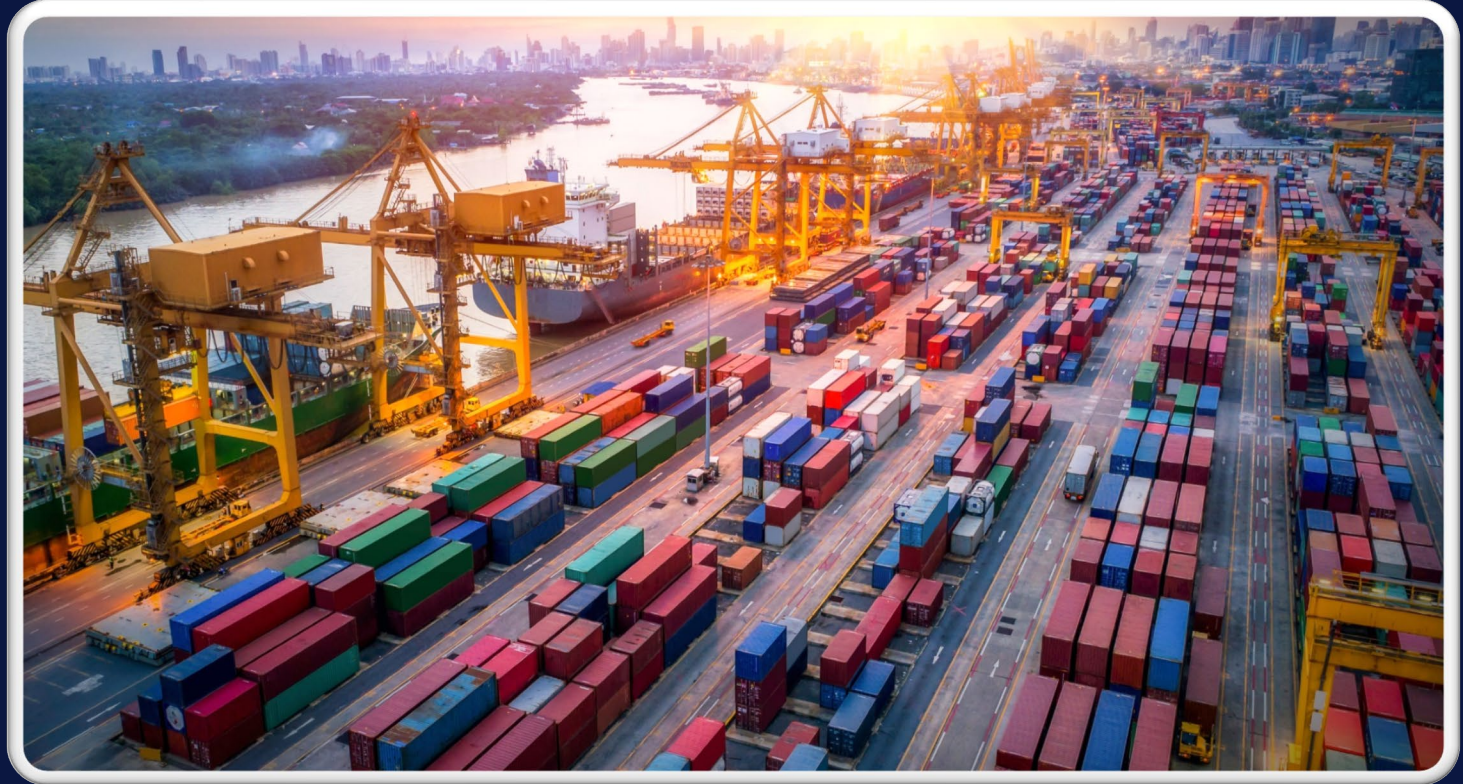


ESPON IRiE

Interregional Relations in Europe

Project Brief



// This document presents a brief description of the key points of the project **ESPON IRiE**

ESPON IRiE

1

Which are the research needs?
Context & Project Objectives

2

How do we address the research needs?
Conceptual Framework - Tasks

3

How do we assure high quality of the results and boost visibility of the project?
Project Management & Outreach

4

Which are the main outcomes?
Results

1

Context Project & Objectives

- The EU is gradually moving from a **‘Place of states’** to a **‘State of places’**.
- The abolition of economic barriers, and the consequent shrinkage of physical distance, has generated **new spatial dynamics that influence the allocation of physical and human capital**.
- National specificities and the level of engagement with the EU project have clear **implications for interregional flows** of people, goods, services and capital.
- As the ‘Space of flows’ (integration) affects the ‘Space of places’ (development), the mix of **opportunities and threats** to EU territories continues to change.
- **Regional development strategies** suffer from a crucial knowledge gap: **the lack of data on interregional relations**, key pieces on the Cohesion Policy agenda.
- It is in this context that the **‘Interregional Relations in Europe’ - ESPON IRiE project** emerges.

ESPON IRiE aims to understand the interregional flows (between regions in ESPON's space) of **PEOPLE, CAPITAL, GOODS, SERVICES and KNOWLEDGE**, and identify what benefits or harms them.

1

Specific Objectives

1. To characterise interregional flows of trade (regional OD matrix)
2. To analyse other specific flows and interactions between regions
3. To provide a systemic overview of the relatedness/ interdependencies between European regions.
4. To test the impacts of potential policy shocks as well as the level of exposure of regions.
5. To feed the discussions on future territorial and sectoral policies at EU, national and regional levels.

2

Conceptual Framework - Tasks



2

Conceptual Framework - Tasks

- Five type of flows:

- Country-to-Country bilateral flows (C2C)

ESPON space: EU27, UK, Norway, Liechtenstein, Switzerland and Iceland

- Region-to-Region bilateral flows (R2R)

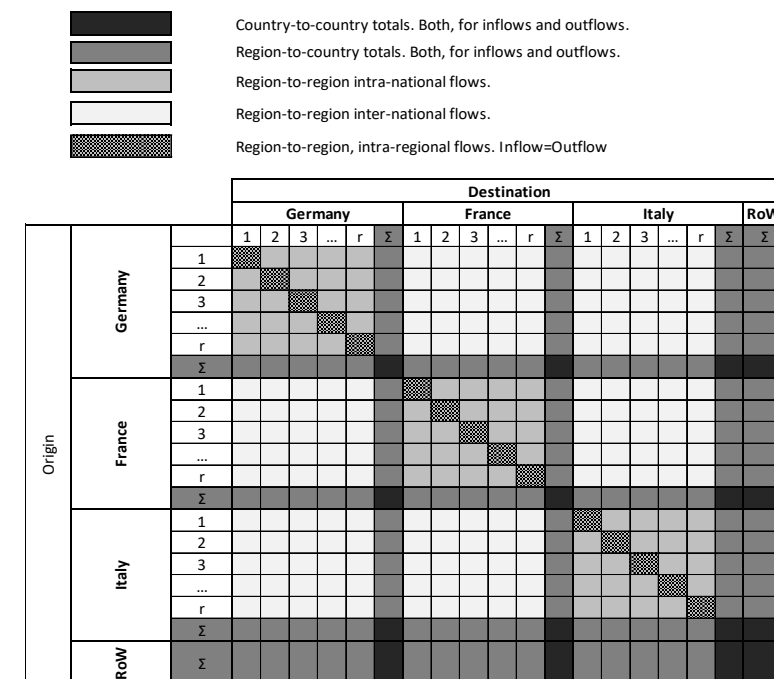
Information at this level of disaggregation only for the intra-ESPON space

- Intra-national flows

- Intra-regional flows (NUTS2): origin and destination are the same
 - Inter-regional flows: origin and destination are different but lie the same country

- Inter-national flows within the ESPON space (R2R)

- Inter-regional flows: the regions of origin and destination belong to separate countries in the ESPON space



Scheme of Origin-Destination flows (NxN countries; nxn regions)

2

Conceptual Framework - Tasks

- The tasks proposed will result in **NEW DATA and EVIDENCE**, while ensuring **complementarity** with other initiatives developed by the European Commission and national authorities in the field of interregional relations such as RHOMOLO, ESPON, OECD, or World Bank.

Data Extended and Improved

EU Interregional Input-Output Tables
(available data: 2000 – 2010 and 2013; spatial extension of EURO-IRIO 2013 / 2014 – 2015 to the NUTS 2 regions of the ESPON countries)
Coordination with the JRC

New Data

- **Flows of goods by transport mode:** road, air, maritime, railway freight flows (2010 – 2018)
- **Flows of services by sector.** Nation-to-nation database (2010 – 2018)
- **Flows of people by motive of displacement** (commuting, tourism and migration) **and transport mode** (basis for the estimation of flows of services, capital and knowledge)
- **Flows of capital and transfer:** FDI, remittances and loans
- **Flows of knowledge:** students (Erasmus); institutions (H2020 partnerships); innovation (patents)

New Evidence

- Extension of the **EU-IRIO model** (improvement on current knowledge of inter-sectoral linkages between regions; generation of quantitative scenarios; collaboration with JRC Seville)
- **Analyses with transport mode competition / cooperation** in Europe (freight and passengers). Essential to decarbonizing the transportation sector
- Baseline knowledge for interregional **flows of people** in the EU

Baseline: official data covered with a Pan-European perspective (Eurostat, EC, WB, OECD); national and regional sources; pre-existing datasets from other institutions and previous ESPON and other European projects (e.g. FIGARO project, ESPON DEMIFER project, etc).

Specific and innovative data will be used in **Exploratory Analyses and Case Studies** (complement to the structural statistics)

Task 1. Building Matrices and Analysing Different Kind of Flows

- Set of matrixes of **interregional flows of goods, services, people, capital and knowledge.**
- For each set of data / type of interaction ESPON IRIE will produce:
 - An overview of characteristics, intensity, and structure of related flows over time
 - A typology of regions by intensity and geographical structure of the flows affecting them → Impact Assessment
 - Traditional and newly developed flow maps and innovative graphs for proper visualization of past and current situations

Flows of Goods. (NxN countries; nxn regions)
Aggregate by products and Transport modes.

Origin		Destination													
		Germany				France				Spain				RoW	
Reg/Reg		1	2	3	r	1	2	3	r	1	2	3	r	z	
Germany	1														
	2														
	3														
	r														
France	1														
	2														
	3														
	r														
Spain	1														
	2														
	3														
	r														
RoW	z														

Flows of Services. (NxN countries; nxn regions)
Aggregate flows

Origin		Destination													
		Germany				France				Spain				RoW	
Reg/Reg		1	2	3	r	1	2	3	r	1	2	3	r	z	
Germany	1														
	2														
	3														
	r														
France	1														
	2														
	3														
	r														
Spain	1														
	2														
	3														
	r														
RoW	z														

Flows of People. (NxN countries; nxn regions)
Aggregate flows.

Origin		Destination													
		Germany				France				Spain				RoW	
Reg/Reg		1	2	3	r	1	2	3	r	1	2	3	r	z	
Germany	1														
	2														
	3														
	r														
France	1														
	2														
	3														
	r														
Spain	1														
	2														
	3														
	r														
RoW	z														

Flows of Capital. (NxN countries; nxn regions)
Aggregate flows.

Origin		Destination													
		Germany				France				Spain				RoW	
Reg/Reg		1	2	3	r	1	2	3	r	1	2	3	r	z	
Germany	1														
	2														
	3														
	r														
France	1														
	2														
	3														
	r														
Spain	1														
	2														
	3														
	r														
RoW	z														

Flows of Knowledge. (NxN countries; nxn regions)

Origin		Destination													
		Germany				France				Spain				RoW	
Reg/Reg		1	2	3	r	1	2	3	r	1	2	3	r	z	
Germany	1														
	2														
	3														
	r														
France	1														
	2														
	3														
	r														
Spain	1														
	2														
	3														
	r														
RoW	z														

Task 1.1 Input – Output Tables

	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI
BE	51135	77384	141264	227958	757101	15395	170464	418061	2123593	745527	48268	1440586	37048	74145	39818	304	148438	42680	95290	198909	208043	377433	112599	27372	34444	128
BG	83251	205370	129877	49320	618553	4834	22292	48997	137997	112565	1257	181693	37728	4507	6228	11081	67263	5740	96271	198448	111689	2382	21400	3850	33045	29
CZ	141673	126774	151091	118586	569043	28367	43120	296260	413252	505084	20961	464625	65430	27392	33071	6300	71860	4062	275936	75377	107090	34978	56548	19243	51	70
DK	232193	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
DE	748792	60356	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EE	14311	4753	30924	70605	121009	28905	23611	9111	30685	7794	2	25593	1033	95103	17594	-99	78	246	29008	1471	11418	2320	45	275	-99	99
IE	172308	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
EL	424715	4955	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ES	2110067	137	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
FR	770376	1141	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
HR	44444	854	20781	40528	647711	99	33957	7436	80800	213041	160771	84796	24	1711	8	329	22714	1740	47050	148484	6555	11508	1333	1617	2152	289
IT	1460237	363	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CY	37606	363	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LV	78108	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LT	42243	6225	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
LU	127	9407	6068	28469	45125	53	3389	3336	12324	50418	8	5383	3536	1	2	0	40	1352	52195	28588	195	90105	169	-99	14	
HU	149960	671	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MT	42051	6784	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NL	94273	90683	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AT	204380	201570	77429	210899	3117430	1337	61894	326927	708678	524622	131760	606858	72324	30136	22228	28476	37144	33715	345588	46366	143816	41980	250062	29070	23026	114
PL	209812	112076	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
PT	376267	1560	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RO	122690	16281	55489	10970	654524	59	38277	117516	610871	342106	1415	1153323	83320	911	9	155	112206	3346	168019	259260	33446	6999	736130	84	27	14
SI	29360	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SK	36208	41754	59311	84	596	75	44846	50917	101601	35947	1681	92943	4630	62	1	-99	924	1238	4753	21425	1816	2227	28	20	34154	10
FI	130160	30035	69265	398025	853908	94147	10390	210438	570765	272906	23194	260661	34632	237293	57850	-99	101587	4036	245240	110584	113471	81729	16076	11238	222	1760
SE	227874	23588	88614	824424	1359999	76876	61989	387384	1221977	530306	65523	433533	106412	110787	37946	185	177188	34338	499180	207215	288475	72424	-99	2411	2795	678
UK	1202866	817182	1294596	2547846	11571184	245918	9605486	4744592	31541706	9798224	626638	10216578	2665268	571456	548172	251566	1025758	1080744	7771692	1682472	4233192	5359328	627314	125366	455390	1002
IS	8191	0	1344	199854	104554	404	1363	533	43865	69568	5	6834	0	983	2	0	1305	0	49869	3971	8891	589	0	492	88	23
LI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NO	125611	55071	97438	1219360	913883	64357	77387	329376	1121762	364723	82706	206549	62862	181772	55313	0	42450	10274	738994	82593	395460	71386	25	134	51	173
CH	398252	40864	158760	313176	3050633	432	145328	446665	2256721	1514026	61903	839185	47007	24161	224	78541	194306	40674	637547	593342	133684	675842	39595	37486	414	141
ROW	3352012	509388	1535201	2983140	12061938	80082	1106182	1037612	2315208	2060912	212361	2336336	582408	514300	123041	214120	249214	130333	2062408	1120732	1802388	161825	235612	157800	0	0

- Close collaboration with the JRC Seville – Rhomolo team
- EURO-IRIO model: JRC and PBL, new tables for 2017, harmonized with the C2C FIGARO new tables (provided in May 2021)
- Our contribution:** to develop and use an extended EURO-IRIO dataset for 2017, and to harmonize it with FIGARO national totals.
- Spatial extension** of EURO-IO 2013 to the NUTS2 regions of the ESPON countries: Iceland, Switzerland, Lichtenstein and Norway
- 63 sectors** disaggregation datasets based on FIGARO.
- Development of scenarios** (Task 3) using the extended datasets

Task 1.2a Interregional flows of goods

- Aim:** to produce region-to-region trade flows of goods (in €) and transport flows (in tons) within and between the regions (NUTS2) in the ESPON space:
- Trade flows of goods by mode and sectors: in € and tons**
 - Compatible with C2C trade totals (BACI; COMEXT and FIGARO)
 - R2R structures based on transport flows by Road (by 14 products NST), Air, Maritime and Railway freight flows
- Transport flows by mode:**
 - Transport statistics on intra-national and international freight flows: Eurostat.

Flows of Goods. (NxN countries; nxn regions)
Agregate by products and Transport modes.

		Destination																					
		Germany					France					Spain					... RoW						
		Reg/Reg	1	2	3	...	r	Σ	1	2	3	...	r	Σ	1	2	3	...	r	Σ	Σ		
Origin	Germany	1	█																				
		2		█																			
		3			█																		
		...				█																	
		r					█																
	Σ						█																
	France	1							█														
		2								█													
		3									█												
		...										█											
		r											█										
	Σ												█										
	Spain	1														█							
		2															█						
		3																█					
...																		█					
r																			█				
Σ																			█				
...																							
RoW	Σ																						

Task 1.2b Interregional flows of services

- Aim:** to produce region-to-region matrixes of different service sectors (EBOPS-2010) within and between the ESPON countries. Such estimates are complementary to the ones in the EURO-IO tables, since cover 2010-2018.
- Modes of service delivery:**
 - Mode 1: Cross-Border Provision
 - Mode 2: Consumption Abroad
 - Mode 4: Producer Presence
- Sources:** inter-national (C2C) flows for different service sectors reported by WTO-UNCTAD and OECD (BATIS), compatible with the FIGARO national-sectoral totals.
- R2R indicators for the regionalization will be mainly based on inputs from **Task 1.3, Task 1.4 and Task 1.5, plus other innovative data (Facebook SCI)**.

Flows of Services. (NxN countries; nxn regions) Agregate flows

		Destination																		
		Germany					France					Spain					RoW			
		1	2	3	...	r	1	2	3	...	r	1	2	3	...	r	Σ			
Origin	Germany	1	█																	
		2		█																
		3			█															
		...				█														
		r					█													
	Σ																			
	France	1					█													
		2						█												
		3							█											
		...								█										
		r									█									
	Σ																			
	Spain	1										█								
		2											█							
		3												█						
		...													█					
r															█					
Σ																				
...																				
RoW	Σ																			

Task 1.3 Interregional flows of people

- **Aim:** to produce region-to-region flows of people in and between ESPON countries
- **Types of spatial mobility:**
 - Short-term: **commuting, tourism**
 - Long-term: **migration** (built on findings of ESPON DEMIFER)
- **Transport mode:**
 - Road, Air, Maritime and Railway
- **Sources:**
 - Eurostat (e.g. national censuses and tourism data)
 - EU's labour statistics

**Flows of People. (NxN countries; nxn regions)
Agregate flows.**

		Destination																					
		Germany					France					Spain					RoW						
		1	2	3	...	r	Σ	1	2	3	...	r	Σ	1	2	3	...	r	Σ	Σ			
Origin	Germany	1	■																				
		2	■	■																			
		3		■	■																		
		...			■	■																	
		r				■	■																
	Σ																						
	France	1						■															
		2						■	■														
		3							■	■													
		...								■	■												
		r									■	■											
	Σ																						
	Spain	1												■									
		2												■	■								
		3													■	■							
		...														■	■						
r																■	■						
Σ																							
...																							
RoW	Σ																						

Task 1.4 Interregional flows of capital

- **Aim:** to produce region-to-region origin-destination matrixes for capital flows in and between ESPON countries
- **Types of capital flows:**
 - Short-term: **remittances, loans**
 - Long-term: **Direct Investment**
- **Sources:**
 - DI: Amadeus database
 - Remittances: UNCTAD, OECD, World Bank, International Monetary Fund, Eurostat
 - Loans: BIS Locational banking statistics (LBS) and EDW database

Flows of Capital. (NxN countries; nxn regions) Agregate flows.

		Destination																Σ				
		Germany					France					Spain					RoW					
		1	2	3	...	r	1	2	3	...	r	1	2	3	...	r	Σ					
Origin	Germany	1	■																			
		2		■																		
		3			■																	
		...				■																
		r					■															
	Σ																					
	France	1					■															
		2						■														
		3							■													
		...								■												
		r									■											
	Σ																					
	Spain	1										■										
		2											■									
		3												■								
		...													■							
r															■							
Σ																						
...																						
RoW																						
Σ																						

Task 1.5 Interregional flows of knowledge

- **Aim:** to produce region-to-region knowledge flows in and between ESPON countries (nature and intensity of flows)
- **Types of knowledge flows:**
 - **Erasmus** student exchange flows
 - European research networks: **H2020** partnership
 - Innovation diffusion: **Patent** citations
- **Sources:**
 - EU Open Data Portal: Erasmus programme mobility dataset and CORDIS database
 - Patents: OECD datasets: PATSTAT, REGPAT

Flows of Knowledge. (NxN countries; nxn regions)

		Destination																			
		Germany					France					Spain					RoW				
		1	2	3	...	r	Σ	1	2	3	...	r	Σ	1	2	3	...	r	Σ	Σ	
Origin	Germany	1	█																		
		2		█																	
		3			█																
		...				█															
		r					█														
			Σ																		
	France	1						█													
		2							█												
		3								█											
		...									█										
		r											█								
			Σ																		
	Spain	1												█							
		2													█						
		3														█					
		...															█				
r																	█				
		Σ																			
...																					
RoW																					
		Σ																			

Task 1.6 Exploratory Analyses and Case Studies

- Innovative analyses designed to reinforce the structural data to deliver
- The outputs of the exploratory analyses will fit into Case Studies

Case studies

Detail flows by road of goods between Spain and the EU with focus in the Spanish-French border/ Spanish-Portugal border

Cross-border migrations across the outer boundary of the EU (1994-2020). The example of Polish-Ukrainian and Polish-Belarusian borders (including the effects of COVID19 in migration flows)

The interregional flows of students in the EU: attractors and barriers

New interregional info sheet for regional development strategies, the case of Navarre (Spain)

Firm Relocation from Greece to Bulgaria in times of economic crisis: Spatial and sectoral analysis

COVID-19 impacts on air transport flows between European regions

Policy Briefs

Interregional statistics in the EU: the state of the art

COVID-19 and Brexit impacts on the interregional flows of students in the EU

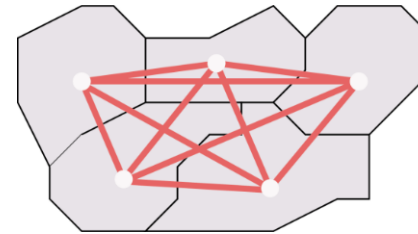
Systemic analysis, scenarios and policy

Task 1.0 Mapping and Visualisation

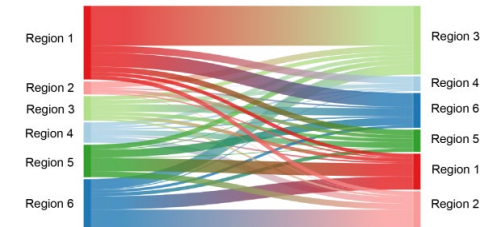
- **ESPON IRiE** focuses on the analysis of the spatial interaction between regions. Thus, a substantial part of the analysis does not deal with data and indicators describing certain aspects of a region, but with flows between all regions.
- As the project presents **interregional flows as spatially conceptualised phenomena**, cartographic methods of presentation play a particularly important role in graphic presentation of the data → Mapping and Visualisation Challenge
- **Visualization options:**
 - To display the full matrix in a figure
 - To show only the flow of one particular region as origin or destination
 - To establish aggregate flow indicators by region and of regional flow typologies (expression of analytical aspects)

Task 1.0 Mapping and Visualisation

- Visualization options
- Regional flow matrix visualisation
 - Full matrix flow maps; Sankey diagrams; Chord diagrams; Heatmaps



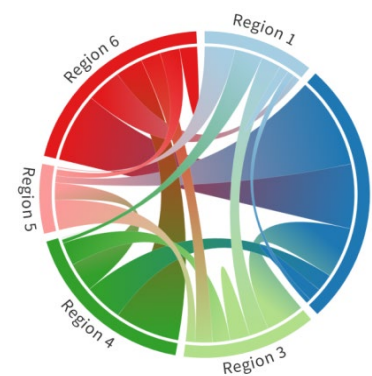
Schematic full matrix flow map



Schematic Sankey diagram

	Destination regions					Indicators for origin regions			
	1	2	3	...	n	A _o	B _o	C _o	...
Origin regions	1	2	3	...	n				
2									
3									
...									
n									
Indicators for destination regions	A _d	B _d	C _d	...					

Regional flow matrix visualisation.



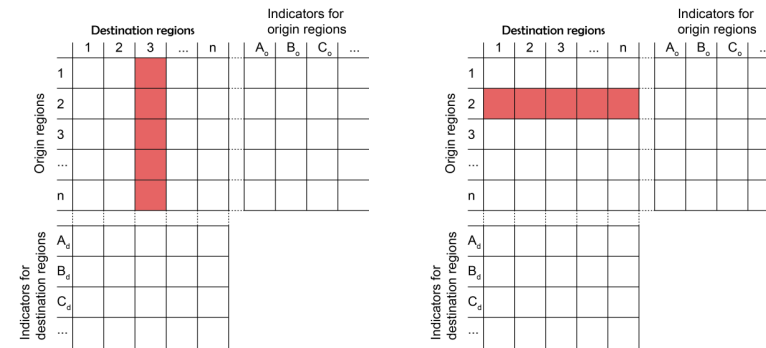
Schematic Chord diagram

	Destination regions				
	1	2	3	4	5
Origin regions	1	2	3	4	5
2					
3					
4					
5					

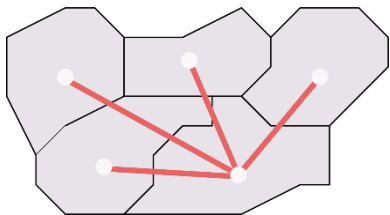
Schematic matrix heatmap

Task 1.0 Mapping and Visualisation

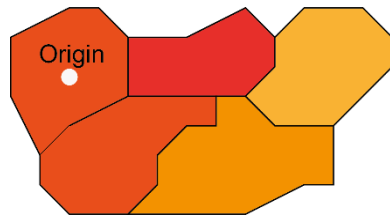
- Visualization options
- Individual region's flow visualisation
 - Spider maps; Choropleth maps; Diagram maps; Symbol diagrams; Treemaps



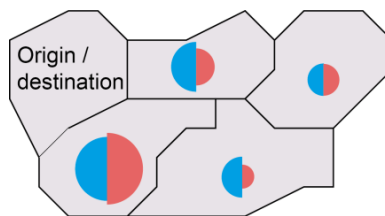
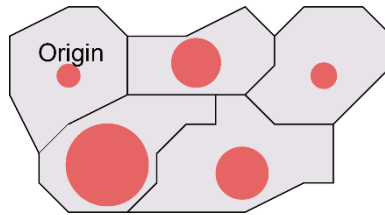
Individual region's flow visualisation
(left for sample destination region, right for sample origin region)



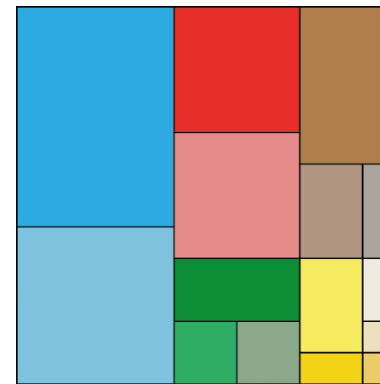
Schematic spider map



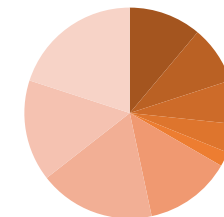
Schematic choropleth map



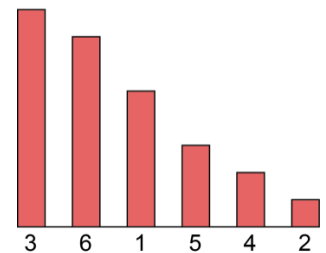
Schematic diagram map
(single value; inflow and outflow separately)



Schematic treemap



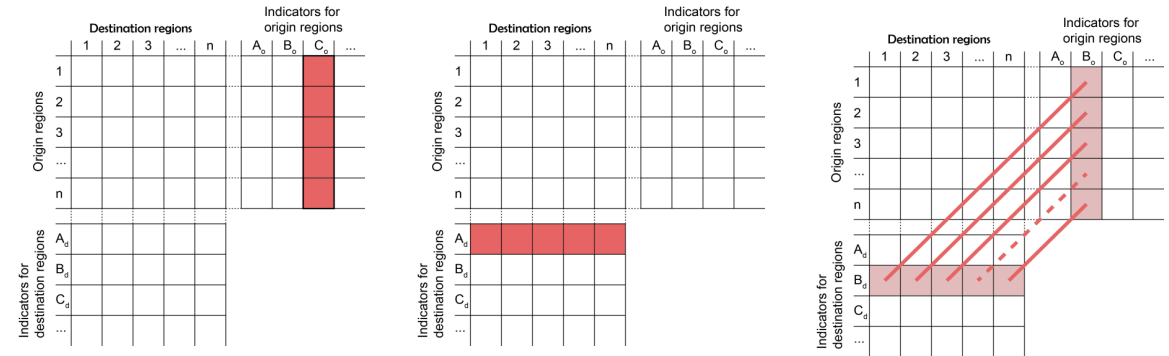
1 2 3 4 5
6 7 8 9



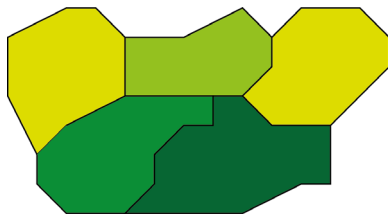
Schematic symbol diagrams
(pie chart, left; ordered bars, right)

Task 1.0 Mapping and Visualisation

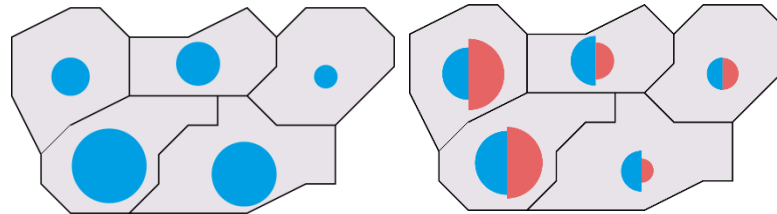
- Visualization options
- Regional flow indicator visualisation
 - Choropleth maps; Symbol maps; Chorochromatic maps



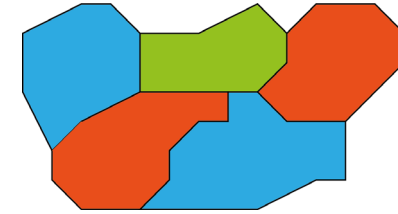
Regional flow indicator visualisation
 (left: sample indicator for origin regions; middle: sample indicator for destination regions;
 Right: intraregional relation between outflow and inflow)



Schematic choropleth map



Schematic symbol maps
 (single value, left; inflow and outflow values, right)



Schematic chorochromatic map

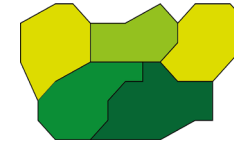
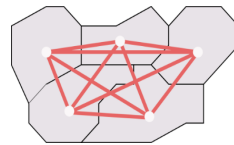
Task 2. Pan-European Systemic Analysis

- **Aim:** to provide a **systemic overview** of the relatedness / interdependencies between European regions combining →
 - Intensity of flows
 - Explanatory factors
 - Territorial characteristics
- Overall ambition: to provide a new **frame of reference** to support regional development policies and inform regional convergence
- Final goal: to define **typologies for regions** using OD matrixes in coordination with the typologies per flow developed in Tasks 1.2 – 1.5

Task 2. Pan-European Systemic Analysis

- **Context:** it is possible to look at the territorial structure of Europe from two sets of data

- A set of regions characterised by their network of external relations
- A complete set of matrix relations



- **Methodology:**

1. **Multiflow typology:** gravity equation, spatial econometrics and statistics, GIS analysis, network analysis. Multivariate analysis such as principal component analysis to build a comparison of flows in four dimensions: symmetry, distribution, impedance, dynamics
2. **Cross-referencing:** correlation relationships. E.g. 'Brain drain' will be analysed by crossing flows of people with flows of knowledge
3. **Regional typology:** based on outputs from the previous stages (multivariate analysis and correlations)
4. **Combined analysis** to assess competitiveness and cohesion in European regions through an analysis of flows
5. **Comparison** with other regional typologies

Task 2. Pan-European Systemic Analysis

- **Expected outcomes:**

- **Typologies of regions** according to the different kinds of interactions, combining identified drivers and causes in relation to regional development. This typologies will distinguish the situation for specific territories: islands, outermost, mountainous, coastal, regions in industrial transition, etc.
 - Series of **maps and visual materials** to capture the main patterns and relatedness between regions and their evolution.
 - **Identification of major driving forces** for the cohesion, competitiveness, quality of life, and well-being of regions and for the convergence of regional economies
- **Pan-European analysis** at the level of interregional relations, at the level of region country relations and analysis for regions (NUTS2).

