The raw data was organised into a 32×32 C2C matrix format, with countries of origin having rows and countries of destination having columns, which involved transposition for data reported at destination. This resulted in two alternative sets of 10 one-year matrices of 992 cells each. In each case, the raw data could only provide no more than \( \frac{2}{3} \) of the total number of cells required.

Another set of C2C cells was estimated based on the stock of migrants (permanent residents of foreign origin). In this case, the assumption was made that new migrants follow an established spatial migration pattern.

After applying Stock-Gain method, missing cells still existed for the following countries: CZ, IE, EL, ES, CV, LV, MT, PL, PT, RO, UK. For these countries, we established two alternative linear models (In-Out-Cross estimation):

- Outflow model based on population as explanatory variable,
- Inflow model based on GDP as explanatory variable.

In the case of regional level migration (R2R), their estimation was largely determined by the existence of C2C flows. Therefore, our task was to decompose the known number of migrants into spatial units, rather than to estimate the number of migrants from scratch, using the population dynamics and structure specific to each spatial unit separately.

The R2R harmonization guideline idea can be summarized as follows: Migrants adhere to country-wide pattern at source and imitate previous migrants at destination. We believe this guideline sets down a relatively safe and conservative approach, which is best fitted for incomplete and risky data sources.

An input to region-to-region flows estimation consisted of three data structures:

- C2C Migration Flows Matrix (generated as described in section C2C flows,
- R-Outflow table of Regional Migration Outflow as Outflow Driver
- R-Stock table of Regional Distribution of foreign population (Stock) as Inflow Driver

New territorial evidence

To complete later, once all the data has been processed.

2.1.5.3 Recommendations for data providers to improve data quality

European migration statistics by country of previous residence and country of next residence are incomplete and come from different sources and surveys, resulting in differences between data on flows between pairs of countries. There is no O-D data at regional level. Eurostat collects migration data from NSIs using various data sources, according to national availability and practice. Regulation (EC) No 862/2007 of the European Parliament and of the Council of 11 July 2007
on Community statistics on migration and international protection provides the basis for data capture and dissemination.

At the time of the huge increase in the mobility of people in Europe with freedom of movement (migration, circular migrant flows, cross-country commuting), migration statistics should be one of the priorities for the development of public statistics and their collection and compilation in a coherent way should be compulsory for the EU countries.

Efforts should be made at EU level to widen the scope of data collected, which will increase the statistical burden but also allow targeted policies to be developed for regions. The extension of statistics should include:

- further improving the quality of data on C2C (long-term) population flows,
- including short-term migration flows and extending the scope of the data made available to include C2C migration,
- including the age and gender of migrants in C2C flows,
- to acquire and make available data at regional level on flows within countries,
- discussing the development of a system for recording population flows between European countries (as exists, for example, for foreign trade), which would allow current demographic trends in the EU to be monitored and demographic policies to be pursued accordingly.

Ultimately, European migration statistics should be available to citizens, decision makers and researchers without the enormous effort required to compare the various data sources and forms of data publication by the NSI.

2.1.5.4 Conclusions

The completion of the results analysis and the explanatory factor analysis are expected to provide solid and insightful conclusions in D4+.

2.1.6 T1.3 Commuting

Full report in Annex 5.

2.1.6.1 Introduction

This analysis corresponds to the Task 1.3 of the IRIE project, where different interregional flows of people are produced and analysed. Complementary to the flows of tourists and migrants, and beyond the estimation of different sets of passengers’ flows by different transport modes, in this sub-task, we focus on the flows of employees within and between the countries described before. The point of departure is the Labour Force Survey microdata provided by Eurostat. This source, in combination of other datasets and following a transparent and consolidated methodology, provides solid estimates of intra-regional and interregional flows of employees, from the region of residency to the one of work. Such estimates cover the whole ESPON space for the period 2010-2018. The flows are associated with the concept of commuting, although the source used might also include temporary workers. In the data generation process, the main contribution corresponds to the methodology developed to assign the most likely region of residence to the FOR employees reported by the LFS at the country level, which is split using a gravity equation. Our
estimates are confronted and harmonized with more structural data on regional employment from the National and regional Accounts. Then, the data produced is analysed using different specifications and a list of explanatory variables, related to the geographical and demographic features of the regions, the regional labour markets, the attraction capacity of each region included in the regional index of competitiveness, etc. As expected, the results remark the relevance of the size of the region and the distance and contiguity variables. In addition, some of the explanatory variables used appear as additional explanatory factors. Finally, the dataset obtained are used to compute several indicators capturing the Connectivity, Intensity, Weighted Intensity, Interregional Balance, Network Selectivity, External Influence, Send-Receive Balance of the flows. Finally, based on these indicators different k-means cluster analysis is conducted, with the aim of creating typologies of regions depending on their exposure to interregional commuting flows, within the country and with other countries.

2.1.6.2 Highlights

**Data**

- In the context of the ESPON IRIE project, which adopts a holistic and pan-European approach to interregional economic relations, this analysis corresponds to the Task 1.3., centred in the estimation and analysis of the intra and interregional flows of employees (commuters) in the whole ESPON space, in the period 2010-2018.
- The data produce covers the whole ESPON space, producing for the first time estimates with a common methodology for the EU27 + UK, Iceland, Lichtenstein, Norway, and Switzerland.
- Such flows complement the other flows related to tourists, migrants, and passengers flows by different transport modes.

**Methodology**

- The point of departure is the Labour Force Survey microdata provided by Eurostat. The flows are associated with the concept of commuting, although the source might also include temporary workers.
- Our main contribution corresponds to the methodology developed to assign the most likely region of residence to the FOR employees reported by the LFS at the country level, which is split using a gravity equation. Our estimates are confronted and harmonized with more structural data on regional employment from the National and Regional Accounts.
- The data is analysed using multivariate analysis, trying to group the regions according to the shape of their inflows and outflows. Then, different econometric estimations are reported with the aim of identifying drivers and barriers for the intra and interregional mobility of employees. The results obtained are aligned with the previous literature and provide certain clues for policy intervention.
New territorial evidence

- The results confirm that commuting is fundamentally a short-distance in-region phenomenon, since only 8.3% on average of employed residents commute to another region in the same country. Moreover, it can be observed that inter-regional intra-national commuters are significantly higher than inter-national (cross-border) commuters.

- The highest intensities of interregional commuting flows correspond to regions located nearby the big metropolitan areas (London, Paris, Berlin, Madrid...). This behaviour is coherent with traditional explanations of commuting based on the different location on jobs (urban areas) and the availability of affordable, and better quality, housing in surrounding areas.

- We have also identified regional disparities in the intensities of cross-border commuting. Based on 2018 flows, the main cross-border commuters are observed between the border regions in the France-Germany border, Italy-Switzerland border and regions from Slovakia. Flows in the periphery (Eastern Europe countries, Spain-Portugal border, and Northern Ireland) are also relevant although less intense.

- The 20 regions with the highest international (cross-border) commuting ratios over residents are in the borders between: BE-DE-FR, PL-DE, AT-DE and AT-SK-CZ-HU. These regions, including the FR-IT-CH area, are also those with the highest value for international commuting flows in absolute terms. This result emphasizes the effect of “proximity” and highlights a clear spatial concentration of this phenomena in Central Europe.

- We also observe intense international flows of employees with residence in Romania and destination in regions located far away. This strange result might correspond to temporary displacement work rather than to strict commuting flows between areas. Such aspect deserves further research. Also connected with this potential bias of the input data used, we found that the Eastern Europe and the Nordic countries, are more oriented towards other ESPON countries, while in western France, Germany, Spain and Italy the relevance of commuters from ESPON countries over the total of foreign employees is lower.

- In the case of international commuting, the analysis of the areas with net inflows shows a clear concentration in the Swiss regions, Luxembourg, and Liechtenstein, and in the Hungarian region of Pest.

- Regarding the dynamics, our results suggest that while employment grew at an average rate of 1.2% in 2010-2018, commuters grew at a rate of 2.7%, and cross-border commuters at a 5.4%. This point to a growing level of integration of the labour markets of the cross-border regions.

- With respect of demographic variables, when all interregional flows are considered (OUTR+FOR), only population density and the migratory balance in the origin region, and the age of the population in both destination and origin regions are significant variables. However, in the model of international flows, all the variables are significant. Population density and
Commuting and the volume of total employment in a region are positively related. The relationship with the other variables related to the labour market is less clear. This is the case of the unemployment rate or the real wage differentials between origin and destination regions.

Clearer is the positive effect on commuting flows of the innovation indicator in the destination region, showing that more competitive and innovative regions attract employees from other regions. The quality of infrastructures seems to be just significant in the case of the origin region, with a positive effect in the inter-national commuters.

A euro variable is included to proxy to the effect of administrative barriers posed by the borders on international commuting flows across countries belonging or not to the Euro-zone. Our analysis confirms that the intensity of international commuters is significantly associated with the fact that the origin and destination regions are in the Euro-zone.

2.1.6.3 Recommendations for data providers
The first set of recommendations puts emphasis on the need to publish and share all the data that has already been produced, but for different reasons, it is not usually disclosed, both, at the national and European levels.

To this regard, a great improvement will come from Eurostat disclosing the information already registered but not shared related to the region of origin/residency (or even the country of citizenship) in all sources related to Labour statistics (LFS; “Permits for intra-corporate transferee permits in the EU”; “Authorisations for the purpose of seasonal work by sector and citizenship”, etc.) or Commuting (Urban Audit, HETUS, etc.). At this moment, this information is shared by most of the countries, but it is not published by Eurostat, even after following the stringent process of microdata request.

Focusing on the LFS published by Eurostat, as we have seen in this report, some countries do not publish the region of household (REGION) at the NUTS 2 level, but at the NUTS 1. This is the case of the United Kingdom (UK), Germany (DE), Netherlands (NL) and Austria (AT). Paradoxically, they are not small countries, or countries with low sensitivity to territorial matters. Indeed, they are in the list of most decentralizes countries in the world, and as we have seen here, appear in the top list of countries with intra-national and cross-border interregional commuting. It is highly desirable that these countries would make an extra effort of transparency, as anonymity is guaranteed, offering such data with the same detail than the rest.

In relation to the LFS and given the observed characteristics of international commuting flows, to carry out a more detailed analysis of this type of mobility, an ad-hoc statistical treatment is necessary, and it must be treated as a module of the LFS of variable periodicity. It is evident that in the case of international mobility a specific sampling procedure is necessary, in which border areas are treated in a special way. Likewise, it is necessary
to differentiate the temporary movements of workers between regions, from the habitual movements directly related to commuting. These two types of mobility have different characteristics and contribute differently to the consolidation process of a single labour market in the EU.

- Digging deeper in the previous comment, it is also interesting to remark that the information about commuting and labour mobility at the geographical level is very disperse and heterogeneous within Eurostat. Part of the information is included in the statistics about labour market, others in the theme related with well-being or the use of time, and other in the section of “other territorial information”, such as Urban Audit. Moreover, the information published there is disconnected, with almost no options of generating a wide picture of the situation in the whole Europe, unless, as we did, one request the microdata of the LFS and confront and treat the figures with certain level of creativity. For example, in labour statistics we have certain information related to the region of work and residence, but the traceability is lost once the commuter cross a national boundary, even if it resides in another EU country. Furthermore, looking at the HETUS, one has very detailed information about the time spent in commuting in each country, with high detail about the time schedule and the transport mode, but with no information about the region of the commuter. In contrast, Urban Audit reports data about number of commuters by transport mode, but with a focus on just the main metropolitan areas, and with figures that are difficult to reconcile with the other structural figures about population or employment.

- Going one step further, each European country in isolation publish very detail information about where employees live and work, with high granularity for the intra-national flows. For example, Census or Social Security Administrative Registers request such data and allow tracing the internal movements of nationals even at the municipality level. However, when one of these individual crosses a national border, even within the EU, the trace is lost, and the flows are just recorded at the region-to-country level. This lack of information is crucial to understand the economic flows connecting different areas in Europe. The cost of requesting the city of birth or residence is the same than the one that requesting the country, but the possibility of the analysis increases considerably with the former. It will be desirable that Eurostat take the lead promoting that all the EU countries change the scope of their census and related statistics about migration and labour mobility, thinking in Europe as a whole, that is, requesting the data needed, at least, for the traceability of people at the region-to-region level within Europe.

The second set of recommendations are associated with small improvements in the statistical frameworks already in course, but just adding small advancements, with almost no cost or organizational changes:

- For a topic such as labour mobility and commuting, the information at the NUTS2 level is insufficient to really address the policies required for the right coordination and planning,
which usually implies the coordination of different levels of administration: national, regional and municipal. It is important to remark that the NUTS 3 level is probably the most homogeneous spatial unit in Europe, and it is the one that better represents the economy of cities, the main protagonist on a knowledge-based economy. Thus, although the most powerful sub-national institutions correspond to the NUTS 2 level, and, therefore, this is the common denominator for most part of the European regional statistics, an extra effort on downscaling covering NUTS 3 level is desirable. This level could even be too large for several issues related to commuting and local labour markets.

- Another paradox is that the data regarding the mobility of passengers by road is completely absent in Eurostat. This situation is a paradox, since in all countries, modern systems of traffic control provide counts of traffic for every minute and in thousands of spots in the road network. If we really want to assess the challenges posed by the European Green Economy and combine the efforts of all administrations in reducing the undesirable effects of transportation around the main metropolitan areas, where the worst health impacts take place, it is necessary to promote a clear improvement in the information available about people mobility by all transport modes, with special emphasize in the competition of individual vehicles and public transportation. Connected to that, the information about the supply of public transportation is very limited, impeding analysis of transport mode competition at the sub-national level with a Pan-European coverage. Thus, the discussion about how urban sprawl or certain urbanistic strategies implemented in certain territories are difficult to be assessed.

- As we have argued before, commuting might be seen as an indicator of very different processes, where the decisions of individuals and families about where to work and live, interacts with the one of firms and other institutions about where to produce. As a result, a complex network of daily flows arises. There are some critical elements in this complex cocktail for which the spatial information is clearly under-developed in Eurostat. One is the information about the local housing market and the local taxation. Currently, it is almost impossible to measure interregional differences with regards to these two critical variables even at the NUTS 2 level. Another interesting layer, that might increase the insights in this regard is the spatial information about education, since in many cases, the rigidity of certain education systems makes difficult to adapt family decisions in terms of reducing the commuting times, or simply moving to another location. Something similar might happen for certain categories of jobs, such as civil servants, educators or health professionals, whose work is usually very fixed, reducing the labour mobility of other members of the family.

- Finally, it is desirable a complementary effort with the aim of linking structural sources and more innovative ones (fiscal information related to the VAT; new sources related to electronic-tolls, tracks of smart-phones and GPS devices installed in cars and heavy trucks), to complement the virtues and drawbacks of both. To this regard, the COVID19
current situation offer many examples on how public and private institutions are sharing resources to improve the quality of the data available about local mobility, with an important emphasize on the anonymization and the use of private information for the public good.

2.1.6.4 Conclusions

In this section, we have described the methodology used to estimate a consolidated dataset on intra and interregional flows of labour within the ESPON space for the period 2010-2018.

This analysis corresponds to the Task 1.3. of the IRIE project, where different interregional flows of people are produced, distinguishing between the motives of displacement (tourists and migrants) and the transport mode used when doing so (passengers flows by air, ship, and train).

The point of departure in our approach is the Labour Force Survey microdata provided by Eurostat. This source, in combination of other datasets and sound econometric techniques to disaggregate the region-to-country flows for the cross-border (international) commuters, provides solid estimates of intra-regional and interregional flows of employees, from the region of residency to the one of work. The flows are labelled as “commuters”, although the LFS might also include temporary workers.

Once that the data has been generated, we deploy a descriptive and econometric analysis, using several specifications and a long list of explanatory variables, related to the geographical features of the regions, the demography and the characterization of the regional labour markets and their capacity of attracting workers because of its level of competitiveness.

The results confirmed that commuting is fundamentally a short-distance in-region phenomenon, since only 8.3% on average of employed residents commute to another region in the same country. As can be expected, workers’ commuting mainly take place around urban areas with a high concentration of firms, and public organizations. Urban areas are employment centres that act as a pole of attraction for workers who live in bordering areas that most of the time come from the same region. As we have previously noted, the administrative delimitation of NUTS2 and the delimitation of the metropolitan area are sometimes not coincident, so that the largest flows between regions occur between regions for which the administrative borders and the delimitation of the metropolitan area intersect. The highest intensities of interregional commuting flows correspond to regions located nearby the big metropolitan areas in coherence with previous analysis, which have identified explanatory factors such as differentials in terms of the regional labour markets, access to better quality of life or housing conditions.

Overall, it can be observed that inter-regional intra-national commuters are significantly higher than inter-national (cross-border) commuters. International commuting flows seem to respond to slightly different fundamentals, and we have identified regional disparities in the intensities of cross-border commuting. The main cross-border commuters are observed between the border regions in the France-Germany Border, Italy- Switzerland border and regions from Slovakia, with
potential outliers related to Romania and some western countries, where the input data was probably more affected by temporary workers. International commuting flows seem to respond to slightly different fundamentals. It is evident that large urban areas are also centers of attraction at the international level, however in the case of cross border flows it is observed that non-densely populated areas such as the Switzerland’ regions or Luxembourg regions act as poles of attraction for workers from other border countries.

Regarding the dynamics, our results suggest that while employment grew at an average rate of 1.2% in 2010-2018, commuters grew at a rate of 2.7%, and cross-border commuters at a 5.4%. This point to a growing level of integration of the labour markets of the cross-border regions.

In addition to the effect of the size of the labour market and the geographical proximity (distance and contiguity), our results suggest that the demographic variables (density and age), the competitiveness level of the destination region, and the fact of belonging to the Euro-zone increase the intensity of interregional commuters. No evidence of statistically significant results is obtained for other variables such as the unemployment, the wage differentials, or the quality of infrastructures, however it must be considered that the use of wide geographic areas, as NUTS2 regions, may influence on these results.

To this regard, a more intense effort should be done producing better statistics with respect to these important aspects, where the information available is very scarce. Moreover, our investigation clearly suggests that the NUTS 2 level analysis at the Pan-European level should be then reinforced with more local analysis, centred in the areas where the growing phenomena of cross-border commuting is taking place.

2.1.7 T1.3 Tourism


2.1.7.1 Introduction

This section contains the methodology and first results with regards to the Task 1.3A of the IRIE project, focused on interregional tourism flows.

In the methodological chapter (see Annex 6), the description of the entire procedure regarding data collection and the methodology to solve data gaps in C2C matrix and disaggregation of C2C matrix to R2R scale has been explained in detail. Further on, a set of indexes dedicated to tourism flows description, as well as synthesis by means of three simple bi-dimensional typologies has been developed.

The section on Country to Country flows (see Annex 6) diagnoses flows between all countries. It can be observed the existence of several dominant tourism countries in the form of Germany, Spain, France, the United Kingdom, the Netherlands, and to a slightly lesser extent Portugal, Poland, Greece, Denmark or Croatia. In addition, the balance between the number of arrivals and departures from each country was analyzed. The analyses conclude with individual analyses for
researched countries (EU27 + UK + EFTA) regarding the relevance of other countries as tourist destinations and tourist origins.

The section on Region to Region flows (see Annex 6) distinguish 5 dimensions of the flow analysis: intensity (size), connectivity, balance (comparison of outflow and inflow), concentration (dispersion of senders and receivers), and distance (how far they travel – to what extent the distance determines their size). Above mentioned are also the 5 basic groups of indicators, which have been analysed and described, while maps have been provided to illustrate the most important issues of tourism flow within the entire researched period 2010-2018. This section ends with the synthesis of the indicators: the indicator of intensity of tourism flows has been confronted with the indicators of balance, concentration and distance of tourism flows.

The results are going to be finalized upon the completion of the analysis and submitted in D4+.

2.1.7.2 Highlights

Data

- Accessible data on tourism flows is incoherent regarding definitional basis and methodology of data gathering by different statistical agencies.

- Two complex sources delivering data on tourism flows within researched area (EU27 + UK + EFTA) at country to country level (EUROSTAT and UNWTO) exists, while both of them are incomplete.

- Data on interregional tourist movement is delivered by statistical agencies of particular countries, but they are too incoherent and incomparable across countries to be applicable as a reliable source of information at international scale.

- The most appropiable data source to implement as support for R2R matrix estimation is data on stocks of yearly domestic arrivals to NUTS 2 by EUROSTAT.

Methodology

- To gain a complex information on spatial and temporal allocation of tourism flows within researched area, there are two procedures needed: data gaps of C2C matrix completing and disaggregating C2C matrix to R2R scale of detail.

- The following methods of C2C matrix completing have been implemented (in order of decreasing priority): 1) cross-reference of indexes on tourist movement delivered by UNWTO; 2) interpolation or extrapolation of temporal rows; 3) analysis of total tourist movement dynamics for temporal rows completing; 4) harmonization of data derived from different sources, by use of RLDR; 5) model of gravity analysis, by use of: GDP PPS, number of arrivals with accommodation and DM.

- The analysis of the model of gravity at the research area scale has been applied for disaggregation of these cells within C2C matrix, which are related to international move-
ment. For completing the cells related to domestic movement, the regional stocks of domestic arrivals at NUTS 2 has been disaggregated by use of the model of gravity adjusted to national specificity of the function of distance.

- A set of indexes dedicated to tourism flows description within four dimensions (intensity, balance, concentration and distance impact) as well as synthesis by means of three simple bi-dimensional typologies has been developed.

New territorial evidence

- The observed tourism flows between all researched countries in the period 2010-2018 have a high inertia in time. This means that the dominant directions of tourism trips of residents of a given country did not change substantially.

- It is possible to indicate a number of countries that are attractive for residents of at least several countries - Austria, Germany, Greece, Spain, France, Croatia, Italy and Portugal. These are countries located in the Mediterranean (summer tourism) and in the Alps (winter tourism).

- There is a whole range of regional attractiveness, which means that a given country is a tourism destination for people from neighbouring countries - for example Danes and Norwegians travel to Sweden, Bulgarians and Hungarians to Romania, or Lithuanians and Estonians to Latvia.

- The presented results directly indicate the potential direction of tourism marketing of individual countries - either to strengthen the dominant destinations or to open up to new destinations.

- Large amount of interregional flows happens within the largest countries of the Mediterranean region (such as France, Spain and Italy). With less intensity, large interregional movement of tourists within the same country is noticed as well in Scandinavian countries (Norway, Sweden and Finland), in Ireland, the Netherlands, Portugal, Poland, Switzerland, Germany, Romania, Bulgaria and Greece.

- Within the international interregional tourism flows, the axis North-West dominates, with flows between regions of Central and Western Europe (mostly Danish and German regions), towards Croatia, flows between regions of Finland, Estonia, Latvia and Lithuania, as well as flows between Germany and Austria, or France and Spain in the Western Mediterranean region.

- Intensity of tourism flows weighted by population of the regions is the largest in the mountainous parts of Austria (Alps, skiing resorts), and the NUTS2 region Adriatic Croatia (code: HR03), situated along the Mediterranean shores in the part where it is the closest in the European continent (and tourism demanding markets). When added other regions above the average tourist intensity values, a few groups of regions can be noticed in the weighted intensity of tourism flows in individual regions: a) regions situated near the sea
shorelines (Baltic Sea, North Sea, Western Mediterranean), b) Mediterranean islands, c) mountain regions (Alps, Pyrenees), and d) capital cities (London, Paris, Berlin, etc.).

- The greatest unbalance in tourism flows within the regions where inflow dominates is observed along the Mediterranean and Baltic seas, more precisely in the coastal regions of Spain, France and Croatia in the Mediterranean region, and in Denmark, north-eastern Germany and north-western Poland in the Baltic Region.

- The inflow to the regions situated in the northern and eastern parts of Europe relies on tourists from a rather small area, mainly domestic ones, while the inflow is dispersed to the tourism destinations in the southern part of Europe. The outflow is the other way around: tourists from the northern and eastern parts of Europe visit different regions, while the ones from the southern part of Europe do not move to dispersed areas outside the Mediterranean zone.

- Concerning the distance of the tourism flows, tourism in northern parts of Europe remains largely within the region, with not many travelling from faraway places to visit i.e. regions of northern Scandinavia, northern UK, Estonia or Latvia. From the other side, inhabitants of mentioned regions would travel larger distances to reach tourism destination.

### 2.1.7.3 Recommendations for data providers to improve data quality

Data providers are understood in this report as the National Statistical Offices of the EU, UK and EFTA countries, which are gathering data on tourism flows from the border crossings or different service providers, mainly accommodation ones. After gathering this data, National Statistical Offices are analysing these data and publishing raw data or/and results.