Task 3. Testing Policy Shocks Scenario Analysis

- **Aim:** to test the impacts of potential policy shocks on interregional relations as well as the level of exposure and resilience of regions according to the intensity of these linkages and their territorial characteristics; to determine the extent to which the previously identified settings of the interregional flows in Europe (T1 and 2) may change in response to policies and external shocks
- **Scenario building:**
 - is **not** equivalent to **forecasting**, but is an **exploration of possible** events / actions based on current social, economic, and environmental drivers
 - is less about predicting the future than about **perceiving long-term futures from the present**
 - will rely on foreseen **external causes**, such as COVID and Brexit, and **realistic expected political decisions**, like the Green Deal, rather than theoretical hypothesis

Task 3. Testing Policy Shocks. Scenario Analysis

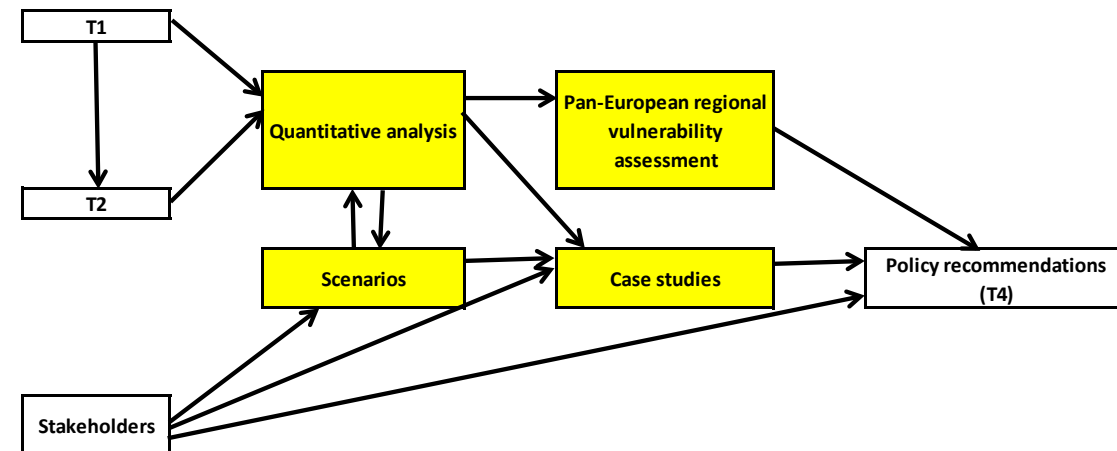
Methodology:

Quantitative and qualitative methods

Inputs: Matrices and conclusions (Task 1); Typologies of regions and flows (Task 2); Stakeholder engagement

Steps in scenario building:

- To describe and recognise **policy design** (i.e. cohesion policy, S3, policy on trade, causes of Brexit, etc)
- To identify different mechanisms that add an emphasis on **external validity**, or the **transferability** of interventions between different contexts. E.g. The Pan-European systemic analysis
- To formulate scenarios based on case studies that engage with **stakeholders**. They will serve to gain more in-depth understanding on drivers and limits of interregional flows, to help interpreting scenarios, and to identify relevant policy recommendations in specific territorial contexts



Task 3. Testing Policy Shocks. Scenario Analysis

- Expected outcomes:
 - Assessment of the impact of specific policy shocks on all regions of the EU (quantitative analysis)
 - Assessment of the impact on flow intensity on regional situations
 - Assessment of the vulnerability of selected regions of external factors (qualitative analysis)
 - Recommendations for different types of regions, to reduce risks arising from external factors

Title	Scenario Description and Assumptions
Green Deal	Changes in the structure of the European economy (especially in the energy sector); Changes in the modal structure of transport (reducing air and road transport, supporting rail, tram, bikes, and other forms of public transport); Circular economy , which means shortening the distance of transport of certain types of goods and promoting prosumers (consumers who also produce the product); Consideration of consequences for certain sectors , including agriculture.
New Globalization	Customs duties (e.g. 25% for automotive products from Europe and Japan in the United States). Assessment of interregional impact of some of the main protectionism measures adopted/announced by the US against the EU. Selected industries (e.g. automotive, aircraft).
COVID-19 long-term effect	Formation of a post-COVID economy ; 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
Brexit	Assumptions to be adopted after the possible conclusion of EU-UK negotiations in 2021. These will include, first of all: trade restrictions, migration restrictions, reduced student flows . These factors will only concern the relationship between the regions in the UK and other regions in ESPON space.

Task 4. Policy Recommendations

- **Aim:** to feed the discussions on future **territorial** (New Territorial Agenda) **and sectoral policies** and interventions at the **EU, national and regional levels** (e.g. on migration, employment, climate change, mobility, economic development), in order to produce **policy recommendations** to increase regional competitiveness and cohesion.
- **Input:** This task will build upon the **results obtained in Tasks 1 – 3**, and will turn the empirical findings into policy recommendations in line with the abovementioned aim. To that end, we will consider how to improve and balance the flows of capital, labour, goods and services to achieve optimal gains for different types of regions in the EU.
- **Output:** Task 4 Will produce **knowledge for policy formulation** (by sector and geographic coverage) at the regional, national and EU level, with respect to territorial cohesion, smart specialization instruments and certain sectoral needs.

Task 4. Policy Recommendations

▪ Methodology:

1. **Define the problem:** to identify the assumptions made about the problem, get metrics, check causal assumptions are correct, explore social and political context
2. **Construct alternative solutions:** a) collecting and inventing possible solutions; b) reducing and simplifying the list of solutions
3. **Select criteria for judging success:** a) generation of a list of applicable criteria; b) rank the criteria (decision matrix)
4. **Project outcomes from alternative solutions:** we look for impartiality applying models and creating scenarios
5. **Analyse trade-offs** between outcomes and estimate what impact they may have
6. **Choose the best solution**
7. **Explain our recommendations** and how we arrived at them

Task 4. Policy Recommendations

▪ ESPON IRiE will:

- **Report** EU, national or regional **policies and interventions** that have already **demonstrated efficiency** in addressing interregional flows
- **Develop a framework of interventions** that could reduce: a) the barriers in interregional flows, b) regional asymmetries in the inflows, and c) the potential risk of specific political decisions
- **Propose a territorial and cohesion policy** for the EU based on place-based regional development strategies and investment policies
- **Make policy recommendations** for the New Territorial Agenda and for regional development needs
- **Focus on different cases**, where different kinds of flows are relevant, and allow for a differentiated approach to regions, since **there is no “one-size-fits-all” set of recommendations**, especially with respect to implementation
- **Cluster flow typologies** to allow more general recommendations on how to manage them for greater competitiveness and cohesion
- **Provide for open communication and transparency** in interactions between policy makers in different regions
- **Tailor our policy recommendations to different types of policymakers**, alongside different typologies of regions and typologies of flows

3

Project Management and Outreach

Strategic Advisory Board (SAG)

Consult service implementation and discuss concrete policy proposals

Evaluation of progress and quality and recommendations

Dissemination activities

Highest impact at the scientific and policy level of project results

ESPON website;
ESPON IRiE web section;
Regional Infosheets;
ESPON events;
Policy briefs;
Press releases;
Social media channels;
Stakeholder meetings;
Scientific papers

On-line tools

Flow data and interregional relations mapping and visualization

ESPON IRiE thematic web portal;
Infosheets for each of the NUTS2 regions (maps, charts, flows description, analyses, scenarios, policy recommendations);
Maps and charts in reports and web services

3

Project Management & Outreach

- **NASUVINSA (Navarre, Spain)** coordinates and leads the project team with the support of:
 - **CEPREDE:** this partner will lead the efforts of all partners in Task 1, and will coordinate efforts with leader of Task 2.
 - **UEF:** this partner will lead the efforts of all partners in Tasks 3 and 4.
- **Management & Outreach documents**
 - **Implementation plan.** The system to implement the project includes:
 - A comprehensive plan for virtual monthly project team **meetings**; coordination meetings with ESPON and the Project Support Team (PST), every two months; project meetings between Nasuvinsa and ESPON, every two months; SAG meetings
 - A plan for **Finances and Deliveries**, with deadlines, progress update (Done, Delayed, In progress), and contingency plan
 - A detailed schedule for all the **tasks and subtasks**: deadlines, progress update (Done, Delayed, In progress), contingency plan
 - **Communication and Dissemination Strategy.** This document gathers:
 - **Evaluation** (communication indicators, such as the expected number of media impacts) **and Schedule**, with delivery deadlines and milestones for every tool / product
 - A description of every **communication tools and products** (see dissemination activities chart)
 - **Quality Control Measures and Risk Management.** This document presents the contingency plans to overcome potential risks

4

Results

1. Interregional trade flows of goods

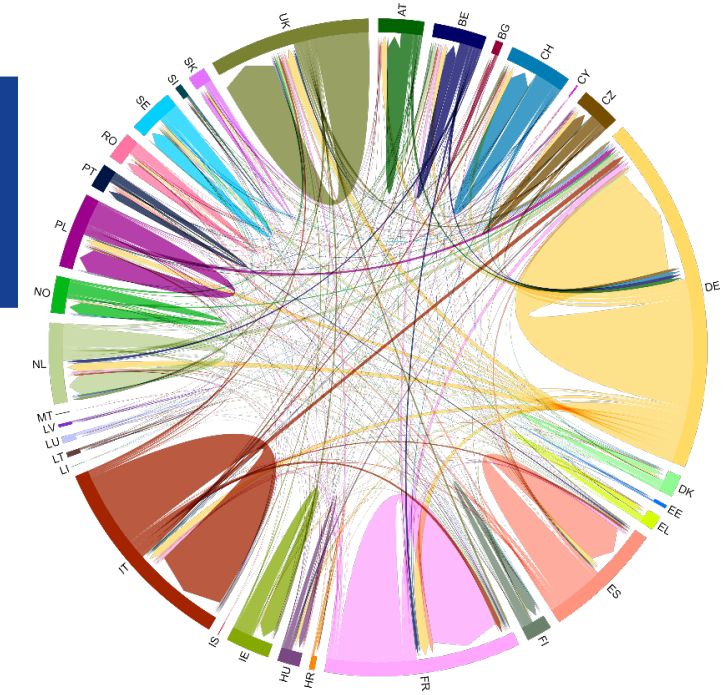
- Country-to-country matrixes (c2c)
- Region-to-region matrixes (r2r)
- Typologies
- Analysis

4

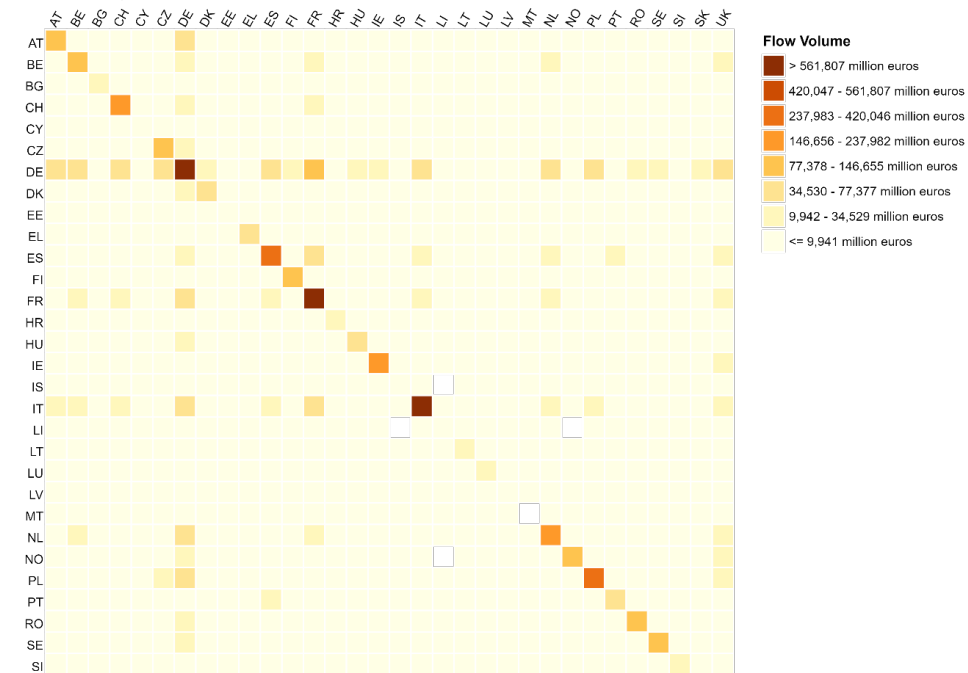
Results. Trade of Goods

Results at country level (NUTS 0)

- Trade flows of goods
- Spatial extent:** EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland
- Temporal scope:** 2010 to 2018
- Sectoral detail:** Total + 14 sectors NST + 5 transport modes.
- Source:** Own elaboration based on WTO-UNCTAD/FIGARO.
- Data features:**
 - 32 X 32 OD matrixes for each year
 - Variable under consideration: trade flows (Mill.€)
 - Intra-national and inter-national flows included. Inter-national are harmonized to BACI (UN/CEPII) and COMEXT (Eurostat). Intra-national flows take FIGARO total output (country-sector-year) as reference.



Goods flow, 2018



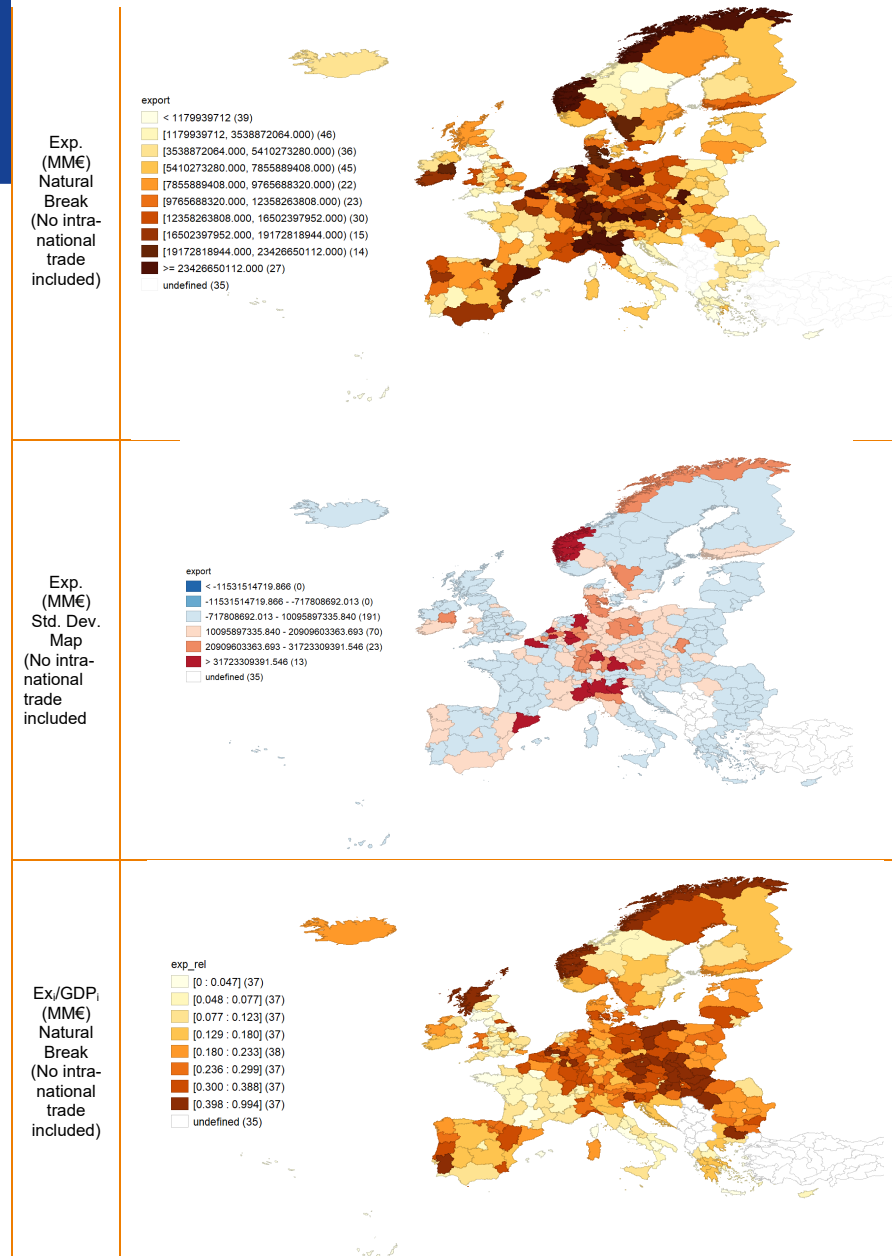
4

Results. Trade of Goods

Results at regional level (NUTS 2)

- Trade flows of goods
- Spatial extent:** EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland
- Temporal scope:** 2010 to 2018
- Sectoral detail:** Total + 14 sectors NST + 5 transport modes.
- Source:** Own elaboration based on WTO-UNCTAD/FIGARO.
- Data features:**
 - 329 X 329 OD matrixes for each year
 - Variable under consideration: trade flows (Mill.€)
 - Intra-national and inter-national flows included. Inter-national are harmonized to BACI (UN/CEPII) and COMEXT (Eurostat). Intra-national flows take FIGARO total output (country-sector-year) as reference.

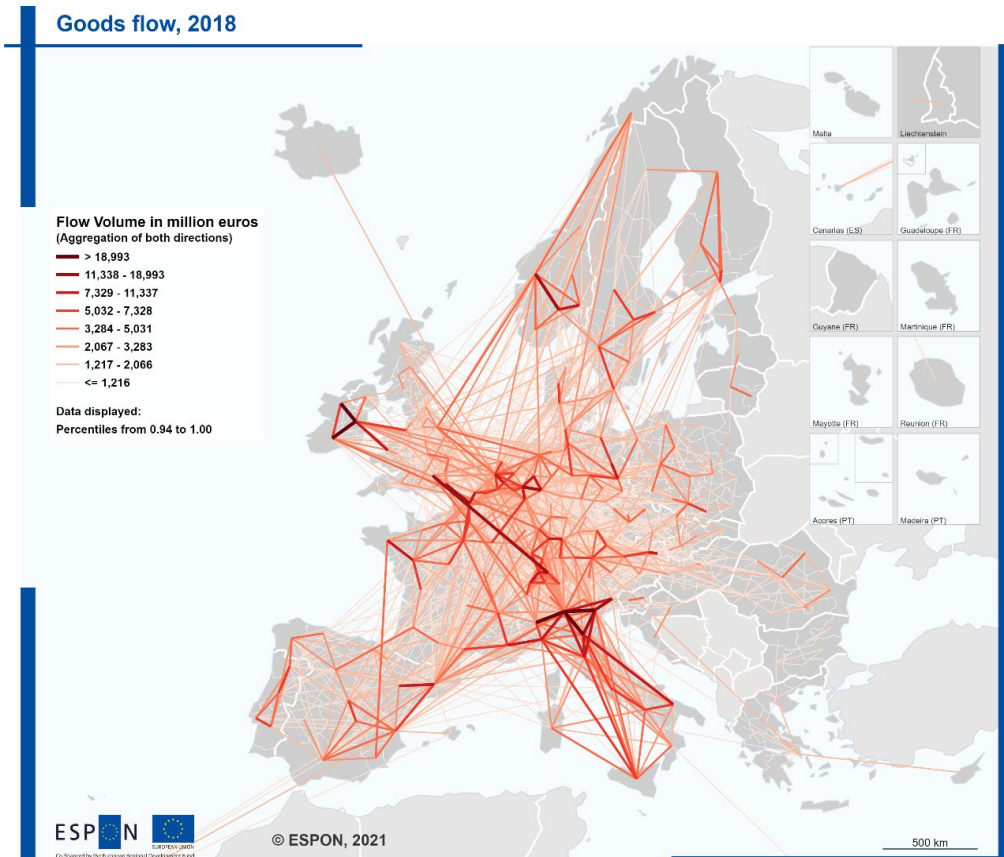
International exports by regions (NUTS 2). 2018. Mill. €.



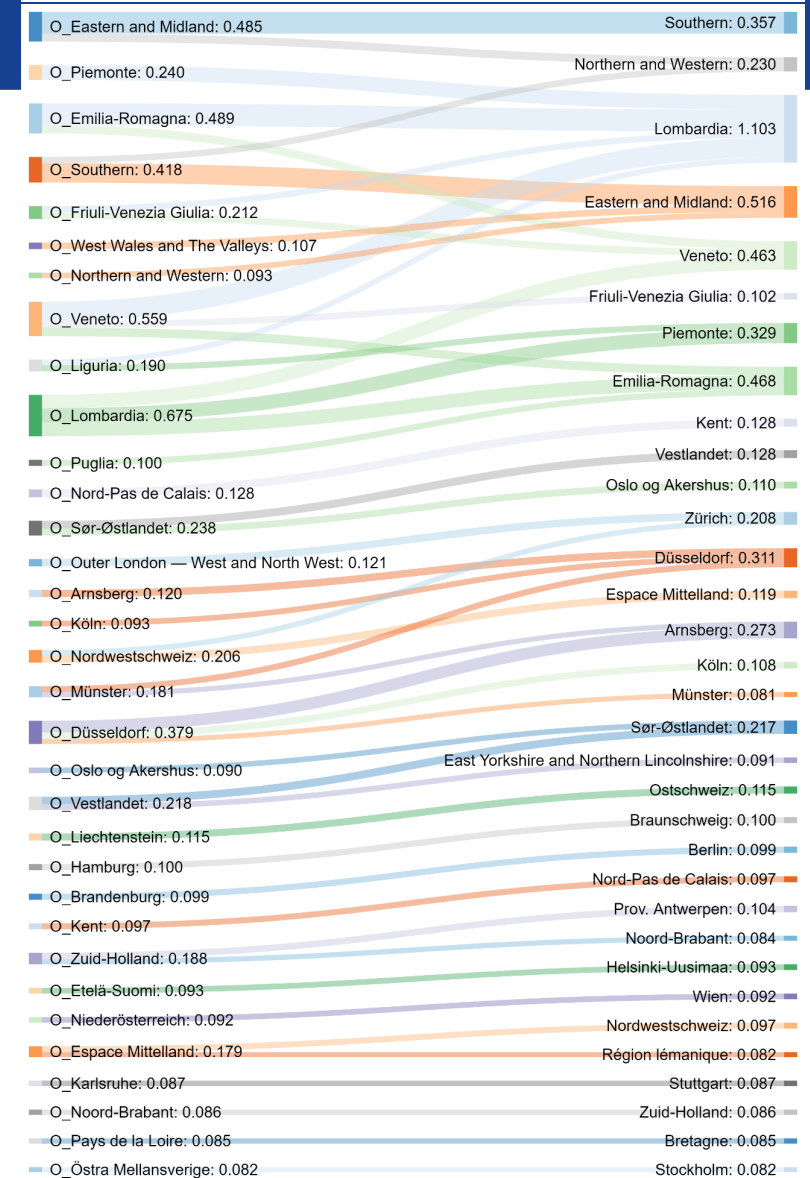
4

Results. Trade of Goods

Map of the R2R flows (exp + imp). Goods. 2018. €.



Sankey diagram with the main bilateral-flows. R2R. ROW and Intra-regional excluded. Average figures 2010-2018. % over Mill. €.

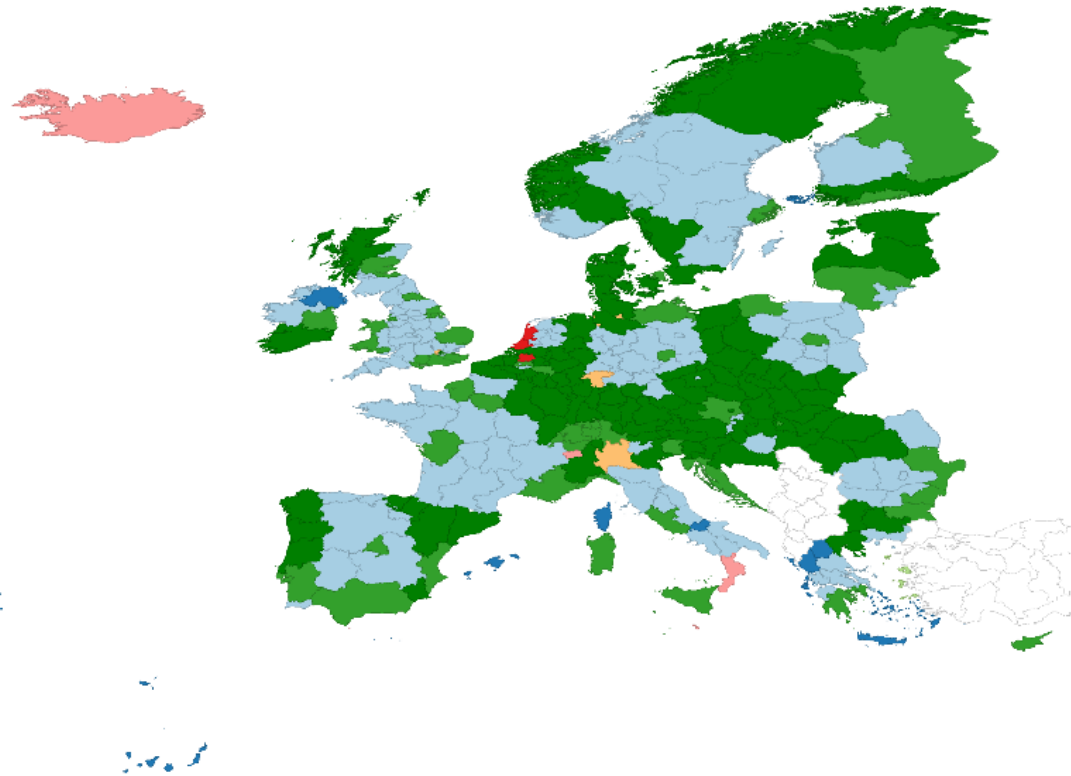
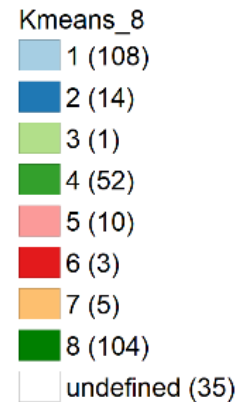


4

Results. Trade of Goods

Cluster analysis: Regional Typologies

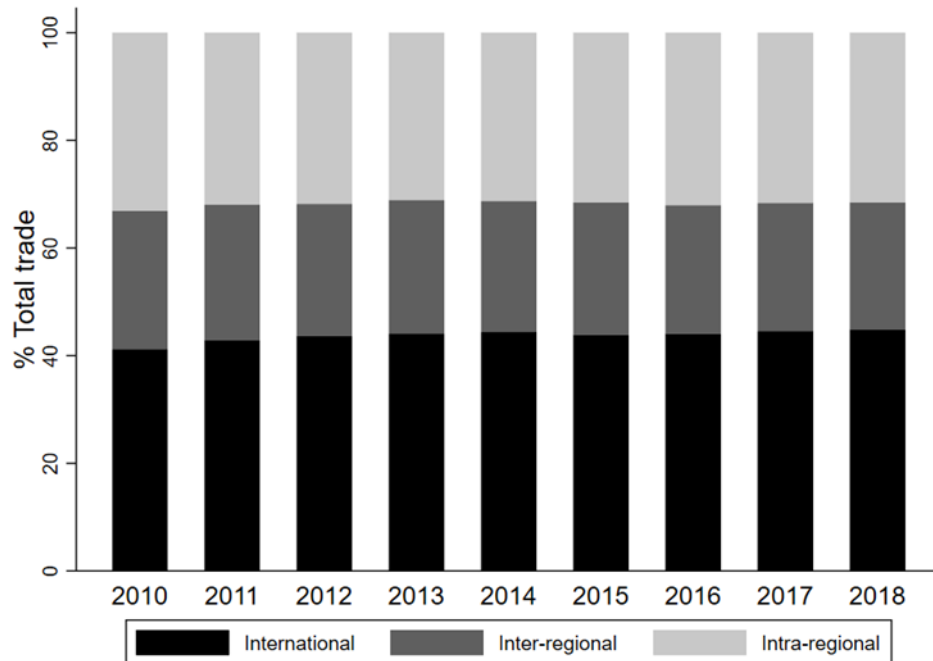
Indicator	Definition	Units
1. Connectivity	Number of destination regions	N° regions
2. Intensity	Total international exports	Th. million euros
3. Weighted Intensity	Total international exports as share of total trade	%
4. Interregional balance	Ratio between the region international exports share and the country international exports share	%
5. Network Selectivity	Share of exports to the main destination region.	%
6. External Influence	Ration between the international exports and the imports from the main destination region.	%
7. Send-Receive Balance	Trade balance. Exports – Imports.	Th. million euros



4

Results. Trade of Goods

$$T_{ijt} = \exp[\beta_0 + \beta_1 GDP_{it} + \beta_2 GDP_{jt} + \beta_3 INTRA_{ij} + \beta_4 INTER_{ij} + \beta_5 CONTIG_{ij} + \beta_6 DIST_{ij} + \beta_6 X_{ij} + \mu_{it} + \mu_{jt}] + \varepsilon_{ijt}$$



Dep. variable	Trade flow (log euros)		Trade flow (euros)		
	OLS	PPML	Trade flow/(GDPi*GDPj)		
	M1	M2	PPML M3	PPML M4	PPML M5
Ln(GDPi)	0.970***	0.663***			
Ln(GDPj)	-0.0201	-0.0533			
Intra	2.905***	3.600***	2.951***	3.438***	3.444***
LnDist	-0.850***	-0.102	-0.796***	-0.505***	-0.499***
Contig	1.044***	0.961***	0.979***	1.365***	1.352***
ComLang	-0.343*	-0.0121	0.0876	0.795***	0.854***
EU	0.518***	-0.0743	0.972**	0.182*	0.412
EUM	-0.242***	-0.187	-0.247	0.688***	0.644***
Island	-0.122*	-0.356*	-1.434*	0.817**	0.753**
Nocoast	-0.375***	-0.0569	-0.419	-1.144***	-1.126***
Constant	-11.06***	-7.489***	5.187***	4.009***	3.852***
exp(Intra)	18	37	19	31	31
Observations	9,397	9,504	9,504	9,504	9,504
R2 / Pseudo R2	0.867	0.954	0.822	0.935	0.948
Year FE	NO	NO	NO	YES	YES
Country FE	NO	NO	NO	YES	YES
Country-Year FE	NO	NO	NO	NO	YES

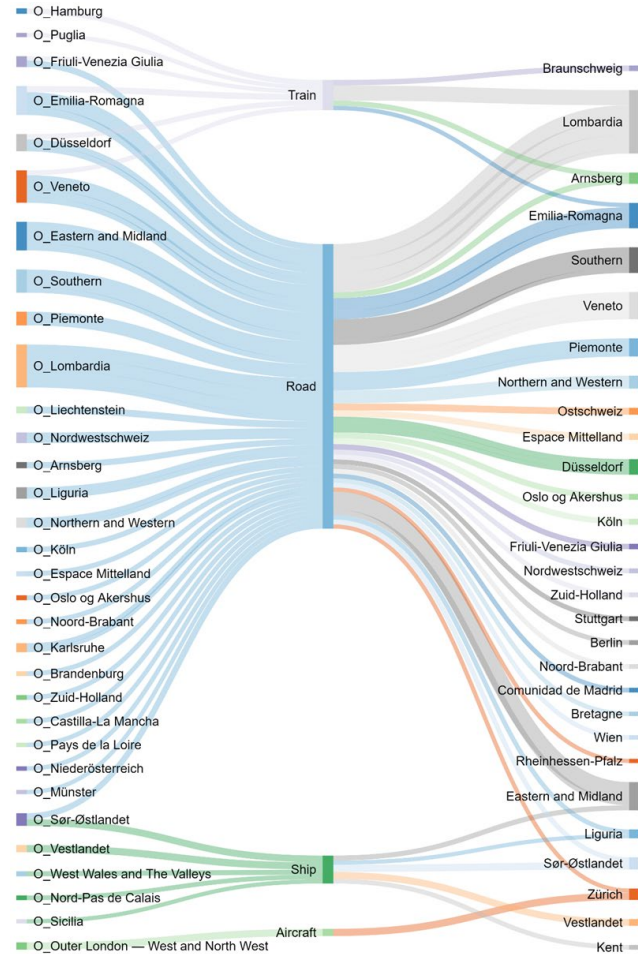
Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4

Results. Trade of Goods

Top-50 inter-regional flows by transport mode. ROW and Intra-regional excluded. Average 2010-2018. % over €.



Dep. variable	Trade flow/(GDPi*GDPj)							
	Ship		Train		Road		Air	
	M1	M2	M3	M4	M5	M6	M7	M8
Intra	2.730***	-0.727	5.422***	2.536***	3.189***	1.645***	-0.524	-4.352***
inter	-0.56	-0.607	-0.632	-0.347	-0.262	-0.132	-0.852	-0.965
LnDist	2.192***	0.713***	4.628***	3.571***	1.689***	1.112***	-3.160***	-2.463***
Contig	-0.28	-0.271	-0.303	-0.212	-0.181	-0.0848	-0.354	-0.394
Contig_C	0.0812	-0.297***	-0.135	-0.906***	-0.539***	-0.936***	-0.537***	-0.906***
ComLang	-0.119	-0.094	-0.151	-0.086	-0.073	-0.036	-0.15	-0.121
EU	0.720**	-0.425**	1.027***	-0.057	1.576***	0.839***	-1.598***	-1.882***
EUM	-0.334	-0.174	-0.163	-0.118	-0.101	-0.052	-0.388	-0.536
Island	-0.172	0.091	1.442***	1.059***	0.698***	0.436***	-0.332	-0.345
Coast	-0.153	-0.127	-0.157	-0.135	-0.0789	-0.04	-0.286	-0.219
Inst	0.074	1.596***	-0.077	0.216	0.198	0.467***	0.177	-0.414
Outermost	-0.23	-0.223	-0.239	-0.133	-0.133	-0.062	-0.301	-0.284
Island_c	-1.379***	-0.069	2.022***	2.169***	1.322***	1.904***	-1.202***	-0.391
Nocoast_c	-0.153	-0.254	-0.339	-0.523	-0.224	-0.239	-0.201	-0.371
Constant	0.364***	0.031	-1.957***	0.266	-0.965***	-0.180***	0.725***	0.082
Observations	-0.114	-0.154	-0.202	-0.198	-0.131	-0.046	-0.207	-0.264
R2 / Pseudo R2	0.906***	0.045	-1.567***	1.632**	0.086	-2.170***	0.411**	-0.108
Year FE	-0.101	-0.18	-0.167	-0.722	-0.25	-0.122	-0.171	-0.559
Region FE	0.047	0.047	0.047	1.132***	0.083	-0.179**	-0.690***	-0.461**
Region-Year FE	-0.253	-0.211	-0.135	-0.082	-0.257	-0.193	-0.257	-0.193
Constant	-0.564***	-0.518***	-0.045	0.128*	-0.101***	0.040**	-0.807***	-0.460***
Observations	-0.062	-0.05	-0.083	-0.069	-0.031	-0.019	-0.139	-0.12
R2 / Pseudo R2	0.193**	1.775***	-3.009***	0.424**	-1.580***	-0.082	1.386***	0.630**
Year FE	-0.098	-0.229	-0.125	-0.17	-0.144	-0.065	-0.197	-0.29
Region FE	0.557*	0.237	0.258**	0.0552	0.0729	1.383***	0.0729	1.383***
Region-Year FE	-0.295	-0.196	-0.295	-0.196	-0.131	-0.0571	-0.215	-0.321
Constant	0.213	-1.349***			-2.550***	-5.574***	-0.109	-5.839***
Observations	-0.432	-0.484			-0.95	-0.602	-0.494	-1.09
R2 / Pseudo R2	-1.472*	2.852***	-3.630***	1.913**	2.638***	5.393***	0.797	6.488***
Year FE	-0.822	-0.673	-0.97	-0.758	-0.598	-0.349	-1.006	-0.871
Region FE	796,554	162,947	754,290	631,760	796,554	743,904	796,554	259,833
Region-Year FE	0.196	0.582	0.601	0.815	0.8	0.906	0.092	0.598
Constant	NO	YES	NO	YES	NO	YES	NO	YES
Observations	NO	YES	NO	YES	NO	YES	NO	YES
R2 / Pseudo R2	NO	YES	NO	YES	NO	YES	NO	YES
Year FE	NO	YES	NO	YES	NO	YES	NO	YES
Region FE	NO	YES	NO	YES	NO	YES	NO	YES
Region-Year FE	NO	YES	NO	YES	NO	YES	NO	YES

Robust standard errors in parentheses

4

Results

2. Interregional freight transport flows by mode

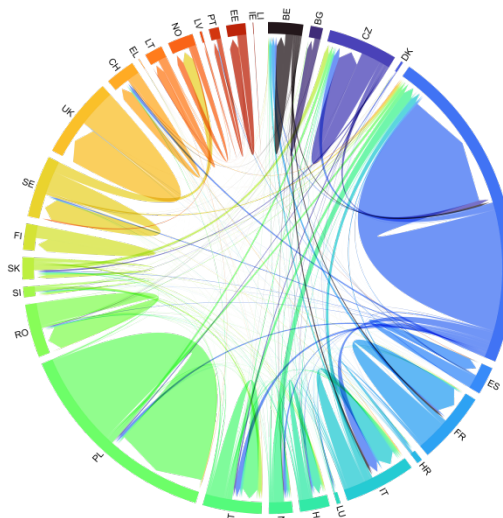
- Country-to-country matrixes (c2c)
- Region-to-region matrixes (r2r)

4

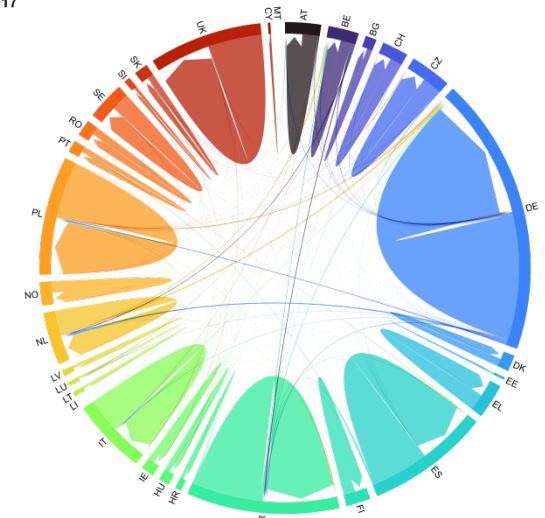
Results. Freight transport flows by mode

- Results at country level (NUTS 0)
 - Freight transport flows by mode at the C2C level
 - Spatial extent: EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland
 - Scope: intra-national and inter-national flows
 - Modes: road, rail, maritime, air
 - Temporal scope: 2010 to 2018
 - Source: Processing of Eurostat data
 - Data features:
 - 32 X 32 OD matrixes for each year
 - Unit: transport volume carried in tons

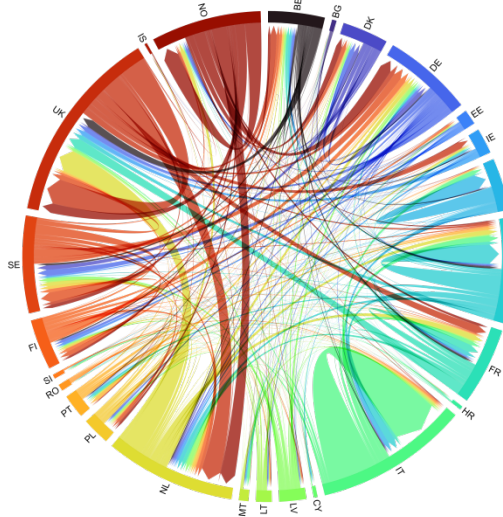
Rail Freight, 2018



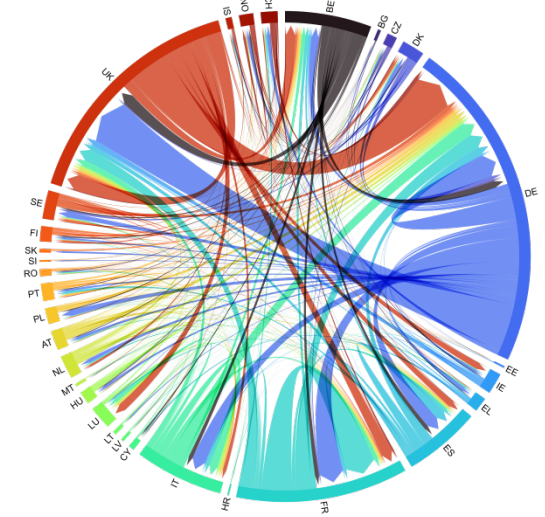
Road Freight, 2017



Maritime Freight, 2018



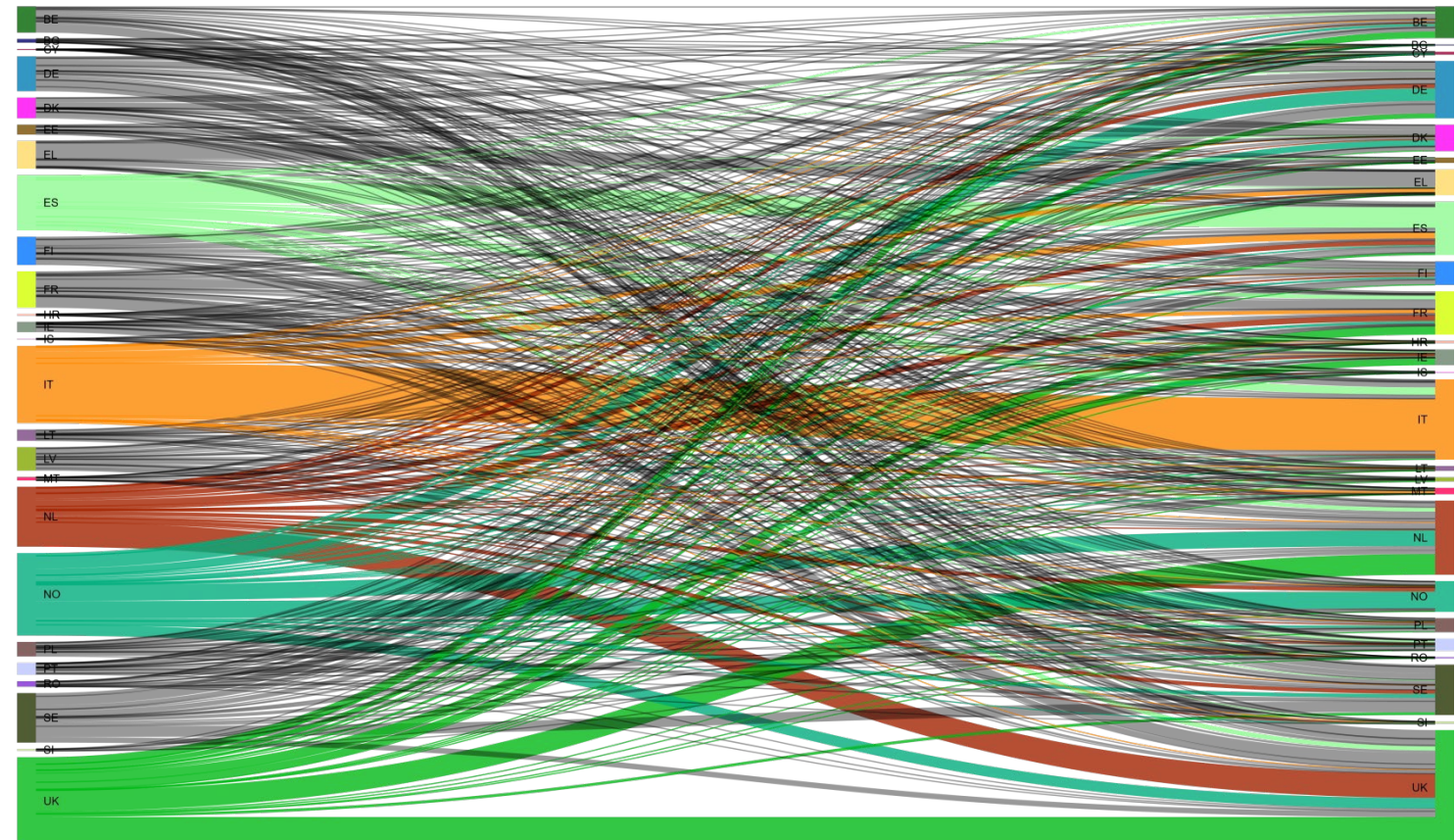
Air Freight, 2018



4

Results. Freight transport flows by mode

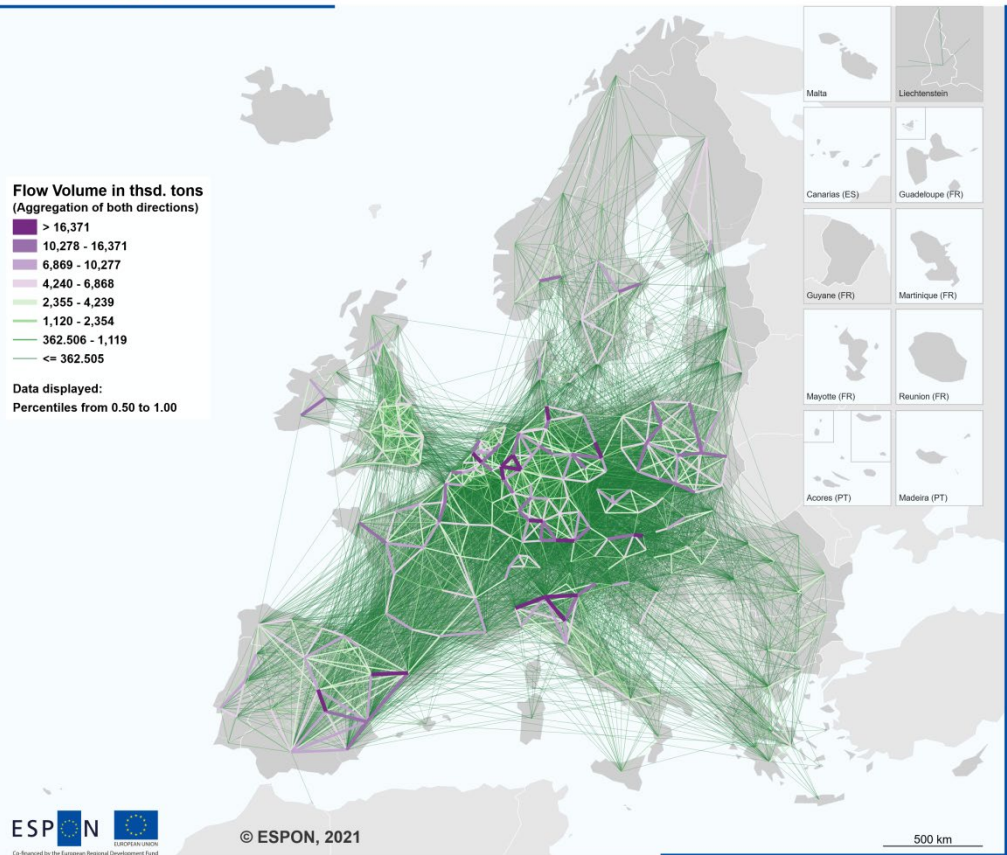
- **Results at regional level (NUTS 2)**
 - **Freight transport flows by mode at the R2R level**
 - **Spatial extent:** EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland
 - **Scope:** intra-national and inter-national flows
 - **Modes:** road, rail, maritime, air
 - **Temporal scope:** 2010 to 2018
 - **Source:** Processing of Eurostat data
 - **Data features:**
 - 329 X 329 OD matrixes for each year
 - Unit: transport volume carried in tons



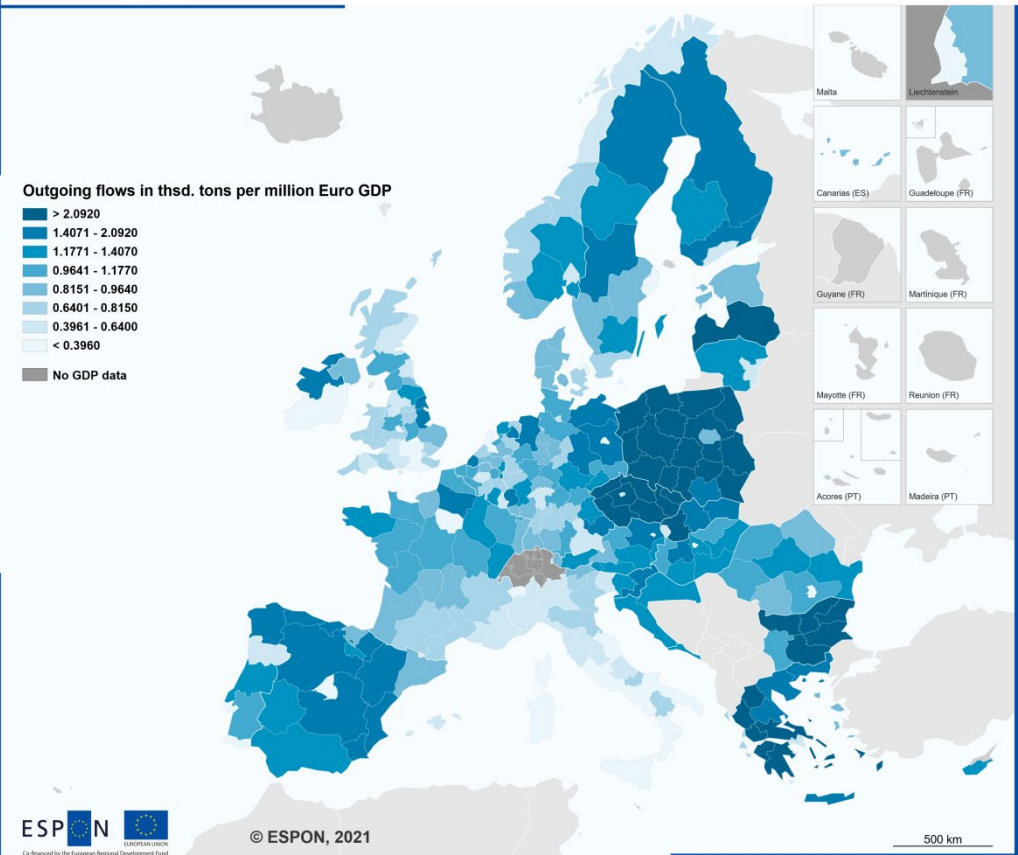
4

Results. Freight transport flows by road

Road Freight, 2018



Road Freight, 2017



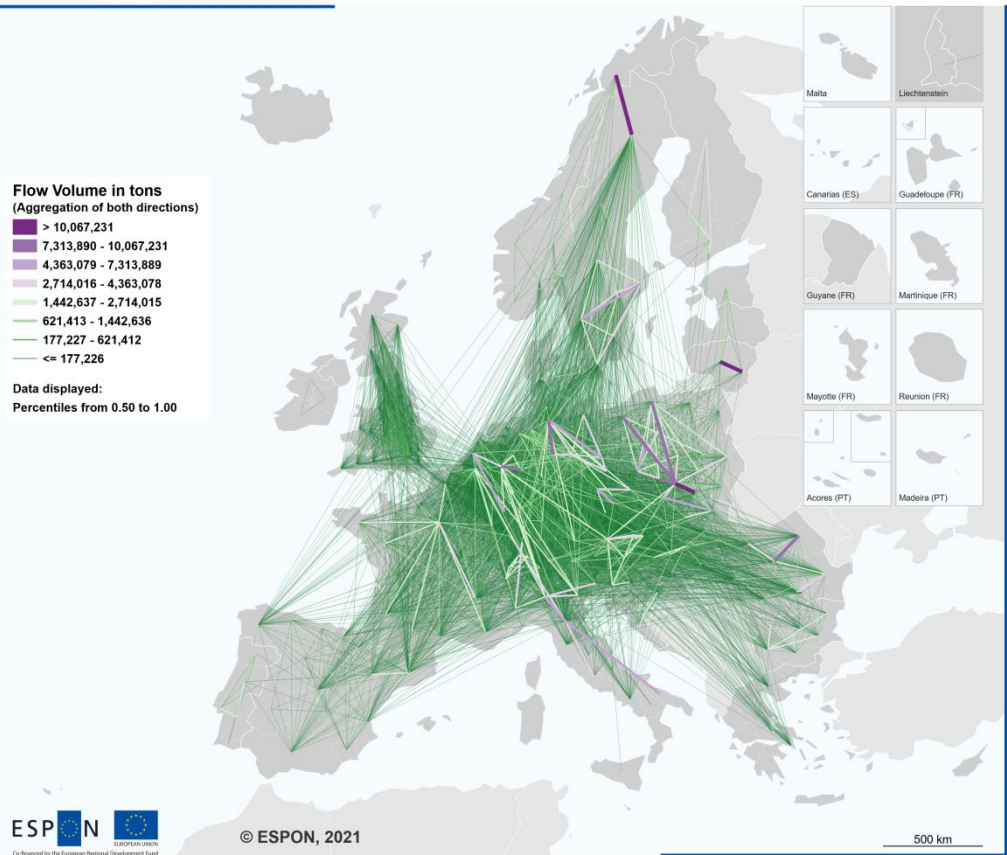
Regional level: NUTS 2 (2016)
Source: ESPON IRIE (S&W FlowMapper), 2021
Origin of data: CEPREDE, 2021
© EuroGeographics for the administrative boundaries

Regional level: NUTS 2 (2016)
Source: ESPON IRIE (S&W FlowMapper), 2021
Origin of data: CEPREDE, 2021
© EuroGeographics for the administrative boundaries

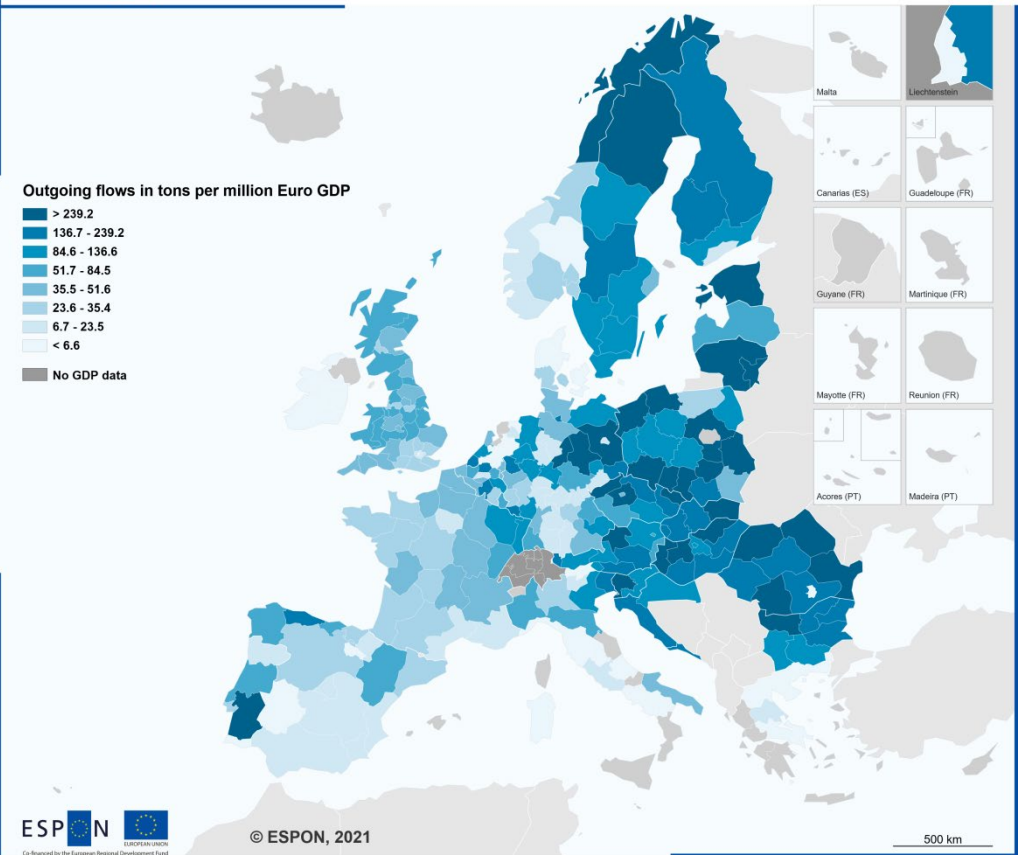
4

Results. Freight transport flows by rail

Rail Freight, 2018



Rail Freight, 2017



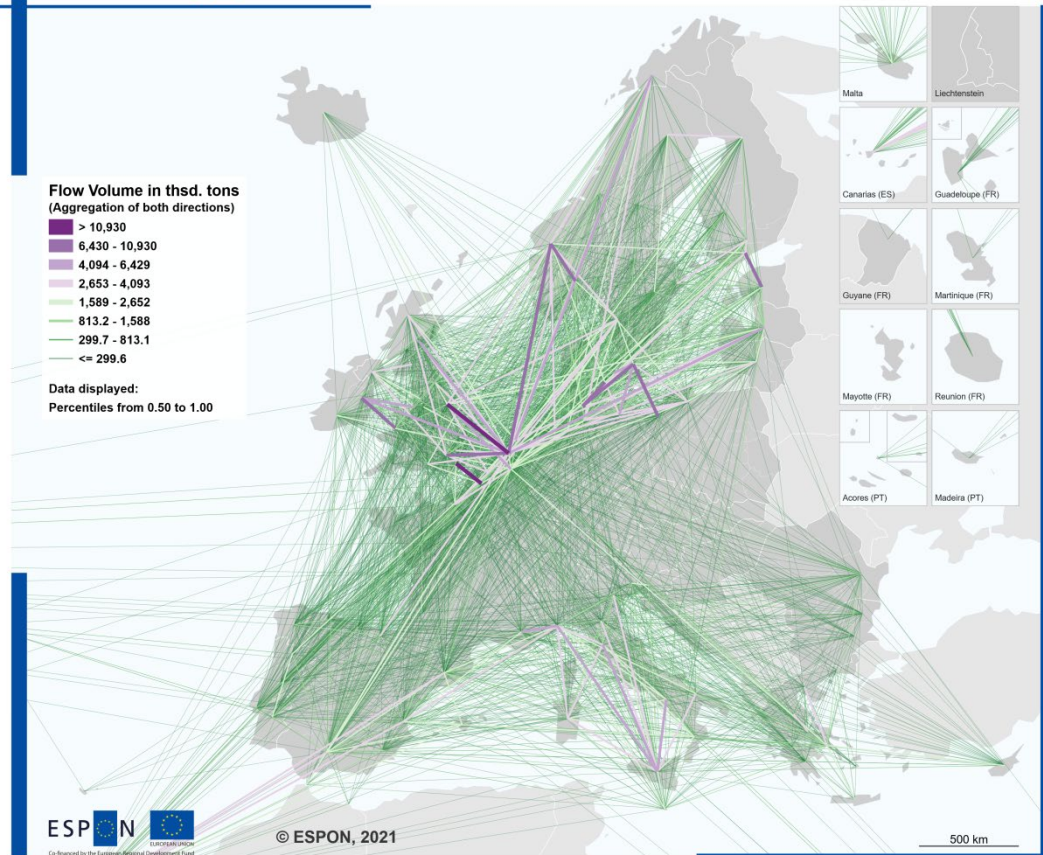
Regional level: NUTS 2 (2016)
Source: ESPON IRE (S&W FlowMapper), 2021
Origin of data: S&W based on Eurostat, 2021
© EuroGeographics for the administrative boundaries

Regional level: NUTS 2 (2016)
Source: ESPON IRE (S&W FlowMapper), 2021
Origin of data: S&W based on Eurostat, 2021
© EuroGeographics for the administrative boundaries