Several recommendations can be distinguished for data providers concerning tourism flows:

- to publish existing raw data: within the ESPON IRIe gathering data process, the researchers witnessed in many countries the existence of data available only after contacting respective offices;

- to gather more information from the sources: i.e. tourism data gathered in accommodation units usually do not cover the origin of the arriving tourist concerning location, except country – data on region of residence of the tourist besides data on country origin would be helpful both for all interesting parties in the tourism sector;

- international tourism database of EUROSTAT should provide series of data both on national and regional/interregional level (between NUTS2 in Europe). In case of lack of these data from the sources (national statistical offices), the aim of the European statistical office EUROSTAT should be to influence member countries to start gathering and providing these kind of data.

### 2.1.7.4 Conclusions

This section describes the methodology followed to generate the most updated series of C2C and R2R tourism flows in Europe. Authors of this report are not aware of existence of similar methodology of estimation.

Concerning data, accessible data on tourism flows is incoherent regarding definitional basis and methodology of data gathering by different statistical agencies, while the two complex sources
(EUROSTAT and UNWTO) even at C2C level are incomplete. The most appropriable data source to implement as support for R2R matrix estimation were data on stocks of yearly domestic arrivals to NUTS 2 by EUROSTAT.

In order to create the data – a complex information on spatial and temporal allocation of tourism flows within the researched area, two procedures were executed: estimation of the gaps for C2C matrix and disaggregation data for R2R matrix. In the methodology, a set of indexes dedicated to tourism flows description within four dimensions (intensity, balance, concentration and distance impact) as well as synthesis by means of three simple bi-dimensional typologies has been developed.

The observed tourism flows between all researched countries in the period 2010-2018 have a high inertia in time. This means that the dominant directions of tourism trips of residents of a given country did not change substantially. It is possible to indicate a number of countries that are attractive for residents of at least several countries - Austria, Germany, Greece, Spain, France, Croatia, Italy and Portugal. These are countries located in the Mediterranean (summer tourism) and in the Alps (winter tourism).

Concerning R2R tourism flows, it can be observed the large amount of interregional flows within the largest countries of the Mediterranean region (such as France, Spain and Italy). With less intensity, large interregional movement of tourists within the same country is noticed as well in Scandinavian countries (Norway, Sweden and Finland), in Ireland, the Netherlands, Portugal, Poland, Switzer-land, Germany, Romania, Bulgaria and Greece. Within the international interregional tourism flows, the axis North-West dominates, with flows between regions of Central and Western Europe (mostly Danish and German regions), towards Croatia, flows between regions of Finland, Estonia, Latvia and Lithuania, as well as flows between Germany and Austria, or France and Spain in the Western Mediterranean region.

Intensity of tourism flows weighted by population of the regions is the largest in the mountainous parts of Austria (Alps, skiing resorts), and the NUTS2 region Adriatic Croatia (code: HR03), situated along the Mediterranean shores in the part where it is the closest in the European continent (and tourism demanding markets). When added other regions above the average tourist intensity values, a few groups of regions can be noticed in the weighted intensity of tourism flows in individual regions: a) regions situated near the sea shorelines (Baltic Sea, North Sea, Western Mediterranean), b) Mediterranean islands, c) mountain regions (Alps, Pyrenees), and d) capital cities (London, Paris, Berlin, etc.)

The greatest unbalance in tourism flows within the regions where inflow dominates is observed along the Mediterranean and Baltic seas, more precisely in the coastal regions of Spain, France and Croatia in the Mediterranean region, and in Denmark, north-eastern Germany and north-western Poland in the Baltic Region.
The inflow to the regions situated in the northern and eastern parts of Europe relies on tourists from a rather small area, mainly domestic ones, while the inflow is dispersed to the tourism destinations in the southern part of Europe. The outflow is the other way around: tourists from the northern and eastern parts of Europe visit different regions, while the ones from the southern part of Europe do not move to dispersed areas out-side the Mediterranean zone.

Concerning the distance of the tourism flows, tourism in northern parts of Europe remains largely within the region, with not many travelling from faraway places to visit i.e. regions of northern Scandinavia, northern UK, Estonia or Latvia. From the other side, inhabitants of mentioned regions would travel larger distances to reach tourism destination.

### 2.1.8 T1.3 People transport by mode

Full report in Annex 7.

#### 2.1.8.1 Introduction

This section contains the methodology and first descriptive results of an analysis of passenger transport flows by mode between NUTS 2 regions and between countries in Europe as part of the IRiE project.

The main purpose of the research conducted is first to establish a homogeneous flow database for the years 2010 – 2018. This database should contain passenger flow matrixes at the country to country level and at the region to region level for the part of the European territory that is part of the ESPON 2020 Programme (EU27 plus UK plus CH, IS, LI, NO). Matrixes have been generated for three transport modes, i.e. for rail, maritime and air. The generation of the matrixes was as data-driven as possible, i.e. modelling techniques came only into operation if data were not available. The further purposes of the research are to present and analyses the different passenger transport flow matrixes obtained, to develop regional typologies following a common approach in the IRiE project and to identify explanatory factors (drivers and barriers) for the passenger transport flows.

Results available already are the passenger transport flow matrixes for the three modes rail, maritime and air. First territorial evidence has been elaborated as part of the analysis done for this version of the report. One of the main issues here are the different spatial orientations of the different transport modes involved in passenger transport within Europe. Intra-European passenger transport flows by rail are overwhelmingly domestic, only a low portion of rail passenger flows are international, i.e. between regions of different countries. On the other hand, intra-European maritime passenger and air passenger transport flows are much more than land modes internationally oriented. Only a lower portion of passenger flows with these modes are intra-national, i.e. most high-volume passenger flows are between regions of different countries.

**Major conclusions will be elaborated once the full analytical spectrum foreseen for the report has been implemented and will be reported in the complete version of the report to be submitted as part of D4+**.
2.1.8.2 Highlights

Data
- Different datasets provided by Eurostat for the same passenger transport flows are not necessarily congruent when it comes to the volume of flows reported. This is valid for both, within a certain dataset and between the datasets.
- Passenger transport matrixes have been generated at the country to country level as well as for the region to region level (NUTS 2) for three main transport modes (rail, maritime, air).
- Passenger transport matrixes have been generated for all years (2010-2018) considered in the IRiE project.

Methodology
- The generation of the different passenger transport matrixes respects as closely as possible the available data from Eurostat. However, several steps of data clearance with consistency and plausibility routines had to be performed. In case no regionalised passenger transport data was available, appropriate disaggregation procedures were developed and implemented.
- The description and analysis of the different passenger transport flows in Europe at national and at regional scale makes particularly use of the FlowMapper, a tool developed in the IRiE project to specifically visualise different kinds of regional flows in Europe by a wide range of appropriate flow maps and flow diagrams.
- The deeper analysis of the passenger transport flows regards typologies and explanatory factors will follow the common guidelines developed in the IRiE project for all flows considered.

New territorial evidence
- The passenger transport flow matrixes by mode (C2C and R2R) covering the years 2010-2018 created in the IRiE project form a unique and consistent flow database for all 32 countries of the ESPON Programme as base for new territorial evidence on interregional relationships in Europe.
- Intra-European passenger transport flows by rail are rather domestic, only a low portion of flows are international, i.e. between regions of different countries. Nevertheless, international rail passenger transport has not to be neglected as the total rail passenger volumes between regions of different countries are significant.
- Intra-European maritime passenger and air passenger transport flows are much more than land modes internationally oriented. In most cases, only a low portion of flows using these modes are intra-national, i.e. most high-passenger volume flows are between re-
gions of different countries. However, substantial domestic maritime passenger flows exist in particular in Mediterranean regions as well as in Germany and Denmark as intraregional maritime passenger flows. Only in countries having larger intra-national distances, domestic air travel has some role. This is particularly true for Norway, but also for Spain, France, Germany and the UK.

- The pattern of rail passenger flows in some countries mirrors the existing polycentric settlement structure, in particular in Germany. Other countries have a more dominant capital region attracting substantial parts of national rail travellers, in particular in France.

- There are a substantial number of international relationships via rail travel existing between regions in all parts of Europe. Several of those international rail routes even have such substantial numbers of rail passengers that they belong to the top 20 percent of flows. Here, highest rail passenger figures are to be noted between Inner London and Ile de France, Nord-Pas-de-Calais and the Brussels capital region as well as between Copenhagen and Malmö in Sweden.

- The maritime passenger transport flows are by nature restricted to a limited number of regions in Europe. All sea basins in Europe see substantial numbers of maritime passenger flows which add up for numerous regions to region flows to several million people travelling by ship. In the Mediterranean, such high figures appear in the connection of larger islands or several smaller islands in the Aegean Sea with the mainland. Across the Channel, across the Irish Sea and across the Baltic Sea maritime passenger flows are particularly international flows linking regions of different countries.

- There is a dense pattern of air passenger flows all over Europe as outcome of different flight purposes such as business, touristic or other privately motivated flights. Two main flow orientations are overlaid. On the one hand, there are high-volume interrelationships between regions in the European core area. On the other hand, the highest flow volumes of airport regions located more outside are with core regions. The airport regions around London, as well as the Ile de France and Nord Holland are major hubs with a substantial number of air connections with more than 2 million passengers. But also airport regions such as the NUTS 2 regions of Madrid, Dublin, Berlin, Darmstadt, Copenhagen, Oslo, Milan or Rome as well as the Canary Islands, the Baleares or Sicily have several flight connections with more than 2 million passengers per year.

- From almost all regions that have an airport there are flight connections to at least one other region having more than 500 thsd. passengers per year. There are substantial air passenger flows between Cyprus, Iceland and Malta and the European core regions. The same is true for the outermost territories. There are several air passenger flows between regions in Eastern Europe, however, the volumes are clearly lower than those of the flows towards central regions in Europe and almost none of the regional interrelationships there have air passenger volumes in the top 20 percent of flows.
2.1.8.3 Recommendations for data providers to improve data quality

The input data for the passenger transport flow matrixes generated is provided by Eurostat which as usual is dependent on data provision of EU member states and other countries. So, Eurostat and the national statistical agencies delivering transport flow data to Eurostat are the main addressees of the recommendations.

The point of departure is that the different datasets provided are not necessarily congruent when it comes to the volume of flows reported. This is valid for both, within a certain dataset and between the datasets. Main problem to be addressed is that the flow value a reporting unit (e.g. country or port or airport) states to be sent to another reporting unit is often not stated as flow of the same magnitude by the receiving reporting unit. Other problems are gaps in time series or provision of regionalised flow data only every five years as it is the case for rail, non-matching aggregations to larger reporting units, data for regions in non-updated NUTS systematic (NUTS 2013 or even NUTS 2010), outdated codes for ports and airports, non-data provision because of claimed confidentially issues etc. So, basically what has to be done to establish a passenger transport flow database that matches research user demand:

- It is to be expected that also in future different national reporting entities are reporting different numerical values for the same flow. Eurostat might go beyond a data collecting role and might become a data clearing house, i.e. tries to wipe out any inconsistencies in the datasets provided.
- Inconsistency checks have also to be performed across the different aggregation levels at which data is provided, i.e. from individual ports or airports via regional data up to national data.
- Gaps in time series have to be prevented by introducing a strict control system for data provision of the national agencies involved.
- Whereas maritime and air flow data are reported at the level of ports or airports even on a monthly or a quarterly base, regionalised rail flows are reported only every five years. This has to be overcome by introducing mechanism for annual reporting of rail passenger flow data.
- For many kinds of research it is necessary to have time series spanning a decade or even longer. Here, it is not helpful that for instance regionalised rail passenger flow data for the years 2005, 2010 and 2015 is reported only for the NUTS system valid at that time. A similar problem exists also for many other categories of regional data (population, economy etc.). It is not acceptable that officially approved historical time series are not available and that Eurostat reports "not available" in the different datasets. Eurostat might take over an important service by recalculating historical data to the current NUTS system. This would benefit spatial research in Europe.
- A minor issue in this context is that some countries, mainly for air transport, are using airport codes for reporting current flows that are not valid any longer. Eurostat might introduce checking routines to avoid this.

- Some reporting countries explicitly declare some passenger flow data as confidential, as it is the case for rail transport of Belgium. It is hardly to accept that apparently commercial interests of rail carriers rule over public interest about data needs although rail transport is in most countries heavily subsidised by the public. Eurostat might initiate a strategy that such kinds of data will become open data available for research and other purposes.

The recommendations for data providers to improve data quality will be further elaborated in the complete version of the report to be submitted as part of D4+.

2.1.8.4 Conclusions

The conclusions will be elaborated in the complete version of the report to be submitted as part of D4+. These conclusions will be worked out in a way that answers to the key policy questions of the project will be given based on the analysis of passenger transport flows by mode:

- What are the characteristics and intensity of interregional relations in Europe in terms of trade of goods, services, capital, people or other relevant flows? How did they evolve over the years?
- How can regional interdependencies at European level be depicted? How structural/important are these interdependencies in order to better understand regional development (competitiveness, cohesion, well-being, quality of life…)? How can regions be clustered according to this relatedness?
- More generally, what are the conditions and drivers that appear to increase interregional flows in diverse regional contexts? What are the barriers that appear to inhibit interregional relations?

In addition, the added value of the research and the new territorial evidence obtained will be discussed. Future research needs will be addressed as well.

2.1.9 T1.4 FDI

Full report in Annex 8.

2.1.9.1 Introduction

The present section describes the production and analysis of interregional FDI flows data (Task 1.4.A). FDI flows are long-term capital flows and refer to money movements that are realized for investment purposes. There is a plethora of information regarding FDI flows across ESPON space. Yet, the information available refers, mostly, at the national level. Information at the regional level is, rather, scarce and this limits the capacity to undertake the required analysis and to derive the corresponding conclusions on the interrelations among regional economies across the ESPON space. ESPON IRiE project sheds light on the issue and compiles comprehensive C2C and R2R (NUTS 2 level) OD matrices for the years from 2010 to 2018. The matrices provided are both economy-wide and sector-specific (NACE 1 level; sectors A - S). The compilation of the
FDI matrixes is based mainly on the aggregation of firm-level data obtained from AMADEUS database. National-level data obtained from the OECD, the IMF, and EUROSTAT are, also, provided. The analysis is conducted in terms of the shareholders’ funds variable (i.e., the amount of equity in a company, which belongs to the shareholders).

The analysis goes further from a mere collection of interregional FDI flows data. This means that the FDI flows obtained are analyzed by means of descriptive analysis, cluster analysis and econometric analysis. By means of descriptive analysis, the “border” effect and the relative significance of each sector are identified. Moreover, the pairs of regions with the highest FDI flows are highlighted. By means of cluster analysis, different regional typologies, able to group regions with similar characteristics, are identified. By means of econometric analysis, the determinants and the growth impact of FDI flows are identified. Moreover, some “non-regular” FDI flows are detected.

Subject to the completion of the econometric analysis (August 2021), valuable insight for both theory and policy-making is expected. The preliminary results of the analysis indicate that the process of (economic) integration across the ESPON space has, still, many steps to go as the impact of the “border” effect is, still, strong.

2.1.9.2 Highlights

Data
- The first comprehensive dataset of economy-wide and sector-specific (NACE 1 level; sectors A - S) FDI flows across the ESPON space is provided, at both the national and the regional level (NUTS 2 level).
- The FDI flows are available for each year between 2010 and 2018.
- The compilation of the FDI matrixes is based mainly on data obtained from AMADEUS database. National-level data obtained from the OECD, the IMF, and EUROSTAT are, also, provided.

Methodology
- The construction of the FDI matrixes is based on the aggregation of firm-level data obtained from AMADEUS database.
- For the measurement of interregional FDI flows, the main variable under consideration is shareholders’ funds. Shareholders’ funds represent the values of the foreign shareholders owing (each one) 10 or more percent of the equity funds in a company and reflect the difference between assets and liabilities in a company’s balance sheet. In plain words, the shareholders’ funds variable yields an approximation of how much the shareholders would receive if a business were to liquidate.
- Within the ESPON IRIE project framework, the term “FDI” acquires an expansive interpretation. This means that under the “FDI” term, the within-country interregional FDI flows
are, also, analyzed, for both technical and scientific reasons. Given that DDI are, also, examined, probably the term DI more appropriate with respect to the analysis conducted. Yet, the term "FDI" is used throughout the text, for the sake of simplicity.

- Quality of data is evaluated on the basis of an array of EUROSTAT criteria that offer to users the capability to understand the potential and the limitations of statistical data.
- The estimated flows are analyzed by means of descriptive analysis, cluster analysis, and econometric analysis. The econometric analysis is, still, pending (August 2021).

**New Territorial Evidence**

- The results offer an, up-to-now, unknown layer of analysis corresponding to interregional flows across the ESPON space.

- The descriptive analysis illustrates the countries and regions with the highest levels of incoming and outgoing FDI flows. NL, UK, LU, FR, DE, ES, IT, CH, and BE are the countries that present, consistently, the highest levels of incoming FDI flows. NL, UK, FR, DE, BE, ES, LU, IT, SE, and IE are the countries that present, consistently, the highest levels of outgoing FDI flows. LU00, NL32, FR10, NL33, UKJ1, IE06, UKI3, ES30, NL31, NL41, ITC4, and BE10 are the regions that present, consistently, the highest levels of incoming FDI flows. LU00, NL32, FR10, UKI3, NL33, ES30, SE11, and BE10 are the regions that present, consistently, the highest levels of outgoing FDI flows.

- The descriptive analysis illustrates the pairs of countries and regions with the highest levels of FDI flows. NL-NL, UK-UK, FR-FR, DE-DE, LU-LU, NL-LU, NL-UK, and ES-ES are the pairs of countries that present, consistently, the highest levels of FDI flows. NL32-NL32, FR10-FR10, UKJ1-UKJ1, LU00-LU00, UKI3-UKI3, NL33-NL33, and LU00-NL32 are the pairs of regions that present, consistently, the highest levels of FDI flows. It comes that the impact of the "border" effect is, still, strong. Surprisingly (?), this applies not only to the national level but also to the regional one.

- Cluster analysis identifies and groups ESPON regions with similar characteristics. Yet, the results necessitate the analysis at the sectoral level. Such an analysis is, still, pending (D4+).

- Subject to the completion of the econometric analysis (D4+), valuable insight for both theory and policy-making is expected. Particularly, the econometric analysis is going to identify the determinants and the growth impact of FDI flows. Moreover, the econometric analysis is going to detect some "non-regular" FDI flows.

### 2.1.9.3 Recommendations for data providers to improve data quality

Access to good-quality data is, probably, the most important element for conducting good-quality analysis on FDI flows. This, of course, applies to other flows as well.
AMADEUS database (BvD), providing financial and business information for an enormous number of firms, became synonymous to FDI data provision. Yet, some recommendations can be made:

- AMADEUS provides FDI flow data for a limited number of years. This is an important limitation for conducting time-series analysis in terms of FDI flows.
- AMADEUS may be more user-friendly, allowing for downloading data in spreadsheet format.
- AMADEUS may ease users to make regional aggregations of the data (at the NUTS 2 and the NUTS 3 spatial levels), given that in many cases such kinds of analysis are addressed to policy-makers at the national and the regional level. This way AMADEUS data may help policy-makers to identify the particular characteristics and the regional trends of firms. The latter is important as regions within the same country can differ significantly in their economic, geographical and, even, cultural characteristics, and this may affect business environment.

International organizations (i.e., OECD, IMF, EUROSTAT) provide no data at the regional level. This is an important drawback that needs to be addressed. Also, they do not provide data at the sectoral level. This is also an important drawback that needs to be addressed. Moreover, and with respect to the national-level and economy-wide data, there is a need for a better explanation of the methodological approaches followed, given that, in some cases, there are some significant differences in the data provided.

2.1.9.4 Conclusions
The information regarding FDI flows across ESPON space is, rather, scarce at the regional level. Such a lack of information limits the capacity to undertake the required analysis and to derive the corresponding conclusions on the linkages between ESPON countries and regions, in an extremely unstable politico-economic environment. ESPON IRiE project sheds light on the issue, offering novel economy-wide and sector-specific (NACE 1 level; sectors A - S) empirical evidence, at both the national and the regional (NUTS2) levels, through the compilation of comprehensive C2C and R2R OD matrices for the years from 2010 to 2018.

The preliminary findings of the empirical analysis highlight that FDI flows across the ESPON economic space are spatially concentrated. The highest volumes of FDI flows are, mostly, conducted to (or from) specific North-Western and South-Western European countries (such as NL, UK, FR, DE, BE, ES, and IT) and regions (such as LU00, NL32, FR10, NL33, UKI3, and ES30). This means that the ESPON economic space is not fully integrated. DI have significant (in some cases higher than 50%) shares to the total intra-regional FDI flows. Apparently, this explains the fact that most of the top-10 ESPON country-pairs in terms of intra-ESPON FDI flows refers, mostly, to DI. This provides another indication that the ESPON economic space is not yet fragmentation-free. The (potentially) explanatory factors examined exhibit almost no correlation with the level of intra-ESPON FDI flows. Such a finding points out the need to adopt sector-specific strategy for
the retention (and/or the attraction) of FDI. Given that the determinants of FDI vary according to the type of FDI, it is important to aim at the “correct” type of FDI, according the possessed comparative advantages.

The completion of the econometric analysis and the completion of the study of sector-specific FDI flows (D4+) are expected to provide solid and insightful conclusions.

2.1.10 T1.4 Remittances


2.1.10.1 Introduction

The present section describes the production and analysis of interregional remittances flows data (Task 1.4.B). Remittances flows are short-term capital flows and refer to money movements that represent household income from foreign economies arising mainly from the temporary or permanent movement of people to those economies. The information regarding remittances flows across ESPON space is, rather, scarce, and only at the national level. This limits the capacity to undertake the required analysis and to derive the corresponding conclusions on the interrelations among regional economies across the ESPON space. ESPON IRiE project sheds light on the issue and compiles comprehensive C2C and R2R (NUTS 2 level) OD remittances matrixes for the years from 2010 to 2018. The compilation of the remittances matrixes is based on national-level estimates obtained from WB. National-level data obtained from EUROSTAT are, also, provided. For the needs of the compilation of R2R matrixes, the corresponding C2C matrixes are "regionalized" with the use of national-level and regional-level data on migration flows.

The analysis goes further from a mere collection of interregional remittances flows data. This means that the remittances flows obtained are analyzed by means of descriptive analysis, cluster analysis and econometric analysis. By means of descriptive analysis, the pairs of regions with the highest remittances flows are highlighted. By means of cluster analysis, different regional typologies, able to group regions with similar characteristics, are identified. By means of econometric analysis, the determinants and the growth impact of remittances flows are identified.

Subject to the completion of the cluster analysis and the econometric analysis (D4+), valuable insight for both theory and policy-making is expected. The preliminary results of the analysis indicate that the process of (economic) integration across the ESPON space has, still, many steps to go as remittances flows are spatially concentrated.

2.1.10.2 Highlights

Data

- The first comprehensive dataset of remittances flows across the ESPON space is provided, at both the national and the regional level (NUTS 2 level).
The remittances flows are available for each year between 2010 and 2018. EUROSTAT provides data up to year 2018, whereas WB provides data only up to year 2017. The report will be updated as soon as WB data for year 2018 become available.

The compilation of the remittances matrixes is based mainly on data obtained from WB. Even though EUROSTAT dataset provides information for year 2018, it has many more missing values comparing to WB database. For the needs of the compilation of the R2R remittances matrixes, national-level and regional-level data on migration flows are utilized.

Methodology

- Regional-level (NUTS2) remittances flows data are estimated through the “regionalization” of the corresponding national-level data. Particularly, regional-level remittances flows are estimated on the basis of a formula that links national-level remittances flows and the share of regional migration flows to the corresponding national ones.

- Even though WB dataset provides information only up to year 2017, year 2018 is used throughout the text for the sake of comparability with the other Tasks of the ESPON IRiE project. The report will be updated as soon as WB data for year 2018 become available. A “silent” assumption can be made that huge differences between the years 2017 and 2018 are not expected.

- Quality of data is evaluated on the basis of an array of EUROSTAT criteria that offer to users the capability to understand the potential and the limitations of statistical data.

- The estimated flows are analyzed by means of descriptive analysis, cluster analysis, and econometric analysis. The cluster analysis and the econometric analysis are, still, pending (D4+).

New territorial evidence

- The results offer an, up-to-now, unknown layer of analysis corresponding to interregional flows across the ESPON space.