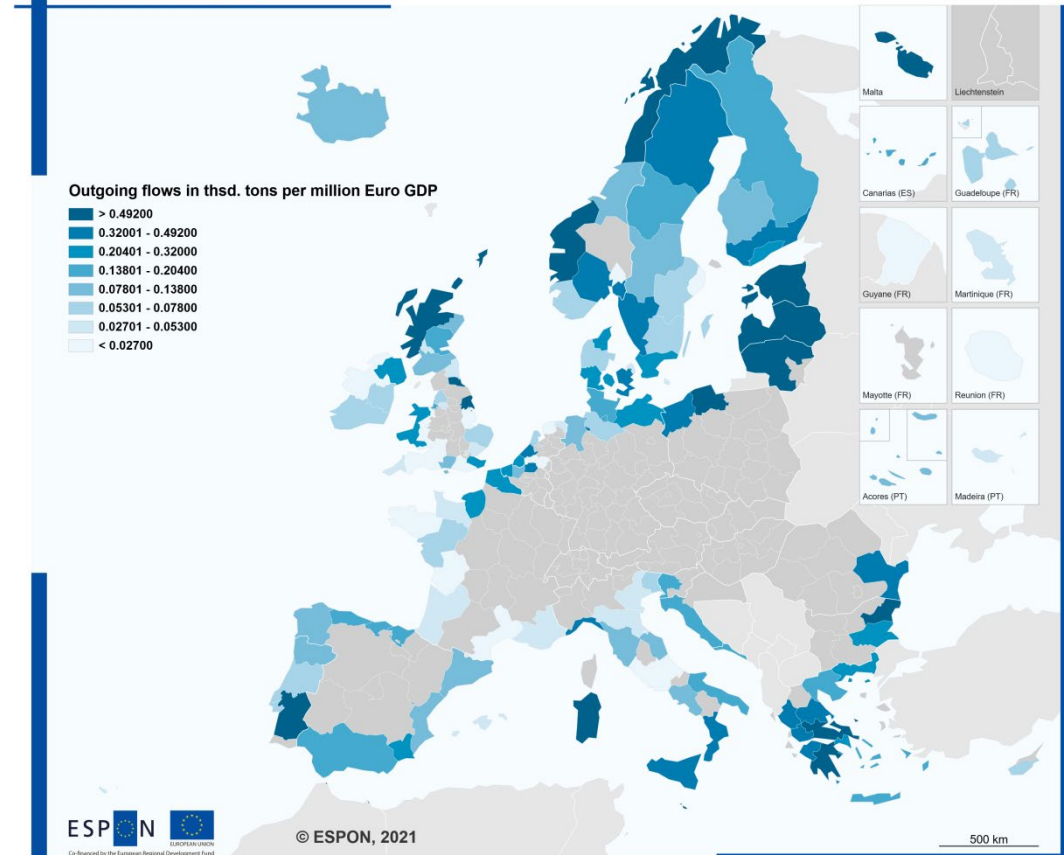
4

Results. Maritime freight transport flows

Maritime Freight, 2018

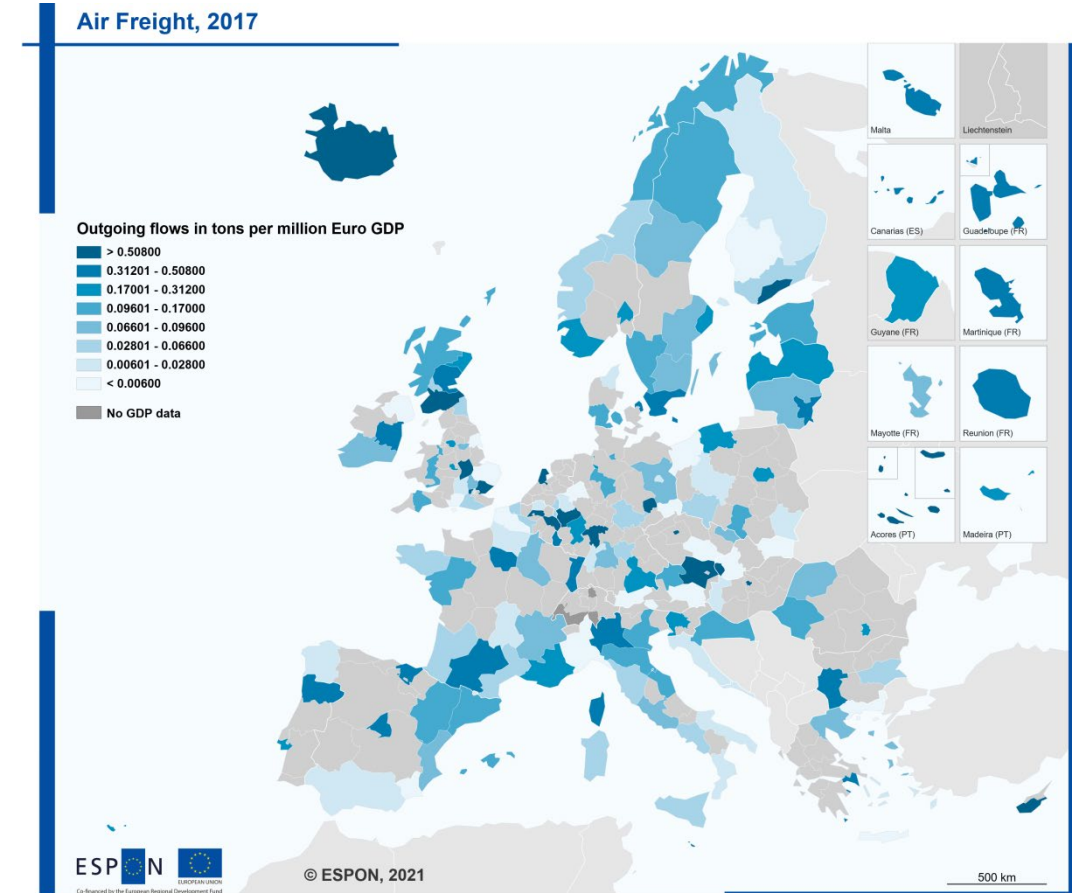
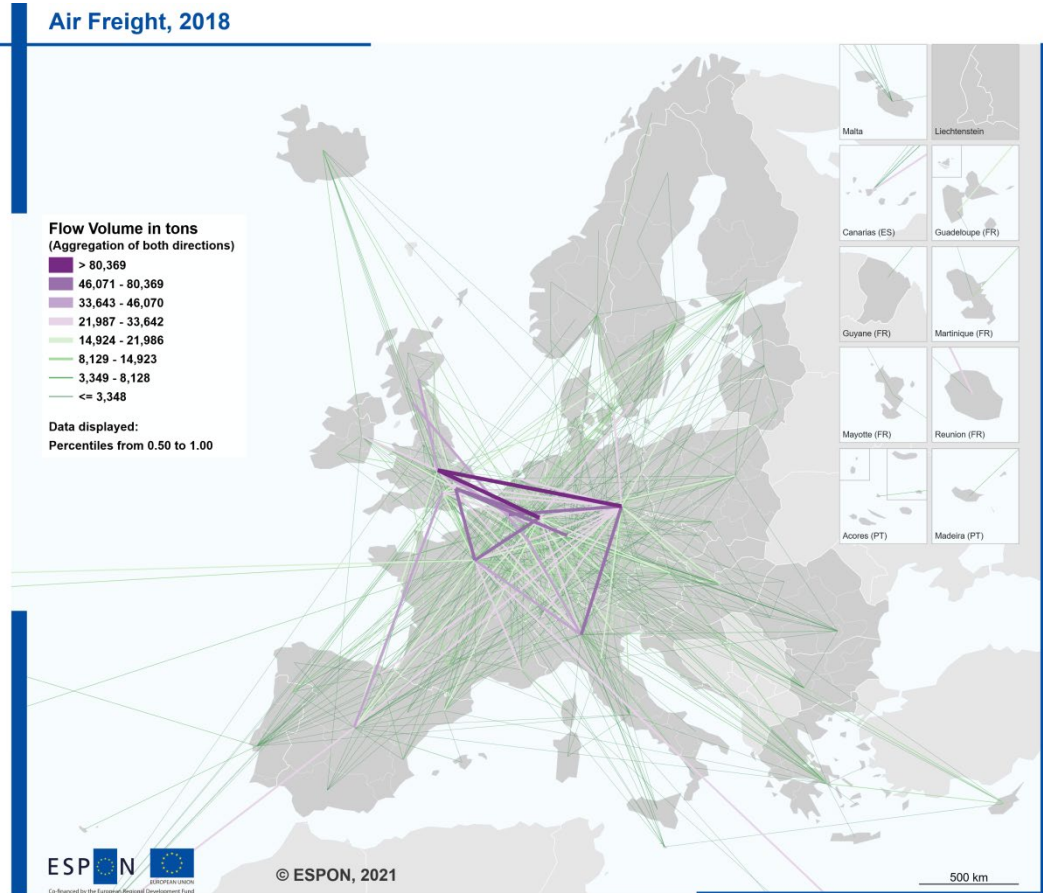


Maritime Freight, 2017



4

Results. Freight transport flows by air



Regional level: NUTS 2 (2016)
Source: ESPON IRE (S&W FlowMapper), 2021
Origin of data: S&W based on Eurostat, 2021
© EuroGeographics for the administrative boundaries

Regional level: NUTS 2 (2016)
Source: ESPON IRE (S&W FlowMapper), 2021
Origin of data: S&W based on Eurostat, 2021
© EuroGeographics for the administrative boundaries

4

Results

3. Interregional trade flows of services

- Country-to-country matrixes (c2c)
- Region-to-region matrixes (r2r)
- Analysis (provisional)

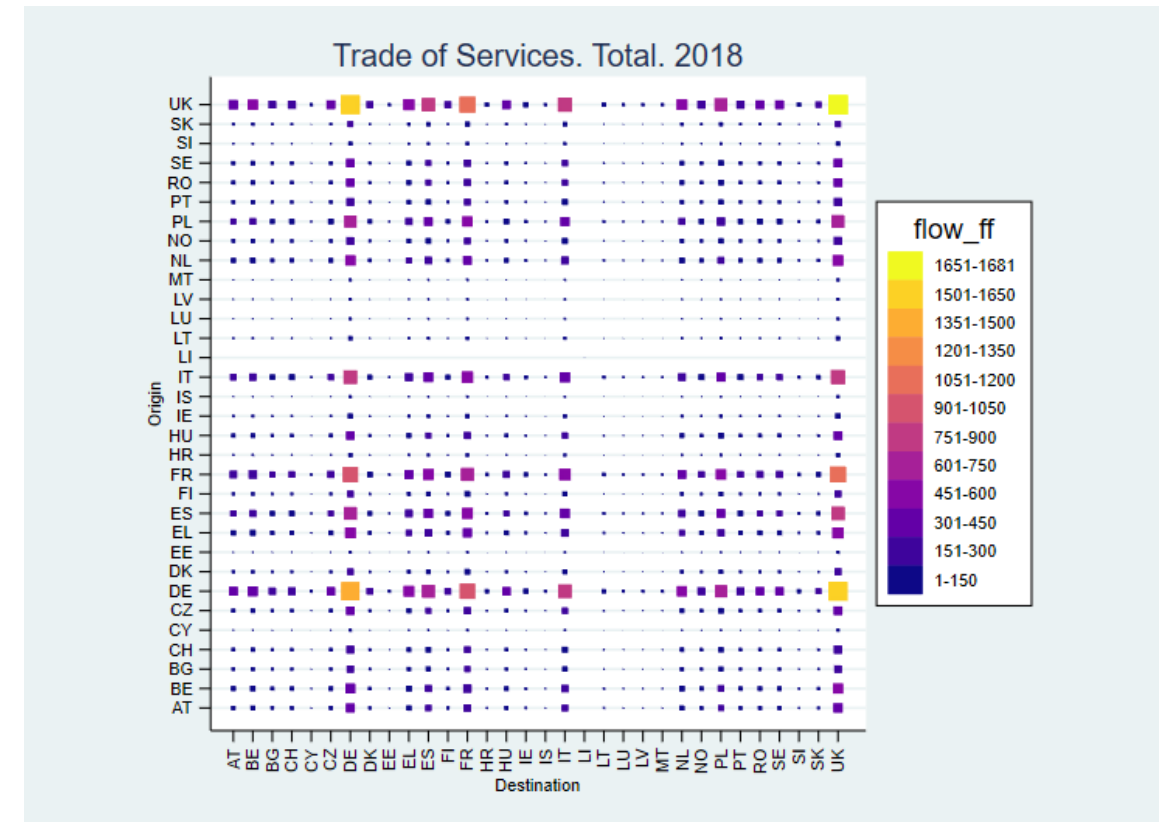
4

Results. Trade of Services

Provisional!!!

- Results at country level (NUTS 0)
 - Trade flows of services
 - Spatial extent:** EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland
 - Temporal scope:** 2010 to 2018
 - Sectoral detail:** Total + 12 sectors EBOPS-2010.
 - Source:** Own elaboration based on WTO-UNCTAD/FIGARO.
 - Data features:**
 - 32 X 32 OD matrixes for each year
 - Variable under consideration: trade flows (Mill.€)
 - Intra-national and inter-national flows included. Inter-national are harmonized to BATIS (WTO-UNCTAD-OECD). Intra-national flows take FIGARO total output (country-sector-year) as reference.

C2C Intra & inter-national flows. All service sectors. 2018. Millions of €.



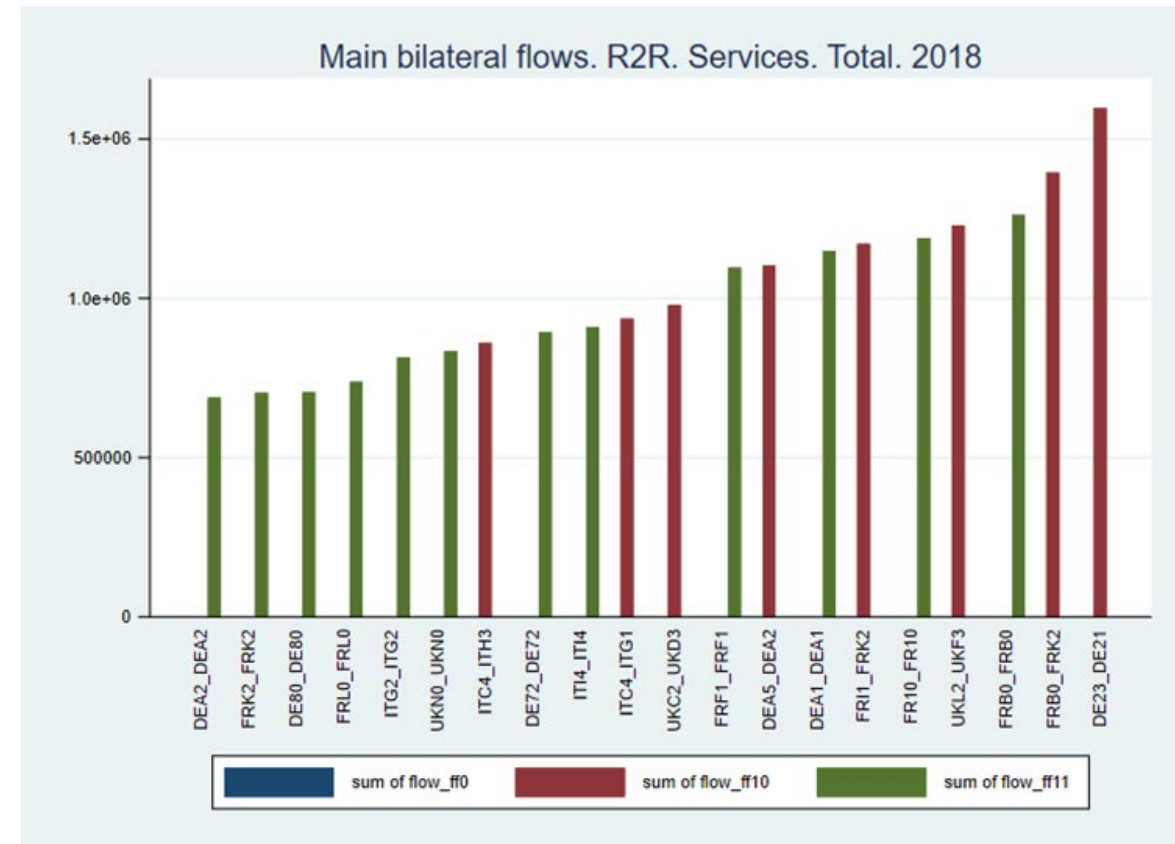
4

Results. Trade of Services

Provisional!!!

- **Results at regional level (NUTS 2)**
 - **Trade flows of services**
 - **Spatial extent:** EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland
 - **Temporal scope:** 2010 to 2018
 - **Sectoral detail:** Total + 12 sectors EBOPS-2010.
 - **Source:** Own elaboration based on WTO-UNCTAD/FIGARO.
 - **Data features:**
 - 329 X 329 OD matrixes for each year
 - Variable under consideration: trade flows (Mill.€)
 - Intra-national and inter-national flows included. Inter-national are harmonized to BATIS (WTO-UNCTAD-OECD). Intra-national flows take FIGARO total output (country-sector-year) as reference.

The main R&R flows. All service sectors. 2018.
Millions of €.



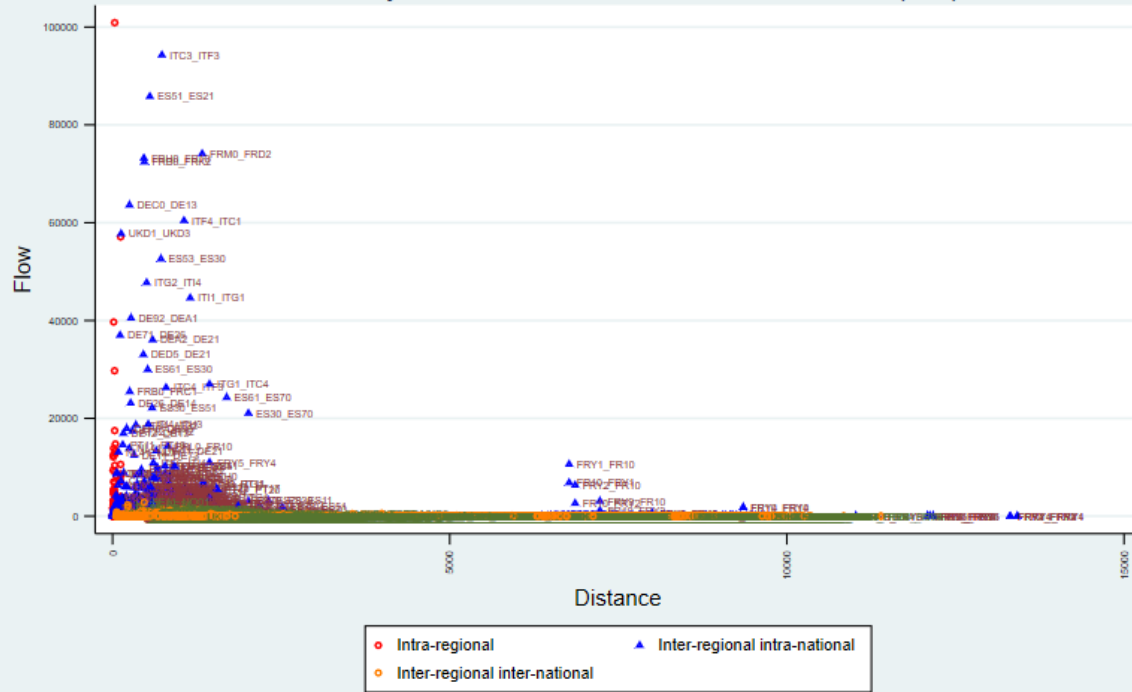
4

Results. Trade of Services

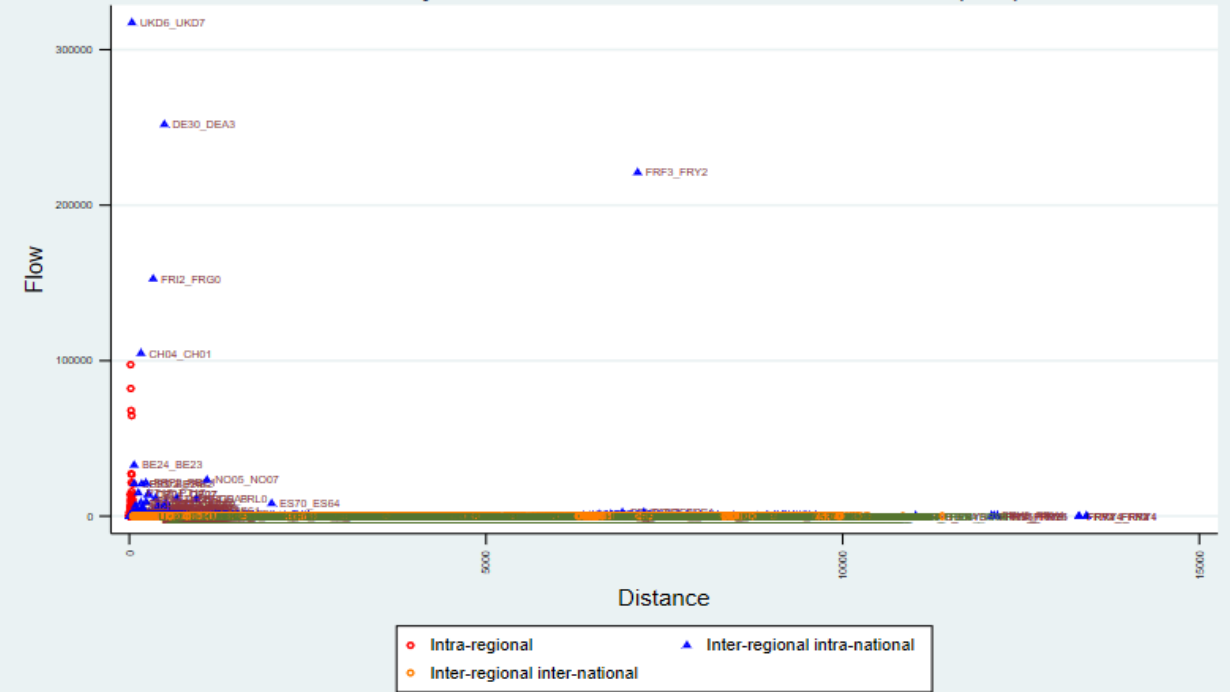
Provisional!!!

Total bilateral R2R flows (Thousand. €) versus distance (Km.) by EBOPS.
 ESPON countries. Millions of €. 2018 (cont.)

Monetary flow of services:SD. versus distance (Km)



Monetary flow of services:SF. versus distance (Km)



4

Results. Trade of Services

 \hat{S}_{ijt}^{eukt}

$$= \exp[\beta_0 + \beta_1 \ln GVA_{ikt} + \beta_2 \ln GVA_{jkt} + \beta_3 \ln Facebook_{ij} + \beta_4 \ln Post_{ij} + \beta_5 \ln Freight_{ij} + \beta_6 \ln Passengers_{ij} + \beta_7 \ln Direct_investments_{ij} + \beta_8 \ln Labour_{ij}] + \varepsilon_{ijt}$$

Dep. variable	Sector specific international trade flow (R2R)												
	SA	SB	SC	SD	SE	SF	SG	SH	SI	SJ	SK	SL	SOX
Ln(facebook)	0.346***	0.138***	0.224***	0.331***	0.492***	0.519***	0.950***	0.494***	0.375***	0.382***	0.539***	0.309***	0.518***
	(0.0576)	(0.0228)	(0.0208)	(0.0356)	(0.0147)	(0.0417)	(0.0546)	(0.0374)	(0.0170)	(0.0133)	(0.0154)	(0.0129)	(0.0202)
Ln(post_tons)	-0.0299	0.0468***	-0.0150	0.0210*	0.0510***	0.0347**	0.0690**	0.0172	0.00459	0.0219***	0.0404***	0.0349***	0.0335***
	(0.0231)	(0.0125)	(0.00959)	(0.0112)	(0.00709)	(0.0148)	(0.0332)	(0.0279)	(0.00805)	(0.00736)	(0.00977)	(0.00592)	(0.00807)
Ln(freight)	0.0224***	0.0324***	0.320***	0.0219***	0.0431***	-0.0102**	-0.0220***	0.000197	0.0309***	0.0645***	0.0224***	-0.00108	0.0123***
	(0.00864)	(0.00593)	(0.0100)	(0.00503)	(0.00407)	(0.00419)	(0.00820)	(0.0132)	(0.00369)	(0.00341)	(0.00344)	(0.00279)	(0.00239)
Ln(Direct_Inv)	0.101***	0.0806***	0.0339***	0.0188***	0.0435***	0.000452	-0.0151*	0.0188*	0.00494	0.0354***	0.0353***	0.00133	0.0355***
	(0.00899)	(0.00436)	(0.00470)	(0.00525)	(0.00298)	(0.00284)	(0.00862)	(0.0106)	(0.00462)	(0.00305)	(0.00451)	(0.00223)	(0.00183)
Ln(all_pas)	0.552***	0.309***	0.111***	0.549***	0.00808*	-0.0163***	0.533***	-0.0185	-0.00716*	-0.0140***	0.00809*	-0.0227***	0.0662***
	(0.0212)	(0.00483)	(0.00450)	(0.0135)	(0.00488)	(0.00419)	(0.0453)	(0.0174)	(0.00433)	(0.00296)	(0.00457)	(0.00394)	(0.00240)
Ln(labor)	0.0550	0.136***	0.0270	-0.0299	0.542***	0.249***	0.445***	0.0408	0.340***	0.285***	0.377***	-0.0635***	0.122***
	(0.0543)	(0.0253)	(0.0285)	(0.0590)	(0.0201)	(0.0678)	(0.0406)	(0.0352)	(0.0452)	(0.0314)	(0.0267)	(0.0138)	(0.0175)
Ln(GVA_i^{ekt})	0.115**	-0.0598***	0.183***	0.134***	0.631***	0.417***	-15.83***	0.477***	0.632***	0.636***	0.466***	0.842***	0.426***
	(0.0515)	(0.0149)	(0.0155)	(0.0256)	(0.0186)	(0.0109)	(0.469)	(0.0400)	(0.0129)	(0.0120)	(0.0153)	(0.0132)	(0.0103)
Ln(GVA_j^{ukt})	0.260***	0.00797	0.275***	0.338***	-14.10***	0.319***	0.950***	0.423***	0.531***	0.638***	0.589***	0.891***	0.451***
	(0.0538)	(0.0126)	(0.0202)	(0.0245)	(0.280)	(0.0146)	(0.0546)	(0.0546)	(0.0125)	(0.0119)	(0.0158)	(0.0127)	(0.0161)
Constant	-11.87***	-3.640***	-7.528***	-9.055***	0.492***	-9.378***	0.0690**	-12.21***	-10.52***	-12.94***	-12.70***	-22.79***	-9.954***
	(1.089)	(0.261)	(0.303)	(0.426)	(0.0147)	(0.199)	(0.0332)	(0.782)	(0.148)	(0.199)	(0.206)	(0.225)	(0.183)
Observations	82,810	82,810	82,810	82,810	82,810	82,810	82,810	82,810	82,810	82,810	82,810	82,810	82,810
Pseudo R2	0.746	0.543	0.600	0.838	0.276	0.223	0.342	0.140	0.468	0.557	0.300	0.230	0.593
Country FE	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Region FE	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Provisional!!!

4

Results. Trade of Services

Gravity equation. OLS & PPML.

Total services. 2010-18. Units: Mill. of €.

$$S_{ij}^{eukt} = \beta_0 + \beta_1 GDP_{it} + \beta_2 GDP_{jt} + \beta_3 INTRA_{ij} + \beta_4 INTER_{ij} + \beta_5 CONTIG_{ij} + \beta_6 DIST_{ij} + \beta_6 X_{ij} + \mu_{it} + \mu_{jt} + \varepsilon_{ijt}$$



Dep. Var	S_{ij}^{eukt} Eq.(24).	S_{ij}^{eukt} Eq.(25)	$\frac{S_{ij}^{eukt} GDP_t}{GDP_{it} GDP_{jt}}$ Eq.(26)
Estimator	OLS	PPML	PPML
Ln(GDP _i)	0.485***		
Ln(GDP _j)	0.548***		
Intra	5.078***	6.253***	6.679***
Inter	4.151***	5.118***	5.479***
Ln(Dist _{ij})	-0.679***	-0.277***	-0.310***
Contig_r	0.731***	0.397***	0.186**
Contig_c	0.121***	0.217***	0.559***
Comlang_off	0.393***	0.792***	1.156***
EU	-0.118***	-0.342***	0.219***
UEM	0.157***	0.247***	0.228***
Island	0.575***	0.261***	0.499**
Coast	0.0775***	-0.0549	0.0609
Inst	-0.0271***	-0.0290	-0.232
Outermost	0.193***	0.278	0.494
Island_c	0.270***	0.311***	0.179**
Nocoast_c	-0.0750***	0.0492	0.0988
Constant	-3.687***	0.305	1.319***
Observations	790,916	790,916	792,396
R ² /Pseudo R ²	0.834	0.796	0.810
Year FE	NO	YES	YES
Country FE	NO	NO	NO
Contry-Year FE	NO	NO	NO
Region FE	NO	YES	YES
Region-Year FE	NO	YES	YES

4

Results

4. Interregional flows of people: migration

- Country-to-country matrixes (c2c)
- Region-to-region matrixes (r2r)

4

Results. People: Migration

- Results at country level (NUTS 0)

- Migration at the C2C level

- Spatial extent:** EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland
- Scope:** intra-national and inter-national flows
- Temporal scope:** 2010 to 2018
- Source:** Eurostat, NSI.

- Data features:

- 32 X 32 OD matrixes for each year
- Variable under consideration: interregional migrants flows.

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Order		BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT
1	BE	0	517	398	393	4934	186	397	821	2800	10326	100	2616	94	88	141	1171	424	19
2	BG	3582	0	960,979	932	39387	13	139	3250	8395	1911,736	30	5934	38,48921	555,1345	25	100	58	26,09711
3	CZ	577	216,0795	0	186	7190	13	362	738,7259	4272,515	427,0913	45	592	46,63428	194,8679	11	88	72	31,65327
4	DK	307	176	250	0	3265	89	198	143	1083	952	26	710	20	279	525	98	239	39
5	DE	4540	23785	6067	3322	0	779	2011	12641	16071	18691	11333	24268	335	4165	3713	2226	21330	159
6	EE	117	7	28	199	1209	0	159	2	50	47	1	137	6	17	9	60	9	2
7	IE	469	89	290	307	3259	129	0	186	1816	3636	72	1846	15	1137	2006	126	351	17
8	EL	854	165	131,7381	233	13717	12	114	0	4405,98	769,056	3	591	0	105,9274	23	122	39	32,8543
9	ES	6067	11080	4426,136	1447	21543	33	2254	4538,345	0	21156	28	9553	143,1445	4394,38	1294	308	224	97,48776
10	FR	17364	658,5966	764,1716	1091	20266	70	2265	2344,923	10545	0	90	3959	624,5534	628,1465	44	2909	380	528,3003
11	HR	208	1	30	39	10269	2	25	2	8	18	0	790	0	0	10	37	176	0
12	IT	4284	492	255	864	27188	51	1075	239	10382	5583	367	0	32	21	57	751	339	115
13	CY	69	39,85812	22,93383	30	395	5	100	0	2314,215	120,357	1	25	0	15,12262	20	8	28	14,03088
14	LV	251	150,3889	163,6026	884	7689	82	1217	477,4207	2578,498	452,965	3	355	0	0	54	64	7	16,40911
15	LT	345	32	115	1511	6143	77	13048	315	3535	618	11	1091	218	233	0	90	21	17
16	LU	1810	22	66	113	2897	22	66	56	127	1509	7	450	1	32	21	0	46	14
17	HU	873	38	47	470	30015	8	676	20	107	285	206	989	59	0	6	138	0	14
18	MT	58	16,36641	14,83158	28	220	0	58	0	2231,945	50,93646	2	154	19,71537	14,10072	0	34	5	0
19	NL	10466	81,36901	235,3843	654	12460	19	569	904,0127	3520	3452,927	44	804	247,6205	63,69512	61	207	390	42,82454
20	AT	373	791	646	241	17859	23	175	239	466	659	974	1013	22	32	47	68	2015	18
21	PL	9769	992,8338	1885,846	3002	125861	13	3923	3645,647	3351	339	50	7414	120,47	978,8624	50	361	192	82,02034
22	PT	2684	185,357	187,6397	197	7257	13	272	750,4746	6847	35132,8	4	475	126,1248	181,588	10	3845	30	31,85684
23	RO	6038	218,139	58,63468	2026	74585	3	1120	133	51823	405	50	92591	0	0	7	317	6581	0
24	SI	317	283	57	49	1886	3	40	14	63	133	1256	413	9	3	10	51	51	0
25	SK	936	5	629	204	8613	2	447	6	22	21	55	926	0	3	2	79	1213	4
26	FI	344	12	40	416	2185	1020	154	49	936	310	10	181	17	35	19	82	62	25
27	SE	505	115	123	5195	3600	145	393	346	1785	923	70	376	69	89	130	131	252	151
28	UK	2607	1637,297	1684,802	2698	16565	108	11798	3557,487	18675	20133	99	7194	1812,13	1503,187	1439	415	964	126,7707
29	IS	52	5	32	945	158	11	15	8	62	33	3	48	2	41	121	49	13	6
30	LI	8	0	1	1	21	0	1	2	17	2	0	22	0	0	0	0	0	0
31	NO	192	62	59	2783	1057	105	168	34	1499	444	20	173	17	119	418	31	146	22
32	CH	780	272,2901	277,1812	428	3879,067	9	199	410,5261	2179	1950,262	179	3296	69,45457	270,2307	13	40	127	50,37193

4

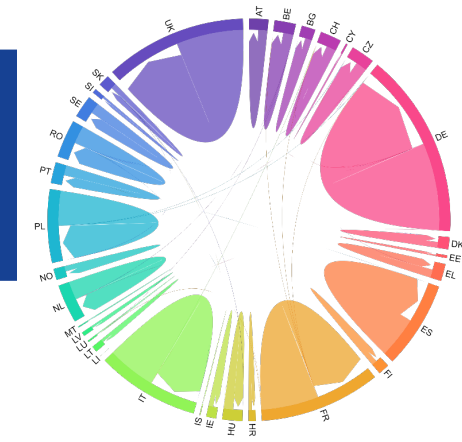
Results

5. Interregional flows of people: labour flows (commuting)

- Country-to-country matrixes (c2c)
- Region-to-region matrixes (r2r)
- Typologies
- Analysis

4

Results. People: Commuting



Results at country level (NUTS 0)

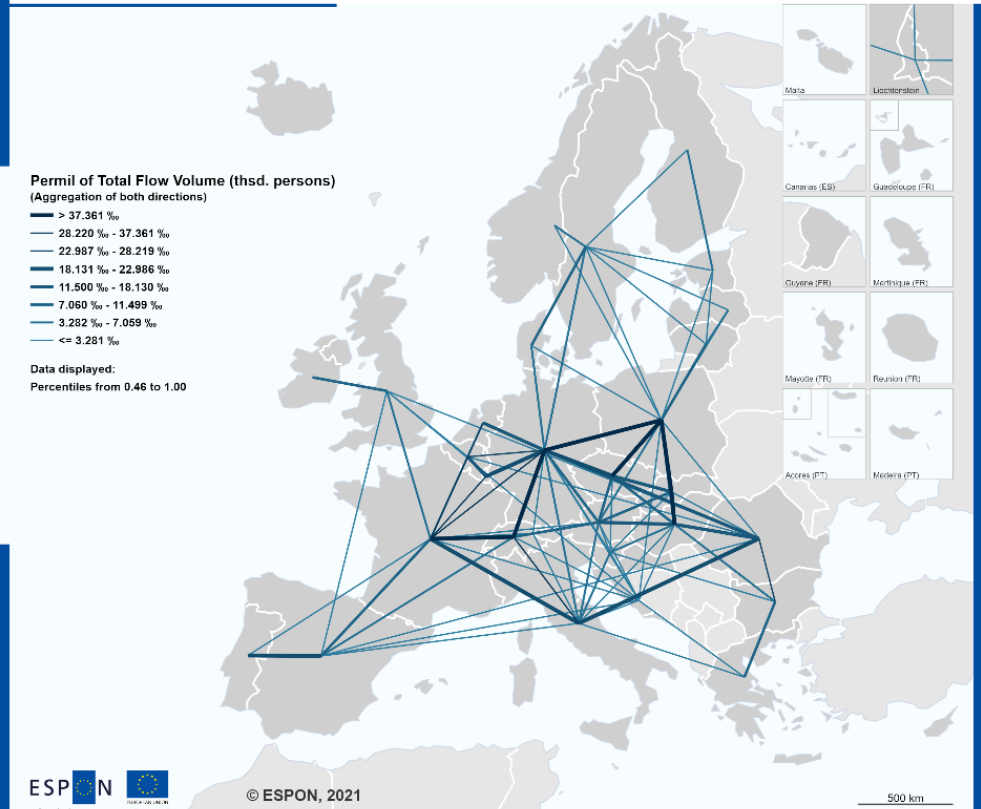
Commuting at the C2C level

- Spatial extent:** EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland
- Scope:** intra-national and inter-national flows
- Temporal scope:** 2010 to 2018
- Source:** Eurostat (LFS).

Data features:

- 32 X 32 OD matrixes for each year
- Variable under consideration: people working in each region by region of residence.

Commuters, 2018

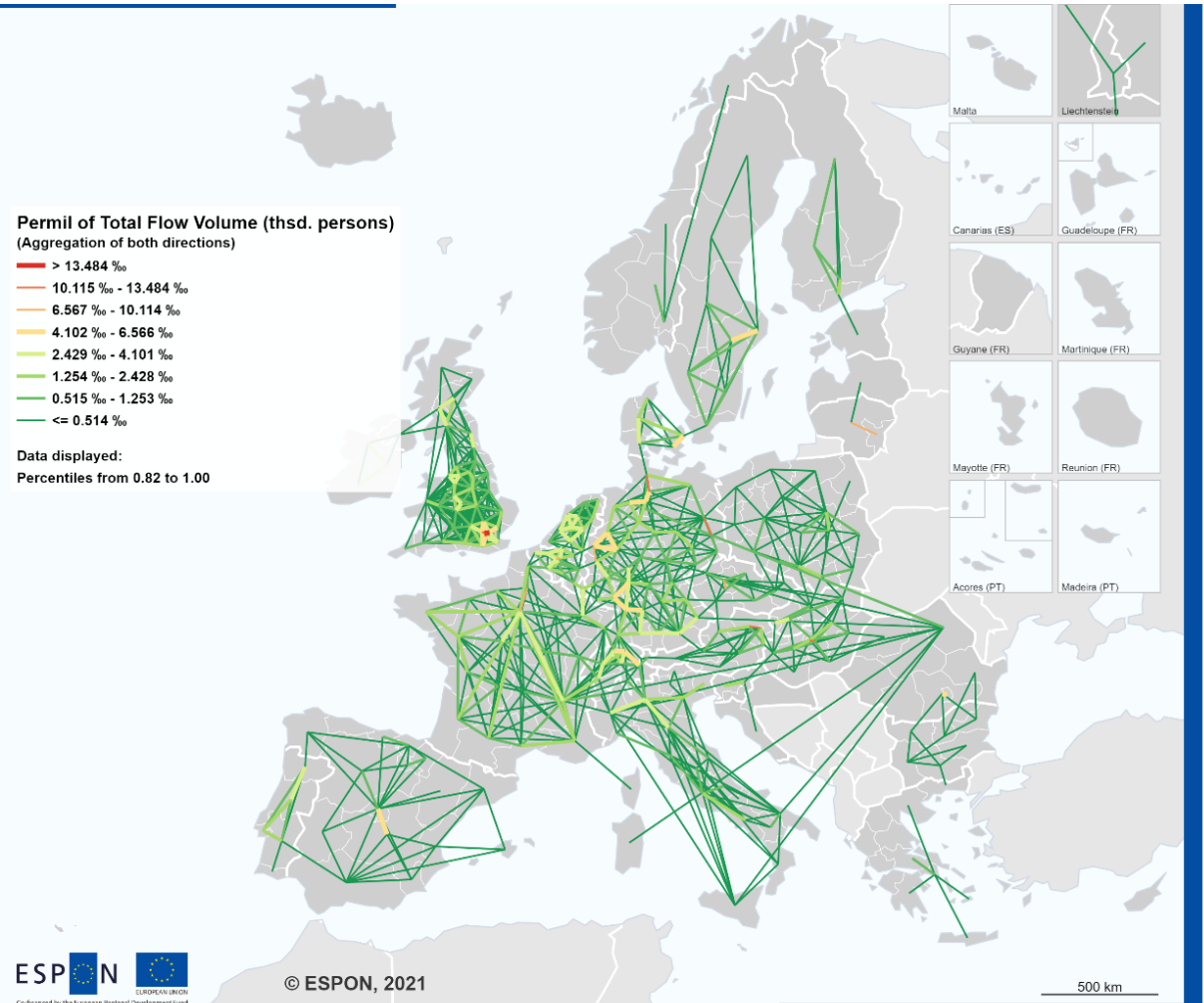


4

Results. People: Commuting

- **Results at regional level (NUTS 2)**
 - **Commuting at the R2R level**
 - **Spatial extent:** EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland
 - **Scope:** intra-national and inter-national flows
 - **Temporal scope:** 2010 to 2018
 - **Source: Eurostat (LFS).**
 - **Data features:**
 - 329 X 329 OD matrixes for each year
 - Variable under consideration: people working in each region by region of residence.

Commuters, 2018

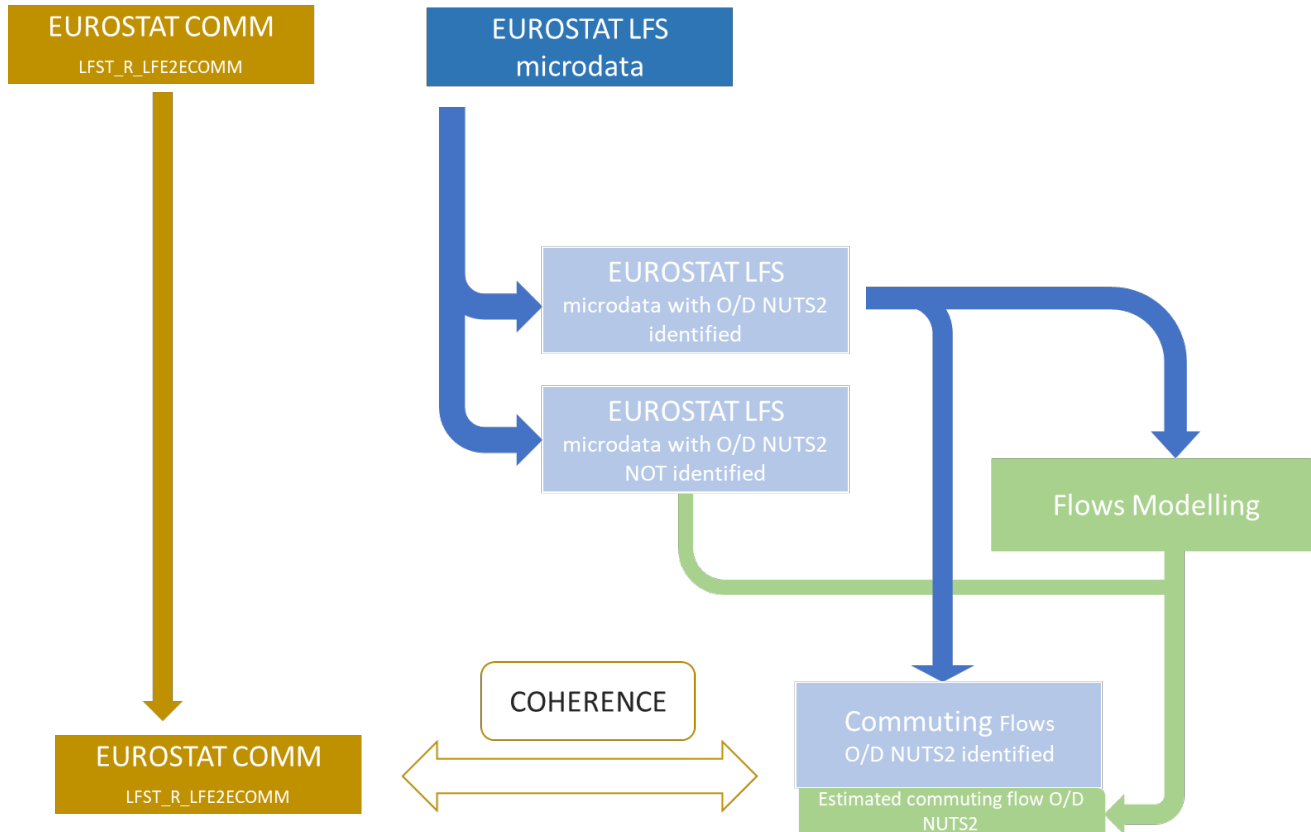


4

Results. People: Commuting

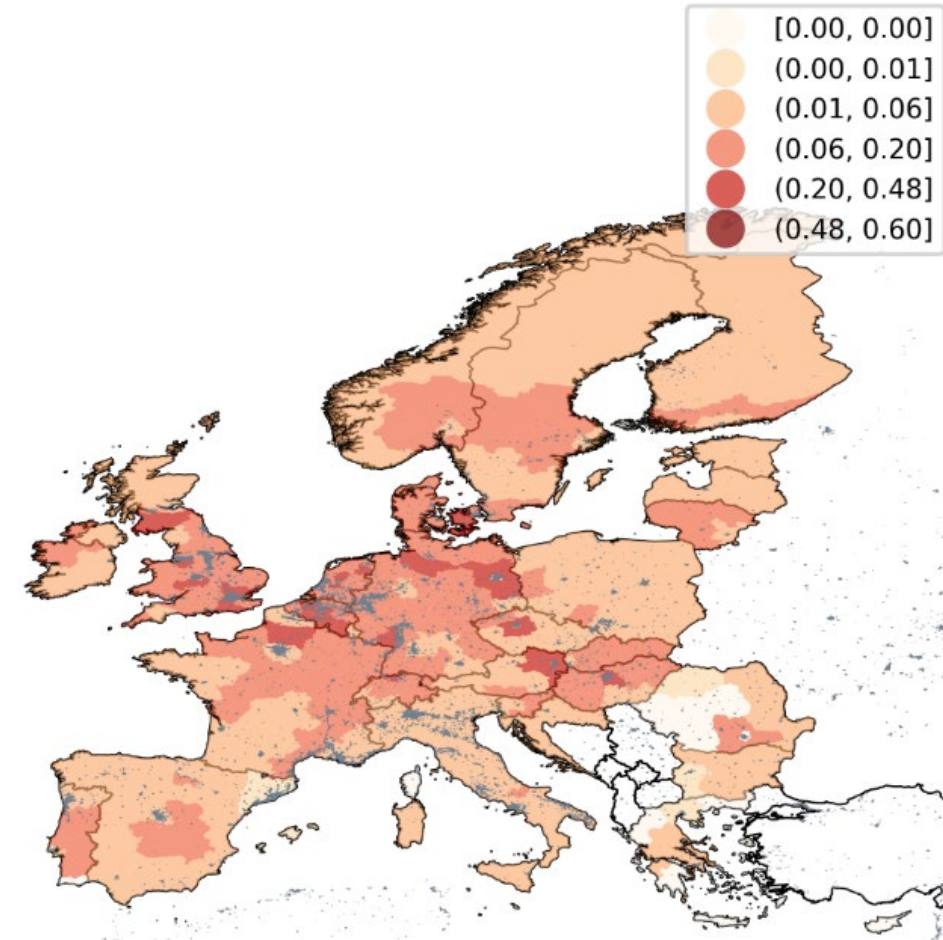
LFS. Commuting intensity by residence (NUTS2).

% of commuters (to other region or country) over total employed residents. 2018.



• Only FOR in Espo countries

- Aggregation OTR and FOR should be the same.
- INR Eurostat



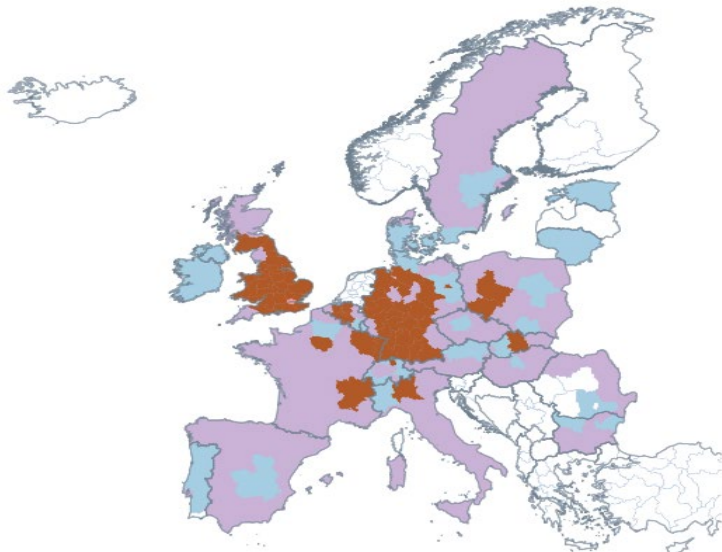
Econometric analysis

$$\log(F_{ijt}) = \mu + X_{i,t}\beta + X'_{j,t}\beta' + X''_{i,j,t}\beta'' + \gamma_t + \varepsilon_{i,j,t}$$

4

Results. People: Commuting

Clusters and type of commuting flows: OUTR +FOR.



	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
Dist.	-0.0003 -13.769	**	-0.0004 -12.986	**	-0.0004 -13.195	**	-0.0004 -14.165	**	-0.0003 -24.501	**	-0.0002 -56.088	**
Neighb.	4.6871 38.064	**	4.8502 44.48	**	4.8523 44.599	**	4.9666 46.153	**	4.9935 48.638	**	4.6548 54.567	**
Density_i	-0.0000421 -3.6806	**	0.0000221 1.1595		-0.0357		-0.000025 -5.0149	**	-0.000021 -5.0626	**		
Density_j	0.0000876 0.7837		0.0000528 3.2143	**	0.00003777 2.5467	**	0.0000132 1.7211	*	0.00001684 2.567	**		
Migration_i	0.0318 5.2289	**	0.0219 3.4498	**	0.017 2.9302	**	0.0105 2.199	**	0.0231 5.9778	**		
Migration_j	-0.003 -0.5685		-0.0062 -1.173		-0.0084 -1.6568	*	-0.0043 -1.1196		0.0045 1.3379			
Age_i	-0.014 -3.4224	**	-0.0342 -11.719	**	-0.0349 -11.957	**	-0.0358 -11.124	**	-0.0316 -12.56	**		
Age_j	-0.0191 -6.5716	**	-0.0286 -9.4587	**	-0.0289 -9.6095	**	-0.0327 -10.694	**	-0.029 -12.311	**		
Empl.	0.0709 6.1581	**	0.0404 3.4569	**	0.0247 2.3916	**	0.0297 2.9469	**				
Wage dif.ij	-0.0027 -9.2962	**	-0.0009 -3.9227	**	-0.0009 -3.9519	**	0.0002 1.3667					
INNOVATION_i	-0.119 -6.361	**	0.0442 2.1724	**	-0.0057 -0.4318							
INNOVATION_j	0.0009 0.0609		0.1237 8.7934	**	0.0899 8.472	**						
INFR_i	0.0115 0.9164		-0.0812 -4.3073	**								
INFR_j	0.0224 1.8954	*	-0.056 -3.8247	**								
Prices_j	0.0022 5.026	**										
Euro	0.2626 13.834	**										
R2:	0.3916		0.3764		0.3754		0.3675		0.354		0.2896	
R2 (Between):	0.4665		0.8809		0.8968		0.9174		0.8494		0.1158	
R2 (Within):	-0.008		-0.008		-0.0081		-0.0104		-0.0135		0	
R2 (Overall):	0.4496		0.8618		0.8777		0.9004		0.8346		0.115	
Log-likelihood	-251400		-338600		-338800		-439200		-544500		-1092000	
N° obs	177253		220486		220486		283416		361216		770004	

4

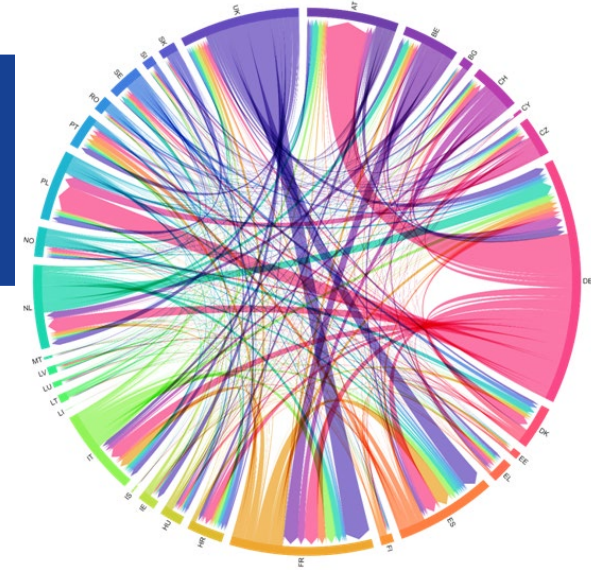
Results

6. Interregional flows of people: tourism

- Country-to-country matrixes (c2c)
- Region-to-region matrixes (r2r)
- Analysis

4

Results. People: Tourism



- Results at country level (NUTS 0)

- Tourism at the C2C level

- Spatial extent: EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland
- Scope: intra-national and inter-national flows
- Temporal scope: 2010 to 2018
- Source: Eurostat, UNWTO.

- Data features:

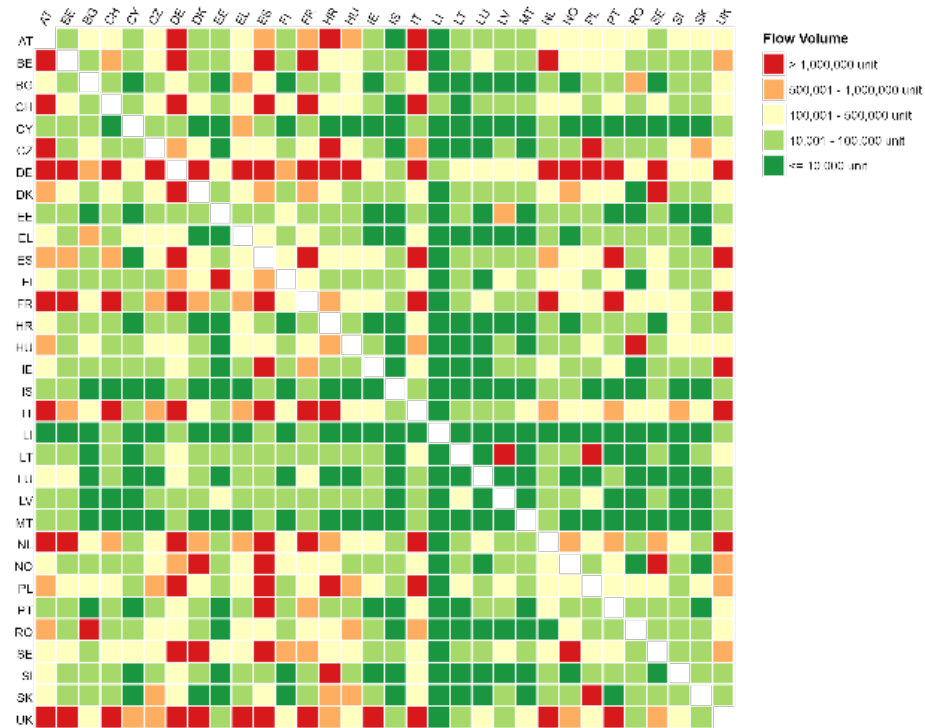
- 32 X 32 OD matrixes for each year
- Variable under consideration: interregional tourism flows.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
Order	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT		
1	BE	74 685	175 059	55 839	#####	12 081	89 333	339 836	#####	#####	#####	1 104 115	24 125	34 271	12 800	362 141	105 259	24 296	#####	1 042		
2	BG	31 051		41 508	23 488	115 734	2 885	7 908	664 389	153 889	52 701	59 425	399 729	8 905	9 194	2 083	1 885	134 000	3 189	70 874	115	
3	CZ	63 041	148 854		126 026	713 144	8 440	31 085	294 936	434 713	243 205	#####	816 161	15 458	26 200	9 100	5 639	271 000	5 923	69 064	1 296	
4	DK	120 484	69 058	232 045		#####	21 466	44 000	240 563	937 726	585 577	161 969	470 812	30 335	53 956	24 800	14 935	78 142	28 830	323 236	714	
5	DE	#####	667 011	#####	#####		177 357	381 000	#####	#####	#####	#####	8 960 697	139 190	175 677	159 200	231 238	#####	126 193	#####	27 617	
6	EE	12 371	9 365	24 215	10 354	76 089		2 498	13 842	68 731	13 459	10 215	36 388	970	746 194	67 000	899	10 519	1 510	31 714	38	
7	IE	84 733	27 684	56 425	15 289	302 033	3 942		65 623	#####	573 990	58 058	348 638	10 527	18 797	6 400	5 454	26 796	25 185	248 890	122	
8	EL	58 567	792 634	104 837	9 162	359 477	6 319	6 049		148 881	257 091	65 679	473 474	127 667	5 767	4 861	4 274	71 693	5 880	96 728	162	
9	ES	762 232	48 362	426 619	329 875	#####	33 065	214 000	155 302	#####	#####	460 896	2 484 031	3 959	18 654	16 600	28 239	231 986	67 842	990 419	606	
10	FR	#####	146 386	553 144	530 890	#####	38 107	344 000	868 346	#####	#####	870 082	4 843 586	28 749	29 649	30 300	252 344	250 000	86 516	#####	1 132	
11	HR	12 890	18 031	83 264	6 100	48 252	1 233	2 592	122 398	70 918	31 947		390 919	1 822	3 504	393	1 528	32 000	2 204	15 813	224	
12	IT	568 505	102 252	740 234	376 720	#####	45 740	214 000	843 613	#####	#####	#####		12 992	44 298	28 200	36 816	330 000	219 663	998 169	2 497	
13	CY	10 008	18 606	15 751	2 879	27 019	694	2 062	574 764	52 234	27 987	2 272	26 008			4 787	844	711	6 439	9 445	13 362	18
14	LV	16 712	6 817	16 196	16 234	86 030	151 670	18 245	21 948	80 139	16 130	13 505	49 046	1 825		146 300	968	12 411	1 170	54 991	30	
15	LT	28 934	7 537	91 050	33 737	142 523	68 920	55 092	16 295	95 270	38 128	39 568	102 708	2 546	#####		1 255	12 234	1 673	27 558	45	
16	LU	176 158	4 080	9 940	16 792	470 799	1 562	13 048	18 593	97 693	271 807	7 672	89 597	3 374	5 064	922		3 005	2 016	85 782	110	
17	HU	53 255	101 261	219 207	28 309	443 500	5 088	53 139	109 160	247 755	122 536	659 473	525 595	10 721	13 443	6 587	3 277		7 747	55 673	996	
18	MT	10 562	5 517	3 426	2 078	22 586	522	4 135	9 651	59 289	24 899	24 899	2 222	58 598	4 358	3 742	354	795	4 587		11 341	10
19	NL	#####	126 690	422 370	719 274	#####	22 618	135 000	528 157	#####	#####	#####	630 837	1 592 483	34 212	24 193	13 900	347 839	224 000	33 425	#####	3 851
20	AT	76 343	146 592	412 731	99 357	#####	10 232	45 333	338 367	561 190	756 240	#####	3 361 695	21 559	13 629	11 900	11 197	935 000	19 908	152 868		
21	PL	176 615	235 071	782 249	194 143	#####	38 524	201 667	402 170	#####	309 875	#####	1 124 044	18 439	169 382	166 000	10 890	556 000	12 070	180 231	772	
22	PT	80 167	8 059	54 204	17 599	257 625	4 466	5 344	19 497	#####	917 430	56 465	284 028	1 161	11 030	2 900	15 246	31 128	4 320	116 409	64	
23	RO	75 418	#####	104 322	83 733	331 076	2 365	26 083	257 959	491 849	223 226	119 359	672 377	19 980	7 496	4 098	4 993	912 000	4 280	8 607	576	
24	SI	17 538	19 019	48 775	17 709	146 329	2 342	5 659	40 082	86 691	47 337	#####	255 651	1 046	4 104	2 202	2 294	14 000	2 976	34 560	225	
25	SK	21 580	78 048	681 487	6 768	163 498	2 919	14 032	49 406	108 149	62 370	688 054	411 974	5 061	10 054	3 374	1 549	586 000	3 942	19 952	289	
26	FI	69 196	37 836	82 841	136 122	621 633	#####	44 645	205 282	507 161	275 975	54 323	217 226	32 886	163 224	65 700	5 120	78 722	11 922	106 824	169	
27	SE	151 589	40 653	178 901	#####	#####	170 231	62 667	281 069	#####	600 034	252 866	444 826	109 746	280 643	33 700	11 832	120 331	37 123	241 145	431	
28	UK	#####	247 077	824 171	#####	#####	72 263	#####	#####	#####	#####	529 658	3 163 036	996 046	71 069	65 200	106 809	319 000	415 099	#####	1 683	
29	IS	12 220	1 888	6 438	2 474	73 943	1 308	1 456	2 913	71 123	28 905	2 769	11 279	144	5 313	1 459	1 265	814	145	13 734	14	
30	LI	3 629	0	1 586	1 598	26 654	131	562	3 577	10 487	33 192	2 752	5 339	174	729	69	608	1 575	128	6 926	8	
31	NO	71 060	45 864	161 818	#####	868 092	82 256	66 300	187 319	#####	342 467	178 849	264 516	63 347	98 870	25 500	4 587	61 466	15 006	217 157	167	
32	CH	168 686	32 981	155 470	202 478	#####	13 469	64 667	274 418	#####	#####	320 939	3 183 639	41 744	11 698	4 600	36 244	175 000	21 522	393 295	2 462	

4

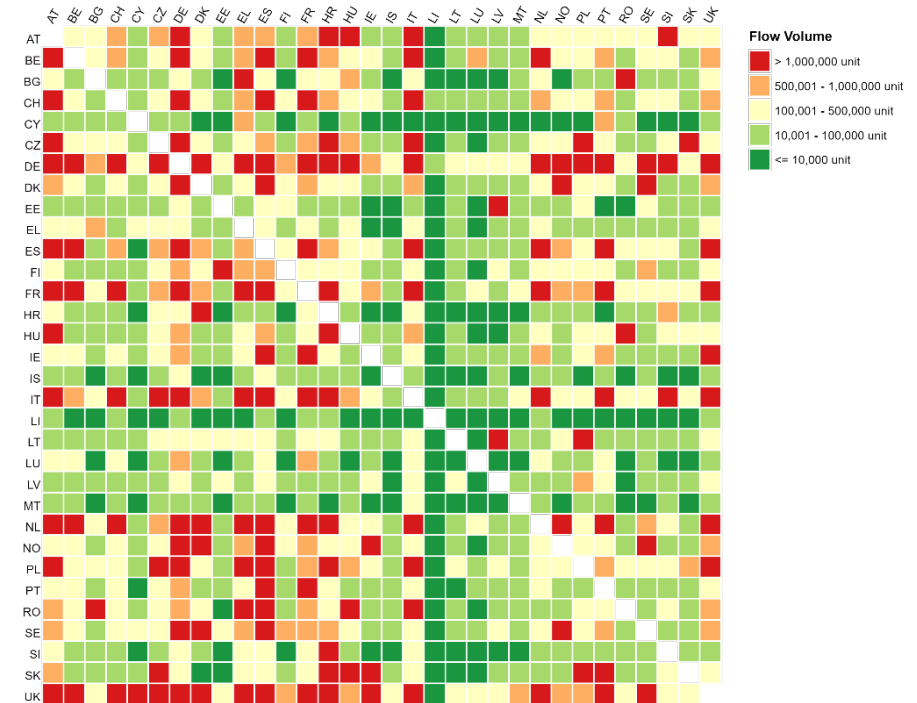
Results. People: Tourism

Interregional tourism, 2010



Matrix of intensity of tourism flows between researched countries, 2010

Interregional tourism, 2018

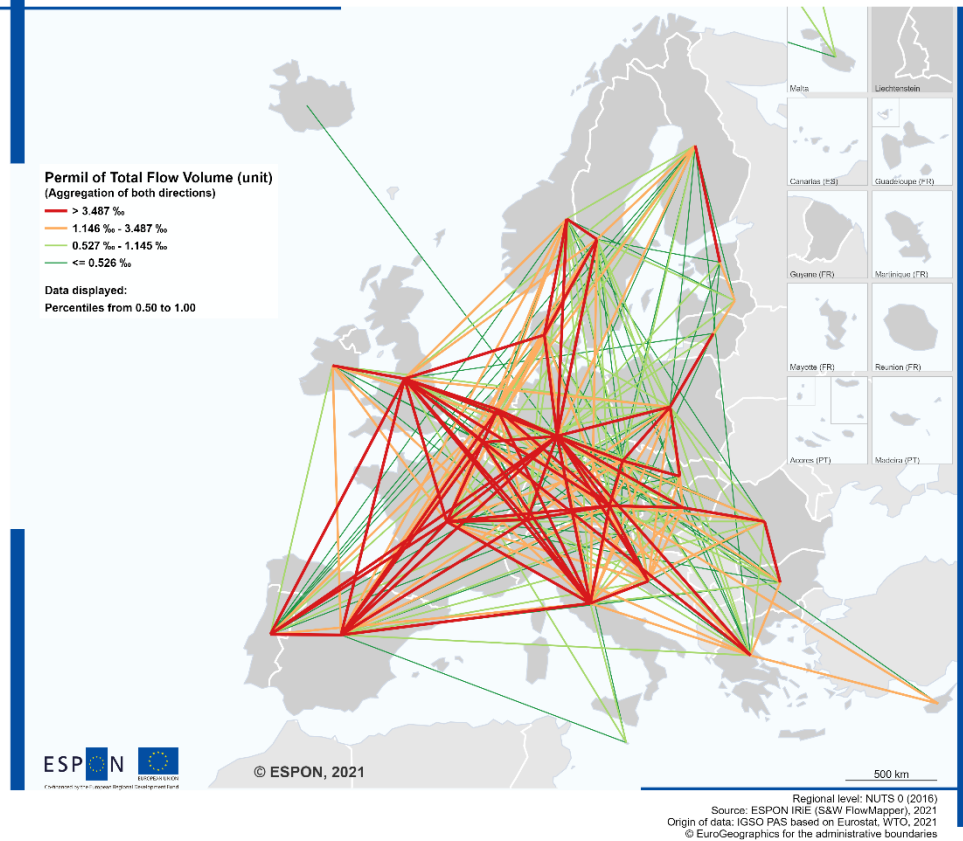


Matrix of intensity of tourism flows between researched countries, 2018

4

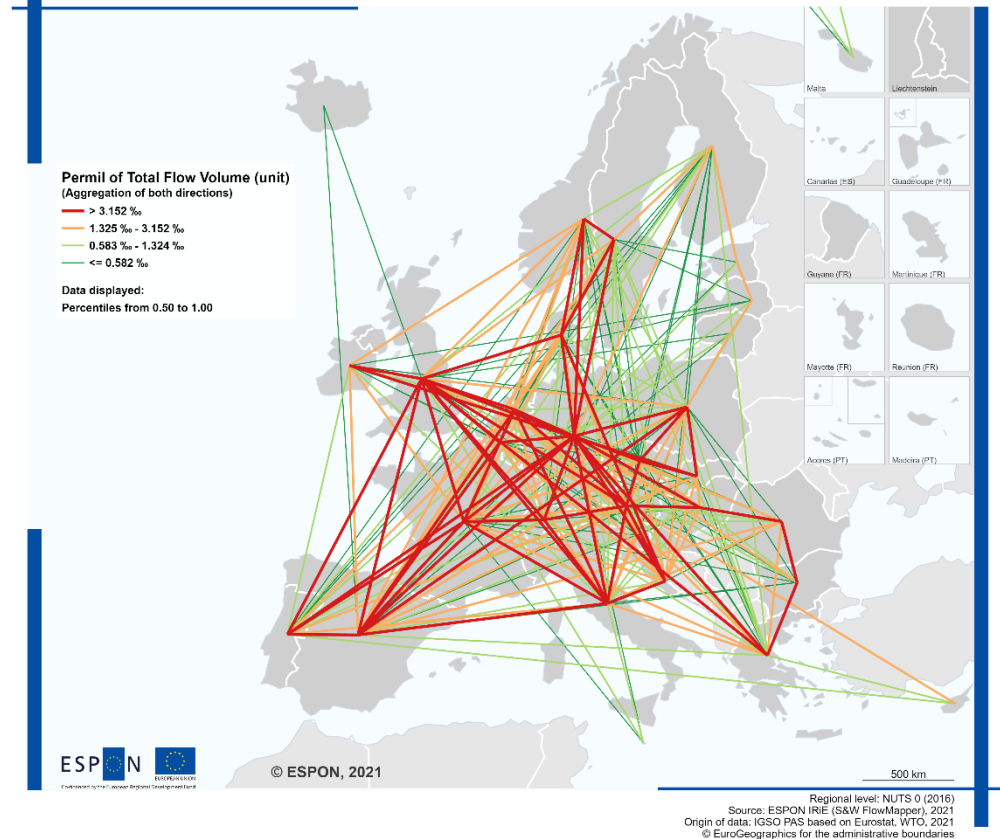
Results. People: Tourism

Interregional tourism, 2010



50% of the most important tourist connection between researched countries (number of tourists in both directions), 2010