- The descriptive analysis illustrates the countries and regions with the highest levels of incoming and outgoing remittances flows. FR, DE, BE, ES, IT, PL, RO, and PT are the countries that present, consistently, the highest levels of incoming remittances flows. DE, FR, UK, ES, IT, CH, BE, NL, AT, and PT are the countries that present, consistently, the highest levels of outgoing remittances flows. FR10, BE10, LU00, FRK2, ES52, ES51, BE32, PT17, and R032 are the regions that present, consistently, the highest levels of incoming remittances flows. CH01, FR10, ES51, ES30, CH04, LU00, ES52, and FRK2 are the regions that present, consistently, the highest levels of outgoing remittances flows.

- The descriptive analysis illustrates the pairs of countries and regions with the highest levels of remittances flows. FR-BE, ES-FR, FR-ES, BE-FR, DE-FR, and DE-PL are the
pairs of countries that present, consistently, the highest levels of remittances flows. CH01-FR10, ES51-FR10, ES30-FR10, FR10-ES51, FR10-BE10, PT11-FR10, and ES52-FR10 are the pairs of regions that present, consistently, the highest levels of remittances flows.

- Subject to the completion of the cluster analysis and the econometric analysis (August 2021), valuable insight for both theory and policy-making is expected. Particularly, the cluster analysis is going to identify and group ESPON regions with similar characteristics. The econometric analysis is going to identify the determinants and the growth impact of remittances flows.

2.1.10.3 Recommendations for data providers to improve data quality

International organizations (i.e., WB, EUROSTAT) provide no data at the regional level. This is an important drawback that needs to be addressed. Access to good-quality remittances data is important for the analysis of policy options. To this, the collaboration between EUROSTAT and the ECB is needed. Of course, this is a not-easy-to-conduct task, given that each (European) country still has its own national banking system (the coordination and the convergence of banking systems regulations in the EU is recent).

2.1.10.4 Conclusions

The information regarding remittances flows across ESPON space is, rather, scarce, and only at the national level. Such a lack of information limits the capacity to undertake the required analysis and to derive the corresponding conclusions on the linkages between ESPON countries and regions, in an extremely unstable politico-economic environment. ESPON IRIE project sheds light on the issue, offering novel empirical evidence, at both the national and the regional (NUTS2) levels, through the compilation of comprehensive C2C and R2R OD matrices for the years from 2010 to 2018.

The first findings of the empirical analysis highlight that remittances flows across the ESPON economic space are spatially concentrated. The highest volumes of remittances flows are, mostly, conducted to (or from) specific North-Western and South-Western European countries (such as FR, DE, BE, ES, and IT). Apparently, these countries comprise the corresponding pairs with the more “intense” remittances flows. Remittances flows are inextricably linked with migration flows. Taking into consideration that the customary labor market conditions are the main drivers of labor migration, it comes that labor market conditions and policies have important implications for remittances. The impact of remittances on growth is subject to the utilization of remittances flows. Particularly, the utilization of remittances either for investment purposes or for the extension of domestic production may become a growth catalyst. Noteworthy is the fact that remittances flows exhibited increase in the vast majority of cases despite the economic crisis (and its profound impact on GDP and employment).

The completion of the cluster analysis and the econometric analysis (D4+) are expected to provide solid and insightful conclusions.
2.1.11  **T1.4 Loans**

Full report in Annex 10.

2.1.11.1  **Introduction**

The financial markets are some of the most integrated markets in the economy, and the creation of the Euro Zone has only increased this integration. Financial markets have become more important in the Finance-Investment and Saving-Funding circuit, and financial innovation has played a key role increasing the diversity and complexity of available assets. However, the information available about the interconnection of the financial institutions and between them and the rest of the agents within the EU is far from optimal. There is not a complete and homogenous source for tracking the region-to-region flows of loans within or between countries in the EU. Thus, the measurement of the financial relationships at the sub-national level is out of reach for the whole Europe. This limits the capacity to undertake the required analysis and to derive the corresponding conclusions from shocks such as the later financial crisis in 2008 or the potential effect of Brexit in the following years. The aim of this report is to shed new light into this issue, offering new evidence about the interregional flows of loans and assets alike within Europe. Our analysis is conceived as an exploratory incursion in a complex field, where the information hardly offers the geographical dimensions covered by the IRIE project in any of the other categories of flows (goods, services, people or even knowledge). Our point of departure is the C2C dataset published by the Bank of International Settlements (BIS), regarding the locational statistics (LBS), whose information about intercountry flows draws the general picture of inter-country linkages in terms of assets and liabilities, including intragroup business. Our analysis focuses on the bilateral flows between EU28 countries for the period 1996-2019, covering different types of assets and liabilities. Then, we analyse a new data source, the “Loan-level Initiative”, recently launched by the European Central Bank (ECB), to investigate the regional breakdown, covering different types of loans and a more reduced sample of countries. Our asset-specific analysis shows some interesting issues about cross-country relationships as well as unveiled concentration of assets in the regions of certain countries. We found: i) a large concentration of RMBS loans (mortgage) in the dataset, with a high share in France and Spain, and an under representation of Germany; ii) a high presence of AUTO loans in Germany, with interesting connections with Luxembourg; iii) a high concentration of Consumer finance and Leasing; iv) an important presence of loans to SME in the Spanish Mediterranean coast. Finally, the regional (NUTS2) dimension of this new dataset is analysed using cluster analysis and different econometric models, with the aim of identifying groups of regions with similar exposure to the financial flows, trying to find significant drivers for explaining the regional financial demand. Although this analysis is limited by the bias found in the geographical dimensions of the ECB dataset, some interesting patterns are identified, regarding the fragmentation of the European financial market, suggesting better data and further research is needed.
2.1.11.2 Highlights

Data

- The ESPON IRIE project adopts a holistic and pan-European approach to interregional economic relations, covering the flows of goods, services, people, capital, and knowledge. In this context, the estimation and analysis of the intra and international regional flows of loans fits within the Task 1.4., as a complement to the analysis deployed with respect to “Direct Investments” and “Remittances”.

- As stated in the technical proposal, the analysis corresponding to the interregional flows of Loans is labelled as an exploratory analysis, since it covers a field in which the quantity and quality of the data is clearly below the standards for the other sub-types of flows. With this perspective, this report includes solid and interesting insights regarding the country-to-country flows of loans using the BIS dataset, plus new evidence about the interregional flows using the ECB/EDW (European Central Bank/European Data Warehouse) “Loan initiative” dataset, with a partial but novel view of the accumulation of securitized loans in certain regions (countries) and types of loans.

- Regarding the country-to-country analysis (C2C), we use the Bank of International Settlements (BIS) locational statistics (LBS), which provides information about the geographical and currency composition of banks’ assets and liabilities, including intragroup business. Our analysis covered bilateral flows between EU28 countries for the period 1996-2019.

- Using the “Loan-level Initiative” dataset from the ECB, we focus on the securitized loans, distinguishing between asset-backed securities (ABSs) such as the residential mortgage-backed securities (RMBSs), ABSs backed by small and medium-sized enterprise (SME) loans, consumer ABSs, auto loan ABSs and leasing ABSs, ABSs backed by credit card receivables, etc.

Methodology

- The C2C analysis uses the original data publicly available through the BIS website. Our analysis covered bilateral flows between EU28 countries for the period 1996-2019, and centres in the network composition of the flows (centrality and connectivity), and applies a gravity-type equation, which relates the intensity of these financial flows with the economic activity (GDP), certain geographical variables (distance) and the intensity of trade of goods between countries.

- The “Loan-level Initiative” dataset from the EDW/ECB is a private own dataset. After signing an agreement through the Universidad Autónoma de Madrid, where CEPREDE is located, and obtaining the corresponding subscription, we access this huge dataset with more than 35 million active loans. Then, we explore all the geographical variables included in the registers with the aim of assigning the most likely region of origin and destination, to build an
aggregate dataset with R2R securitized loans, distinguishing by type of asset, quarters and years.

- The R2R dataset is then analysed using different visualizations and econometric approaches.

**New territorial evidence**

- Although the amount of loans included is enormous, the possibilities offered by this new source for unveiling the interregional flows of loans for the ESPON space is limited. Thus, we conducted an asset-specific analysis, which shows some interesting aspects about the intra-national relationships as well as unveiled concentration of assets in certain countries and regions.

- To this regard, we found: i) a large concentration of RMBS loans (mortgages) in the dataset, with a high share in Netherlands and Spain, and an under representation of Germany; ii) a high presence of AUTO loans (automobiles) in Germany and UK with interesting connections with Luxembourg; iii) an important presence of loans to SME (small and medium enterprises) in Italy, Spain and the Netherlands.

- The concentration of loans by country and type also affects their temporal evolution. EDW dataset allow to have access not only to the current value of loans but also to their original value at origination date. The analysis of loan flows by origination date shows a different behaviour in the countries that experienced with higher intensity the housing prices bubble prior to 2008, such as Spain or the United Kingdom. Other countries such as France, concentrate the volume of RMBS loans in 2015-16, a period with rising house prices. A cluster analysis based on the volumes of RMBS loans by origination dates and regions confirms a differentiated behaviour by countries, since the clusters are basically made up of regions that belong to the same country.

- The evolution of active loans amount in the EDW database is decreasing as new deals are not large enough to offset the effect of repaying the loans over time (the mean amount per deal has decreased from 1.5 billion € to 1.3 billion €). This evolution is consistent with a process of debt reduction after the financial and sovereign debt crises that occurred in the period 2008-201.

- That temporal evolution and the above-mentioned representativeness problems have made it impossible to obtain a robust estimate of the factors that affect regional credit volumes. Given the importance of knowing in greater detail the regional characteristics of credit flows, we recommend that the European authorities should increase the quantity and quality of the publicly available data at regional level.

**2.1.11.3 Recommendations for data providers**

- The analysis included in this exploratory analysis confirms the difficulty of conducting a territorial analysis centred in the traceability of financial flows at the country and regional level. This difficulty is inherent to all countries and groups of countries in the world, but it
is more evident for Europe, where each country had his own national system, and the coordination and convergence of regulation affecting the banking system is very recent.

- The analysis shows the solvency of the BIS dataset. It is also remarkable the strong effort of transparency made by the ECB creating the “Loan initiative”, a unique dataset with no-precedent in Europe before the crisis. Such dataset is a laboratory for many analyses centred in the complex field of securitized loans. However, our analysis shows that such dataset, as it is conceived today, does not allow the right traceability of the financial flows at the sub-national level, and furthermore, it does not provide the expected “frame” to downscale, to the region-to-region level, the more structural data reported by the BIS, and analysed in this report.

- Regarding the BIS, it will be desirable to give a further step, geo-localizing the country-to-country flows, so that they can be traced at the sub-national level. Similarly, regarding the ECB/EDW, an effort regarding the completeness of the variables included in the templates are desirable, so all the “geographical” aspect that are, in theory included in the dataset, are effectively applicable to empirical analysis.

- It is also clear that the information currently available in the field of finance, and regarding the potential explanatory variables for the financial flows, at the sub-national level needs a clear push. Further collaboration between the ECB and Eurostat in this field is probably the best way to start. Indicators such as the rating of sub-national public debt, regional prices index at the regional and local level are provided and used in daily basis by private actors, while this information is secluded for the public interest.

- Having obtained an interesting significance result for the aging variables, it is reasonable to claim for an improvement in the quantity and quality of the information related to the link between the financial flows at the regional level, the movement of people (tourists and pensions) and the real estate in certain hot locations, such as big metropolis or coastal spots, where the financial bubbles usually start. BREXIT adds a new twist in this regard, knowing the huge number of retirees receiving pensions in Pounds but settle and expending their rents in Euros in certain Mediterranean locations.

### 2.1.11.4 Conclusions

The growing integration of European regional economies is evident in trade and service exchanges, and it is also evident in the relevance of intra-European capital flows. To highlight this growing integration in this study we analyse two main data sets. On the one hand, we will analyse the BIS data about cross-border positions of banks located in ESPON countries (unfortunately there is no data for all countries). On the other hand, we explore the data in the EDW repository on securitized assets backed loans, an a priori very promising information source about financial interrelationship at regional level, but unfortunately with important limitations for this goal.

The Locational Banking Statistics (LBS) statistics published by the BIS provide information about the geographical composition of internationally active banks’ balance sheets on a country-to-
country basis. Data from LBS allow to construct an origin-destination (OD) matrix tables for claims and liabilities where origin is the country in which the reporting bank is located regardless of nationality of the controlling parent, and destination is the country of the counterparty.

According to BIS data the evolution of cross-country banking financial flows, shows two fundamental elements. Financial flows show more volatility than GDP, and since 2008 there is a marked reduction in cross-border banking positions. Both elements are consistent with the role of bank credit during the pre-2008 and post-crisis phases of the 2008 crisis. The global financial crisis was followed by a rapid decline in international capital flows intermediated by banks, partly due to some prior excesses and partly due to bad economic prospects in the area and increasing risk signals. The euro area sovereign debt crisis worsened this reduction in cross border banking positions, and between 2014 and 15 the lowest value of cross border claims was recorded.

With data from BIS-LBS the financial position of the banking system of each country and their counterparty countries has been identified. This analysis allows to see the geographic breakdown of claims/liabilities in the banking system of a given country. As it can be expected, the most important flows are found between central countries: UK, DE, FR, IT, NL, and LU. A structural feature of cross-border banking is its high degree of concentration, with a small number of very large bilateral links in global cross-border bank credit.

A simple model for cross-border financing flows at country level was proposed where financial flows are depending on both the level of economic activity and to the levels of financial risk in the countries of origin and destination. The results of the estimation show a positive effect of the activity levels of the country of origin (GDP$_i$) on the intercountry financial flow, and a negative effect of the level of activity of the destination country (GDP$_j$). The risk level, measured by the NPL ratio is negatively related with the intensity of financial flows. As our results show, belonging to a single monetary zone such as the Euro seems to have a positive effect on cross border banking flows.

To deepen into the regional aspects of these significant financial flows at country level, we have explored the EDW database. According to EDW, the number of active loans in the EDW database was 35.5 million in Q1 2019, irrespective of the date of issuance, while the outstanding balance of active (outstanding) loans was €867 billion. Although the impressive volume of information, this dataset is highly concentrated in one type of assets: RMBS (mortgages), which represents 71% of loans value in Q1 2019. Another problematic characteristic of the dataset is the distribution of securitized loans by countries, with clear differences between asset types. A first look at these data warns of a problem of representativeness of the information, since there are no data for all ESPON countries, nor do the data correspond to the importance in economic terms of the countries that are represented.

The evolution of active loans amount in the EDW database and their geographical breakdown show two main characteristics. First, the amount of active loans is decreasing as new deals are
not large enough to offset the effect of repaying the loans over time (the mean amount per deal has decreased from 1.5 billion € to 1.3 billion €). And second, there are significant differences by countries unrelated with the country economic relevance measured by the GDP. This later characteristic points on the role of institutional factors (regulation, banks culture…) on the practice of securitization among countries. The problem of representativeness of data in EDW database is clear when we confront the composition of RMB loans by country and date of origination with the mortgage data obtained from the European Central Bank for euro area countries. Germany is clearly infra represented in the EDW dataset, and the dynamics of new loans according to these two sources are not coincident.

Given the importance of knowing in greater detail the regional characteristics of credit flows, we consider that the European authorities should increase the quantity and quality of the publicly available data. It is evident that the information from cross-border payment systems (such as TARGET2) combined with the territorialized information on loans currently published by the ECB and the National Central Banks can help shed light on these interrelationships between regions.

2.1.12 T1.5 Erasmus

Full report in Annex 11.

2.1.12.1 Introduction

This section describes the production and results of the interregional knowledge flows based on Erasmus student mobility (Task 1.5.A). The database generated in the form of matrices contains the region-to-region and country-to-country flows of knowledge for the period 2010-2014. The remaining dataset comprising the years 2015-2019 is currently being produced and will be submitted at a later stage. The matrices are created from a database of individual movements between a sending and a receiving region, organized by year and produced by the European Commission – Directorate General for Education, Youth, Sport and Culture. Sending and receiving institutions are coded as to their NUTS 2 location and then aggregated and the regional, and then national, levels. All countries which are not part of ESPON space but join the Erasmus programme are included due to their relevant flows, such as Turkey. This effort generates a complete matrix of Erasmus student mobility, revealing the patterns devised by regions when they engage in knowledge network-building. The descriptive analysis is performed both at country-to-country and region-to-region level. Top-performing senders and receivers are identified at both scales, as well at the main rank changes during the study period and the balance between sending and receiving flows. The strongest international flows are described for countries and regions together with their preferred international linkages and the weight of these partnership in different regional and national totals. The fastest-changing regions are identified. The role of leading regions in their respective countries is discussed. The descriptive statistics are provided in this report, which will be expanded in a subsequent delivery by a cluster analysis aimed at extracting regional typologies based on the nature of their flows, which will be checked against a battery of specific indicators.
to achieve a thorough understanding of the explanatory factors underlying each type of flow and allow the definition of specific policy recommendations.

2.1.12.2 Highlights

Data

- The first comprehensive dataset of knowledge flows based on Erasmus student mobility across and beyond the ESPON space is provided, both at the national and the regional level (NUTS 2 level).
- The knowledge flows matrices have been created for each year between 2010 and 2014, with data obtained from the publicly available datasets created by the European Commission. The more recent years will be included in the study as the new datasets become available.

Methodology

- Regional-level (NUTS2) are calculated by geocoding the name and location of the sending and receiving institutions (HEIs) named in each individual movement through a correspondence list between HEIs and NUTS regions.
- Then, the individual pairings of regions are aggregated at the desired scale.
- The resulting flows are international by definition and the full R2R list covers 329 regions in 34 countries (ESPON + TR + MK).
- The flows are analyzed by means of several descriptive statistics. The next stage will be to perform a cluster analysis to build regional typologies based on the nature of their flows, to which specific common characteristics, explanatory factors, drivers and barriers can be associated.

New territorial evidence

- The results provide an as yet unexplored layer of analysis of interregional knowledge flows across the ESPON space, carried by individuals, complementing the flows carried by institutions (H2020 partnerships) and firms (co-patents).
- The descriptive analysis illustrates, at the national level, the countries with the largest flows, both as senders and receivers: ES, FR, DE and IT, with the UK being also a top performer as a receiver. As senders, HR, TR, MT and CY have experienced the biggest increases, revealing their ongoing integration in knowledge flows. As receivers, the biggest increases have been in the Baltic States, Eastern Europe and TR.
- When these results are weighted according to the national student population, the scenario changes, and PT, ES, CZ and FI perform remarkably well as senders, while PT,
FI, IE and SE perform above the average as receivers. The send-receive balance indicates indeed that some countries specialize in sending students abroad (BG, LU, RO, TR, SK) and other are mainly receivers of inflows (DK, IE, MT, SE, NO, IS, UK).

- At the regional level, ES30, FR10, ES61 and ITI4 are the largest senders, with the remaining top 10 clustering capital city regions and other regions with large cities, reflecting the high concentration of institutions with large student cohorts. The main senders also tend to have connections of varying intensity with many regions, with some exceptions, and to capture a large share of the national outgoing flows (above their share of student population). They may also be a preferred partner of several destination regions. The number of high-performing regions per country varies, reflecting the more monocentric and polycentric regional systems of European countries.

- As receivers, the top performing regions are less dominated by players in the main receiving countries, with some space for other regions in SE, PT and TR. The pattern of high connectivity with many regions is kept (and has been growing over time), as well as the large share of the national flows captured by these regions and their significance for the preferred sending regions.

- The most intensive flows occur between Southern European regions, especially the Paris (FR10) – Madrid (ES30) link.

- These and other aspects of the analysis will be given further attention in the future, as the most recent years are considered and they stand under a new light in reference to the cluster analysis and the resulting regional typologies.

2.1.12.3 Recommendations for data providers to improve data quality
To complete later, once all the data has been processed in the cluster analysis (D4+).

2.1.12.4 Conclusions
The completion of the cluster analysis and the explanatory factor analysis are expected to provide solid and insightful conclusions (D4+).

2.1.13 T1.5 H2020
Full report in Annex 12.

2.1.13.1 Introduction
This section describes the production and description of the interregional knowledge flows based on Horizon 2020 (H2020) partnerships (Task 1.5.b). The database generated in the form of matrices contains the region-to-region and country-to-country flows of knowledge for the period 2015-2020 in which the H2020 Framework Programme was active (FP8). The logic of the creation of matrices for all flows demands the definition of a sending and a receiving node. Being H2020 based on multi-partner project networks, varying from two to 170 partners, a transformation is
performed, in which a coordinating role in a project is defined as the sending node and a participant role as a receiving node. In that way, all connection pairs between any two partners are counted as one send-receive instance as long as one partner acts as coordinator and the other as participant. The raw data allowing the construction of this wholly new dataset are the lists of H2020 partner organizations and H2020 projects, organized by year and available at the CORDIS database. Organizations are coded as to their NUTS 2 location and then associated to the relevant partnerships based on the project list and respective participants. This effort generated the first and most complete ESPON-wide matrix of H2020 project partnerships, revealing the patterns devised by ESPON regions when they engage in knowledge network-building. The descriptive analysis is performed both at country-to-country and region-to-region level. Top-performing senders and receivers are identified at both scales, as well at the main rank changes between 2015 and 2020 and the balance between sender (coordinator) and receiver (participant) roles. The level of internationalization of knowledge partnerships is described for countries and regions together with the preferred international partner and the weight of that partnership. The fastest-growing and fastest-shrinking regions in knowledge networks are identified. The role of leading regions in their respective countries is described and a focus on the trajectory of key capital regions is provided for a deeper understanding. The descriptive statistics are provided in this report, which will be expanded in a subsequent delivery by a cluster analysis aimed at extracting regional typologies based on the nature of their flows, which will be checked against a battery of specific indicators to achieve a thorough understanding of the explanatory factors underlying each type of flow and allow the definition of specific policy options.

2.1.13.2 Highlights

Data

- The first comprehensive dataset of knowledge flows based on H2020 project partnerships across the ESPON space is provided, both at the national and the regional level (NUTS 2 level).
- The H2020 knowledge flows are available for each year between 2015 and 2020, with data newly created from the lists of projects and participant organizations obtained from CORDIS at data.europa.eu.

Methodology

- Regional-level (NUTS2) are calculated by geocoding the H2020 list of participant organizations through the EUROSTAT correspondence list between place names (LAU2) and NUTS 2 regions.
- Then, every partnership between pairs of organizations is counted according to the respective NUTS 2 region code, where the coordinating partner in the partnership is counted as ‘sending’ region and the participant partner as ‘receiving’ region.
• The resulting partnerships can be intra-regional, national or international and the full R2R list covers 329 regions in 32 countries.

• The flows are analyzed by means of several descriptive statistics. The next stage will be to conduce a cluster analysis to build regional typologies based on the nature of their flows, to which specific common characteristics, explanatory factors, drivers and barriers can be associated.

New territorial evidence

• The results provide an as yet unexplored layer of analysis of interregional knowledge flows across the ESPON space, carried by institutions, complementing the flows carried by individuals (Erasmus students) and firms (co-patents).

• The descriptive analysis illustrates, at the national level, the countries with the largest flows, both as partnership coordinators and participants; their balance between sending and receiving flows; their proportion of international and national partnerships; their preferred countries; and how this has changed during the study period.

• At the regional level, the analysis illustrates the regions with the largest flows, both as partnership coordinators and participants; how much of the respective national flows is captured by these regions; the balance between sending and receiving flows; the strongest partnerships, both intra-regional and international; the patterns of change, including the fastest-growing regions between 2015 and 2020; and a focus on European capital regions, revealing their trajectories in comparison with the overall H2020 trends.

• Nationally, the main findings reveal stability at the top, DE, ES and IT lead across study period, with UK substantially dropping. Smaller countries have been rising. Most countries have improved their ratio of coordinating roles over participant roles, except for IS, UK, SI and SK. Increases in participant roles have also been large, except UK and MT.

• Most countries have over 80% international partnerships, with largest gains in LV, HR, LT, CZ, but strong losses in RO, BG, PL. DE tends to be the preferred international partner, with UK losing its relevant role in this respect.

• At the regional level, FR10 leads as sender and receiver every year, with strong advantage over other regions. But FR is not a top-4 country as to total flows, revealing that FR10 (Paris) has a strong weight in the national flows. FR10 and other large capitals capture more than half of the national flows, but other top performers allow a more polycentric national distribution.

• One third of all regions don’t have any sender (coordinating) roles, just receiver (participant). Send-receive ratio is balanced in top performing regions, larger imbalances (specializations) are in smaller regions, except RO32 (Bucarest), lacking sender roles.
Four/five strongest partnerships tend to be within same region (FR10-FR10), followed by international partnerships (FR10-BE10). National partnerships between two regions are uncommon at the top.