Interregional tourism, 2018

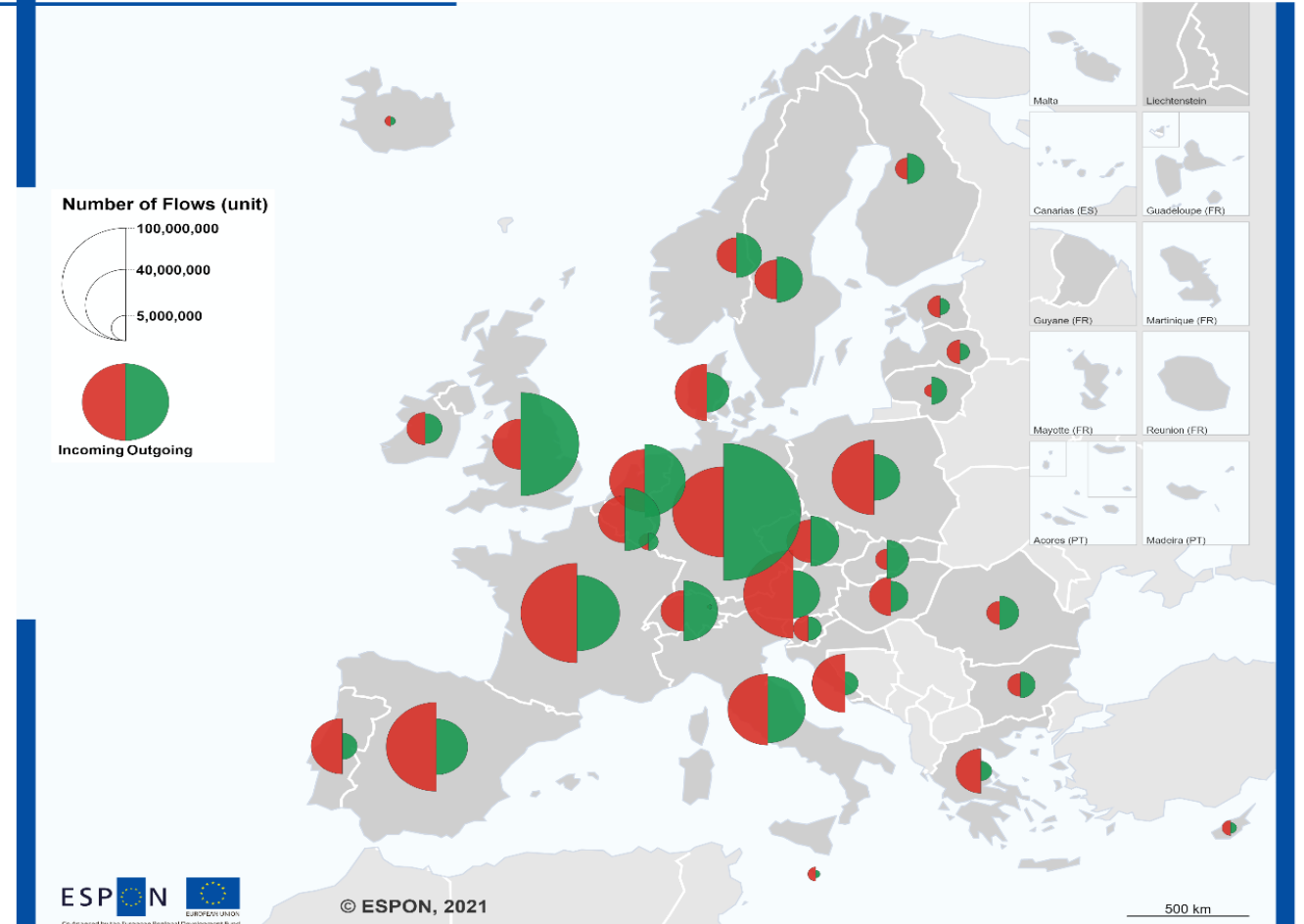


50% of the most important tourist connection between researched countries (number of tourists in both directions), 2018

4

Results. People: Tourism

Interregional tourism, 2015

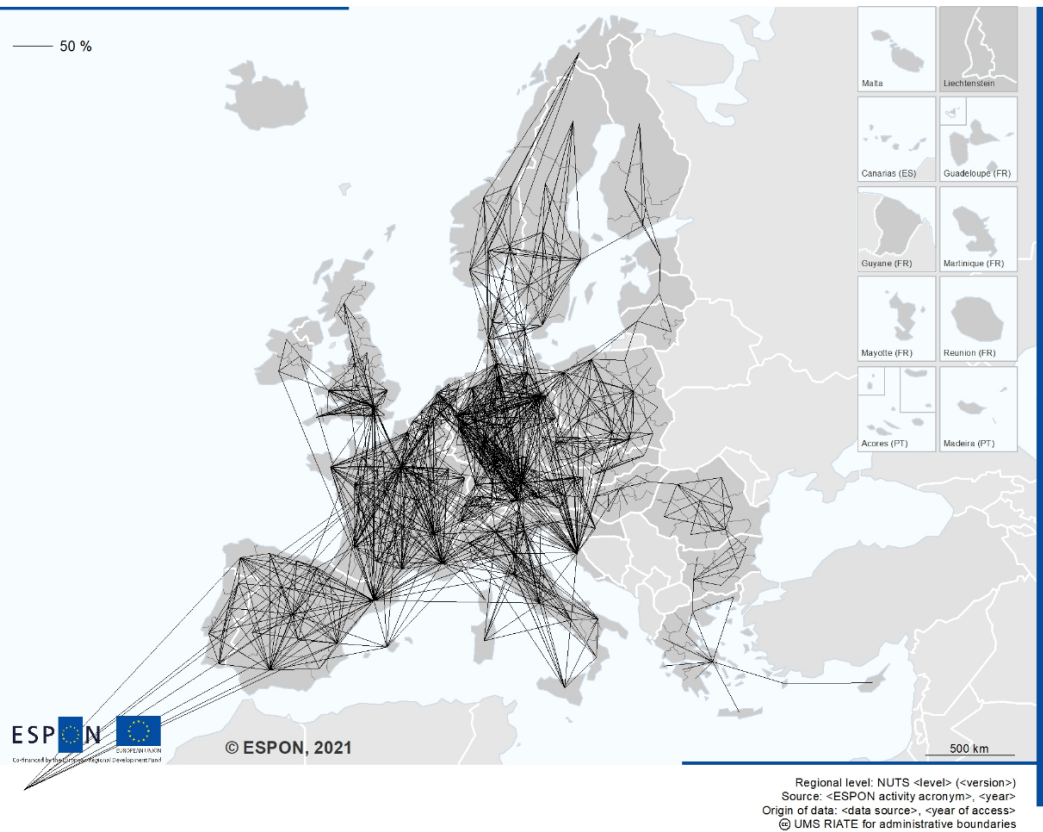


Differences between number of incoming and outgoing tourists in researched countries, 2015.

4

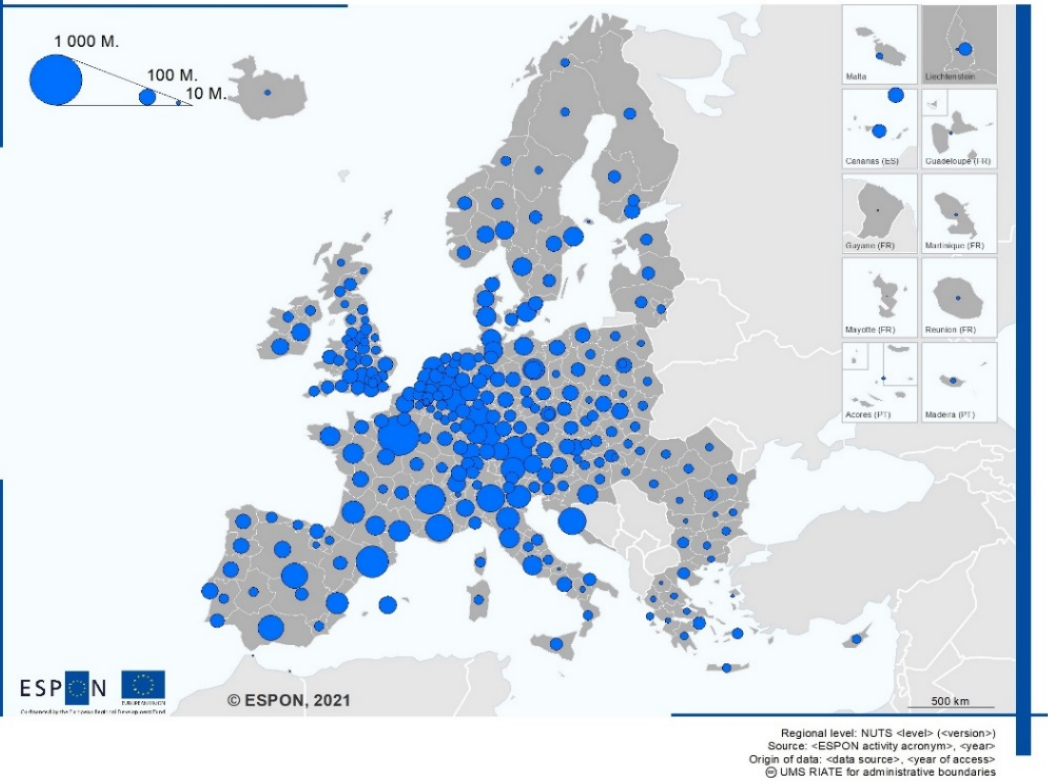
Results. People: Tourism

TOURISM relations



Relations with the largest absolute values of the tourism flow in the researched area

Intensity

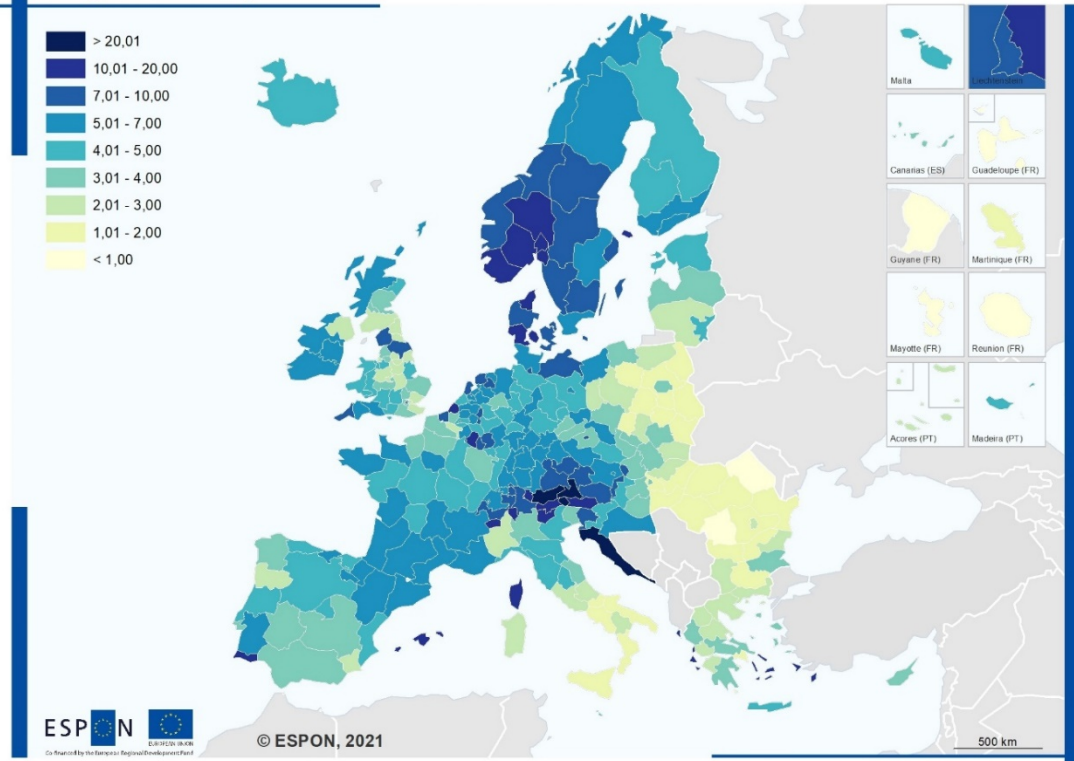


Intensity

4

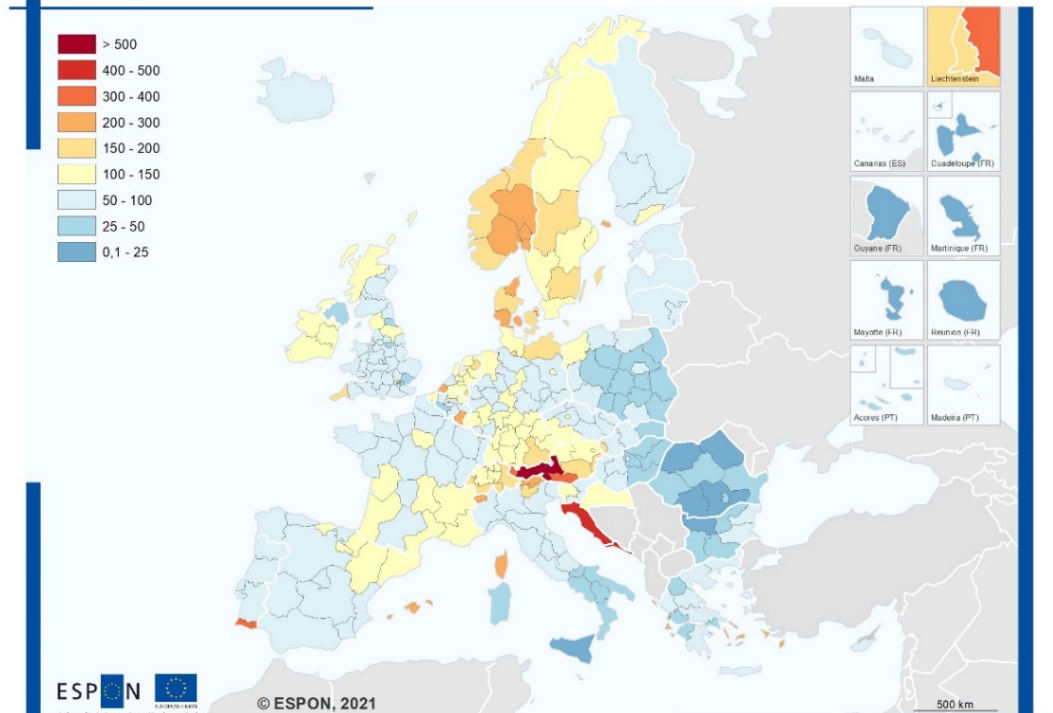
Results. People: Tourism

Weighted intensity



Weighted intensity

TOURISM



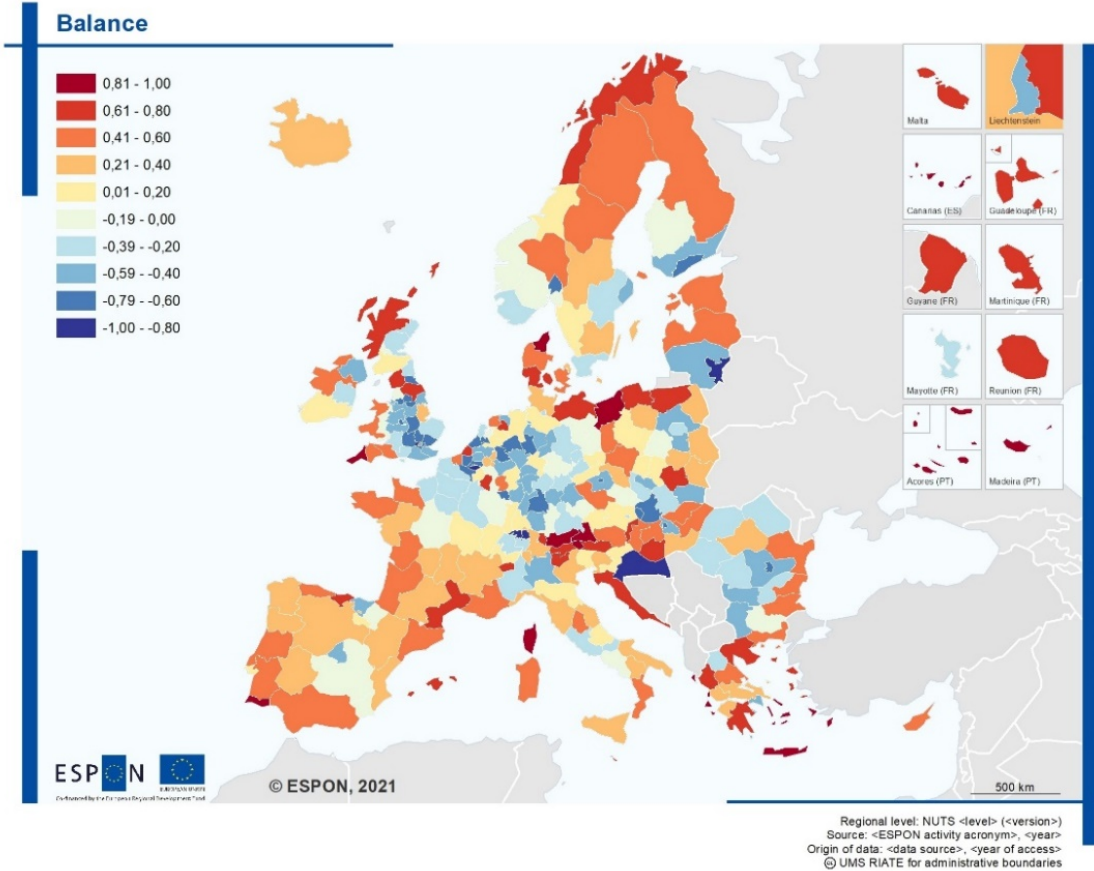
Weighted intensity of tourism flows in individual regions

Regional level: NUTS <level> (<version>)
 Source: <ESPON activity acronym>, <year>
 Origin of data: <data source>, <year of access>
 © UMS RIATE for administrative boundaries

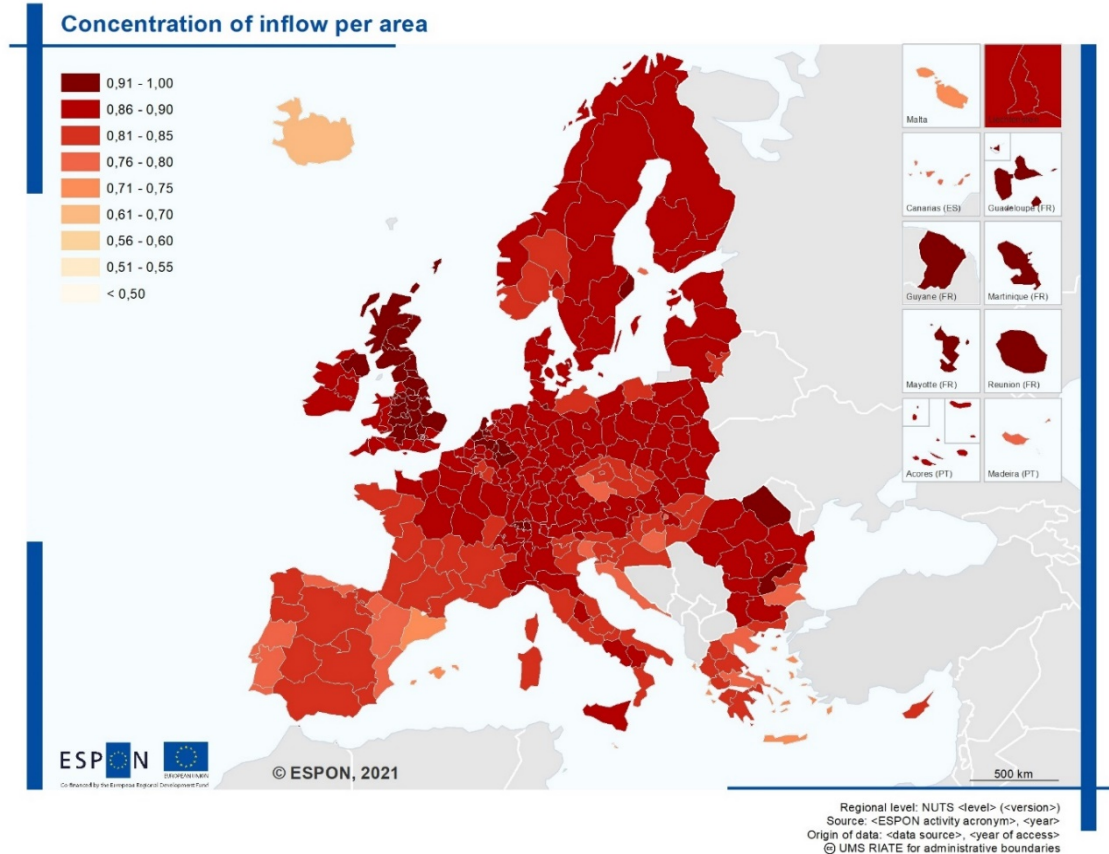
Regional level: NUTS <level> (<version>)
 Source: <ESPON activity acronym>, <year>
 Origin of data: <data source>, <year of access>
 © UMS RIATE for administrative boundaries

4

Results. People: Tourism



Balance of tourism flows



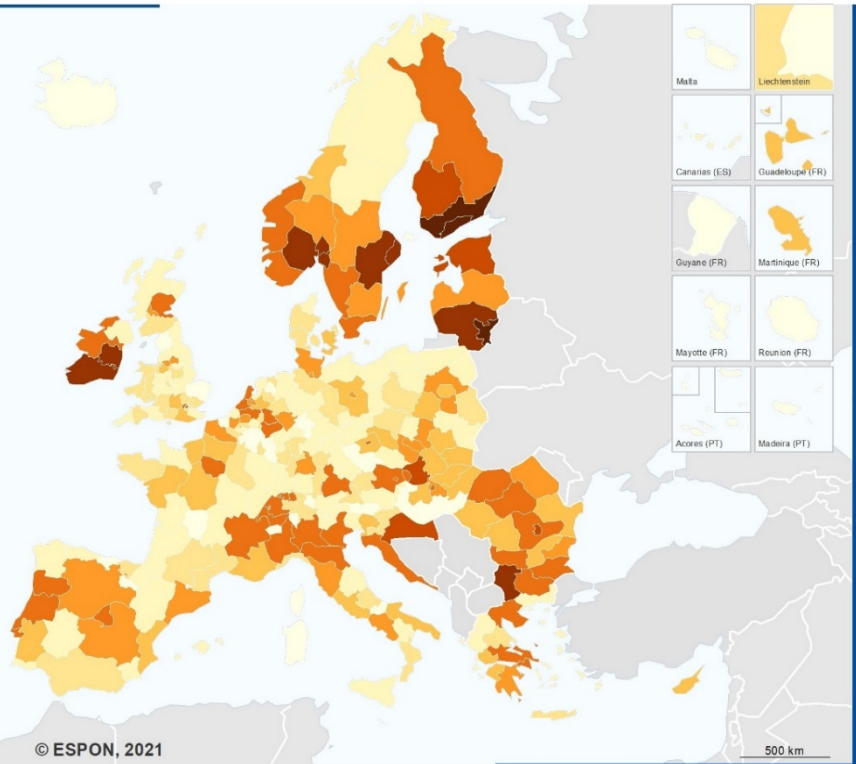
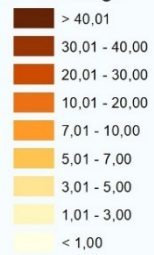
Concentration of inflow per area

4

Results. People: Tourism

External influence

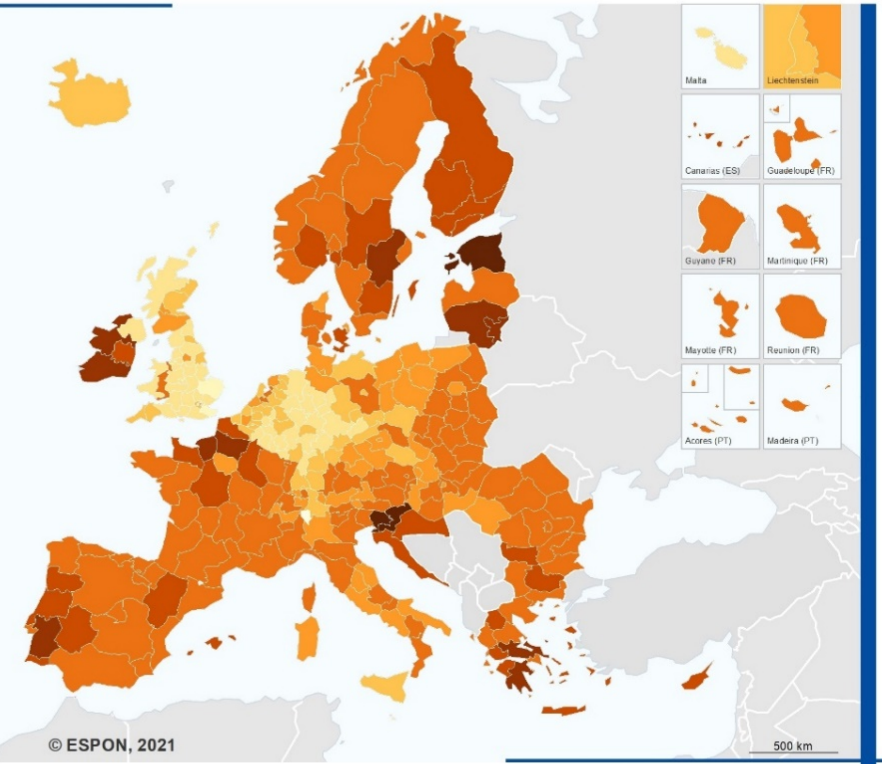
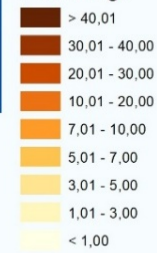
Percentage



External influence

Selectivity

Percentage

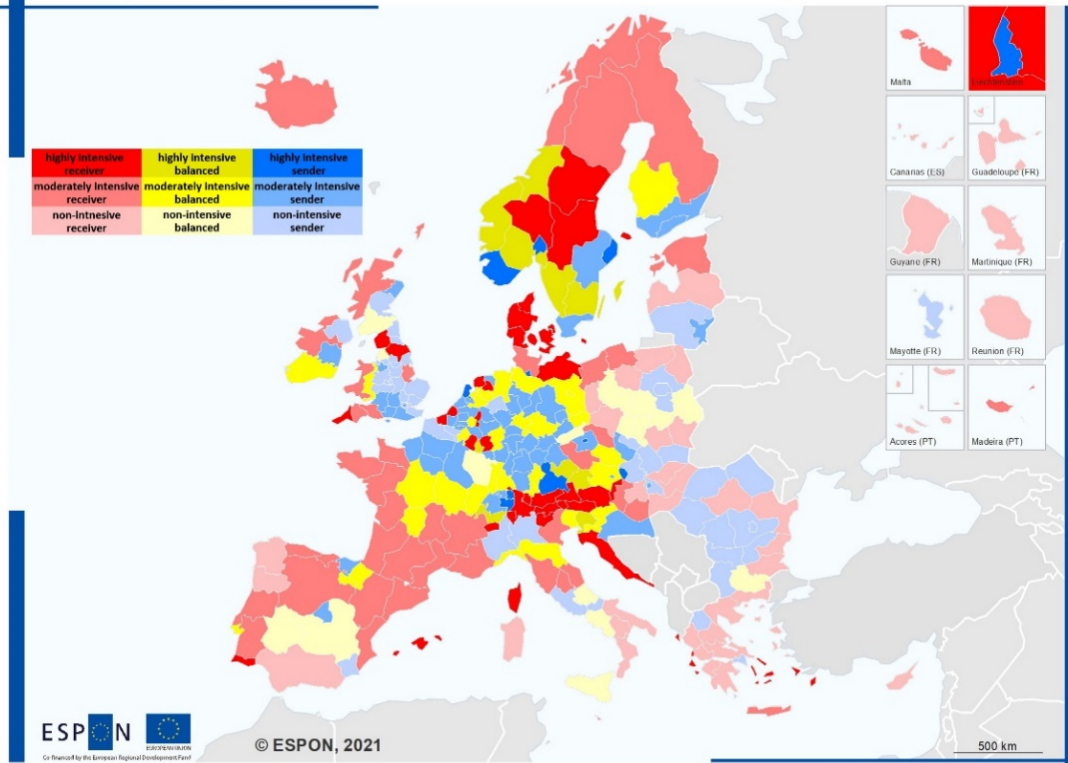


Selectivity

4

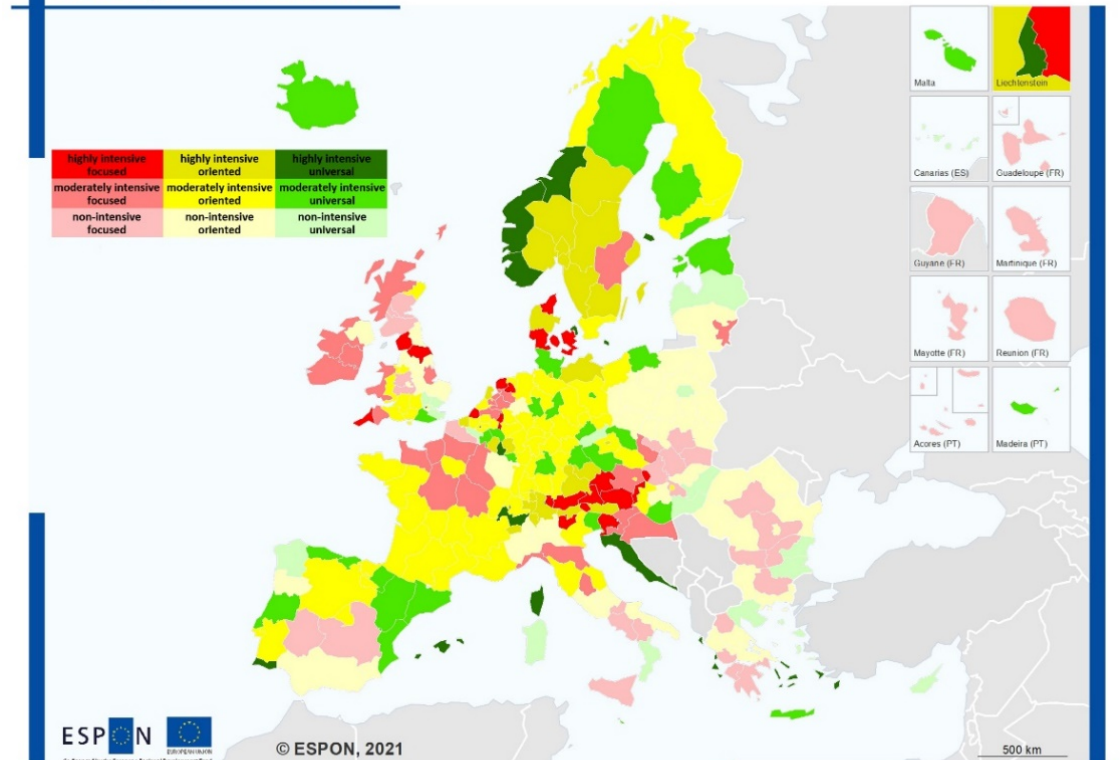
Results. People: Tourism

Intensity vs. Balance



Intensity vs. Balance

Intensity vs. Concentration



Intensity vs. Concentration

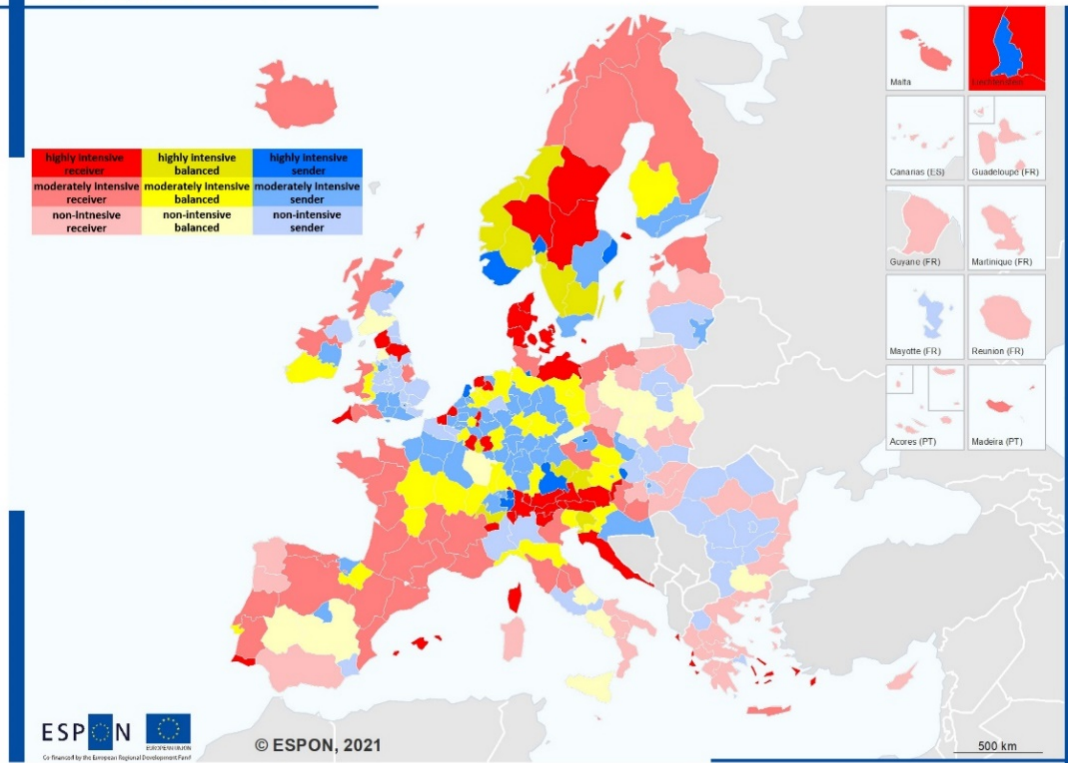
Regional level: NUTS <level> (<version>)
 Source: <ESPON activity acronym>, <year>
 Origin of data: <data source>, <year of access>
 © UMS RIATE for administrative boundaries