There are many fast-growing regions, but these tend to depart from modest starting points, except for ES61, ITH3, ITF3, SE23, with fast growth and strong absolute numbers. Shrinking regions are in the UK, as well as remote rural regions and RO32.

Capital regions have been evolving in line with overall trends, although some with sharper peaks and drops. Athens has grown unaffected by overall changes in project numbers, while London has dropped substantially.

These aspects of analysis will be given further attention in the future, as they stand under a new light in reference to the cluster analysis and the resulting regional typologies.

2.1.13.3 Recommendations for data providers to improve data quality

To complete later, once all the data has been processed in the cluster analysis (D4+).

2.1.13.4 Conclusions

The completion of the cluster analysis and the explanatory factor analysis are expected to provide solid and insightful conclusions (D4+).

2.1.14 T1.6 Case study: interregional trade between Spain, France, and Portugal


2.1.14.1 Introduction

As a complement to the production and analysis of the interregional trade flows of goods provided in the Task 1.2.a. of this project, this case study analyses, with a detail that has never been done before, the interregional-international trade of Spain with France and Portugal. The core data used here corresponds to the C-intereg project (www.c-intereg.es), which provides a long series of interregional flows in Spain and the whole EU, covering data at the NUTS 3 level. This unique dataset in the EU context serves as a good example for other EU countries, both in the generation of data and the continual updating of structural and current linkages between regions in the EU. It combines interregional freight flows by road and international customs data, covering 2004-2018 and different sectoral disaggregation. In this case study, by means of GIS network analysis, each interregional flow is allocated to an optimal route considering the actual transport infrastructure by road. Then, the intra-national flows within Spain, and their equivalent inter-national flows with France and Portugal at the NUTS 3 level are modelled using different specifications of the gravity equation. The results are very powerful and new, identifying different patterns of trade between these three countries, and finding geographical and economic drivers explaining the intensity and direction of the bilateral flows. Our findings are in line with previous analysis conducted in Europe and other countries such as the United States, Canada or China, although the finer grid of the data used also helped to add new light in some specific respects. For example,
the use of NUTS 3 level data, partially qualify the role of being a border-region in the exporting and importing country, as well as the spatial advantages by each region in terms of accessibility to the main gateways in the national border, both with France and Portugal. The results also remark the spatial differences between the flows between Spain and France, crossing the northern border though the natural wall of the Pyrenees, in comparison to the East-West border with Portugal, more porous and with larger numbers of gateways. The study also includes an exercise of computation of the national and regional border effect in Spain, which helps to illustrate how different is the level of regional integration of trade within a country, and with the two neighbouring economies. The results are displayed through an online tool available at [https://irie.espon.eu/pages/cs-goods-fr-sp-pt](https://irie.espon.eu/pages/cs-goods-fr-sp-pt).

2.1.14.2 Highlights

In the context of the ESPON IRIE project, which adopts a holistic and pan-European approach to interregional economic relations, the aim of this case study is to analyse, with a detail that has never been done before, the interregional-international trade of Spain with France and Portugal.

- The core data used here corresponds to the C-intereg project (www.c-intereg.es), which provides a long series of interregional flows in Spain and the whole EU, covering data at the NUTS 3 level. This unique dataset in the EU context serves as a good example for other EU countries, both in the generation of data and the continual updating of structural and current linkages between regions in the EU. It combines interregional freight flows by road and international customs data, covering 2004-2018 and a wide sectoral disaggregation.

- By means of GIS network analysis, each interregional flow is allocated to an optimal route considering the actual transport infrastructure by road. Then, the intra-national flows within Spain, and their equivalent inter-national flows with France and Portugal at the NUTS 3 level are modelled using different specifications of the gravity equation.

- The results are very powerful and new. Although the flows perform following the classical gravity equation, we can obtain new insights thanks to the use of NUTS 3 level data. The detailed consideration of two very different borders, and the right control of variables related to accessibility, contiguity, and geography, also help to exploit the spatial heterogeneity of the data.

- The French border is of particular interest, because of its geographic specificities, given the fact that the Pyrenees behave as a natural wall for the economic interaction between Spain and the European core, with two main gateways (“Biriatou/Irun” and “Le Perthus/La Jonquera”) located considerable far away one from each other (more than 600 km).

- The Spanish-Portuguese border is longer and more porous, with a larger number of crossing points and border regions. However, the population and the economic activity is more concentrated around Lisbon and Oporto, both located in the coast, something that clearly shapes the spatial pattern of the trade relations reported here.
In the NUTS 3 level, it is not clear that being a border-region is always positive for trade. The Spanish border-regions at the NUTS 3 level do not coincide with the leading provinces within the corresponding NUTS 2 region. This is especially true for the Basque Country and Catalonia, for which Gipuzkoa and Girona, the true border-provinces with France, are less powerful in terms of production and exportation than Vizcaya or Alava and Barcelona. The case of Navarre is also of particular interest to us since it is the only single-province NUTS 2-Spanish border region with France. The Spanish border provinces with Portugal are in the group of peripheral provinces. Something similar happens from the perspective of Portugal. At the NUTS 2 level, most of the Portuguese regions are coastal and border regions at the same time. However, at the NUTS 3, the coastal and border spatial units are put apart, revealing a core-periphery structure following a coastal-landlocked duality.

By computing the optimal route for each delivery, we connect the phenomenon of trade and freight, and find core nodes in the transport network, offering a more realistic view of the true accessibility of each location. This exercise also helps to derive additional consequences for the regions that are crossed in each delivery, in terms of positive spill overs and negative externalities. Moreover, in the context of COVID19 pandemic, routing the trade flows also helps to anticipate to possible disruptions in the supply chain due to restrictions to mobility affecting passengers and freight.

Through this long case study, the main bilateral flows are identified and visualized. Some of such flows were predictable given the typical variables in the gravity equation, that connects big regions (capital cities) located at a reasonable distance (contiguous and border regions). But in addition, our analysis has identified very singular flows such as the ones that connect Valladolid with some specific French regions, with a clear linkage to the automotive sector. This specific example helps to illustrate how macro-economic figures such as bilateral trade can finally relate to firm-specific flows, with a critical role in the economic activity and the employment generated in an entire region.

The home bias analysis confirms how regions are more integrated with other regions of the same country, despite the strong linkages that some of them have with foreign regions, in this case, in France and Portugal. Creating a European Single Market can be associated with promoting the inter-national cooperation to the level that this national border-effect will converge to a factor of one, that is, expecting that the regions of different countries will trade one each other with the same intensity than equivalent regions within own territory. As our figures reveal, national borders still matter, even when considering countries with a great level of integration.

The results are available as part of an online tool in ESPON IRIE website ([https://irie.espon.eu/pages/cs-goods-fr-sp-pt](https://irie.espon.eu/pages/cs-goods-fr-sp-pt)).
2.1.14.3 **Policy implications**

The final aim of this case study is to convince policy makers, managers, and researchers that what we knew about international trade between three neighbours’ countries, sharing the same currency and belonging to the European Union, was just the pick of the iceberg.

Having just country-to-country statistics for the trade between Spain-France and Portugal, is like assuming that all the GDP and population of these three countries concentrates in three points in the space, with the reductionist temptation of identifying them with Madrid, Paris, and Lisbon.

Even for the lucky countries that periodically publish trade flows at the region to country level, the possibilities of really measure the level of integration and the exact allocation of the economic interactions in the space remain partially secluded.

Moreover, the analysis conducted here suggest that it is not enough with having a static view of such relations, or just to focus on one spatial grid such as the NUTS 2 level, for example, arguing that this is the scale at which the decentralized countries adopt most of the decisions (i.e., Autonomous Communities for the case of Spain). Many economic phenomena are sensitive to the “modifiable area unit problem” (MAUP), and trade is one clear example.

In this analysis we have seen, with very simple visualizations and robust econometric approaches, that what we might expect at one spatial scale is not necessarily true for another, or at least, requires a more carefully consideration. This is so because of the great heterogeneity of the economic relations in the space, as well as the clear persistence of certain dynamics, where the current spatial interactions between different regions are clearly conditioned by stubborn geographical and historical factors. On the contrary, a single start shining (leading firm) in a peripheral territory can produce strong international connections. Without having considered firm-specific information, some non-predictable flows analysed here are driven by a short list of big firms (some of which are multinationals) operating in very few locations, i.e., performing in the automobile sector, the food and beverage industry or the chemical-pharmaceutical cluster.

This analysis has shown that trade between Spain-France and Portugal performs, in general, following the rules of the gravity equation, where two big economies that are close together have more probability of interacting. But we have also learned that this relation is not linear, and that many other factors can be also at work. First, economic geography, and all factors linked to the first nature (geography) and the second nature (human action) are relevant. In principle, being a border region to the foreign market will increase your trade with that partner, but this positive effect can be moderated if one must overpass a natural wall such as the Pyrenees, or if, through centuries, the border regions have been living in isolation or turning their backs to their neighbours, maybe in prevention of their hostility or expansionist impulses of any kind. Cross-border cooperation and building common infrastructure is all about bridging these inertial forces.

Before this analysis, we knew that a border Spanish NUTS 2 regions with France and Portugal increases one’s intensity of trade with these two countries. The typical example was the Basque Country and Catalonia are two main Spanish exporters and have geographical advantages
through the two main gateways in the northern border. However, at the NUTS 3 level, the predominant provinces within these NUTS 2 regions are Vizcaya and Barcelona, which are not border provinces. Our analysis has sown similar effects for the case of Portugal, where the results at the NUTS 2 and NUTS 3 level are sensitive to the administrative units used, given the strong concentration of the population and the economic activity in the coast, and the flatter economic landscape in the inner-border regions with Spain.

Our analysis has also shown that, once that the strong and growing trade relationships between these three countries are identified, they are much smaller than the ones that take place within the national borders. For a region, everything that is out of its border is “the rest of the world”. They are truly open economies, and disconnection is a synonym of economic calamity. By contrast, though openness, competition and increasing efforts of integration, small spatial units can benefit from the winds of globalization and the growing integration in the European Single Market. Having said that, it is quite necessary to remember that the economic relations have inertia, and the most important markets corresponds to the own region and the neighbours in the same country. Thus, in general, finding positive home bias effect should be interpreted as a sign of internal integration, and not necessarily as an indication of disconnection with other countries. However, without being naive, there are also evident and no so evident barriers to trade with the foreign neighbour. This was tested for countries such as Canada and United States, and now is revisited for three European countries.

Every region faces a tension between intra-national and inter-national integration. Similarly, there are trade-offs between internal and external inequality or trilemmas between economic growth, equal distribution of income and the protection of the environment.

What seems critical is to find the correct path for each spatial unit, with a diversified range of relations, a vibrant entrepreneurial and work force, able to take advantage, or simply overpass the geography and historical burdens. A good mix of human capital, good institutions and a permanent effort of innovation are critical. Resilience and smart specialization are key concepts here, which unfortunately, in many cases, are not well routed in a detailed knowledge of the true territorial relations affecting each region. This case study wants to remark that “smartness” requires “good data”, and in the 21st century, this is synonym of geo-referenced data.

Far from being conclusive, our analysis also suggests that, once that we have unveil the spatial dimension of the bilateral flows within and between countries, interesting new questions arise, such as, for example, guessing the most optimal route followed by each delivery. By doing so, it is possible to better understand how the production, transportation and consumption decisions are taken, and how the policy intervention can help to compensate the geographical and historical obstacles that leaves some regions behind. Our effort of “routing” the origin-destination flows open new avenues for the policy actions in terms of creating the required infrastructure for facilitating the interaction for the leading and the lagging regions. The current COVI19 shock is telling us how relevant the exact knowledge of the routes followed by every input and every output of one’s economy is for the current and future performance.
In the case of the relations between Spain, France and Portugal, several policy options pop-ups:

- The Pyrenees impose a clear barrier for economic and human interaction. The high cost of developing fast infrastructures have polarized the traffic and the economic interaction around the two main gateways: “Biriatou/Irun” and “Le Perthus/La Jonquera”. A strong effort of cross-border cooperation between the regions directly implied in the Atlantic and Mediterranean corridors (Ten-T) seems to be critical. But, furthermore, the dynamization of the economic activity in the other less-favoured-border-regions also suggest the need for amplifying the transport infrastructures connecting the north-centre of Spain (Aragón-Middy-Pyrenees) in line with some current projects such as the development of the highway of the Pyrenees, connecting the Atlantic and Mediterranean corridor, or further strengthening of North-South less developed gateways. The relations between the Spanish border regions and those of the south of France, and the improvement of the connections with the nodes of the Bordeaux-Toulouse-Montpelier axis, can consolidate a cross-border Macro-region and another decentralized European area, around the Pyrenees, of intense activity and economic flows of all type. An extra effort in this dimension is needed.

- Part of the trade flows observed are likely to be associated with the role played by multi-country-multi-region firms, whose efficient contribution to the economy requires enjoying economic of scales. All efforts towards a friendly and stable legal framework at different spatial levels will help to reduce the transaction costs that remain after the elimination of tariffs and the introduction of the euro. Technical barriers, overlapping regulations, taxes and legal differences between regions within and between countries also hamper an efficient deployment of the production and exchange of goods and services within territories. Greater harmonization and cooperation between all levels of government are desirable. All the efforts conducted in favour of the European Single Market at the country level, should be also followed by an equivalent effort at the sub-national level, considering not just the governance at the NUTS 2 level, but also at lower scales such as provinces or municipalities.

- This analysis has centred in the flows by road, given the lack of equivalent information for the other modes. An important implication of the intra-national and inter-national trade is the environmental impact that generates, which do not affect just the exporting and importing regions, but also the transit locations. Our contribution to the “optimal routing” of trade helps to illustrate how certain locations perform as gateways to flows generated elsewhere, enjoying positive spillovers linked to the traffic of people and vehicles, but also suffering the bad externalities of congestion and pollution. Thus, improving the quality of the information for all modes and their combination seems critical to have the whole picture of the production-trade-environment linkage of the current growth model of each country and region. But it is also needed to formulate precise policy actions to promote the de-carbonization of the current trade-transport mix, by easing the transport-mode
shifts from air and road to train and ship and promote the introduction of less polluting technologies in each mode.

- The results suggest that an extra effort is needed to compensate the burdens imposed to some geographical and historical factors, improving the quality of the transport infrastructure connecting these three countries and promoting the social and economic cooperation in all dimensions. In this regard, reinforcing the cooperation between the border-regions seems to be critical, strengthening the links within the existing Euro-regions where regions of Spain, France and Portugal are involved.

### 2.1.14.4 Recommendations for data providers

Several recommendations for data providers are drawn from this case study:

- The fastest way to improve the information about interregional economic relations between the EU countries is to publish the data that is already available but, for different reasons, it is not usually disclosed. Our analysis proves that a layer of truly valuable information, such as the region of origin and destination of the international freight flows by road can be of great interest when it is combined with other information, such as the official trade flows. All EU countries produce equivalent datasets in the field of the road freight survey, under the coordination of Eurostat, but most of them do not publish any information about the intra-national or the inter-national deliveries with the equivalent spatial grid that we have used in this case study.

- In many EU countries, and in Eurostat as a whole, trade statistics do not offer any information about the region of origin or destination. Instead, country-to-country flows are published with detail at the product level by months. In some other countries, such as Spain, these official statistics are published at the NUTS 3 level every month. Furthermore, there are even large samples with international exports at the firm-level, which can be geo-localized at the zip code level. This is a clear paradox, knowing that in the whole EU27 trade statistics share the same Intrastat / DUA information system, so the data collected might be really the same in all countries. Thus, the harmonization and publication of these data that is already there will be a great improvement for researchers and the development of evidence-based policy.

- It is highly appreciated the effort done by Eurostat in the harmonization and publication of the European Road Freight Survey in the microdata format. However, any attempt to use this relevant source for extending this analysis to the whole Europe, as we do in the IRIE project (Task.1.2.), face clear limitations. On the one hand, the spatial level offered is restricted to the NUTS 2 level, impeding analysis like the one conducted here. Moreover, the time window covered is limited to 2011-2019, losing the long run perspective or even the pre-crisis situation.

- In line with the previous comment, we want to highlight that, as we have shown in this analysis, many economic phenomena are sensitive to the spatial administrative unit used,
in line with the literature on the modifiable areal unit. It is important to remark that the NUTS 3 level is probably the most homogeneous spatial unit in Europe, and it is the one that better represents the economy of cities, the main protagonist on a knowledge-based economy. Thus, although the most powerful sub-national institutions correspond to the NUTS 2 level, and, therefore, this is the common denominator for most part of the European regional statistics, an extra effort on downscaling covering NUTS 3 level is also desirable.

- Another paradox is that the data regarding the transport mode that are more concentrated in very few actors (train and ship) and are supposed to be the mode of the future in a European Green Economy, are the ones with the worst statistical information, and with the less transparent policy for publication and use. To this regard, there are no sectoral information about the region-to-region freight flows between the regions, train stations or ports of any country in the EU, something that diverge from the information available for road mode, where, in principle, the higher level of atomization raise the cost of data collection.

- All in all, the collection of data about trade and freight flows in each country, and for the whole Europe, can be clearly improved if each statistical exercise is defined with a spatial perspective and a holistic approach. For example, it will be reasonable that transport and trade statistics will be, somehow, more comparable, both in terms of the product classifications and their correspondence, the coverage of the spatial unit of reference, or the units of measurement used. Moreover, with focus in the transport statistics, it will be desirable that each transport mode will not be considered in isolation, including fields related with multimodality and intermediation. This aspect is critical in the context of "the last mile revolution", the political interest on tracking the environmental footprint of the flows generated, and the additional difficulties introduced by the parallel development of the e-commerce, where transactions are arranged over non-located digital platforms, and the complex logistic network that serves the deliveries, which multiplies the number of transit locations from the producer to the final destination.

- Finally, the true statistical revolution regarding the spatial tracking of economic flows will come from unveiling the fiscal information, always with full respect of firms and individual information rights. Assuming that the VAT is the most homogeneous and European tax of all, wouldn’t be possible that its information will be also used for the public good of knowing the origin-destination of the flows in Europe. Some exploratory analyses are being conducted in certain countries, but they are completely disconnected to the rest of the statistical system.

2.1.14.5 Conclusions

Researchers in empirical trade do not live in a world with perfect traceability, where products can be followed from the exact point of production to the exact final point of consumption. Instead, they usually confront the frustrating reality of a world of incomplete information, full of statistical
gaps, disconnections, and data constraints. This is clear for the EU, where the information with respect to the economic flows (goods, services, people, capital, and knowledge) between regions in different countries is almost inexistent. Consequently, the spatial pattern of the EU single market at the sub-national level, and several important questions regarding the dynamics of its level of integration, are simply unknown.

The main goal of the ESPON IRIE Project is to alleviate this burden, making an extraordinary effort, never accomplished before in this scale in Europe and elsewhere, to estimate, analyse and combine all types of flows at the regional level (NUTS 2) covering the whole ESPON space, that is, the EU27 plus the UK, Switzerland, Iceland and Liechtenstein.

In this context, the IRIE Project includes several case studies, aimed to offer a reinforced analysis, with focus in certain flows or territories, for which better data is available or specific conclusions can be drawn as a complement to the ones to be taken in the general analysis.

In this case study we explore the information already developed by the c-intereg project (www.c-intereg.es), funded by many regional governments in Spain, which offers, to the best of our knowledge, the largest and more detailed dataset on the intra-national and inter-national region-to-region flows for a European country. The project also serves as a living example on how some regional governments can mix efforts, going beyond the guidance of the national institutions, which sometimes goes one step behind the needs of the sub-national units.

The dataset combines the official trade and transport statistics available in Spain. The process followed during several years for estimating such flows for Spain is basically the one that we follow using equivalent data for the whole Europe in the Task 1.2. of the IRIE project. Indeed, this case study wants to illustrate the contribution that the ESPON IRIE project is expected to make for all regions in the ESPON space once that data equivalent to the one used here will be available for all countries and regions. This is the appetizer of what the IRIE project will serve once it is finished.

Our datasets capture the intra-national flows within Spain as well as the inter-national flows between Spain and the main partners in Europe, with a specific focus in the flows traveling by trucks. Our analysis centres in the period 2004-2018, covering volumes and monetary units, and specifically wants to unveil the bilateral trade relations between Spain, France and Portugal, using the Spanish data as pivot.

Based on this singular dataset obtained for Spain, several analyses are developed with the aim of testing the robustness and coherence of the figures, as well as for the identification of the main trading patterns with a region-to-region specific breakdown, working always at the NUTS 3 level, a spatial grid that is the most homogeneous within Europe, and that better represents the economy of cities, the main protagonist on a knowledge-based economy.

Our analysis starts with a descriptive section, where several visualizations based on maps, Sankey diagrams and tables, allow identifying the main structural relations between these three highly integrated economies. Then, by means of several specifications of the gravity equation, we model
econometrically the relations between the bilateral trade and several variables, selected among the most common factors performing as drivers and barriers of the interregional trade of goods. Such variables correspond to geographical and economic factors and wants to consider with more detail the accessibility of each region when engaging in trade with the closest and furthest regions in the sample.

As always, the analysis is partial, and allows several extensions and improvements, that we expect to cover in the other parts of the IRIE project, as well as in future academic papers to be publish in this regard.

2.1.15 T1.6 Policy Brief: interregional statistics in Europe

2.1.15.1 Introduction
Artificial impediments to cross-border movements of people, goods, services and capital have been removed within the EU for the sake of integration. The EU is gradually moving from a ‘place of States’ to a ‘State of places’, especially since the completion of the Single Market and the formation of the Economic and Monetary Union. This process has brought benefits (e.g. economic restructuring, socio-political transformation, democratization, curtailment of corruption, development) but also produced a range of more ambiguous effects.

As the level of integration affects the level of development, the mix of opportunities and threats to EU territories continues to change. In this context, inter-regional relations, as key drivers of regional economic, social and sustainable development, are becoming a fundamental base for several European policy initiatives such as the cohesion policy, the smart specialization strategies or the policy on trade. However, policy research and assessment on regional development strategies is currently hampered by a crucial knowledge gap: the lack of inter-regional data.

This policy brief makes a review of the situation of the EU in the development and use of inter-regional statistics about different types of flows (goods, services, people, capital and knowledge), shedding light on the availability of data and on limiting factors without losing a policy-oriented perspective. The paper briefly describes the state-of-the-art on interregional data within the EU, providing the context and the rationale behind the IRIE project, the applied research initiative launched by ESPON which pursues to push the frontiers of knowledge about the interregional flows in Europe. To that end, IRIE uses innovative methods that will allow to overcome data limitations on inter-regional linkages, deliver systemic pictures of regional interactions and provide useful insights with which to support regional strategies at different levels. More specifically, ESPON IRIE pivots about the following key policy questions with the aim of giving answers to some of the main gaps in the field of inter-regional relations in Europe:

- What are the characteristics, intensity and temporal evolution of interregional relations in Europe?
- How can regional interdependencies at European level be depicted? How structural/important are these interdependencies in order to better understand regional development
(competitiveness, cohesion, well-being, quality of life…) How can regions be clustered according to this relatedness?

- What should be the impacts of potential political decisions or shocks (e.g. Brexit, implementation of the New Green Deal, COVID-19 health crisis, or new globalization economy) on interregional relations and what is the level of exposure or resilience of European Regions accordingly?
- What are the conditions and drivers that appear to increase interregional flows in diverse regional contexts? What are the barriers that appear to inhibit interregional relations?
- What interventions may reduce/increase such barriers? For which policy purposes and potential impacts? Which EU, national or regional policies have already demonstrated efficiency in addressing interregional flows?

2.1.15.2 Key policy messages

- The situation of the EU in the development and use of interregional statistics about different types of flows such as goods, services, capital, people and knowledge is sub-optimal in all cases. However, with the adoption of targeted measures it can be easily improved.
- There is an urgent need of establishing a data policy at the regional scale, as coherent as possible on the NUTS 2 scale, and if possible on the NUTS 3 scale.
- It is important to build new comprehensive and reliable interregional evidence to go beyond the existing regional data monitoring and collection framework (the European Statistical System).
- Because of its potential use and policy relevance, interregional data should feed the intergovernmental debate on future territorial development policies. Similarly, they should inform future debates on convergence for a deeper and fairer economic and monetary union.

2.1.15.3 Conclusions and policy recommendations

In a knowledge based economy, access to data is essential. Big data is needed as much as good data. Access to good statistics is nowadays a public good, whose generation and analysis improves the wellbeing for all.

The aim of this paper is to briefly review the situation of EU in the development and use of interregional statistics about different types of flows such as goods, services, people, capital and knowledge. In doing so, we have reviewed the main theoretical limitations for each category.