Regional level: NUTS <level> (<version>)
 Source: <ESPON activity acronym>, <year>
 Origin of data: <data source>, <year of access>
 © UMS RIATE for administrative boundaries

4

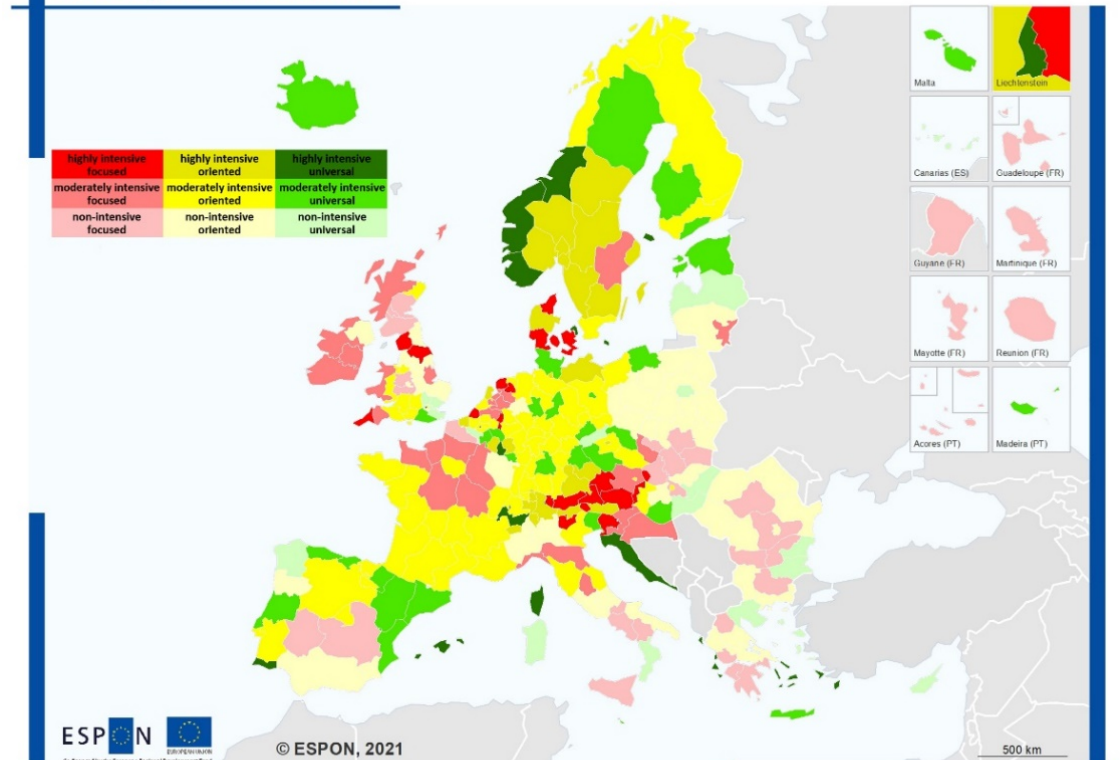
Results. People: Tourism

Intensity vs. Balance



Intensity vs. Balance

Intensity vs. Concentration



Intensity vs. Concentration

Regional level: NUTS <level> (<version>)
 Source: <ESPON activity acronym>, <year>
 Origin of data: <data source>, <year of access>
 © UMS RIATE for administrative boundaries

Regional level: NUTS <level> (<version>)
 Source: <ESPON activity acronym>, <year>
 Origin of data: <data source>, <year of access>
 © UMS RIATE for administrative boundaries

4

Results

7. Interregional passenger transport flows by mode

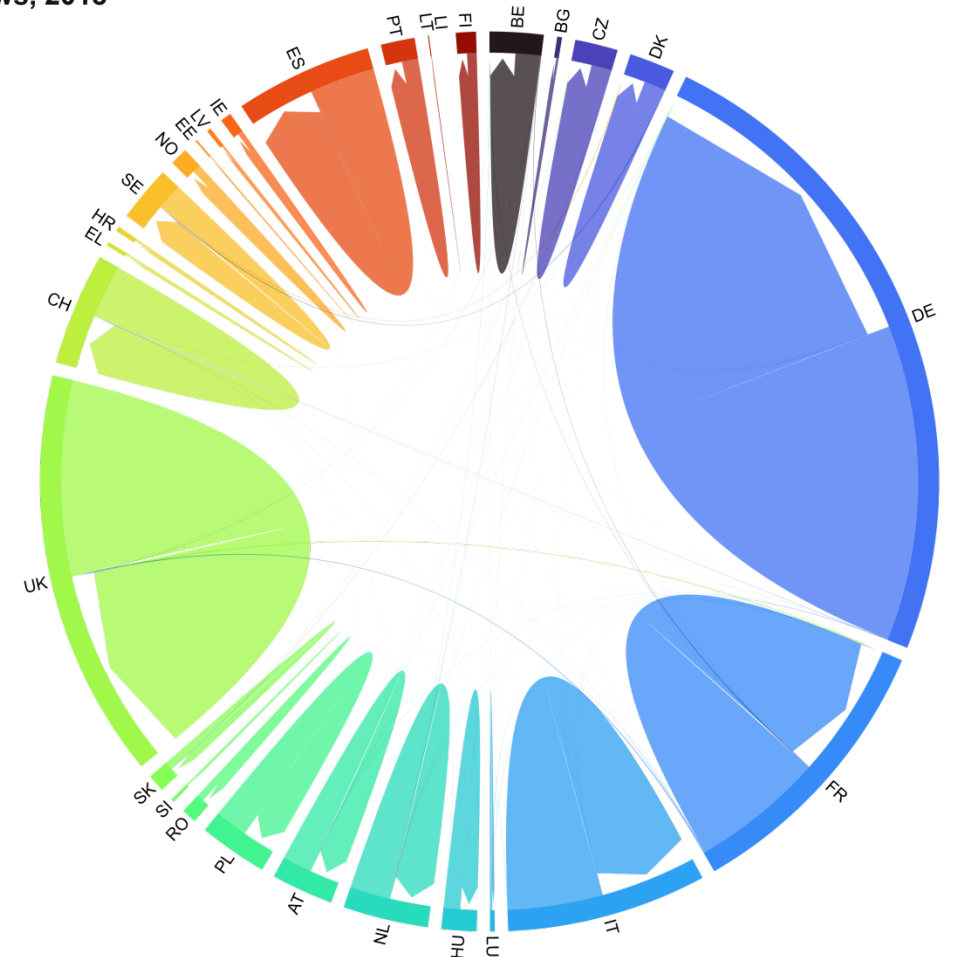
- Country-to-country matrixes (c2c)
- Region-to-region matrixes (r2r)

4

Results. Passenger transport flows by mode

- **Results at country level (NUTS 0)**
 - **Passenger transport flows by mode at the C2C level**
 - **Spatial extent:** EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland
 - **Scope:** intra-national and inter-national flows
 - **Modes:** rail, maritime, air
 - **Temporal scope:** 2010 to 2018
 - **Source:** Processing of Eurostat data
 - **Data features:**
 - 32 X 32 OD matrixes for each year
 - Unit: transport volume carried in tons

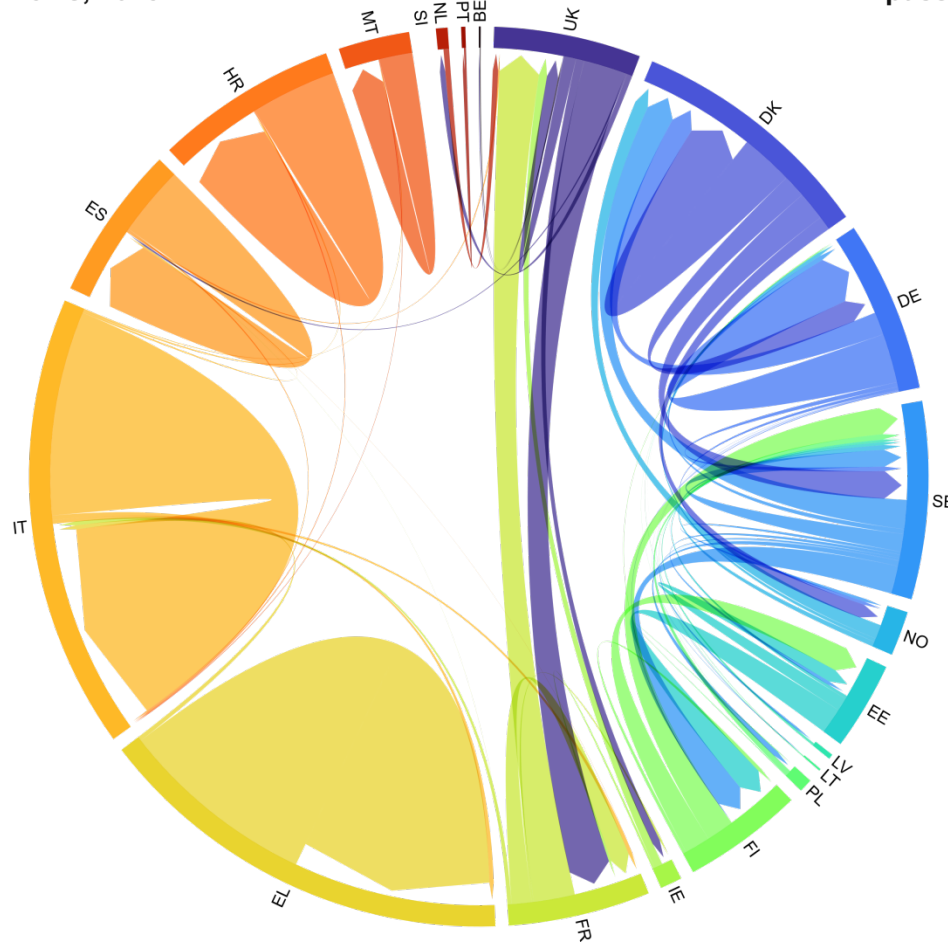
Rail passenger flows, 2018



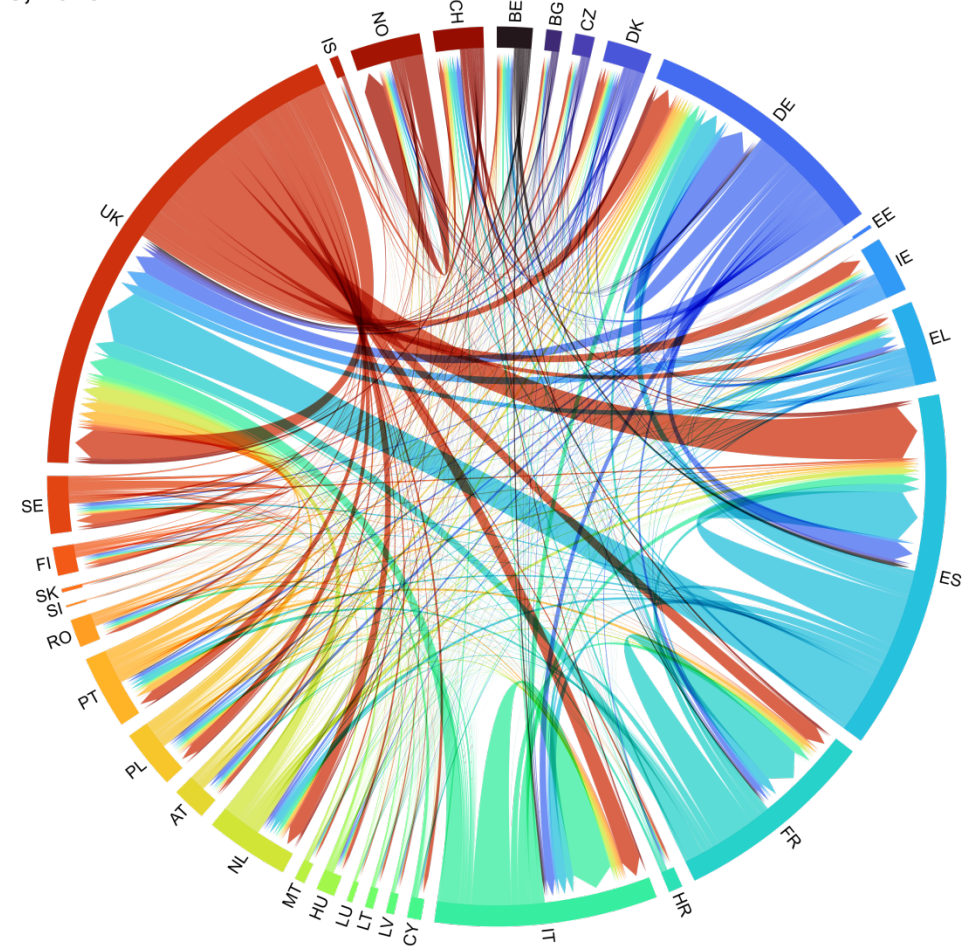
4

Results. Passenger transport flows by mode

Maritime passenger flows, 2018



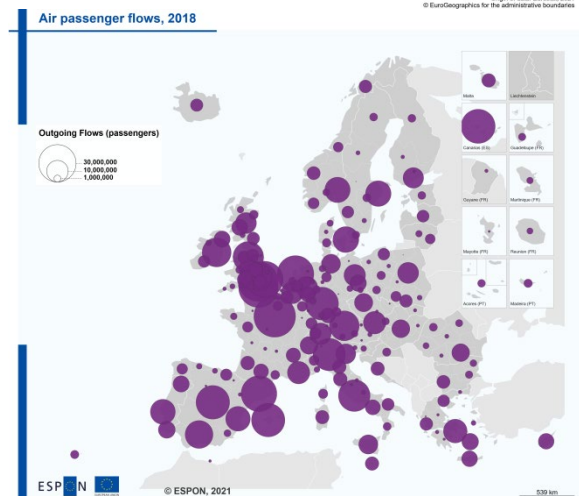
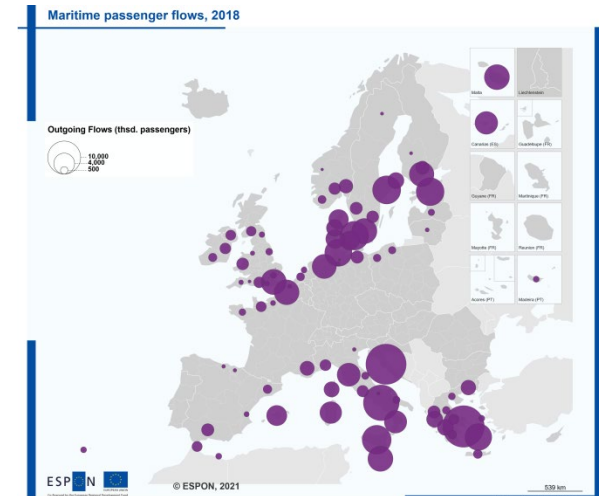
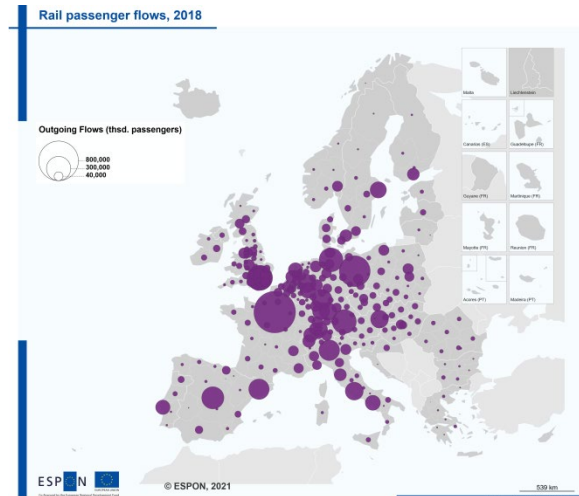
Air passenger flows, 2018



4

Results. Passenger transport flows by mode

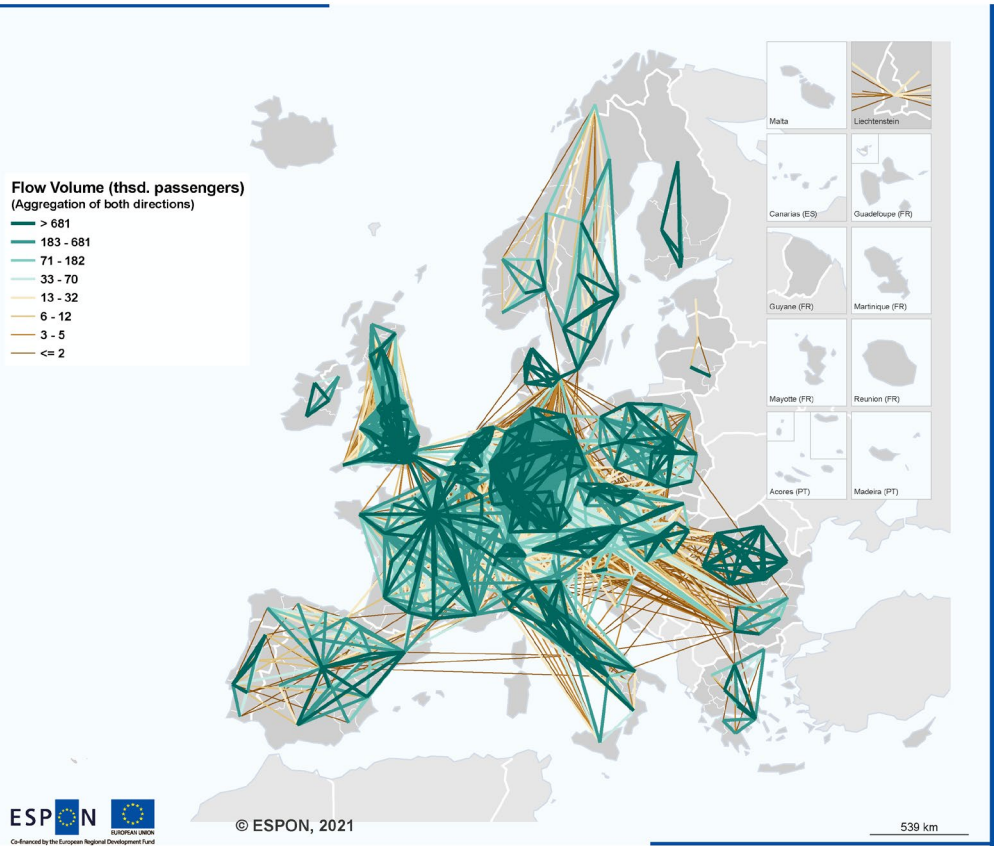
- Results at regional level (NUTS 2)
- Passenger transport flows by mode at the R2R level
 - Spatial extent: EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland
 - Scope: intra-national and inter-national flows
 - Modes: rail, maritime, air
 - Temporal scope: 2010 to 2018
 - Source: Processing of Eurostat data
- Data features:
 - 329 X 329 OD matrixes for each year
 - Unit: transport volume carried in tons



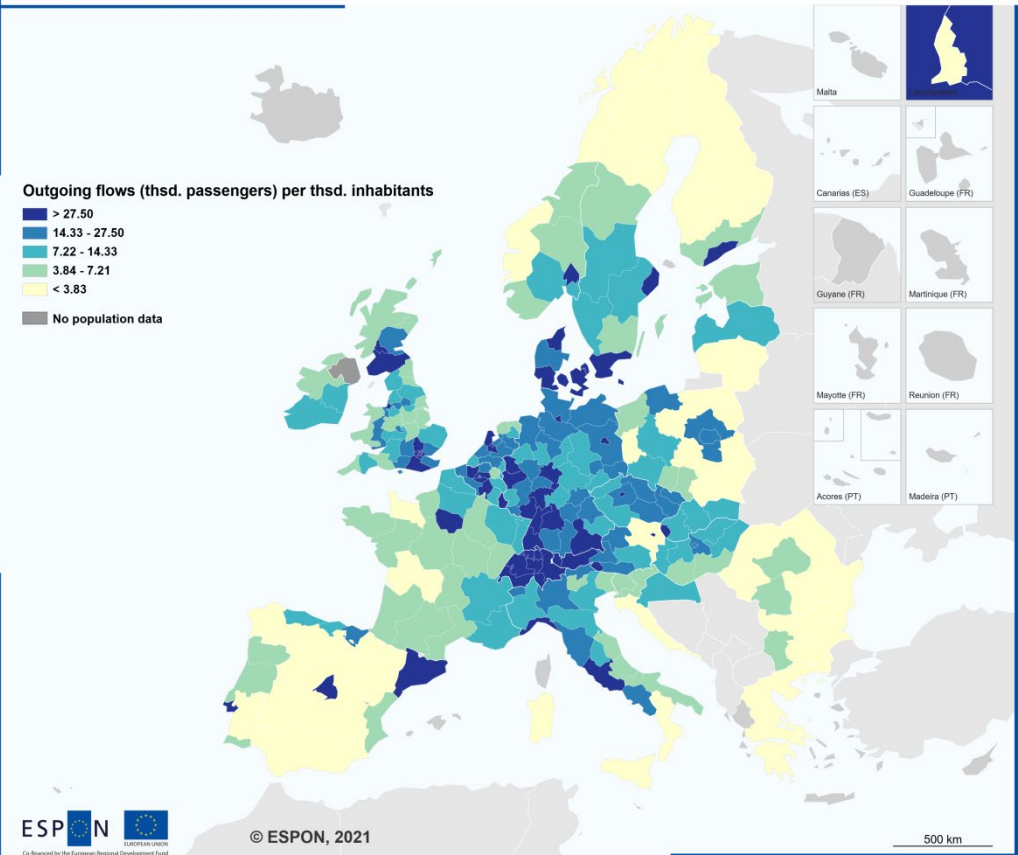
4

Results. Passenger transport flows by rail

Rail passenger flows, 2018



Rail passenger flows, 2018



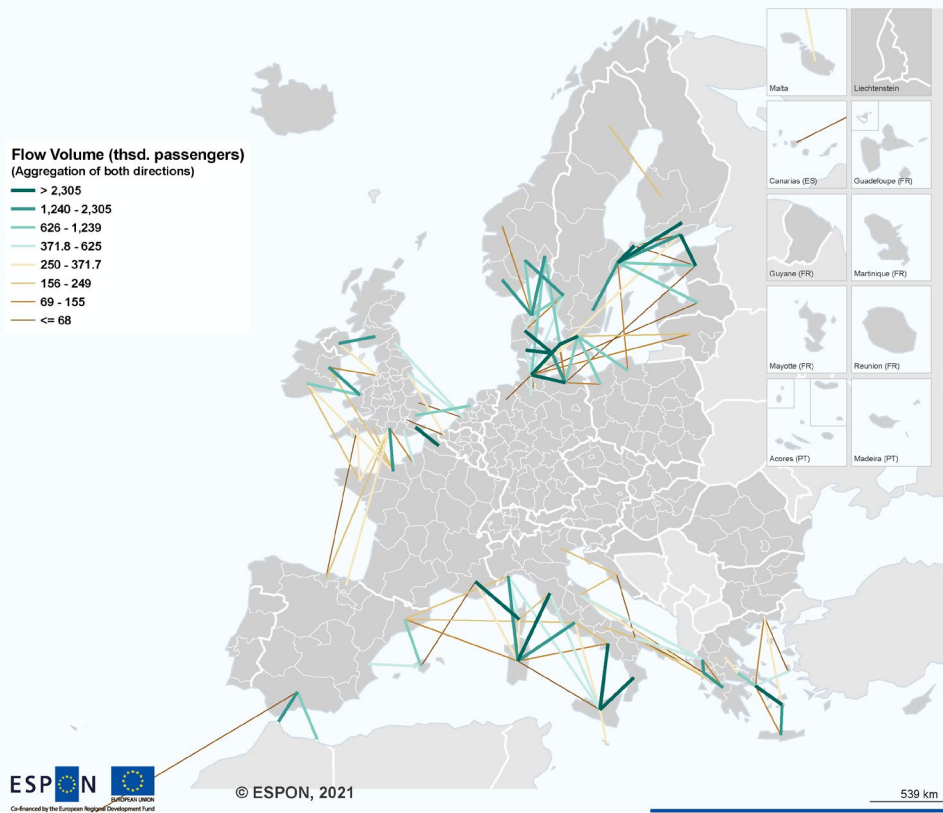
Regional level: NUTS 2 (2016)
Source: ESPON IRIE (S&W FlowMapper), 2021
Origin of data: Eurostat, 2021
© EuroGeographics for the administrative boundaries

Regional level: NUTS 2 (2016)
Source: ESPON IRIE (S&W FlowMapper), 2021
Origin of data: Eurostat, 2021
© EuroGeographics for the administrative boundaries

4

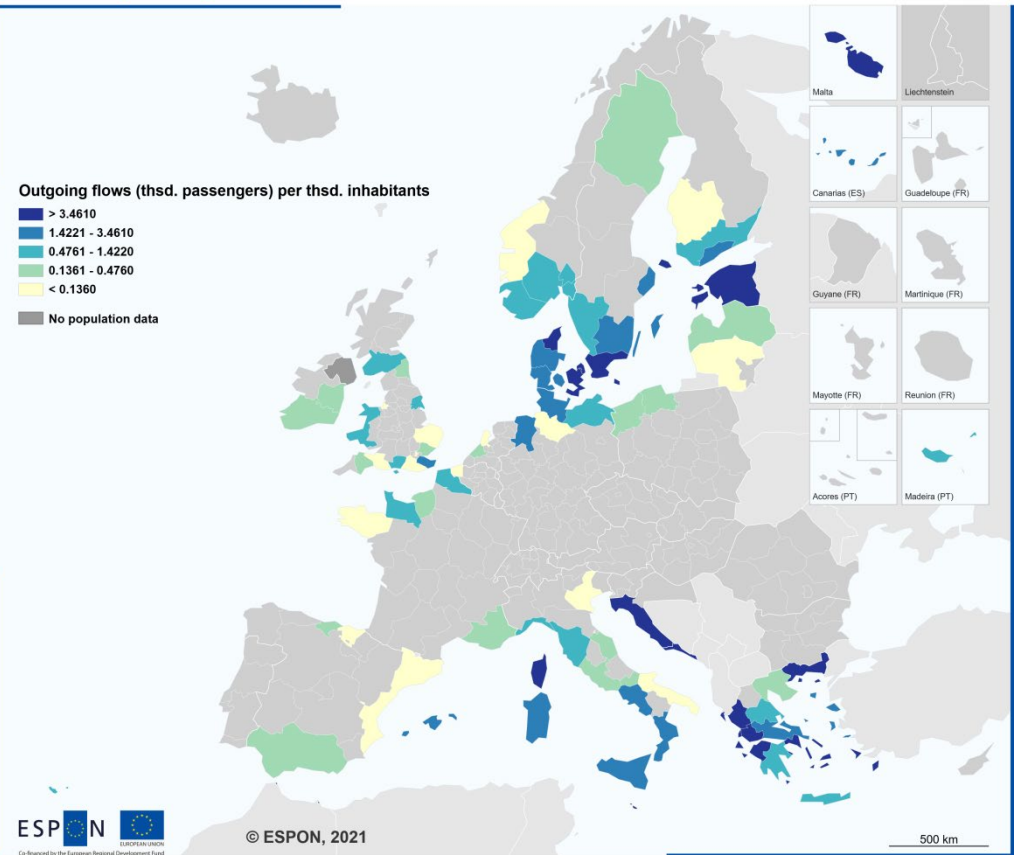
Results. Maritime passenger transport flows

Maritime passenger flows, 2018



Regional level: NUTS 2 (2016)
Source: ESPON IRIE (S&W FlowMapper), 2021
Origin of data: Eurostat, 2021
© EuroGeographics for the administrative boundaries