The analysis suggests that the situation is sub-optimal in all cases and can be improved easily. It is not just a matter of resources but of interest and change of perspective when collecting and publishing the information.

In many cases, the data is there, already produced. However, the access to it is restricted for several reasons. With the excuse of data protection, it could be the case that lack of interest and trust in the misused by other member countries bring all potential users to a lose-lose situation.

Having this in mind, we finish this policy brief with two groups of recommendations, some of which are general, some other very specific and easy to implement.
The first set of recommendations emphasises the need to publish and share all the data that has already been produced, whose publication remains partially secluded. In this case, the progress will be huge without any economic cost.

- **Trade of goods.** Every country in the EU27 follows the same statistical systems. All can report the variables related to the sub-national unit of origin for exports and destination for imports, at the NUTS 2 and NUTS 3 level. All can publish the flows as well by transport mode, completing the data that (partially) Eurostat publishes, just for certain countries.
- **Migration.** All EU members might share the information already captured by the Census, with the region-country break down.
- **Eurostat might disclose the information already captured but not shared related to the country (and region) of origin/citizenship in all variables related to Labour statistics (LFS; Multinationals; Temporary workers) or Commuting (HETUS).** At this moment, this information is shared by the countries, but it is not published by Eurostat, even after following the stringent process of microdata request.

Then, a second set of recommendations comes immediately. They are associated with small improvements in the statistical frameworks already in course, but just adding small advancements, with almost no cost or organizational changes:

- **Trade of goods.** It is desirable that every country in the EU27 might include the variable related to the origin and destination of the flows at the sub-national level (NUTS 2 and NUTS 3 level), in the same way than the freight statistics does. It will also help including a variable related to the combination of different transport modes used in the deliveries, for example, suggesting, when known, the multi-modal cooperation (road with railway, ship, and aircraft).
- **Similarly, freight statistics can be easily improved, both, by slight variations in the within-mode data recollection, and the between-modes data coordination.** In relation to the former, it is critical to improve the quality and quantity of the flows using railway, ship, and aircraft. Regarding the later, the afore-mentioned inter-link of data about multi-modality, as well as the treatment of logistic intermediations (wholesales, warehouses, dry ports, etc.).
- **Related to people,** an extra effort on the connection between the information about travel (passengers by mode with trips) and overnight stays. Effort is put in the distance travelled but not in the length of the go-return period, which in addition to the motive of the trip, might serve to split mobility with the nature of the displacement (migration, tourism, commuting). The incorporation of the region (NUTS 2 and 3) of origin and destination in the corresponding surveys to travellers, with the aim of, at least, treat intra-EU flows with the same detail than the intra-national flows are now covered in a typical EU country.
- **Capital flows:** reinforce the transparency process promoted by the BIS (LBS statistics) and the ECB through the recent “Loan initiative”, to allow the interconnection of data related to international financial flows at the region-to-region level within the EU. Note that the variables are already considered in the standard templates produced by the ECB, but as it happened in the case of other EU statistics (i.e. EFRT by Eurostat), the fulfillment of such variables is not compulsory, and finally not reported.

Finally, it is desirable a complementary effort with the aim of linking structural sources and more innovative ones (fiscal information related to the VAT; new sources related to electronic-tolls, tracks of smart-phones and GPS devices installed in cars, coaches and heavy trucks), to complement the virtues and drawbacks of both. To this regard, the COVID-19 current situation offer
many examples on how public and private institutions are sharing resources to improve the quality of the data available, with an important emphasize on the anonymization and the use of private information for the public good.

2.2 Task 2. Pan European systemic analysis

Full report in Annex 15.

2.2.1.1 Introduction

At the most general view on the topic, we are looking among others for answers to the following research questions: (1) What are the general characteristics of each of the flows? How to compare them between each other? (2) Border effect. For which of the flows the region is more internationally concentrated and for which flows domestic part is more important? (3) Are the flows balanced, concentrated or dispersed, spatially dependent/independent? (4) Volume (magnitude). Autarky. Whether the region is generally flow (total/inflow/outflow) dependent? If so, does this dependency apply to one flow or is it more diverse? (5) Concentration. Is the region strongly focused on any of the flows? Which flow is dominant for the region? Is there a spatial concentration of inflow (outflow)? (6) Balance. Is region sender or receiver? What is the distribution of balance for the region for all flows? In which flows the region is among the outliers and in which flow the region is among the receivers. (7) Distance impact. What is the average length of flow from the region? Is a region distance dependent or not? (8) In what way the flows co-existence between each other within the whole set?

We use inputs (OD matrixes) from Tasks 1.2-1.5 to prepare characteristic of flows and typologies for regions, considering different features. In both cases, the typologies consider 2010-2018 datasets at the regional level. The objects are analysed consequently according to four basic dimensions: (1) intensity (intensity, weighted intensity); (2) balance (balance, average unbalance of relation); (3) concentration (concentration, UK dependency); (4) distance impact (average distance and distance dependency). The intentionally selected measures will be aggregated within types based on terciles, composing classifications of NUTS2 regions according to particular feature and dimension. In the sixth (final) stage a comparison of the outcomes of the third and fourth stage of analysis (regional typology and combined analysis) with other regional typologies (including ESPON 2013) will be conducted.

In this version of the paper, six indicators (intensity, weighted intensity, balance, concentration, UK dependency and average distance) were calculated in the first round for four R2R matrices (goods/trade, air passengers, commuting and tourism). Two other indicators, i.e. average unbalance of relation and distance dependency, will be calculated in the second round, also for the remaining matrices.

The average value of the weighted intensity index for all analysed flows can be treated as the overall flow dependency of the region. Regions with high index values are regions strongly dependent on interregional flows. On the other hand, those with low values are strongly autarky and only slightly connected with other regions. In spatial terms, there is a clear division of the ESPON
space into regions highly dependent on interregional flows located in Norway, Switzerland, Austria, in the western part of Germany, Benelux and around London, and single regions, mainly tourist regions, in the Southern Europe. The more autarky regions, on the other hand, are those in the eastern periphery of the ESPON space, in eastern Poland, Romania, Bulgaria and Greece. In general, the core-periphery pattern is much clearer than with each matrix independently. It can be concluded that as the number of matrices increases, the flow core-periphery pattern of the ESPON space will be increasingly correlated with the distance from the European pentagon and the GDP per capita (with the exception of tourist destinations in the Mediterranean, which, however, will decrease in importance as more matrices are added).

2.2.1.2 Highlights

Data

- We use the procedure of standardization of the R2R matrices on the basis of the so-called 'standardized flow unit'.
- Calculation of the sum matrix for each flow – addition of 9 yearly matrices from 2010-2018 period for each indicator.
- In this version of the paper, six indicators (intensity, weighted intensity, balance, concentration, UK dependency and average distance) were calculated in the first round for four matrices (goods/trade, air passengers, commuting and tourism).
- Two other indicators, i.e. average unbalance of relation and distance dependency, will be calculated in the second round, also for the remaining matrices.

Methodology

- The objects are analysed consequently according to four basic dimensions: (1) intensity (intensity, weighted intensity); (2) balance (balance, average unbalance of relation); (3) concentration (concentration, UK dependency); (4) distance impact (average distance and distance dependency).
- Two-dimensional typology, which is based on terciles (99 regions in each tercile) of one selected indicator to be applied as a measure of each particular dimension, related to the set of NUTS 2.
- In the final stage a comparison of the outcomes of the regional flow typology and combined analysis with other regional typologies (including ESPON 2013) will be conducted.

New territorial evidence

- Among the four matrices considered, the largest flows are intra national ones for goods, tourism and commuting. For air passengers there are no major inter-regional flows in Central and Eastern Europe.
- There is a clear division of the ESPON space into regions highly dependent on interregional flows located in Norway, Switzerland, Austria, in the western part of Germany, Benelux and around London, and single regions, mainly tourist regions, in the Southern Europe.
- The more autarky regions, on the other hand, are those in the eastern periphery of the ESPON space, in eastern Poland, Romania, Bulgaria and Greece.
- The flow core-periphery pattern of the ESPON space is correlated with the distance from the European pentagon and the GDP per capita.
2.2.1.3 Typology

Two-dimensional typology, which is based on terciles (99 regions in each tercile) of one selected indicator to be applied as a measure of each particular dimension, related to the set of NUTS 2 (see description of indicators in Annex 15).

Weighted intensity index vs balance index

Figure 2.3: Two-dimensional typology of intensity and balance (weighted intensity index vs. balance index) based on terciles

2.2.1.4 Conclusions

At this stage of the work, the authors of the report are waiting for the last R2R matrices to close the list of matrices for the calculation of synthetic indicators and flow typologies. Nevertheless, based on the test with four matrices, it can be concluded as follows.

Among the four matrices considered, it is clear that the largest flows are intra national ones for goods, tourism and commuting. For goods/trade, some exceptions are the large flows between the regions of Norway and the UK, Germany and the Netherlands. Apart from this exception, and air passenger flows, interregional flows between countries over longer distances are not evident. For air passengers there are no major inter-regional flows in Central and Eastern Europe. There is a strong presence of the largest European hubs, led by London airports. Air passengers is the only one of the analysed flows, for which the cumulative top 25% of flows are primarily international flows over longer distances, primarily between southern Europe and London. The picture
is different for commuting. This flow is much more dispersed and in the cumulative top 25% of flows there are only single short-distance flows, mostly in metropolitan areas.

The average value of the weighted intensity index for all analysed flows can be treated as the overall flow dependency of the region. Regions with high index values are regions strongly dependent on interregional flows. On the other hand, those with low values are strongly autarky and only slightly connected with other regions. In spatial terms, there is a clear division of the ESPON space into regions highly dependent on interregional flows located in Norway, Switzerland, Austria, in the western part of Germany, Benelux and around London, and single regions, mainly tourist regions, in the Southern Europe. The more autarky regions, on the other hand, are those in the eastern periphery of the ESPON space, in eastern Poland, Romania, Bulgaria and Greece. In general, the core-periphery pattern is much clearer than with each matrix independently. It can be concluded that as the number of matrices increases, the flow core-periphery pattern of the ESPON space will be increasingly correlated with the distance from the European pentagon and the GDP per capita (with the exception of tourist destinations in the Mediterranean, which, however, will decrease in importance as more matrices are added).

2.3 Task 3. Testing impacts of existing/upcoming policy decisions and external shocks on interregional relations

Full report in Annex 16.

2.3.1.1 Introduction

This section contains the methodology and first results with regards to the Task 3 of the IRIE project, centred in D4 in the selection of scenario case studies. The document recalls the role of case studies in Task 3. Those selected for detailed research are: Zuid-Holland, Netherlands (NL33); Comunidad Foral de Navarra, Spain (ES22); Eastern and Midland, Ireland (IE06); and Śląskie, Poland (PL22). The selected areas are characterised using basic statistical data and a description of the processes taking place in them. The paper concludes with a first approximation of the flows from and to the case studies studied in terms of commuters, tourism, goods, FDI and cooperation in the implementation of H2020 projects. A report on the first project stakeholder meeting, held in online format at the end of May 2021, is included as an annex (see Annex 16, annex 1).

2.3.1.2 Highlights

- Based on the methodological preconditions presented in Conceptual Framework we have selected for scenarios case studies regions - Zuid-Holland (NL33), Comunidad Foral de Navarra (ES22), Eastern and Midland (IE06) and Śląskie (PL22).
- The regions selected are much differentiated according to GDP, population, location in Europe or urban-rural typology.
- First observations of flows (e.g. commuters, goods or FDI) shows a good selection of regions to study – e.g. Intensive commuting patterns from Eastern and Midland region in Ireland to Great Britain and big amount of FDI flows from Zuid-Holland to many regions.
in Europe. The four scenarios (BREXIT, COVID-19, New Green Deal and New Globalisation) will be analysed in each case study region as part of the next tasks in the work plan.

2.3.1.3 Case study selection

About Task 3 – Introduction

The primary objective of the scenarios analyses is to determine the extent to which the previously identified (in Tasks 1 and 2) setting of the interregional flows in Europe may change in response to policies and external shocks. This is in agreement with Objective 4 of the entire project, formulated in the following manner: To test the impacts of potential policy shocks on interregional relations as well as the level of exposure of regions by the intensity of these linkages and their territorial characteristics.

Next figure shows the scheme of the research procedure associated with Task 3 and indicates the complementary character of the applied quantitative and qualitative methods. The results will make possible to elaborate policy options at the European level. It will also be possible to forward the policy options to the member-states, especially for the case-study regions.

Figure 2.4: Scheme of the study procedure.

Scenario selection

On the basis of the work done within the ESPON IRiE project it was decided that the following four scenarios will be tested. The scenarios were consulted with stakeholders in terms of their importance for the implementation of policies at the national and regional level.

- **Brexit Scenario.** This scenario will consider the consequences for the analysed flows of the UK leaving the European Union. These include, first of all: trade restrictions, migration restrictions, reduced student flows. These factors will only concern the relationship between the UK and regions in ESPON space.

- **COVID-19 long term effect scenario.** Scenario taking into account the formation of a post-COVID economy. Assumptions will include first of all: development of teleworking and e-services and reduction of commuting (including trans-border commuting), changes in the pattern of international mobility of the population within ESPON space, changes in
the dynamics of development of particular branches of the economy, reduction of external flows (e.g. EU-China), change of some trends observed in recent decades (development of air transport, globalisation of production chains, reduction of individual transport, etc.), consequences of anti-COVID programmes to mitigate the effects of the crisis at the European and Member State level.

- **Green deal scenario.** Scenario assuming changes in the structure of the European economy (especially in the energy sector), as well as changes in the modal structure of transport (reducing air and road transport, supporting rail, tram, bikes, and other forms of public transport) and in the transport intensity of the economy. The scenario will take into account the circular economy assumptions, which means shortening the distance of transport of certain types of goods and promoting prosumers (consumers who also produce the product). It is important to take into account the consequences for certain sectors, including agriculture. An important element in the assessment of changes in the distribution of flows must be to take into account relations with the Rest of the World.

- **New Globalization scenario.** Scenario based on assumptions of changes in customs duties (e.g. 25% for automotive products from Europe and Japan in the United States). The aim would be to assess the interregional impact of some of the main protectionism measures adopted/announced/retired (before implemented) by the US against the EU, as well as potentially the interactions with China. The study would have to be conducted in selected industries (e.g. automotive, aircraft). An important element in the assessment of changes in the distribution of flows must be to take into account relations with the Rest of the World (outside ESPON space).

**Scenario case study selection**

Scenario case study realization will be performed as qualitative research in several selected regions. Case studies will serve as a means to gain more in-depth understanding of drivers and limits of interregional flows, to help interpret scenarios, and to identify and analyse relevant policy recommendations in specific territorial contexts. There are four regions selected within the ESPON Space. Selection was based on the following criteria: (a) type of region; (b) level of development of the region (GDP); (c) geographical location within the ESPON Space; (d) degree of peripherality; (e) degree of urbanisation. Besides that, we will include one with a particular focus on the Brexit effects in Ireland. As a key aspect, four cases will be selected in relation to four scenarios, but in every case the four scenarios will be tested.

As it was defined in the ESPON IRiE “Conceptual Framework”, scenario case studies were selected based on the mentioned above criteria.

**Table 2.2: Proposed scenarios – methodologies.**

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Methodology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brexit Scenario</td>
<td>EURO-IO</td>
</tr>
<tr>
<td></td>
<td>Analysis and transformation of the flow matrices elaborated (T1)</td>
</tr>
<tr>
<td></td>
<td>Case study (e.g. a region with strong migration outflow to UK, London City as the financial flows centre, as well as impacts in Ireland)</td>
</tr>
</tbody>
</table>
Scenarios | Methodology
--- | ---
COVID-19 long-term effect scenario | EURO-IO Analysis and transformation of the flow matrixes elaborated (T1); assumption of distance shortening regarding (a) trade, (b) migrations, (c) tourism. Case study (e.g. automotive industry / tourism region) together with JRC

Green deal scenario | EURO-IO (in terms of ecological footprint; CO2 or H2O content of trade), potentially also GHG emissions associated with a Post-COVID-19 EU Economy Case study (e.g. traditional energy / mining sector region)

New Globalization scenario | EURO-IO Case study (e.g. automotive industry region)

Therefore, taking into account the assumptions indicated above, the following regions were selected for the case studies.

Table 2.3: Proposed case studies regions.

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Selected region</th>
<th>GDP in PPS per capita in EUR in 2019 (EU=100%)</th>
<th>Population (mln)</th>
<th>Geographical location</th>
<th>Urban-rural typology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brexit Scenario</td>
<td>Eastern and Midland (IE06), Ireland</td>
<td>63,100 (209%)</td>
<td>2.37</td>
<td>Northern Europe</td>
<td>predominantly rural</td>
</tr>
<tr>
<td>COVID-19 long-term effect scenario</td>
<td>Comunidad Foral de Navarra (ES22), Spain</td>
<td>34,500 (114%)</td>
<td>0.64</td>
<td>Southern Europe</td>
<td>intermediate</td>
</tr>
<tr>
<td>Green deal scenario</td>
<td>Śląskie (PL22), Poland</td>
<td>23,200 (77%)</td>
<td>4.50</td>
<td>Central Europe</td>
<td>predominantly urban</td>
</tr>
<tr>
<td>New Globalization scenario</td>
<td>Zuid-Holland (NL33), Netherlands</td>
<td>40,100 (133%)</td>
<td>3.68</td>
<td>Western Europe</td>
<td>predominantly urban</td>
</tr>
</tbody>
</table>

The Eastern and Midland Region covers 14.466 km², representing approximately 21% of the area of the Republic of Ireland. It is divided into 3 sub-regions: Dublin, the Mid-East and Midland regions. In 2019, the total population was 2.37 mln inhabitants. Although, the region is the smallest in the country in terms of area coverage, it accounts for almost half of the country’s population (49%). The Eastern and Midland Regional Assembly is part of regional governance in Ireland, established under local government reform in January 2015.

Eastern and Midland region’s economy specialized in sectors such as ICT, Entertainment, Financial and Business Services, Bio-pharma, Medical and Clean Technologies, Industrial Products and Chemicals. While the services sector (ICT, Retail, Finance and Business, etc.) dominates the national and regional economy, the region also has an abundance of natural assets, as well as renewable energy, tourism and maritime potential. Between the early 1990’s and 2007 the Dublin economy expanded by nearly 100%, with a substantial shift away from older manufacturing industries towards high value (e.g. financial) services and knowledge-based sectors and also low-skilled retail and domestic services. Since 2012, the regional unemployment rate has steadily decreased from 14.6% to 4.7% in 2019. The manufacturing sector is a key contributor to Ireland’s economy and manufacturing is a key driver of RD&I. Especially active in these regards is the Trinity College Dublin, which collaborates with Industry in particular but also with international
research partners to develop new manufacturing technologies and processes to raise efficiency and positively impact the Irish economy (https://ec.europa.eu). The region has intensive cooperation and flows of people and goods with the UK and particularly Northern Ireland, so the impact of Brexit on existing flows seems to be important to determine.

The **Chartered Community of Navarra** (Comunidad Foral de Navarra, “Foral” corresponds to the exercise of autonomous competence prior to the Spanish Constitution of 1978) is located to the north of the Iberian Peninsula, neighbouring France, and at the western end of the Pyrenees mountainous massif. Its extension is 10,391 km² and it is inhabited by 640,000 people distributed in 272 municipalities (NUTS 5) and, approximately, 600 population centres, some with a scarce ten inhabitants and others as Pamplona / Iruña, the regional capital, with 200,000 population.

Navarra has a diversified economy open to the outside world. With some specialization in industrial production and exports in the automotive, renewable energies and agrifood sectors (approximately 30% of the active population in the secondary sector). The Plan Reactivar Navarra 2020-2023 aims to transition towards a new economic and social model, based on progress, cohesion and innovation, but taking advantage of the contribution of community funds in the design of the response of the Chartered Community to the crisis caused by the COVID-19 pandemic. In the transition to this new model, Navarra faces challenges such as transforming the economy towards a fair digitization, accelerating the ecological transition, structuring the territory and deepening our framework of coexistence. All this under the leadership of the public sector (driven by the New Green Deal) and with a clear external dimension (dealing with the New Globalization), in sectors such as digitization, automotive, renewable energies and action against climate change.

The effect that COVID-19 has had during 2020 and 2021 has been evident in health, social and economic matters, but also in territorial matters and the provision of services to citizens. COVID-19 has had an effect on labour and personal relations, capital flows, provision of raw materials and production, etc. Some indicators such as GDP, poverty, employment, unemployed population or in ERTE (Temporary Employment Regulation Files), allow an analysis of the territorial evidence of the effect of COVID-19 and also to establish prospective scenarios that facilitate the taking of planning decisions for the future, in terms of distribution of economic activity and provision of services and equipment as well as indicators of service quality and accessibility that favour the analysis of the quality of the territorial structure and the structuring carried out by certain nuclei (nodes) in the network services (relationships and flows).

The **Silesian Voivodeship** (województwo śląskie), one of 16 voivodeships in Poland, covers an area of 12.3 thus. km² and is inhabited by over 4.5 million people. It is the voivodeship with the highest degree of urbanisation (there are 71 towns in the region) and population density (372 persons/km²). Katowice is the seat of the voivodeship authorities. The Silesian Voivodeship has very good transport connections, mainly thanks to motorways A1 (from Baltic Sea to Czechia) and A4 (from Germany to Ukraine). The voivodeship also has a well-developed rail network and an airport serving around 5 million passengers in 2019.
The Silesian Voivodeship has the highest proportion of people working in industry, accounting for almost 20% of total average employment in industry in Poland. Located in the central part of the voivodeship, the Upper Silesian Industrial District is the most heavily industrialised area in Poland. In the voivodeship the industrial plants include hard coal mines, steelworks and power plants. Mining is the fourth largest contributor to GDP in the region, but the sector is a burden on the voivodeship, reducing entrepreneurship and labour force participation. On a macro scale, the Silesian economy has been losing ground to other Polish regions for almost two decades. Although the region's economy is still one of the most developed in Poland - second in terms of gross domestic product and fourth in terms of its volume per capita - the growth dynamics and the region's share in GDP are decreasing. Back in 2003, the region generated nearly 14% of Poland's GDP. Since then, the voivodeship's share of GDP has been falling, and today it amounts to just over 12%. On a European scale, the Silesian voivodeship is classified as a less developed region. This means that GDP per housing unit does not exceed 75% of the EU average. The region has been restructuring its coal mining industry for over three decades, during which time employment in the coal mining industry has fallen by 385 000 and currently stands at 83 000. The last mine is expected to close in the next 30 years. There are also two car factories in the region. For these reasons, the region seems to be optimal for detailed analyses of the impact of the "Green Deal" scenario in the context of structural changes in the economy and related changes in flows.

The Zuid-Holland region's population reaches nearly 3.7 million and its population density is about 1,373/km2, making it the country's most populous province and one of the world's most densely populated areas. Situated on the North Sea in the west of the Netherlands, South Holland covers an area of 3,419 km2, of which 605 km2 is water. It borders North Holland to the north, Utrecht and Gelderland to the east, and North Brabant and Zeeland to the south. The provincial capital is the Dutch seat of government The Hague, while its largest city is Rotterdam. The Rhine-Meuse-Scheldt delta drains through South Holland into the North Sea. Europe's busiest seaport, the Port of Rotterdam, is located in South Holland. It has commercial networks with many regions, strongly focused on chemical industry and manufacturing and industrial FDI from many world regions beyond EU. The region performs well when it comes to international metropolitan functions and in 'regular' urban functions.

Visualization of flows
The following maps show the basic characteristics of flows in the four regions selected for the study. The data on flows are as of the end of June 2021, therefore the matrix developed in the ESPON IRiE project is not complete. However, the role of the Dutch region in international capital flows - both outbound and inbound - is clearly evident from the maps presented. Therefore, an analysis of the "New Globalization" scenario in this area seems to be most justified. In the case of the Irish region, on the other hand, a strong and close cooperation with the English regions, especially with Northern Ireland, is noticeable in terms of commuting and the flow of goods. Further studies on the impact of scenarios on flows in the analysed regions should provide interesting insights for stakeholders.
Figure 2.5: Commuting form selected case studies regions in 2018.
Figure 2.6: Commuting to selected case studies regions in 2018.

Figure 2.7: Interregional tourism flows form selected case studies regions in 2018.
Figure 2.8: Interregional H2020 partnerships in selected case studies regions in 2018.
Figure 2.9: Interregional patent citations in selected case studies regions in 2018.
Figure 2.10: Interregional flow of goods from selected case studies regions in 2018.
Figure 2.11: Interregional foreign direct investments to the selected case studies regions in 2018.
2.3.1.4 Further steps in D4+/D5

Qualitative analysis, including envisaged contact with the SAG and stakeholders from the selected regions is planned. Direct meetings with stakeholders in particular regions will be in the form of expert panels (or through virtual sessions, using ESPON’s IRIE website). We seek the following participants: (a) self-governmental authorities of the regions; (b) large enterprises / business associations; (c) labour offices; (d) tourist organisations; (e) universities; (f) chambers of commerce; (g) trade unions; (h) local action groups. The participation of stakeholders would allow us to: (a) learn about the regional context of the flows; (b) bring to light flows that have remained elusive (within the estimated statistics); (c) verify our quantitative picture; (d) determine the implications on spatial and other sectoral policies; (e) identify key information to bring into the regional info sheets.

As indicated in the previous subsection, Task 3 will be closely linked to the results of the work in the other project tasks. Above all, the following aspects that will require special considerations are indicated in the flow-specific reports that are being developed:
Every aspect of the analysed flows are subject to variation in the context of any of the big scenarios considered in the IRIE project. BREXIT, the new trends in the globalization, the long-term effects of COVID19 pandemic or the EU New Green Deal have direct and indirect effects on the intensity and shapes of the regional relationships described in Task 1.

Brexit will be materialized in the increase of tariffs and non-tariff barriers to trade, FDI and some restrictions concerning flows of people (tourism, migration, commuting, and students) and knowledge. Such new obstacles will generate creation and deviation effects, with a clear impact on the most direct connections between United Kingdom and other countries (especially those with the highest intensity of interactions, as Ireland, France or Germany).

The long term of COVID19 and the EU Green Deal might re-shape the regional distribution of certain economic activities. Everything related with the mobility of people will affect all the services. Tourism and related activities will be dramatically affected in the short-medium term. The raise in public indebtedness will affect economic growth of certain locations in the following years. The right deployment of national and regional strategies in the use of the EU funds for the recovery will also make a different, promoting the smart specialization of certain regions, or maybe deepening the dependencies and burdens of the others.

Efforts related to the di-carbonization of freight and passenger transportation, promoted by the EU reconstruction funds, might also boost the development of certain industries, heavily agglomerated in certain regions, but also putting pressure in others, whose products face a shrinking demand.

The analyses in Task 3 will also refer to the results of Task 2. On the one hand, through detailed research in selected case study regions, which can be regarded as representative of the individual types developed in Task 2, the resulting analyses will have a broader interpretative dimension. On the other hand, the detailed and consistent methodology for the delimitation of regions developed in Task 2 will facilitate quantitative analyses reconfiguring flows according to the scenario studied. Naturally, the results of Task 3 will provide one of the layers for proposing policy options in Task 4. Flow data/analyses, typologies, and scenario reports will be utilized in Task 4 to support/formulate tailor-made policy options.

### 2.4 Task 4. Policy options

Full report in Annex 17.

#### 2.4.1 Introduction

#### 2.4.1.1 Territorial cohesion, resilience and recovery

EU Cohesion and Structural Policy currently contains five major funding streams, namely the European Regional Development Fund (ERDF), the European Social Fund (ESF), the Cohesion Fund (CF), the European Agricultural Fund for Rural Development (EAFRD) and the European
Maritime and Fisheries Fund (EMFF). Each of these funding streams has a different history and over time these different funding streams have come together at different stages to provide today an overall integrated package for regional development support. In addition, EU Cohesion Policy also played a critical role in supporting the public investment portfolios of various central European member states in the immediate aftermath of the 2008 Global Financial Crisis (McCann and Ortega-Arigles, 2021).

The long-run impacts of the global financial crisis, especially as manifested in the ‘geography of discontent’ (McCann, 2018) displayed by economically weaker places in which local citizens use the ballot box as a means of exacting revenge (Rodriguez-Pose 2018), have meant that even some of the most ardent earlier space-blind advocates have now been forced to re-think their positions (Austin et al., 2018). Interregional inequality is threatening the stability of many of our institutional structures and systems, as citizens in certain places perceive that they are increasingly being ‘left behind’ by globalisation and technological progress (McCann and Ortega-Arigles, 2021).

EU can and should play an important role in mitigating these negative effects. EU Cohesion policies are required to rebalance the spatial effects that crises pose on interregional convergence trends. Crises hit different regions differently (Hadjimichalis, 2011). The winning strategy is to focus on the development potential of all places, represented by its territorial capital – material, human, cognitive, social, and relational. Policies should be tailored on each region’s specificities, competitive advantage and needs, engaging all assets and enlarging existing excellences (Camagni and Capello, 2015). This is in line with the place-based approach outlined by Barca (2009).

As a result of the increasing number of refugees arriving to Europe, the EU also launched an initiative that facilitated the integration of non-EU immigrants into European societies under the European Investment Fund (EIF). All EU countries except for Denmark participate in the EIF. For the period 2014-2020, a new fund was set up: The Asylum, Migration, and Integration Fund (AMIF) is EUR 3.137 billion for seven years. Hence, the 2015 migration crisis has led to responses at EU level, the impacts remain to be seen (Rauhut and Sielker, 2021).

A new set of EU polices have now been set up to address the current challenges: (a) The Green Deal is an action plan to make EU’s economy sustainable by turning climate and environmental challenges into opportunities and making the transition just and inclusive for all (CEC, 2019). (b) The Just Transition Fund aims to alleviate the social and economic costs resulting from the transition towards a climate-neutral economy, through a wide range of activities directed mainly at diversifying the economic activity and helping people adapt in a changing labour market. (c) The Recovery Fund’s aim is to mitigate the economic and social impact of the coronavirus pandemic and make European economies and societies more sustainable, resilient, and better prepared for the challenges and opportunities of the green and digital transitions (CEC, 2021a). (d) The New Cohesion Policy (CEC, 2021b) contains several aspects. A) Regional development investments will strongly focus on objectives 1 and 2. 65% to 85% of ERDF and Cohesion Fund
resources will be allocated to these priorities, depending on Member States’ relative wealth. Five main objectives will drive EU investments in 2021-2027: i) Smarter Europe, through innovation, digitisation, economic transformation, and support to small and medium-sized businesses. ii) a Greener, carbon free Europe, implementing the Paris Agreement and investing in energy transition, renewables, and the fight against climate change. iii) a more Connected Europe, with strategic transport and digital networks. iv) a more Social Europe, delivering on the European Pillar of Social Rights and supporting quality employment, education, skills, social inclusion and equal access to healthcare, and v) a Europe closer to citizens, by supporting locally led development strategies and sustainable urban development across the EU. B) A more tailored approach to regional development will be applied. The allocation method for the funds is still largely based on GDP per capita. New criteria are added (youth unemployment, low education level, climate change, and the reception and integration of migrants) to better reflect the reality on the ground. The outermost regions will continue to benefit from special EU support. Moreover, Cohesion Policy further supports locally led development strategies and empowers local authorities in the management of the funds. The urban dimension of Cohesion Policy is strengthened, with 6% of the ERDF dedicated to sustainable urban development, and a new networking and capacity-building programme for urban authorities, the European Urban Initiative. C) The New Cohesion Policy also lists several simplifications of its legal framework and better use of the financial resources.

2.4.1.2 Implementation of the new EU policies

The Green Deal, the Just Transition Fund, the Recovery Fund, and the New Cohesion Policy all include, in one way or another, economic, social, and territorial dimensions. The economic aspects of these funding schemes are relatively uncomplicated in terms of discretion and implementation. As discussed above, the EU has no competence in the social policy area. It must be emphasised that this should not be interpreted as if the social aspects addressed by these policy initiatives are paper tigers. Rather, they will be an important complement to national initiatives. How efficient the policies will be in addressing the territorial cohesion aspect depends largely on how well the Member States implement the policies and whether the Member States and their regions are eligible for the support schemes.

Funding eligibility is indeed a key question here. The European Green Deal provides an action plan to boost the efficient use of resources by moving to a clean, circular economy, to restore biodiversity and cut pollution. The Commission has proposed a 25% target for climate mainstreaming across the budget of all EU programmes and it will work with the Member States and regions to help them put in place territorial transition plans (CEC, 2019). All programmes directly relevant to the transition, as well as other funds, e.g., the European Regional Development Fund (EDRF) and the European Social Fund Plus (ESF+), will contribute to the Green Deal transition (CEC, 2021a), i.e., being eligible for funding through the existing funds is a pre-requisite for obtaining funding from the Green Deal and Just Transition Funds. Regarding the Recovery Fund, the Member State must write a National Recovery Plan. Depending on how aligned this plan is to the EU policy agenda funding will be granted (Article 17 in EU REGULATION 2021/241).
When looking at the breakdown of the allocations for the NextGenerationEU per Member State (Table 1) countries like Denmark, Germany, Ireland, Spain, France, Italy, Luxembourg, the Netherlands, Austria, Finland, and Sweden are not eligible for any Cohesion Fund support. The allocated resources regarding ESF+ and EDRF varies a lot, but leaves countries like Denmark, Ireland, the Netherlands, Austria, Finland, and Sweden with marginal support. The conclusion is that the Green Deal, the Just Transition Fund, the Recovery Fund, and the New Cohesion Policy will present significantly smaller impact in some countries simply because the resources allocated to them are marginal, while the impact in other countries can be assumed to be significant due to a bigger resource allocation. However, distribution of these allocated resources shows also a differentiated regional impact within the countries. Differences between the regions can be remarkable, because financial support for the green transition is targeted in less developed areas in countries.

Table 2.4: Breakdown of Cohesion Policy allocations per Member State in million Euros (2018 prices).

<table>
<thead>
<tr>
<th>Country</th>
<th>ESF+</th>
<th>EDRF</th>
<th>CF</th>
<th>Transferred to the CEF</th>
<th>ETC</th>
<th>Total allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>1 037</td>
<td>1 022</td>
<td>-</td>
<td>-</td>
<td>327</td>
<td>2 386</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>2 326</td>
<td>5 087</td>
<td>1 467</td>
<td>346</td>
<td>119</td>
<td>8 998</td>
</tr>
<tr>
<td>Czechia</td>
<td>2 397</td>
<td>9 251</td>
<td>7 389</td>
<td>1 741</td>
<td>272</td>
<td>19 308</td>
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<tr>
<td>Denmark</td>
<td>106</td>
<td>125</td>
<td>-</td>
<td>-</td>
<td>225</td>
<td>457</td>
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<td>Germany</td>
<td>5 791</td>
<td>9 683</td>
<td>-</td>
<td>-</td>
<td>892</td>
<td>16 366</td>
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<td>Estonia</td>
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<td>1 502</td>
<td>952</td>
<td>224</td>
<td>51</td>
<td>2 951</td>
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<td>Ireland</td>
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<td>-</td>
<td>-</td>
<td>258</td>
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<td>Greece</td>
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<td>10 156</td>
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<td>-</td>
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</tr>
<tr>
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<td>4 094</td>
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<td>326</td>
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<tr>
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<td>196</td>
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<td>2 909</td>
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<tr>
<td>Slovakia</td>
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<td>1 868</td>
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<tr>
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<td>765</td>
<td>-</td>
<td>-</td>
<td>311</td>
<td>1 703</td>
</tr>
</tbody>
</table>

Source: CEC (2021c).
2.4.2 Methodology

Our methodology draws from “policy option analysis” by Bardach and Patashnik (2019), which describes separate (but interrelated) stages of forming the policy options. These stages are not necessarily sequential, but can be done in different order:

1. Define the problem.
2. Collect evidence.
3. Construct alternative solutions.
4. Select criteria for judging success.
5. Project outcomes from alternative solutions.
6. Analyse trade-offs between outcomes and estimate what impact they may have.
7. Choose the best solution.
8. Explain our recommendation.

In this report we go through the first four stages of the methodology. 1) We begin by defining the problem that our policy options should address. This step draws from mapping of key EU level policies and legal frameworks that are related to inter-regional flows (see Annex 18, annexes 1-3). 2) After this, we compare these frameworks with the preliminary empirical findings generated by the IRiE project regarding commuting flows, trade flows and capital flows. Moreover, we will identify how aligned the flows are with EU’s policy ambitions. In this stage, we also utilize data acquired from stakeholder workshops. 3) As a result, we propose set of policy options to address the gap that exist between policy ambitions and actual flows. It should be underlined that this is a preliminary formation of policy options that acts more as proof of concept. Policy options will become more extensive and refined in later iterations as more empirical data and analyses become available. 4) Finally, we propose our success criteria for our policy options. Later stages of policy option methodology (5-8) will be developed in our next report.

2.4.2.1 Defining the problem: Competence, policy conflicts and re-bordering

To perform step one, a mapping of policies and legal frameworks related to inter-regional flows was carried out (see Annex 18, annexes 1-3). While the policies to be mapped represent the policy ambitions on what a desirable society is like and how we can reach this society, the legal framework represents the current tools for achieving such a desirable society. It is worth remembering that the link between the policies and the legal framework is strong as the legal framework is a function of policies. The baseline for policy mapping regarding inter-regional flows in this report is the “four freedoms” of the European free market, which aim to ensure the free movement of people, goods, services, and capital. These have been set out in several treaties – the Treaty of Rome (1957), the Single European Act (1986), the Maastricht Treaty (1992), the Amsterdam Treaty (1997), the Treaty of Lisbon (2007), to mention a few. All these treaties have, in one way or another, an impact on the flows analyzed in this project. So have the key policies and legal framework which are presented in Annex 18, annexes 1-3. As a result of the policy and legal framework mapping exercise, we can make a preliminary definition of problems that should be considered as they potentially impact inter-regional flows. Namely, we discuss three broad EU
level problems which influence inter-regional flows: EU discretion and competence, policy conflicts and re-bordering.

**Problem 1 - EU discretion and competence**
EU has discretion and competence when it comes to economic aspects in a number of policy areas. This is especially so regarding the economic aspects of goods and capital, with numerous policies and legal regulations. When it comes to capital flows, the EU has some discretion and competence, but some issues (e.g., income tax of individuals and corporate taxation) are still in the discretion of the Member States (CEC, 2001b, 2006, 2010).

Despite the broad ambitions being targeted at the EU and a diversification in EU sector policies, social policy remains in the discretion of Member States (Rauhut and Sielker, 2021; Marques da Costa, 2021; Szyszczak, 2013; Sindbjerg Martinsen, 2013). The prevailing contradiction between the EU’s enhanced objectives in the social policy field and its under-developed competence base is not settled (Schiek, 2013). Hitherto, the EU legislator avoids forcing the Member States to clearly formulate neoliberal economic logic into their existing welfare systems (Wehlander, 2016). Without competence in the social policy area (Bauby, 2011), EU incentives can only be a complement to national policies. However, as such, EU incentives in the social policy area can still play a key role (Rauhut and Sielker, 2021).

The territorial aspect is as troublesome as the social. The EU competence in planning issues is not acknowledged in all Member States (Faludi, 2021), and the focus on polycentricity makes much of the EU approach to territorial development problematic for monocentric countries in North-Eastern Europe (Eskelinen and Fritsch, 2009). Moreover, the tool for achieving territorial cohesion is based upon the Open Method of Coordination (OMC) and soft law (Schön 2005; Schmeitz, 2005; CEC 2001a). The OMC is based on the voluntary cooperation of its member states, and rests on soft law mechanisms such as guidelines and indicators, benchmarking and sharing of best practice. This means that there are no official sanctions for laggards or ‘cherry-picking’. Rather, the effectiveness of OMC relies on a form of peer pressure, naming, and shaming, as no member state wants to be seen as the worst in each policy area (Pochet, 2005).

**Problem 2 - Policy conflicts**
Departing from a general level, conflicting or incompatible policy goals represent an underlying problem in EU policy deployment in a variety of fields. Policy conflicts occur when a policy designed to achieve a certain objective works to the detriment or at the cost of other policy goals. Policy conflicts are especially likely in highly compartmentalized or container-like sectoral policy-making. In this respect, a major challenge for the EU is to harmonise the New Cohesion Policy, New Territorial Agenda and the Green Deal place with their strong emphasis on sustainability and green development with the EU’s key legal directives such as public procurement, service, competition directives, which are based on economic values, i.e., market stimulation and economic growth. In this regard, for the inter-regional flows to become greener, market profitability and demand must be met (in the current legal framework). Similarly, a policy conflict can be identified in the Territorial Agenda 2030 between policy objectives of “a Greener, carbon free Europe” and
"More connected Europe". More connected Europe means that public services are at a reachable distance, but currently in peripheral areas this means practically use of personal car, which again does not coincide with the objectives of "Greener, carbon free Europe". In this regard, objective of "more connected Europe" can be considered to stimulate flows from periphery to centre, but no other way around, which can further deepen the shrinking of the population in peripheral regions, for example, in Northern Europe.

This already points to the problematic nature of one-size-fits-all approaches. For example, sustainability policy cannot be adapted in the same manner all over Europe. Indeed, the actions expressed in the "Green Deal" can be considered as targeted towards features of regions located in central and Eastern Europe, and do not necessarily fit the peripheral regions such as ones in Nordic countries. This is so for two reasons. Many of the EU policies strongly focus on polycentrism, which is difficult to achieve for sparsely populated monocentric countries. Moreover, as mentioned above, the allocated support from the NextGenerationEU schemes is related to the national eligibility of ESF+ and EDRF funding. Countries that are only eligible for minor support will have less funding from the Green Deal, the Just Transition Fund, the Recovery Fund, and the New Cohesion Policy. The new course of the EU with the Green Deal has also an important emphasis on the EAFRD funding that offers, among others, support for environmental actions in agriculture and fisheries (CEC 2019). EAFRD is a main source of funding, especially in Nordic peripheral regions. Especially in Nordic peripheral regions.

Problem 3 – Re-bordering
The EU also faces some fundamental challenges with regard to the future of the integration process and political climates in a number of EU Member States have turned increasingly inward-looking, which in the longer run can have significant influences on inter-regional flows. In fact, the EU currently experiences a period that is characterised by re-bordering processes. Not only Brexit has re-introduced borders in Europe, but also the refugee crisis and Covid-19 is deemed to have negative impacts on the flow of people, goods, and services (Evrard and Chilla, 2021; Faludi, 2021). Intra-EU re-bordering process does not only manifest itself in relation to refugees and Covid-19. Lithuania has since long tried to stop the outmigration from the country (Thaut, 2009).

As a recent example from rebordering process, Sweden has revoked the tax treaty with Portugal in order to stop the outflow of human capital to Portugal (Rauhut and Laine, 2020). The Swedish Government argues that Portugal has become a tax haven for Swedish pensioners who want to evade tax (Government of Sweden, 2021). With a net outmigration of less than 200 persons annually, such argument is not convincing (Rauhut, 2021). The share of the Swedish citizens permanently residing in Portugal between 20 and 64-year-old is 65 per cent, while the share of the same age-group in the Swedish population is 58 percent (Rauhut and Laine, 2020). This is an issue with far more delicate implications than one first may think. Intra-EU migrant labour will be punished through this re-bordering, which may lead to a lower intra-EU flow of people. As an example, the Portuguese intra-EU migrants can be used. If they move to countries such as France and Sweden to work, become eligible for the pension schemes in these countries, they will be
punished when returning to Portugal by the re-bordering conducted by the countries in which they have earned their pension rights. This was not how freedom of mobility was thought. This is not about tax evasion, but re-bordering to lower the flow of people and capital.

2.4.2.2 Analysing flows: Preliminary findings on trade, people and capital flows

This section summarizes early empirical findings on flows produced by different tasks of IRiE project, and reflects them with the current EU policy framework, and broader obstacles of inter-regional flows discussed in the previous section. Namely, we focus on findings from trade flows (case-study on inter-regional trade flows between Spain and the regions of France and Portugal, and the interim report of trade flows), commuting flows (interim report on commuter flows), and capital flows (interim reports on loan, FDI and remittance flows). We also present results obtained from the stakeholder workshop which was carried out to support the policy option formation process.

Trade flows

Free movement of goods has been a tenet of the EU since the beginning of the European Union as Trade Union for coal and steel. Later, free movement of goods became one of the primary pillars of the Single Market enshrined in the Single European Act and its various legal provisions. While the formation of Single Market has had generally stimulating effect on trade flows, it has also led to unwanted effects such as high concentration of trade flows between strong economies such as Germany, UK and France. This has been one of the main reasons for the inception of Cohesion Policy that aims to reduce economic disparities between Member States. Most recently UK has left the EU Single Market and Customs Union, which has effectively put an end to the free movement of goods (among persons, services, and capital), and split the EU and UK into two separate markets. Attempt to mitigate the effects of this disintegration has been somewhat achieved by the EU-UK trade agreement.

Preliminary findings on inter-regional trade flows in Europe (ESPON, 2021a) identify certain key drivers for the flows. Firstly, findings indicate that the highest trade flows in Europe are intra-national (Germany, Italy, France, UK, Spain, Poland, Switzerland, The Netherlands). These findings underline the negative influence of the border effect concerning trade flows. Identified significant drivers of international flows included contiguity of the regions (or countries that the regions belong to), membership of the European Union, and being the outermost region of the EU. These findings correspond with the gravitation equation which states that two big economies that are close to each other have more probabilities for interacting. However, this link can be weakened by various barriers such as geological obstacles. This notion was highlighted in the findings of IRiE case study on inter-regional flows on goods between Spain, France, and Portugal (ESPON, 2021f), which provide further empirical evidence on the role of geological obstructions as clear obstacles to the flow of goods between NUTS3 areas in the EU. Concerning cross-border flows, the findings underline that while the border regions in principle have higher trade flows, the natural obstacles, or isolation can moderate this effect. Findings illustrate such effect of the mountain range of the Pyrenees between Spain and France. However, similar natural obstacles to the flows
of people and goods can be found all over Europe. Another obstacle the report discusses is the isolation of border regions which can be caused, for example by animosity or distrust towards the neighbours caused by historical reasons. In addition, the cul-de-sac character of many border regions can play an important role in inhibiting cross-border flows, despite the efforts to improve cross-border infrastructures in the EU.

At the level of EU policy, the matter of natural obstacles to trade flows has been addressed in the Territorial Agenda 2030 (European Union, 2020), which states the aim to provide equal opportunities, including access to public services for people and enterprises, wherever they are located in the EU territory. Specifically, the two sub-objectives of “Balanced Europe” and “Sustainable connections” address the issue of natural obstacles: The sub-objective for “Balanced Europe” underlines the importance of unleashing the unique potential of territories with specific geographies and address the constraints of these areas through integrated and cooperative approaches. Another sub-objective of “Sustainable Connections” highlights the importance of secondary and local transport networks and their links into transnational networks and urban centres, for business opportunities, and underlines the importance of integrated territorial or local development in order to implement these approaches. Both objectives draw from territorial capital and place-based approach.

**Flows of people**

At an EU level, the free mobility of people is a key policy objective, mentioned already in the Treaty of Rome (1957). As such, it should be stimulated to the largest possible extent. Free movement of people in the EU is guaranteed by the Schengen agreements, which allow people to travel from country to country without passports. However, the free mobility of people should not include criminals, victims of trafficking, etc. In recent decades, the refugee crisis, Brexit and Covid-19 have imposed significant disruptions to the free mobility of people by a re-bordering of the internal borders. There are also signs of indirect re-bordering linked to the social insurance systems. EU citizens from several Member States are penalised when moving to the other Member States than the one in which they have earned their pension rights. In effect, this means re-bordering with the explicit aim of reducing the migration flows within the EU.

The IRIE study on inter-regional commuting flows (ESPON, 2021b) in Europe illustrates that inter-regional commuting flows in Europe mostly occur within member states, while there are some notable exceptions, especially in border regions. While inter-regional commuters have grown in the EU, there still is a persistent imbalance in certain European regions. In this regard, there was found a high concentration of both cross-border and inter-regional flows in highly connected regions in central Europe (such as border-border regions of BE-DE-FR), while flows in countries such as Scandinavian countries or Spain were found more dispersed, due to the high geographical extension of the NUTS2 regions. Highest cross-border flows were found in the Swiss regions, Luxembourg, and Liechtenstein, and the Hungarian region of Pest. Findings reinforce the understanding of volume (employees residing in the destination and origin regions) and distance as key drivers of commuter flows between EU regions (into-regional and cross-border). Other significant
drivers that were found to have statistical significance include contiguity, and innovativeness of region (attractiveness).

A key barrier that was identified in the findings was a “border deterrent effect”, referring to administrative barriers in border-crossing that limit the potential commuting flows. Indeed, as pointed out in the 7th report on territorial cohesion, (European Commission, 2017), while there has been the elimination of many institutional and regulatory barriers, borders continue to obstruct the movement of goods, services, people, capital, and ideas. ESPON State of European Territory report (2019) has proposed that commuting patterns could be facilitated by easing legal setting across borders and taking advantage of multimodal transport solutions (joint bus lines, etc.). A similar approach has been advocated by the OECD in Principles of Urban and Rural policy (OECD, 2019) to promote flexible and collaborative territorial governance and policy beyond administrative parameters where appropriate, by supporting a functional urban area approach (cities and their commuting zones). Finally, the Territorial Agenda 2030 in the sub-objective of “functional regions” has advocated an integrated multilevel governance approach to promote cooperation and networking within and between cities, towns, and their surrounding areas of the same functional region. It further emphasized that such functional regions often break with existing administrative delineations.

**Capital flows**

Free movement of capital is one of the primary pillars of the Single Market, already enshrined in the Treaty of Rome (1957). The EU’s current policy ambitions regarding capital flows are under transition in order to meet the climate and energy targets for 2030 and the objectives of the European Green Deal. This means specifically directing capital flows towards sustainable projects and green investment. The need for this transition is further amplified by COVID–19 pandemic to direct capital flows towards sustainable projects to reduce the risk of climate and environmental shocks. Another key change in policy level has been BREXIT, which implies the end for free movement of capital between, although this change has been mitigated by the EU-UK trade agreement.

The free mobility of capital, is, in effect, a restricted mobility. Of course, tax evasion, money laundering and other criminal actions related to capital flows should be restricted and hence not the target of questioning. In reality, the free mobility of capital flows relates to the capital flows between enterprises while capital flows related to people is more restricted. As mentioned in previous section regarding flows of people, citizens from several Member States are penalised when moving to other Member States than the one in which they have earned their pension rights. If a person has earned a pension right, that person should not be penalised when moving to another Member State. Such re-bordering by some Member States will challenge not only the free mobility of people, but also the free mobility of capital. The underlying problem relates to the division of discretion/competence between the EU and the Member States in the fiscal policy area. As core state areas, fiscal and monetary policy are in the hands of the Member States and if they give
discretion/competence to the EU they undermine their own legitimacy (Schelkle 2014). The economic crises many Euro countries have experienced are also crises of economic governance in the EU (Jabko 2014).

The IRiE studies on loans (ESPON, 2021e), FDI (ESPON, 2021c), and remittances (ESPON, 2021d) presents preliminary evidence on capital flows in Europe. Firstly, findings on loan flows indicate further integration of European regional economies, but also points out that the securitization market in Europe is not yet fully developed as all EU countries do not participate with the same intensity. Findings on FDI highlight the strong spatial concentration of FDI flows in Western European countries, but also show that the highest positive changes can be found in Eastern European countries. Findings on remittance flows indicate that flows have been persistent regardless of economic crisis.

At the general level, findings on capital flows display a resilience between 2010 and 2018. However, as pointed above beyond this period there have been events, such as BREXIT, COVID–19 pandemic, and European Green Deal, which have had high impact to capital flows, and continue to bring uncertainty of the structure of international capital flows in Europe.

Stakeholder involvement
To support the process of forming policy options and ground it to issues that regional and national stakeholders face regarding inter-regional flows, we apply stakeholder involvement methodology (Annex 18, annex 5). The first time to implement our involvement methodology was carried out as part of IRiE online workshop organized on 25.05.2021, where national and regional stakeholders participated from Greece, Ireland, Poland, Spain, and Finland. The method utilised in the workshop was a website-based collaborative tool (Padlet) which allowed participants to share responses simultaneously i.e., seeing each other responses in real-time. The central objectives of our questions were to identify 1) what impact the disruption of the flows has on the regions/countries of the participants, 2) how participants consider the role of EU policy in alleviating the effect of it, and 3) what competence their organization has in dealing with disruptions of the flows (full list of question in Annex 18, annex 4).

Preliminary analysis of the results showed that the expectations of the New Territorial Agenda, Cohesion Policy, the Green Deal, the Recovery Fund, and the Just Transition Fund are high. At the same time, the stakeholders have varying experiences of the outcomes so far. Both the key EU policies and as well as disruptions for many flows to and from the regions impact regional development from a strategic point of view. Few alternatives exist to deal with disruptions at a regional level and especially economic aspects play a key role if the organisations the stakeholders represent must revise their goals and ambitions.

For the next step regarding stakeholder involvement, we will organize a workshop targeted for policy experts for different EU organs such as Committee of Regions, and DG Regio in autumn 2021.
2.4.3 Results

The policy options proposed here operate at two levels. While one level addresses the EU-level, the other level targets the flows analysed in this project. In some cases, the proposed policy options may cause both dilemmas and dichotomies, and in these cases, we will propose suggestions on how to mitigate or solve these situations.

2.4.3.1 Trade flows

Policy option 1 – Assessment of the impact of sustainable development goals on trade flows

Trade flows can be expected to be impacted by current EU policy that emphasizes sustainable development and green economy. This is relevant especially for the trade flows that produce high amount of emissions, such as shipping and air freight. Indeed, the transport sector has currently the lowest share of renewable energy use and it can be expected that, for example, the extension of emission trading schemes to sectors such as shipping might have differentiated impacts on EU countries and regions (i.e. stronger impact on regions that rely on shipping as a main mode of transport).

Policy option 2 – Utilization of accurate geo-referenced data

Crucial step in forming policy level interventions to overcome geographical and historical burdens of trade flows must start with the acknowledgement of the need for better understanding of the dynamics of mobility of the flows to support the strategic development of these regions (ESPON, 2019). The findings of IRiE project contributes towards this objective, and further underline the necessity for deepen the understanding of inter-regional trade flows in border and outermost regions. Further analyses of the IRiE project are expected to contribute towards this objective.

Policy option 3 – Revision of the quality of regulatory framework

New and changing regulations continue hinder trade flows in Europe. This matter has been worsened by recent COVID-19 crisis and BREXIT which have brought about rebordering processes that have further imposed changes in regulatory frameworks. In these regards, quality of regulatory framework concerning trade flows must be revised to mitigate the presence of non-tariff barriers to trade between countries and sub-national entities.

2.4.3.2 Flows of people

Policy option 1 – Promotion of multilateral agreements on social policy, welfare and taxation between Member States to deepen the integration

The fact that the EU has no competence in social policy and social insurance issues, has is some extent contributed to the re-bordering. Social issues do impact the willingness to migrate/commute, both in the place of origin and destination. For time being there is no majority of the Member States in favour of a coordinated approach to social policy-oriented issues. Multilateral agreements between the Member States that see benefits from coordinated social policy, welfare and taxation related issues could be applied to achieve a deeper integration.

Policy option 2 – Promotion of multilateral agreements between Member States to facilitate cross-border commuting flows
The IRIE case study report on commuting flows indicates that some of the highest cross-border commuting flows were found in the regions of Swiss border and Liechtenstein. What unites these regions is that there is only partial political integration: Whereas the full personal mobility is guaranteed via the absence of border controls inside the Schengen Area, domestically dominated regulations ensure attractive labour markets on the side of the border. In this regard, as pointed out in a recent study by Evrard and Chilla (2021), *a certain mix of political integration and non-integration lead to the highest cross-border dynamics*.

**Policy option 3 – Reduction of commuting flows by supporting distant/multiplace work possibilities**

Currently, the EU is heavily investing towards more "Greener Europe" (Green Deal, New Cohesion Policy, New Territorial Agenda), which advocates reducing the transportation emissions in order to meet sustainable development targets. Additionally, COVID-19 crisis has dramatically cut commuting, and has brought about "new normal" in working life, where multi-place work becomes more common place. In these regards, *policy options that aim to reduce commuting flows, or support multiplace working become more salient*. This option is valid only for certain work sectors, where physical presence is not necessary.

2.4.3.3 **Capital flows**

**Policy option 1 – Promotion of multi-lateral tax agreements between Member States**

The issues related to discretion/competence between the EU and the Member States as well as the economic governance problems have an impact on capital flows between the Member States. A common fiscal and monetary policy, with discretion and competence handed over to the EU from the MS is not on the political agenda and is unlikely to emerge on it during a foreseeable period. If the EU cannot agree on common tax rules for private people and enterprises, *the Member States should be encouraged to engage in multi-lateral tax agreements to avoid negative effects on the mobility of people in general* and, specifically, the intra-EU mobility of labour. The countries entering such multi-lateral agreements will become more attractive for intra-EU labour migrants and enterprises.

2.4.3.4 **Success criteria**

Evidence based evaluation models measure the impact of an intervention by looking at the causality, namely: input → output → outcome → impact. In order to understand and explain why an intervention succeeds or fails, we simply need to understand what happens in the “black box”, i.e., the policy processes that lead to certain impacts (Astbury & Leeuw, 2010). As the flows of people, capital, goods, services and knowledge between the Member States are highly politised and dependent on what happens in the “black box” of policy processes, success criteria need to be related to (policy) processes. Hence, success should not only be measured in terms of direction and magnitude of flows, but also to how the processes address issues related to (dis)integration, de/re/bordering and discretion. Solutions breaking a stalemate and moving the process for-
ward towards the overarching objective of the EU must be considered positive. If the same solu-
tions also lead to increased flows, economic, social and territorial cohesion and a deeper integra-
tion between the Member States, such a solution should be considered a success.

This approach to success criteria is pragmatic. There is no breakpoint to which success or failure emerges in terms of output, outcome or impact. Rather, success is related to the integration pro-
cess in which the Member States are involved and the flows of people, capital, goods, services
and knowledge between them evolve.

2.4.4 Conclusions
What we have done in this Interim Report is to outline a preliminary set of policy options. These
policy options will be further elaborated in the draft Final Report. In this Interim Report, we have
focused on the first four steps in the policy options methodology we use; all eight steps will be
applied in the draft Final Report. Since we only have the preliminary flow findings available, it is
not possible to estimate the fifth step in the model. We can, however, tentatively, say a few words
about the possible policy solutions and the rationale for choosing them.

For the time being, it is not possible to stop the ongoing disintegration and re-bordering we can
identify. However, the Member States who are willing to enter a deeper integration, de-border,
and remove all obstacles to deeper integration, should be encouraged to do so through multilat-
eral agreements. Such a process would stimulate the flow of people, capital, goods, and services
between these Member States. The Schengen Agreement is a good example of such a multilat-
eral agreement.

The argument for choosing “multilateral agreements” as a policy option is that contrary to the
OMC, it is a legally binding agreement between countries. Moreover, the Member States that
want to achieve a deeper integration between their countries can do so without those that do not
want any deeper EU integration can obstruct the process.

2.5 Task 5. Project management and outreach

2.5.1 Project management
Since project started the team has worked in a coordinated way, showing enthusiasm and interest
in addressing the research challenges and making communication and collaboration between
partners easy and productive. Rather than reportable incidents, we expect the consortium to con-
tinue working smoothly and proceeding apace to the next tasks. Risks in the project remain me-
dium to low, tending to low, thanks to the mitigation measures in place. The following table sum-
marises the meetings held since the kick-off meeting, which have been the key to overcome the
difficulties imposed by COVID-19 travel limitations.
Table 2.5: List of meetings held from the kick-off of the project.

<table>
<thead>
<tr>
<th>Coordination meetings</th>
<th>Participants</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kick-off meeting online</td>
<td>RESEARCH TEAM &amp; ESPON EGTC, PST</td>
<td>22/04/2020</td>
</tr>
<tr>
<td>Project team meeting 1 online (internal kick-off) - Moving</td>
<td>All partners</td>
<td>27/04/2020</td>
</tr>
<tr>
<td>Backwards</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project meeting (overview) online</td>
<td>NASUVINSA &amp; ESPON EGTC</td>
<td>11/05/2020</td>
</tr>
<tr>
<td>Project meeting (online tools) online</td>
<td>NASUVINSA &amp; ESPON EGTC</td>
<td>13/05/2020</td>
</tr>
<tr>
<td>Provide a framework with specific issues related to COVID19</td>
<td>ESPON</td>
<td>26/05/2020</td>
</tr>
<tr>
<td>that might be included in the scope of the project</td>
<td></td>
<td></td>
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<tr>
<td>Project team meeting 2 online</td>
<td>All partners</td>
<td>28/05/2020</td>
</tr>
<tr>
<td>Coordination meeting 1 online (D1)</td>
<td>RESEARCH TEAM &amp; ESPON EGTC, PST</td>
<td>19/06/2020</td>
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<td>Project team meeting 3 online</td>
<td>All partners</td>
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<td>All partners</td>
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<td>All partners</td>
<td>27/08/2020</td>
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<td>Proposal to deal with COVID19 both in the implementation</td>
<td>NASUVINSA</td>
<td>04/09/2020</td>
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<td>Project team meeting 6 online</td>
<td>All partners</td>
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<td>RESEARCH TEAM &amp; ESPON EGTC, PST</td>
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<td>All partners</td>
<td>23/12/2020</td>
</tr>
<tr>
<td>Project meeting online</td>
<td>NASUVINSA &amp; ESPON EGTC</td>
<td>12/01/2021</td>
</tr>
<tr>
<td>Project meeting 10 virtual</td>
<td>All partners</td>
<td>28/01/2021</td>
</tr>
<tr>
<td>Coordination meeting 3 online (D3)</td>
<td>RESEARCH TEAM &amp; ESPON EGTC, PST</td>
<td>11/02/2021</td>
</tr>
<tr>
<td>Project team meeting 11 virtual</td>
<td>All partners</td>
<td>25/02/2021</td>
</tr>
<tr>
<td>Project team meeting 12 virtual</td>
<td>All partners</td>
<td>25/03/2021</td>
</tr>
<tr>
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<td>NASUVINSA &amp; ESPON EGTC</td>
<td>25/03/2021</td>
</tr>
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<td>22/04/2021</td>
</tr>
<tr>
<td>Technical meeting: typologies and EA</td>
<td>NASUVINSA &amp; ESPON EGTC</td>
<td>29/04/2021</td>
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<td>30/04/2021</td>
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<td>27/05/2021</td>
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<td>NASUVINSA &amp; ESPON EGTC</td>
<td>10/06/2021</td>
</tr>
<tr>
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<td>All partners</td>
<td>25/06/2021</td>
</tr>
</tbody>
</table>
2.5.2 Strategic Advisory Group (SAG)

During the first SAG meeting (May 20th 2021), the IRiE consortium had the opportunity to present and explain to the representatives of several top European organisations (JRC, OECD, DG Regio, CoR, and the Government of Navarra) the scope and main points of the project.

The audience agreed on the need of filling the current gap in the data about interregional relations in Europe and remarked the relevance of this research when it comes to foreseeing and drafting territorial policies for regional development.

Currently, the project has passed its half-way mark. Task 1, dedicated to developing the methodology to get the data and build the origin-destination matrixes is almost completed. This means that in this part there is not that much manoeuvring room to apply structural changes or include substantial modifications to the conceptual framework. However, whenever possible and realistic according to the timeframe and budget, the consortium is open to apply the SAG ideas in this respect and improve the quality of the works, as explained in each section below.

All in all, the SAG qualified positively the progress and preliminary outcomes of Task 1, making special emphasis on the complexity of getting the interregional data. It is really challenging to compile data from different sources and develop a proper methodology to create the matrixes.

The works related to Tasks 2, 3 and 4 are just starting. In this case, the feedback from the SAG will be used to get the best out of our activities, considering the route map and budget.

The SAG insights on these tasks are described below, collected and structured according to the main blocks of the project and the questions provided in the meeting agenda. As expected, the guidance given by the experts was elaborated according to their own interests and expertise. The result is a complete list of insights on different aspects of the project that will help the research team to get the best out of the activities being developed in the coming months.

- Summary of data sources, methodologies and expected results and innovations in the project.

SAG QUESTION: What is the best approach to include interregional statistics as part of the official statistics at the EU, national and regional levels?

The SAG agreed on the need of making interregional data available through official institutions. This is certainly a challenging process, but IRiE is paving the way to get there. In fact, the research team, besides developing an ad-hoc methodology for each flow to build the region-to-region (R2R) matrixes, is also including a specific section in all reports with several remarks to data providers. The aim is to share the obstacles, barriers found in carrying out these works to improve the quality and accessibility to the raw data used, and thus, improve the quality and coverage of the interregional flows in Europe.

In line with the activities planned in this phase of the project, the experts gave several clues to add value to the research. On the one hand, they emphasized the need of incorporating some explanatory factors on the ‘drivers and barriers’ analyses, such as demographic changes (e.g.,
depopulation and ageing), typologies (e.g., urban/rural, border regions, etc.) and others (e.g., quality of governance). They also made comments on data sources, like Amadeus, highlighting possible limitations to take into account to avoid bias on the results. On the other hand, special attention was paid to the Erasmus flows and the time series presented. It is of primary importance to extend the period of study to capture the Brexit or COVID-19 impacts. Moreover, in this regard, there was a vivid debate on the suitability of using Erasmus data to monitor knowledge flows. Some of the experts pointed out the appropriateness of considering other indicators, such as researchers and professors’ mobility data (Marie Curie actions, CORDIS database). Lastly, the sectoral disaggregation of certain flows was also debated.

The consortium committed to include the aforementioned explanatory variables in the corresponding analyses. They also expressed their opinion and knowledge on the data sources used, being aware of the limitations and virtues of working with them. In the case of Erasmus, we will keep analysing these flows, expanding the dataset till 2020 or beyond, if possible. This has been always our initial plan, but due to some issues out of our reach, we do not have these data yet. We will be able to show more results about this topic in our next SAG meeting. About the recommendation of considering other knowledge indicators, the consortium sees the potential of the CORDIS data and will try to dive into them. Finally, the sectoral disaggregation will be covered in the study of some flows such as FDI, goods and services.

- Flow Mapper tool.

SAG QUESTION: What kind of contributions can visualisation tools bring to the analysis of flows?

The experts’ panel enjoyed the demo of the Flow Mapper tool. They highlighted the design and the performing options it offers users to create customized maps according to their needs. At the same time, they requested to include context to the shown data. In other words, they must provide not only maps and graphs but also storytelling. At that point it was clarified that the Flow Mapper is an internal-use tool conceived to help partners better present and explain their outcomes. As far as its original purpose was only for internal use, the tool was not designed to make storytelling. However, this tool is only the tip of the iceberg of a broad range of online tools that the consortium is working on to provide the functionality requested by the SAG and ESPON. It is probable that for the next coming SAG meeting in autumn we can show our progress in this regards, although the deadline for these tasks is established later in the project.

- List of case studies.

SAG QUESTION: What is your suggestion to get the best out of these Case Studies with regard to future policy options at different levels (EU, national, regional)? i.e. Territorial Cohesion and Regional Development Strategies

Currently, the list of case studies is already closed. The SAG expressed their interest in several questions of the selected examples and contributed with interesting considerations. The experts
encouraged the leaders of the different studies to make the effort to link the insights and conclusions of this task to the regional development strategies. For them, it was especially important to keep in mind the target audience, to reach properly stakeholders and policymakers to get the expected impacts of our research. In this sense, they emphasised the need to apply a policy-oriented approach and be clear in the description of likely policy implications. Here, specific advice was related to the possibility of involve somehow representatives from the Euroregions (e.g., EGTC Nouvelle-Aquitaine, Euskadi and Navarra if we consider the case study on flows of goods between Spain and France and Portugal). Another interesting suggestion was to keep always a focus on the value chains and the regional resilience (e.g., to reduce the km per ton or €, link the routes of the flows to pollutants’ emissions, consider transition regions that are affected by transport but are neither the origin nor the destination, etc.) Some of these points also applied to the scenarios case studies, still in definition.

All these recommendations were very welcomed by the IRIE consortium and will be taken into account when possible. Bearing in mind the case study on flows of goods between Spain and France and Portugal, several points arose to enlarge the study. However, this is the first example presented to ESPON and is almost finished. The contributions made would undoubtedly help to improve and complete the analysis, but they cannot be addressed in the short term in the framework of the IRIE project.

Considering the suggestions related to reach a suitable audience and pay special attention to policy implications, the consortium informed of a series of actions already planned in the communication and dissemination strategy of the project. On the one hand, we are going to present the results and relevance in terms of policy options of our case studies in different events, such as the Slovenian and French presidencies and dedicated workshops, like the one we are organising for the European Week of Regions and Cities (proposal already accepted). Further actions might be conceived in this regard with the aim of making our outcomes as useful as possible.


SAG QUESTION: What is your suggestion to get the best out of these Scenarios with regard to methodology and future policy options at different levels (EU, national, regional)?

SAG QUESTION: In your opinion, which are the key stakeholders at EU, national and regional level?

SAG QUESTION: How do we best engage with key stakeholders?

At this stage of the project, and bearing in mind that the scenarios activities have just started, it was very interesting to get feedback from the SAG. Brexit, COVID-19, New Globalisation and Green Deal are the four scenarios selected to deal with in the framework of IRIE. Because the case studies associated with these scenarios are still in definition the experts could not go into specific details but on the contrary, they focused on broader aspects related to this task. This fact far from being an obstacle was evaluated as a positive point since most of the recommendations made by the SAG might be more easily addressed than those made for almost finished tasks.
Some of the comments arisen in this regard were linked to the need of considering, for example, the innovation diffusion effects, the integration of different regional strategies or to boost the international attractiveness of regions for increasing investments. Related to the later, the experts’ panel also advise us to take into account the governance dimension and the institutional relations. These are important factors when it comes to evaluating which is the best place to invest. On the other hand, there were some ‘key words’ that emerged several times during the meeting as significant topics to keep in mind: territorial cohesion, value chains, commuting, cross-border effects, multinational environment, innovation, combination of investments, investment policies, relations with China and US, resilience, time series of data to assess COVID-19 and Brexit impacts, etc. Although some of them are scenario-specific, others are applicable to all of them.

Similarly to the case studies, the SAG remarked the importance of involving stakeholders as well as national and local representatives in the building of the scenarios, the definition of the assumptions and key questions that must be covered. In this case, in comparison with the other case studies, we would push the envelope since we would count on the final users for the development of this task from the beginning. This parallel approach will allow us to know the final users’ needs and requirements beforehand, making a more accurate analysis of scenarios possible, and getting more meaningful outcomes with a bigger impact on the target audience.

The research team was very grateful for this helpful feedback and committed to consider all the suggestions in the development of the scenarios and the selection and definition of the related case studies. Moreover, they explained to the attendees that with the aim of engaging with stakeholders a scenarios’ workshop had been organised. In fact, the scenarios’ workshop will be divided into two or three days (May 2021, September-October 2021, 2022). This way the regional and national authorities will be able to participate throughout the process. The SAG members are also invited to join the scenarios’ group and the associated events and activities if they consider it appropriate. The next meeting of the SAG will be in October 2021 to discuss D4+ materials.

Table 2.6: List of organizations and potential representatives for the SAG.

<table>
<thead>
<tr>
<th>REPRESENTATIVE</th>
<th>ORGANISATION</th>
<th>SPECIFIC ROLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marie Lorraine Dangeard</td>
<td>ESPON PST</td>
<td>Oversee conformity of project to ESPON needs</td>
</tr>
<tr>
<td>Giovanni Mandras</td>
<td>JRC</td>
<td>Oversee conceptual framework and scientific approach and methods of analysis</td>
</tr>
<tr>
<td>Jayne Woolford</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Giampaolo Lanzieri</td>
<td>EUROSTAT</td>
<td>Oversee data gathering and treatment process</td>
</tr>
<tr>
<td>Deidre Forde</td>
<td>Committee of the Regions</td>
<td>Ensure that policy needs at the regional level are addressed</td>
</tr>
<tr>
<td>Laura de Dominicis</td>
<td>DG REGIO</td>
<td>Ensure that policy needs at the national and EU level are addressed</td>
</tr>
<tr>
<td>Varinia Michalun</td>
<td>OECD</td>
<td>Oversee conceptual framework and scientific approach and methods of analysis</td>
</tr>
<tr>
<td>Sergio Pérez García</td>
<td>Regional authorities</td>
<td>Ensure that policy needs at the regional level are addressed</td>
</tr>
</tbody>
</table>
2.5.3 Online tools

The goal of the online tools is to increase awareness and facilitate the use of ESPON IRIE results to policy makers and the scientific community. To that end, we have created a specific section in the ESPON Programme website (available at https://irie.espon.eu). The new thematic portal will display data and maps using appealing visualization techniques and will use story telling techniques.

2.5.3.1 Draft design (product backlog)

This section presents a draft design of the IRIE thematic portal that will be implemented in the following months (D4+/D5). The design makes use of the innovative visualization solutions proposed by the Flow Mapper (see section 2.1.1) as well as the proof of concept prepared during proposal preparation.

The current proof of concept, available at https://irie.espon.eu, is implemented as an ArcGIS Hub hosted in ArcGIS Online and makes use of different web GIS tools (web Feature Services, Web maps, Story maps and Dashboards). It has the following structure (red highlights to differentiate elements).

Figure 2.13: IRIE portal proof of concept with structure highlighted in red.
In the following paragraphs we describe the proposed design departing from the proof of concept and the Flow Mapper.

**Logo**

The ESPON logo and brand will be used in the IRIE thematic portal.

**Search**

All the documents, data and maps available in the portal will be available in the search tool.

**Top menu**

This element will be used to deploy transversal elements in the project. The proposed items in the top menu are:

- **Home**
- **Regional info sheets:** this item will link to a page with a web map that will give access to the info sheets of every region in ESPON Space.

**Figure 2.14: draft of web map to access infosheets.**

- **Stakeholder engagement:** this item will link to a page with three cards, each card will give access to a page with specific content.
  - Strategic Advisory Group
  - Scenarios workshops
  - Policy workshops
- **Case studies:** this item will link to a page with two cards:
  - Flows: One card per T1.6 case study.
  - Scenarios: One card per T3 case study.
- **Outreach:** this item will link to a page with several cards with materials and events:
  - Project brief
  - Videos with IRIE results
  - EWRC
  - Event XY
Content cards
This element will be used to provide access to focused products. The items (and sub items) proposed as content cards are:

- Flow Analysis: this item will include the results of Task 1 in IRIE project.
  - Input-Output tables
  - Trade
    - Goods
    - Services
  - People
    - Migration
    - Tourism
    - Commuting
  - Capital
    - FDI
    - Remittances
    - Loans
  - Knowledge
    - Erasmus students
    - H2020
    - Patents
- Typologies: this item will present the key results of Task 2 in IRIE project.
- Scenarios: this item will present the key results of Task 3 in IRIE project in several cards.
  - Brexit
  - COVID-19
  - New Green Deal
  - New Globalisation
- Policy options: this item will present the key aspects of Task 4 in IRIE project.

For each of the case studies, flow analysis, typologies and scenario cards we will display a page with the following content:

- Link to the specific report.
- Explanation of the product and brief analysis
- Dashboard with key content (interregional relations, sectoral disaggregation, time series), using dynamic maps, graphs and indicators in different widgets.
2.5.3.2 Work plan (monthly releases)

The IRIE thematic portal will be open to the general public after testing with partners and stakeholders (during SAG, Scenarios and Policy workshops) and validation by ESPON EGTC. Meanwhile, IRIE content (in progress) will be accessible using username and password. During the configuration of the portal any user with credentials will be able to view the ongoing improvements in real time. In the next table we show the monthly release plan for the different items in the portal.

Table 2.7: Monthly releases.

<table>
<thead>
<tr>
<th>Item</th>
<th>Deadline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure: front page and pages with cards (including images)</td>
<td>September 2021</td>
</tr>
<tr>
<td>Flow Analysis Dashboards</td>
<td>October 2021</td>
</tr>
<tr>
<td>Typology Dashboard</td>
<td>November 2021</td>
</tr>
<tr>
<td>Stakeholder engagement page</td>
<td>November 2021</td>
</tr>
<tr>
<td>Outreach page</td>
<td>November 2021</td>
</tr>
<tr>
<td>Case studies (page and first round)</td>
<td>January 2022</td>
</tr>
<tr>
<td>Scenarios Dashboard</td>
<td>February 2022</td>
</tr>
<tr>
<td>Case studies (second round)</td>
<td>March 2022</td>
</tr>
<tr>
<td>Regional Infosheets page</td>
<td>April 2022</td>
</tr>
<tr>
<td>Policy options Dashboard</td>
<td>May 2022</td>
</tr>
</tbody>
</table>

2.5.4 Outreach

In this section we present the outreach activities developed after D3.
2.5.4.1 Press releases and social media
After every coordination project meeting and the SAG meeting, the consortium has prepared press releases and social media posts in close cooperation with ESPON EGTC. These communication actions focus on the objectives and achievements (results) of ESPON IRiE.

2.5.4.2 Videos
A short video has been published in Youtube (https://www.youtube.com/watch?v=jCAPGtHXeMg) explaining the project objectives and expected results. This is the first in a series of videos with project results that will be circulated through social media and in events where the project is presented (e.g. SAG, stakeholder meetings, etc.). Besides these simple videos, a professional video will be created when all results in the project are obtained to facilitate dissemination and visibility among IRiE target audience.

2.5.4.3 Policy brief
As explained in section 2.1.15, this Interim Report contains the first draft of a Policy Brief aimed at presenting the state of the art of interregional statistics in Europe. The Policy Brief addresses the following key policy issues:

- There is an urgent need of establishing a data policy at the regional scale, as coherent as possible on the NUTS 2 scale, and if possible on the NUTS 3 scale.
- It is important to build new comprehensive and reliable interregional evidence to go beyond the existing regional data monitoring and collection framework (the European Statistical System).
- Because of its potential use and policy relevance, interregional data should feed the intergovernmental debate on future territorial development policies. Similarly, they should inform future debates on convergence for a deeper and fairer economic and monetary union.

2.5.4.4 Events
**EWRC**
The EWRC has accepted a session with title “Interregional relations in Europe: will the COVID pandemic result in deeper interdependencies or in increased divergence between regions?”. This session was proposed by NASUVINSA under guidance from ESPON EGTC. In the following months, the session will be promoted among IRiE target audience (scientists and policy makers) while the required materials (including video testimonials) are prepared. At the core of this session is the presentation of several case studies/policy briefs: Goods transport between Spain, France and Portugal (section 2.1.14); Interregional statistics in Europe (section 2.1.15); Erasmus students flows (D4+).

**Closure event**
After the ESPON events linked to the EU Presidencies are held, a final conference will be celebrated in Pamplona, Navarra, Spain, in June/September 2022, aimed at the IRiE target audiences (scientists and policy makers). The arrangements for this event have started (venue, agenda, etc.) The idea is to co-organise this event between ESPON EGTC, JRC and ERSA.
Other events
A proposal was submitted to present the case study on interregional flow of goods between Spain, France and Portugal (specifically its online tool) in the GeoEuskadi Conference in October 2021 (https://www.geo.euskadi.eus/iicongreso-geoeuskadi-2021/s69-geodir/es/).

2.5.4.5 Project brief with main interim results and key maps and figures (PPT)
The consortium has updated the PPT presentation delivered in D3 with new results obtained during D4 preparation. See file ESPON-IRiE_Project_Brief_20210122.pptx.

2.5.4.6 Scientific papers
To increase visibility of project results among the scientific community, we are planning to publish a book in Springer’s collection Advances in Spatial Science (https://www.springer.com/series/3302).

Moreover, we plan to finance at least one special issue in a WoS-1st quartile magazine, such as Economic Geography, Journal of Economic Geography, European Economic Review; Cambridge Journal of Regions, Economy and Society, etc.
3 Data

In this section we briefly describe the data obtained and prepared at the country-to-country (C2C) and region-to-region (R2R) for this fourth deliverable, which is presented in a systematic way in a set of Excel files, according to the methodologies described in section 2.1.

The information collected here is complementary to the one provided in the page ‘Dictionary’ within each of the Excel files. All the data covers the whole sample of interest in this project, to say, the EU27 plus UK, Norway, Lichtenstein, Island and Switzerland.

Besides the data matrixes, we deliver a File Geodatabase “IRIE.gdb” that contains a Feature Class named “NUTS_LB_2016_3035_OriginDestinationLinks”. This feature class includes the vectors connecting origins and destinations. This feature class will be extensively used in the online tools (see section 2.5.3).

Table 3.1: Benchmark data provided at the country to country (C2C).

<table>
<thead>
<tr>
<th>Name of the files (xlsx)</th>
<th>Content</th>
<th>Source</th>
<th>Comments</th>
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<tbody>
<tr>
<td>capital_fdi_c2c</td>
<td>Foreign direct investments (FDI). Shareholders’ funds</td>
<td>Bureau van Dijk Ama-deus Data-base</td>
<td>Bilateral flows of shareholders’ funds (thousands of euro)</td>
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<tr>
<td>capital_fdi_c2c_OECD</td>
<td>Foreign direct investments (FDI). FDI inward positions</td>
<td>OECD</td>
<td>Bilateral flows of FDI inward positions (mil.euro)</td>
</tr>
<tr>
<td>capital_fdi_c2c_IMF</td>
<td>Foreign direct investments (FDI). FDI inward positions</td>
<td>IMF</td>
<td>Bilateral flows of FDI inward positions (mil.euro)</td>
</tr>
<tr>
<td>capital_fdi_c2c_Eurostat</td>
<td>Foreign direct investments (FDI). FDI inward positions</td>
<td>Eurostat</td>
<td>Bilateral flows of FDI inward positions (mil.euro)</td>
</tr>
<tr>
<td>capital_rents_remit_tance_c2c_WB</td>
<td>Bilateral Remittances</td>
<td>World Bank</td>
<td>Bilateral Remittance Estimates (mil.euro)</td>
</tr>
<tr>
<td>capital_rents_remit_tance_c2c_Eurostat</td>
<td>Bilateral Remittances</td>
<td>Eurostat</td>
<td>Personal remittances (personal transfers and compensation of employees), total inflows</td>
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<td>knowledge_erasmus_c2c_v2</td>
<td>International student exchanges, Erasmus+ programme</td>
<td>European Commission, EU Open Data Portal</td>
<td>2009-2010 to 2013-2014, number of students sent and received per country.</td>
</tr>
<tr>
<td>H2020_C2C_delivery</td>
<td>Horizon 2020 partnerships</td>
<td>CORDIS/European Commission</td>
<td>Partnership pairs in H2020 projects in which the coordinating partner is defined as sender and the participant partners are receivers. 2015-2020.</td>
</tr>
<tr>
<td>Freight flowsROAD_c2c_v1</td>
<td>Transport flows of goods by road (in tons). 2010-2018.</td>
<td>Eurostat. ERFT.</td>
<td>Bilateral flows based on the ERFT microdata. No constrained by trade statistics</td>
</tr>
<tr>
<td>Name of the files (xlsx)</td>
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<td>Comments</td>
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<tr>
<td>Railfreight_C2C_v2.xlsx</td>
<td>Freight flows by rail (in tons), 2010-2018</td>
<td>Own elaboration based on Eurostat</td>
<td>Substantial processing of raw data necessary</td>
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<tr>
<td>Airfreight_BRD_C2C_v2</td>
<td>Freight flows by air (in tons), 2010-2018</td>
<td>Own elaboration based on Eurostat</td>
<td>Substantial processing of raw data necessary</td>
</tr>
<tr>
<td>Maritimefreight_C2C_v2</td>
<td>Maritime freight flows (in tons), 2010-2018</td>
<td>Own elaboration based on Eurostat</td>
<td>Substantial processing of raw data necessary</td>
</tr>
<tr>
<td>Freight flows_TO-TAL_c2c_v1</td>
<td>Transport flows of goods by all modes (in tons), 2010-2018</td>
<td>Own elaboration based on Eurostat and other sources</td>
<td>Bilateral flows obtained by the aggregation of the corresponding matrices for road, railway, ship, air. Intra-national and inter-national flows.</td>
</tr>
<tr>
<td>Trade flows_TO-TAL_c2c_v1</td>
<td>Trade flows of goods. Total (in Mill. €). 2010-2018</td>
<td>Own elaboration based on several sources: BACI; COMEXT; Eurostat transport statistics</td>
<td>Bilateral flows obtained by the aggregation of the corresponding matrices for road, railway, ship, air, others. Intra-national and inter-national flows.</td>
</tr>
<tr>
<td>Trade flows_AIR-CRAFT_c2c_v1</td>
<td>Trade flows of goods by air (in Mill. €). 2010-2018</td>
<td>Own elaboration based on several sources: BACI; COMEXT; Eurostat transport statistics</td>
<td>Bilateral flows by air (all products). Intra-national and inter-national flows.</td>
</tr>
<tr>
<td>Trade flows_ROAD_c2c_v1</td>
<td>Trade flows of goods by road (in Mill. €). 2010-2018</td>
<td>Own elaboration based on several sources: BACI; COMEXT; Eurostat transport statistics</td>
<td>Bilateral flows by road (all products). Intra-national and inter-national flows.</td>
</tr>
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<td>Trade flows_SHIP_c2c_v1</td>
<td>Trade flows of goods by ship (in Mill. €). 2010-2018</td>
<td>Own elaboration based on several sources: BACI; COMEXT; Eurostat transport statistics</td>
<td>Bilateral flows by ship (all products). Intra-national and inter-national flows.</td>
</tr>
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<td>Trade flows_TRAIN_c2c_v1</td>
<td>Trade flows of goods by train (in Mill. €). 2010-2018</td>
<td>Own elaboration based on several sources: BACI; COMEXT; Eurostat transport statistics</td>
<td>Bilateral flows by train (all products). Intra-national and inter-national flows.</td>
</tr>
<tr>
<td>Name of the files (xlsx)</td>
<td>Content</td>
<td>Source</td>
<td>Comments</td>
</tr>
<tr>
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<td>---------</td>
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<td>----------</td>
</tr>
<tr>
<td>Trade flows_OTHER_c2c_v1</td>
<td>Trade flows of goods by other/unknown transport mode (in Mill. €). 2010-2018.</td>
<td>Own elaboration based on several sources: BACI; COMEXT; Eurostat transport statistics</td>
<td>Bilateral flows by other/unknown transport mode (all products). Intra-national and international flows.</td>
</tr>
<tr>
<td>Trade flows_NST1_c2c_v1</td>
<td>Trade flows of goods. Product NST1. All transport modes (in Mill. €). 2010-2018.</td>
<td>Own elaboration based on several sources: BACI; COMEXT; Eurostat transport statistics</td>
<td>Bilateral flows. Intra-national and international flows. Product NST1. All transport modes.</td>
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<td>Trade flows_NST5_c2c_v1</td>
<td>Trade flows of goods. Product NST5. All transport modes (in Mill. €). 2010-2018.</td>
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<td>Bilateral flows. Intra-national and international flows. Product NST5. All transport modes.</td>
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<td>Trade flows_NST10_c2c_v1</td>
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<td>Services flows_TOTAL_c2c_v1</td>
<td>Trade flows of services. All service sectors (EBOPS-2010-1st level) in Mill. €. 2010-2018.</td>
<td>Own elaboration based on several sources: BACI; TIS; TISMOS (WTO-UNCTAD-OECD); FII-GARO (JRC)</td>
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<td>Trade flows of services. Service sectors: SL (EBOPS-2010-1st level) in Mill. €. 2010-2018.</td>
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<td>Rail passenger flows, 2010-2018</td>
<td>Own elaboration based on Eurostat</td>
<td>Substantial processing of raw data necessary</td>
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<td>Airpassenger_BRD_C2C_v2</td>
<td>Air passenger flows, 2010-2018</td>
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<td>Financial flows: loans (claims). Units: US Dollars Millions</td>
<td>BIS (LBS dataset)</td>
<td>Bilateral flows of claims. Inter-national flows</td>
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<td>capital_liabilities_c2c_v1</td>
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<td>Financial flows. All ABS loans. Units: Millions Euro.</td>
<td>EDW/ECB database</td>
<td>Bilateral flows (usually origins concentrated in one region). Intra-national and inter-national flows (but most are intra). All ABS loans. Million €</td>
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<td>Loans_Auto_c2c_v1.1</td>
<td>Financial flows: Auto ABS loans. Units: Millions Euro.</td>
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<td>Bilateral flows (usually origins concentrated in one region). Intra-national and inter-national flows (but most are intra). Auto asset-backed securities (auto ABS) are structured finance securities collateralized by pools of auto loans. Million €</td>
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<td>Loans_CMR_c2c_v1.1</td>
<td>Financial flows: CMR ABS loans. Units: Millions Euro.</td>
<td>EDW/ECB database</td>
<td>Bilateral flows (usually origins concentrated in one region). Intra-national and inter-national flows (but most are intra). Consumer Finance ABS includes consumer loans, except credit card receivables. Million €</td>
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<td>Loans_LES_c2c_v1.1</td>
<td>Financial flows: LES ABS loans. Units: Millions Euro.</td>
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<td>Bilateral flows (usually origins concentrated in one region). Intra-national and inter-national flows (but most are intra). Finance securities backed by underlying pools of leasing loans. Million €</td>
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<td>Loans_RMBS_c2c_v1.1</td>
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<td>Bilateral flows (usually origins concentrated in one region). Intra-national and inter-national flows (but most are intra). Residential mortgage-backed securities (RMBS) are a debt-based security backed by the interest paid on loans for residences loans backed by a real state property. Million €</td>
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<td>Loans_SME_c2c_v1.1</td>
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<td>to small and medium enterprise (SME's). Million €</td>
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Table 3.2: Benchmark data provided at the region to region (R2R).
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<td>Freight flows_ROAD_r2r_v1</td>
<td>Transport flows of goods by road (in tons). 2010-2018.</td>
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<tr>
<td>Railfreight_R2R</td>
<td>Freight flows by rail (in tons), 2010-2018.</td>
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<td>Airfreight_BRD_R2R</td>
<td>Freight flows by air (in tons), 2010-2018.</td>
<td>Own elaboration based on Eurostat</td>
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<td>Maritimefreight_R2R</td>
<td>Maritime freight flows (in tons), 2010-2018.</td>
<td>Own elaboration based on Eurostat</td>
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<td>Freight flows_TO-TAL_r2r_v1</td>
<td>Transport flows of goods by all modes (in tons). 2010-2018.</td>
<td>Own elaboration based on Eurostat and other sources</td>
<td>Bilateral flows obtained by the aggregation of the corresponding matrices for road, railway, ship, air. Intra-national and inter-national flows</td>
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<td>Trade flows_TO-TAL_r2r_v1</td>
<td>Trade flows of goods. Total (in Mill. €). 2010-2018.</td>
<td>Own elaboration based on several sources: BACI; COMEXT; Eurostat transport statistics</td>
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<td>Trade flows_AIRCRAFT_r2r_v1</td>
<td>Trade flows of goods by air (in Mill. €). 2010-2018.</td>
<td>Own elaboration based on several sources: BACI; COMEXT; Eurostat transport statistics</td>
<td>Bilateral flows by air (all products). Intra-national and inter-national flows.</td>
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<td>Bilateral flows</td>
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<td>Trade flows ROAD r2r_v1</td>
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<td>Trade flows of goods by ship (in Mill. €). 2010-2018.</td>
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<td>Bilateral flows by train (all products). Intra-national and inter-national flows.</td>
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<td>Bilateral flows by other/unknown transport mode (all products). Intra-national and inter-national flows.</td>
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<td><strong>Services flows_TOTAL_r2r_v1</strong></td>
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<td>Flows of tourists, 2010-2018</td>
<td>Own elaboration based on Eurostat and WTO</td>
<td>Bilateral flows of tourists. Intra-national and inter-national flows.</td>
</tr>
<tr>
<td>People flows_Tourism_r2r_v2</td>
<td>Flows of tourists, 2010-2018</td>
<td>Own elaboration based on Eurostat and NSI</td>
<td>Bilateral flows of immigrants. Intra-national and inter-national flows.</td>
</tr>
<tr>
<td>capital_claims_r2r_v1</td>
<td>Financial flows: loans (claims). Units: US Dollars</td>
<td>BIS (LBS dataset)</td>
<td>Bilateral flows of claims. Inter-national flows</td>
</tr>
<tr>
<td>capital_liabilities_r2r_v1</td>
<td>Financial flows: loans (claims). Units: US Dollars</td>
<td>BIS (LBS dataset)</td>
<td>Bilateral flows of claims. Inter-national flows</td>
</tr>
<tr>
<td>EDW_loans_r2r</td>
<td>Financial flows. All ABS loans. Units: Millions Euro.</td>
<td>EDW/ECB database</td>
<td>Bilateral flows (usually origins concentrated in one region). Intra-national and inter-national flows (but most are intra). All ABS loans. Million €</td>
</tr>
<tr>
<td>Loans_Auto_r2r_v1.1</td>
<td>Financial flows: Auto ABS loans. Units: Millions Euro.</td>
<td>EDW/ECB database</td>
<td>Bilateral flows (usually origins concentrated in one region). Intra-national and inter-national flows (but most are intra). Auto asset-backed securities (auto ABS) are structured finance securities collateralized by pools of auto loans. Million €</td>
</tr>
<tr>
<td>Loans_CMR_r2r_v1.1</td>
<td>Financial flows: CMR ABS loans. Units: Millions Euro.</td>
<td>EDW/ECB database</td>
<td>Bilateral flows (usually origins concentrated in one region). Intra-national and inter-national flows (but most are intra). Consumer Finance ABS includes consumer loans, except credit card receivables. Million €</td>
</tr>
<tr>
<td>Loans_LES_r2r_v1.1</td>
<td>Financial flows: LES ABS loans. Units: Millions Euro.</td>
<td>EDW/ECB database</td>
<td>Bilateral flows. (usually origins concentrated in one region). Intra-national and inter-national flows (but most are intra). Finance securities backed by underlying pools of leasing loans. Million €</td>
</tr>
<tr>
<td>-------------------</td>
<td>-----------------------------------------------------</td>
<td>------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Loans_RMBS_r2r_v1.1</td>
<td>Financial flows: RMBS ABS loans. Units: Millions Euro.</td>
<td>EDW/ECB database</td>
<td>Bilateral flows (usually origins concentrated in one region). Intra-national and inter-national flows (but most are intra). Residential mortgage-backed securities (RMBS) are a debt-based security backed by the interest paid on loans for residences loans backed by a real state property. Million €</td>
</tr>
<tr>
<td>Loans_SME_r2r_v1.1</td>
<td>Financial flows: SME’ ABS loans. Units: Millions Euro.</td>
<td>EDW/ECB database</td>
<td>Bilateral flows (usually origins concentrated in one region). Intra-national and inter-national flows (but most are intra). Finance securities backed by underlying pools of loans to small and medium enterprise (SME’s). Million €</td>
</tr>
</tbody>
</table>
4 Next Steps

According to the implementation Plan (IP), Deliverable 5 (December 31, 2021) should be the next Deliverable. Despite this, an intermediate Deliverable 4+ has been agreed to provide final materials for outreach purposes. It will contain the following elements:

- Report with progress and results in Tasks 1-4:
  - T1
    - Data matrixes, description of methodology and results, typologies, analysis of explanatory factors: all flows.
    - Case studies: two additional T1.6 case studies.
  - T2
    - T2 typologies.
  - T3
    - Evaluation and analysis of Scenarios (qualitative, not quantitative).
    - First version of T3 case studies.
  - T4
    - Policy recommendations based on the results of Tasks 1-3 and inputs from stakeholders.

- PPT presentation with main interim results and key maps and figures.

Annex 1 Trade of goods

Full report in document Annex_T1_2_GoodsTrade_D4.docx
Annex 2 Goods by transport mode

Full report in document Annex_T1_2_GoodsTransportMode_D4.docx
Annex 3 Trade of services

Full report in document Annex_T1_2_Services_D4.docx
Annex 4 Migration

Full report in document Annex_T1_3_Migration_D4.docx
Annex 5 Commuting

Full report in document Annex_T1_3_Commuting_D4.docx
Annex 6 Tourism

Full report in document Annex_T1_3_Tourism_D4.docx
Annex 7 People transport by mode

Full report in document Annex_T1_3_PeopleTransportMode_D4.docx
Annex 8 FDI

Full report in document Annex_T1_4_FDI_D4.docx
Annex 9 Remittances

Full report in document Annex_T1_4 Remittances_D4.docx
Annex 10 Loans

Full report in document Annex_T1_4_Loans_D4.docx
Annex 11 Erasmus students

Full report in document Annex_T1_5_Erasmus_D4.docx
Annex 12 H2020 networks

Full report in document Annex_T1_5_H2020_D4.docx
Annex 13 Case study: trade of goods between Spain, Portugal and France

Annex 14 Policy brief: interregional statistics

Full report in document Annex_T1_6_PB_InterregionalStatistics_D4.docx
Annex 15 Task 2 Typologies

Full report in document Annex_T2_Typologies_D4.docx
Annex 16 Task 3 Scenarios

Full report in document Annex_T3_Scenarios_D4.docx
Annex 17 Task 4 Policy Options

Full report in document Annex_T4_PolicyOptions_D4.docx
The ESPON EGTC is the Single Beneficiary of the ESPON 2020 Cooperation Programme. The Single Operation within the programme is implemented by the ESPON EGTC and co-financed by the European Regional Development Fund, the EU Member States and the Partner States, Iceland, Liechtenstein, Norway and Switzerland.

Disclaimer
This delivery does not necessarily reflect the opinion of the members of the ESPON 2020 Monitoring Committee.