Maritime passenger flows, 2018

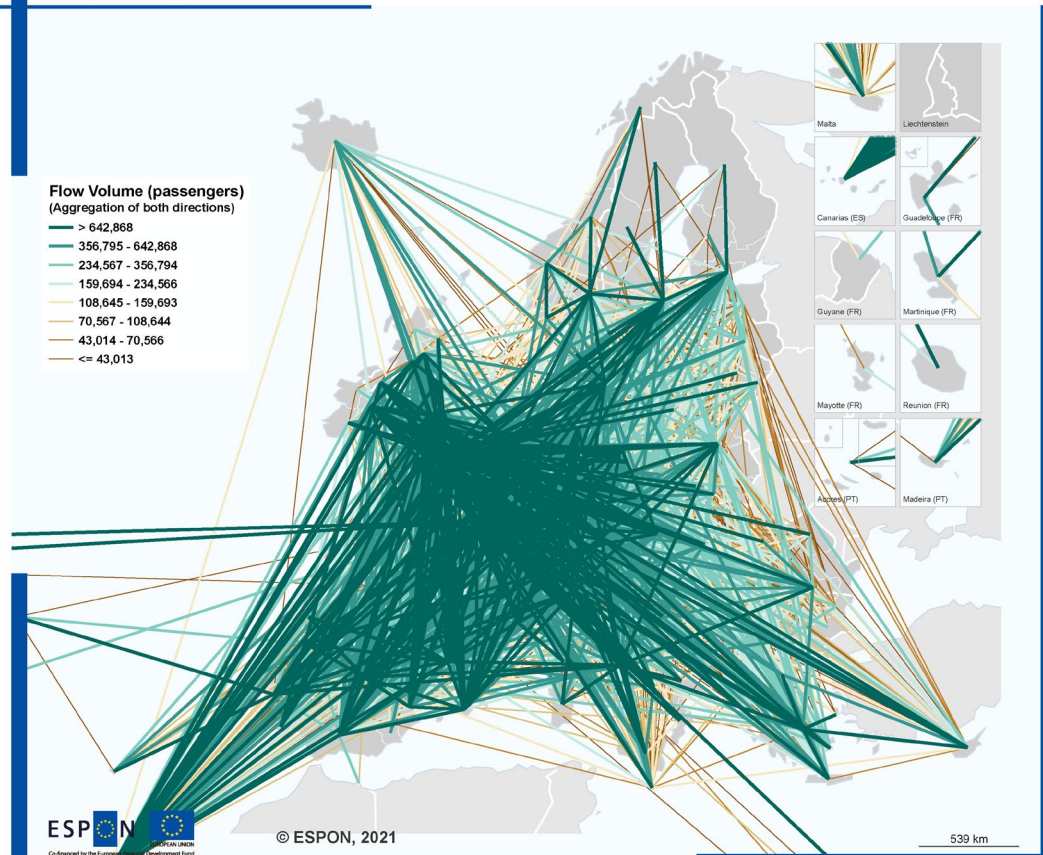


Regional level: NUTS 2 (2016)
Source: ESPON IRIE (S&W FlowMapper), 2021
Origin of data: Eurostat, 2021
© EuroGeographics for the administrative boundaries

4

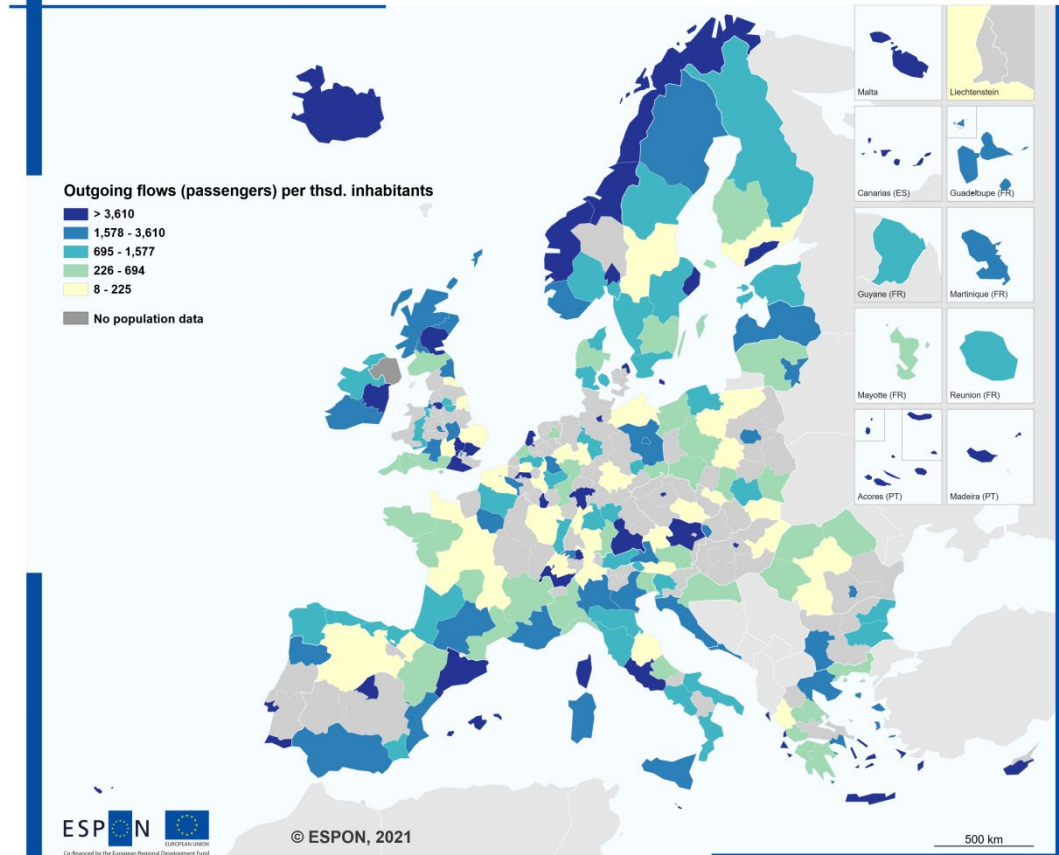
Results. Passenger transport flows by air

Air passenger flows, 2018



Regional level: NUTS 2 (2016)
 Source: ESPON IRIE (S&W FlowMapper), 2021
 Origin of data: Eurostat, 2021
 © EuroGeographics for the administrative boundaries

Air passenger flows, 2018



Regional level: NUTS 2 (2016)
 Source: ESPON IRIE (S&W FlowMapper), 2021
 Origin of data: Eurostat, 2021
 © EuroGeographics for the administrative boundaries

4

Results

8. Interregional Flows of Capital. FDI

- Country-to-country matrixes (c2c)
- Region-to-region matrixes (r2r)
- Analysis

4

Results. Interregional Flows of Capital Foreign Direct Investment (FDI)

▪ Results at country level (NUTS 0)

- **FDI country-to-country matrixes** - capital_fdi_c2c.xlsx
- **Spatial extent:** EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland
- **Temporal scope:** 2010 to 2018
- **Source:** AMADEUS
- **Data features:**
 - 32 X 32 OD matrixes for each year
 - Variable under consideration: shareholders' funds
 - Access to 2,887,867 firms - 1,319,189 (45.68%) served for the estimation of C2C flows (only active firms); share varies significantly, from 0.005% (Denmark) to 86.4% (Greece)
 - Clean-up: firms with gaps in the data (financial over time or spatial); shareholders' funds with negative values
 - Sample narrowed to 8.5% of the initial list (Share varies significantly, from 0.005% (Denmark) to 86.4% (Greece))
 - Data extracted in euro prices

4

Results. Interregional Flows of Capital Foreign Direct Investment (FDI)

- **Results at country level (NUTS 0)**

- **FDI country-to-country matrixes** - capital_fdi_c2c.xlsx

- **Spatial extent:** EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland + 3rd countries

- **Temporal scope:** 2010 to 2018

- **Source:** **OECD**

- **Data features:**

- 77 X 77 OD matrixes for each year

- Variable under consideration: FDI stocks

- Data have extracted in euro prices for most of the countries. Data available in USD or other currencies have been converted to euros at the exchange rate provided by Eurostat

4

Results. Interregional Flows of Capital Foreign Direct Investment (FDI)

- **Results at country level (NUTS 0)**
 - **FDI country-to-country matrixes** - capital_fdi_c2c.xlsx
 - **Spatial extent:** EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland + 3rd countries
 - **Temporal scope:** 2010 to 2018
 - **Source:** **IMF – International Monetary Fund Data features**
 - **Data features:**
 - 77 X 77 OD matrixes for each year
 - Variable under consideration: stocks (or positions)
 - Data extracted in USD and converted to euro prices at the exchange rate provided by Eurostat

4

Results. Interregional Flows of Capital Foreign Direct Investment (FDI)

- **Results at country level (NUTS 0)**
 - **FDI country-to-country matrixes** - capital_fdi_c2c.xlsx
 - **Spatial extent:** EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland + 3rd countries
 - **Temporal scope:** 2010 to 2018
 - **Source:** **EUROSTAT**
 - **Data features:**
 - 77 X 77 OD matrixes for each year
 - Variable under consideration: FDI positions
 - Data extracted in euro prices

4

Results. Interregional Flows of Capital Foreign Direct Investment (FDI)

- Results at regional level (NUTS 2 – 2016 classification)

- FDI region to region matrixes - capital_fdi_r2r.xlsx
- Spatial extent: EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland
- Temporal scope: 2010 to 2018
- Source: AMADEUS
- Data features:

- 329 X 329 OD matrixes for each year
- Variable under consideration: shareholders' funds
- 246,665 firms (8.54% of initial amount) were used (only active firms)
- Data extracted in euro prices

The screenshot shows an Excel spreadsheet with a large data table. The columns are labeled 'Origen' (Origin) and 'Destino' (Destination), with sub-columns for various regions (e.g., BE10, BE11, BE12, etc.). The rows represent different regions, with the first few rows showing data for BE (Belgium) and subsequent rows for BG (Bulgaria), CZ (Czechia), DE (Germany), DK (Denmark), and others. The table contains numerical values representing interregional flows of capital.

4

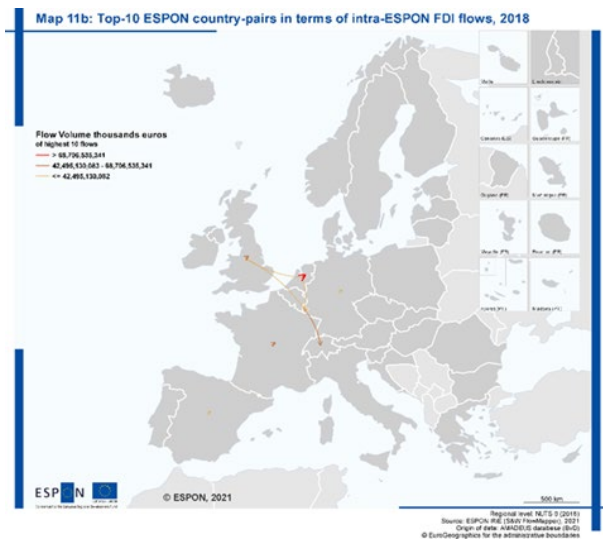
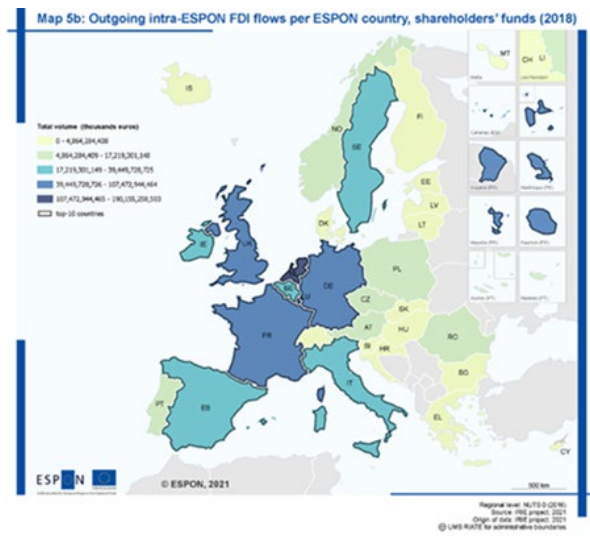
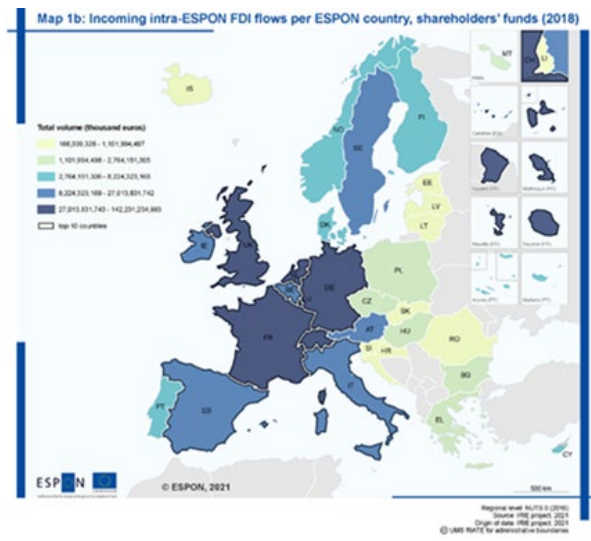
Results. Interregional Flows of Capital Foreign Direct Investment (FDI)

- **Analysis of the results:**

- Comparative analysis of the years 2010 and 2018
- Flows at country level and at regional level:
 - **Country level**
 - Total number, numbers per country; level and change; incoming and outgoing FDI
 - Per capita number, per capita numbers per country; level and change; incoming and outgoing FDI
 - Top-10 country-pairs with the highest flows
 - **Regional level**
 - Total number, numbers per region; level and change; incoming and outgoing FDI
 - Per capita number, per capita numbers per region; level and change; incoming and outgoing FDI
 - Top-10 region-pairs with the highest flows

4 Results. Interregional Flows of Capital Foreign Direct Investment (FDI)

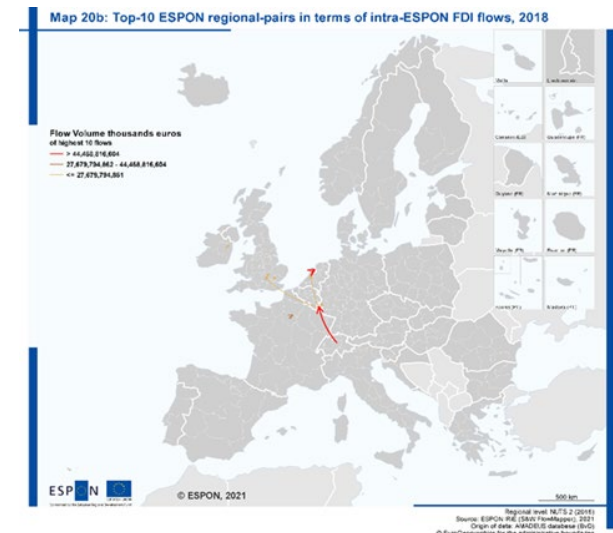
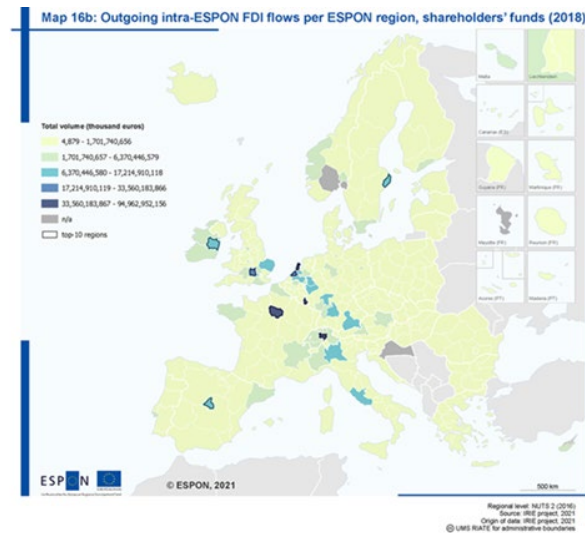
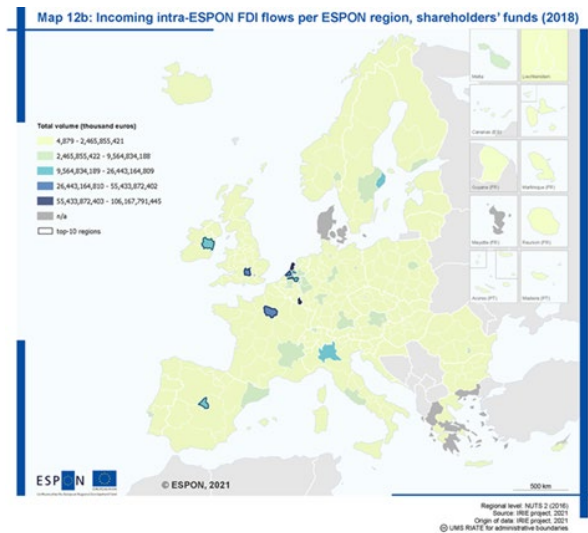
- **Country level.**
- NL, UK, LU, FR, DE, ES, IT, CH, and BE are the countries that present, consistently, the highest levels of incoming FDI flows. NL, UK, FR, DE, BE, ES, LU, IT, SE, and IE are the countries that present, consistently, the highest levels of outgoing FDI flows.
- NL-NL, UK-UK, FR-FR, 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.



4

Results. Interregional Flows of Capital Foreign Direct Investment (FDI)

- **Regional level.**
- 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.
- 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.



4

Results

9. Interregional Flows of Capital. Remittances

- Country-to-country matrixes (c2c)
- Region-to-region matrixes (r2r)
- Analysis

4

Results. Interregional Flows of Capital Remittances

- Results at country level (NUTS 0)

- Remittance country-to-country matrixes - capital_rents_remittance_c2c.xlsx
- Spatial extent: EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland + 3rd countries
- Temporal scope: 2010 to 2018
- Source: World Bank
- Data features:
 - 77 X 77 OD matrixes for each year from 2010 to 2018
 - Data extracted in USD and converted to euro prices

The screenshot shows an Excel spreadsheet titled 'capital_rents_remittance_c2c.xlsx'. The main content is a table of bilateral remittance estimates. The columns represent the sending country (across) and the rows represent the receiving country (down). The countries listed include BE, BG, CZ, DK, DE, EE, IE, EL, ES, FR, HR, IT, LV, LT, LU, HU, MT, NL, and AT. The values are in million euros. The spreadsheet also shows standard Excel interface elements like the ribbon (Inicio, Insertar, etc.) and the formula bar.

4

Results. Interregional Flows of Capital Remittances

- Results at country level (NUTS 0)

- Remittance country-to-country matrixes - capital_rents_remittance_c2c.xlsx
- Spatial extent: EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland + 3rd countries
- Temporal scope: 2010 to 2018
- Source: **EUROSTAT**

- Data features:

- 77 X 77 OD matrixes for each year from 2010 to 2018
- Data extracted in euro prices

The screenshot shows an Excel spreadsheet titled 'capital_rents_remittance_c2c.xlsx'. The main data area is a 77x77 matrix of bilateral remittance estimates. The columns represent the 'Remittance-sending country (across)' and the rows represent the 'Remittance-receiving country (down)'. The countries included are BE, BG, CZ, DK, DE, EE, IE, EL, ES, FR, HR, IT, LV, LT, LU, HU, MT, NL, and AT. The values in the cells represent remittance flows in million euros for each year from 2010 to 2018. The spreadsheet also includes a ribbon with various tabs like 'Inicio', 'Insertar', 'Diseño de página', 'Fórmulas', 'Datos', 'Revisar', 'Vista', and 'Compartir'. The status bar at the bottom indicates the current year is 2010.

4

Results. Interregional Flows of Capital Remittances

- **Results at regional level (NUTS 2 – 2016 classification)**
 - **Remittance country-to-country matrixes** - capital_rents_remittance_r2r.xlsx
 - **Spatial extent:** EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland
 - **Temporal scope:** 2010 to 2017
 - **Source:** **World Bank**
 - **Data features:**
 - 329 X 329 OD matrixes for each year from 2010 to 2017
 - National-level data were “regionalized”

Order	Remittance-sending country (across)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Order	Remittance-receiving country (down)	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	LV	LT	LU	HU	MT	NL	AT	
1	BE	12.98	18.65	611.50	31.83	14.54	912.36	2344.85	128.46	3.91	0.19	1.19	1.36	4.96	1						
2	BG	2.79	4.00	1.34	67.32	1.21	46.31	251.65	14.66	38.21	4.75										
3	CZ	13.36		3.11	233.37	32.97	5.64	40.28	35.11	29.96	2.49										
4	DK	13.82	0.48	103.74	4.13	5.66	47.97	21.77	9.91	0.52	2.30										
5	DE	244.96	26.81	91.74	47.42	34.52	750.49	470.28	26.46	143.66	6.31	3.76	2.79	44.09	72.59	1.32	325.37	566			
6	EE	1.86	0.09	1.61	9.13	5.15	0.19	1.88	1.14	1.29	0.04										
7	IE	2.70	0.05	1.02	10.84	0.83	11.42	4.04													
8	EL	14.25	1.65	1.17	442.45	0.65		4.03	12.60	8.48	19.27										
9	ES	220.13	0.98	23.62	290.52	52.62	1.12		2107.20	129.20	0.78										
10	FR	1284.88	26.63	41.26	1248.97	99.08	13.56	1832.72		3.60	290.58	5.88	0.87	171.93	25.14	0.93	149.62	56			
11	HR	0.00	2.09	1.11	464.89			1.40	0.53	2.53	41.67			35.07	0.10						
12	IT	191.62	1.51	7.14	1243.76	12.43	9.58	135.38	658.30	2.87											
13	CY	0.18	0.04	0.10	1.02	0.26	13.93	0.24	0.78	0.16											
14	LV	3.99	0.22	3.52	29.74	5.05	35.79	0.11	4.79	2.20											
15	LT	6.44	0.49	13.42	54.25	4.30	111.31	0.79	69.00	4.20											
16	LU	267.40	0.32	1.94	334.36	3.48	4.37	35.37	241.21												
17	HU	25.93	21.02	8.45	317.83	17.18	0.74	27.71	42.09	24.67	1.05										
18	MT	0.04	0.00	0.02	0.14	0.11	0.08	0.07	0.21	0.26	0.03										
19	NL	189.78	0.82	10.04	303.60	9.34	6.88	85.90	66.50	15.76	0.63										
20	AT	15.86	27.92	6.15	1053.81	3.43	9.47	40.09	52.08	6.79	32.28	1.17									
21	PL	78.76	43.29	48.70	1123.98	186.97	66.31	155.58	221.88	210.99	1.11	1.32									
22	PT	32.62	0.05	1.37	224.87	7.72	0.24	188.03	929.26	7.61	0.07										
23	RO	23.91	12.53	4.68	149.02	13.80	47.69	80.16	59.19	875.78	5.12										
24	SI	0.04	0.45	0.37	59.61	0.35	0.17	1.97	19.17	43.75	7.04	0.03									
25	SK	2.91	651.86	1.54	93.03	28.61	1.46	19.29	12.23	22.69	0.28										
26	FI	7.12	0.64	8.08	41.32	1.92	2.62	2.45	25.41	7.71											
27	SE	8.61	0.34	26.76	44.20	4.31	5.60	39.34	15.96	0.49	20.61	1.30	1.44	0.05	1.98	1.86					
28	UK	30.64	1.73	17.53	185.57	473.32	16.73	487.46	204.95		46.78	35.12	0.99	0.18	4.72	4.38	6.08	55.32	16		
29	IS	0.10	0.01	4.19	0.96	0.05	0.01	0.59	0.16		0.08	0.01									

4

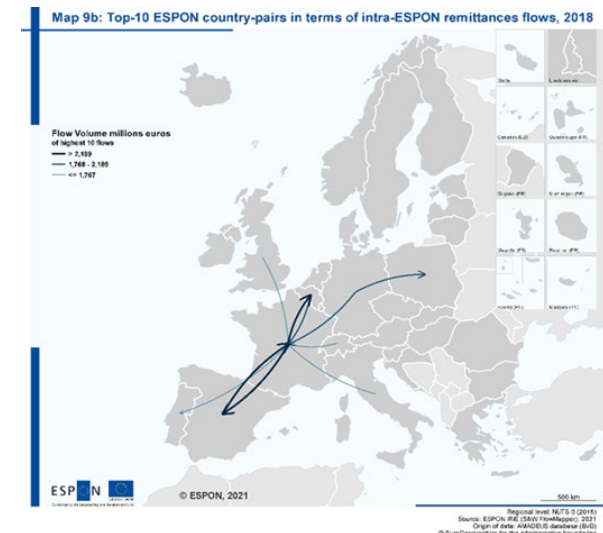
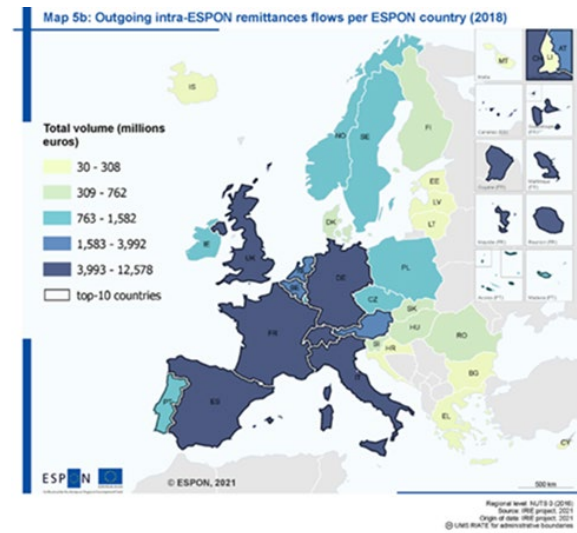
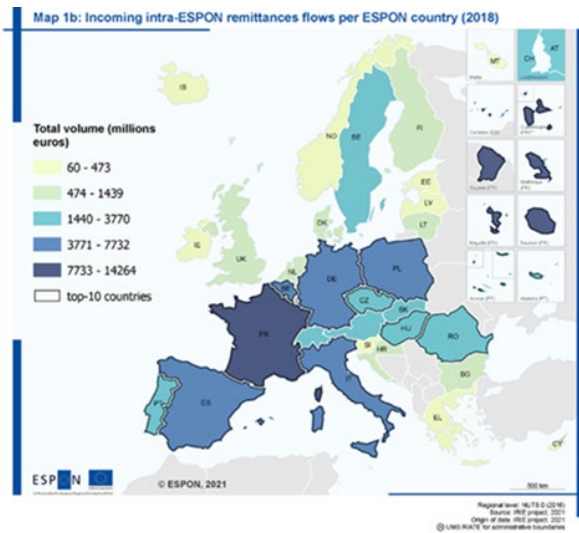
Results. Interregional Flows of Capital Remittances

▪ Analysis of the results:

- Comparative analysis of the years 2010 and 2017; the report will be updated when data for year 2018 become available
- Flows at country level and at regional level:
 - **Country level**
 - Total number, numbers per country; level and change; incoming and outgoing remittances
 - Per capita number, per capita numbers per country; level and change; incoming and outgoing remittances
 - Top-10 country-pairs with the highest flows
 - **Regional level**
 - Total number, numbers per region; level and change; incoming and outgoing remittances
 - Per capita number, per capita numbers per region; level and change; incoming and outgoing remittances
 - Top-10 region-pairs with the highest flows

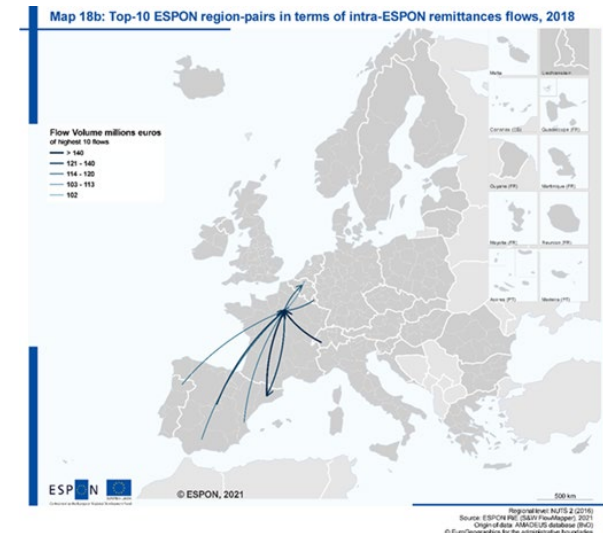
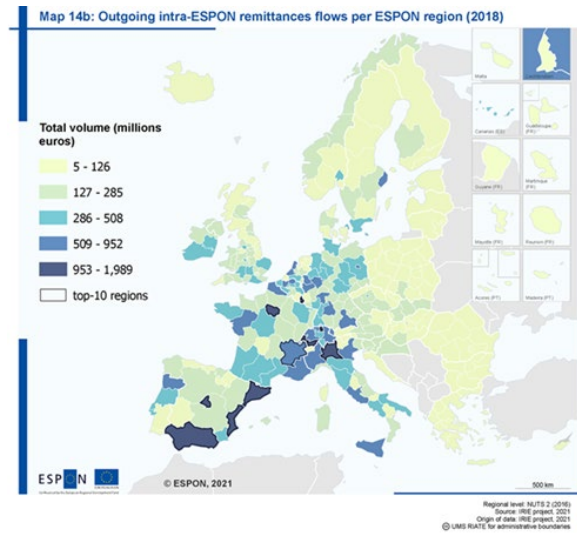
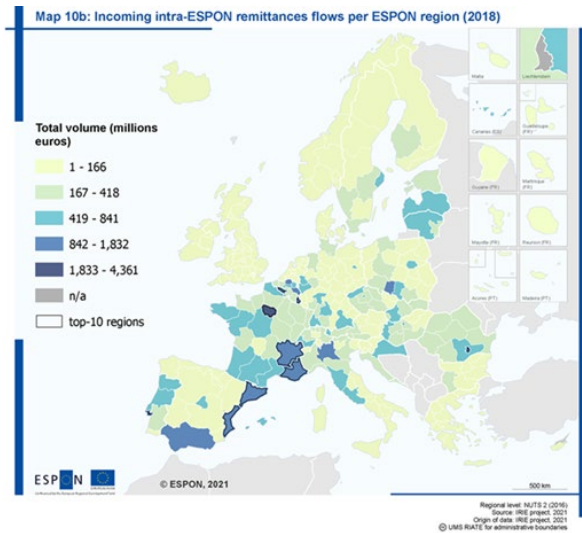
4 Results. Interregional Flows of Capital Remittances

- **Country level.**
- 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.
- 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.



4 Results. Interregional Flows of Capital Remittances

- **Regional level.**
- 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.
- 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.



4

Results

10. Interregional flows of capital: loans

- Country-to-country matrixes (c2c)
- Region-to-region matrixes (r2r)
- Typologies
- Analysis

4

Results. Capital: Loans “Exploratory analysis”

Cross-border banking positions by reporting country. BIS. 2019Q4

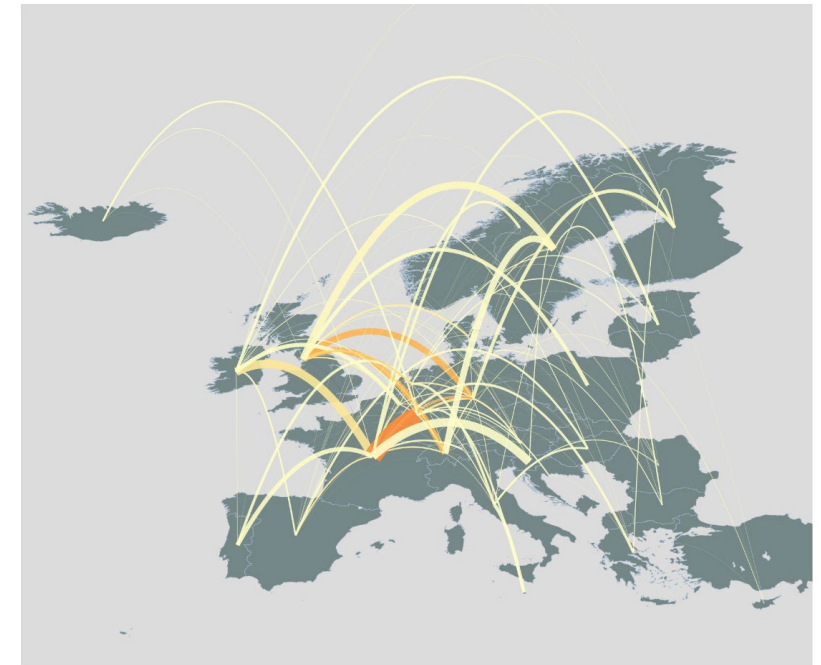
Results at country level (NUTS 0)

- Loans at the C2C level
- BIS (claims & liabilities)
 - Spatial extent: EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland
 - Temporal scope: 2010 to 2018
 - Source: **BIS/LBS.**
- EDW/ECB (flows by ABS type)
 - Spatial extent:
 - Temporal scope: 2010 to 2018
 - Source: **EDW(ECB).**

Claims



Liabilities



4

Results. Capital: Loans

- **Results at R2R level (NUTS 2)**
 - **EDW/ECB (flows by ABS type)**
 - **Spatial extent:** no pan-European coverage
 - **Temporal scope:** 2010 to 2018
 - **Source:** **EDW(ECB).**

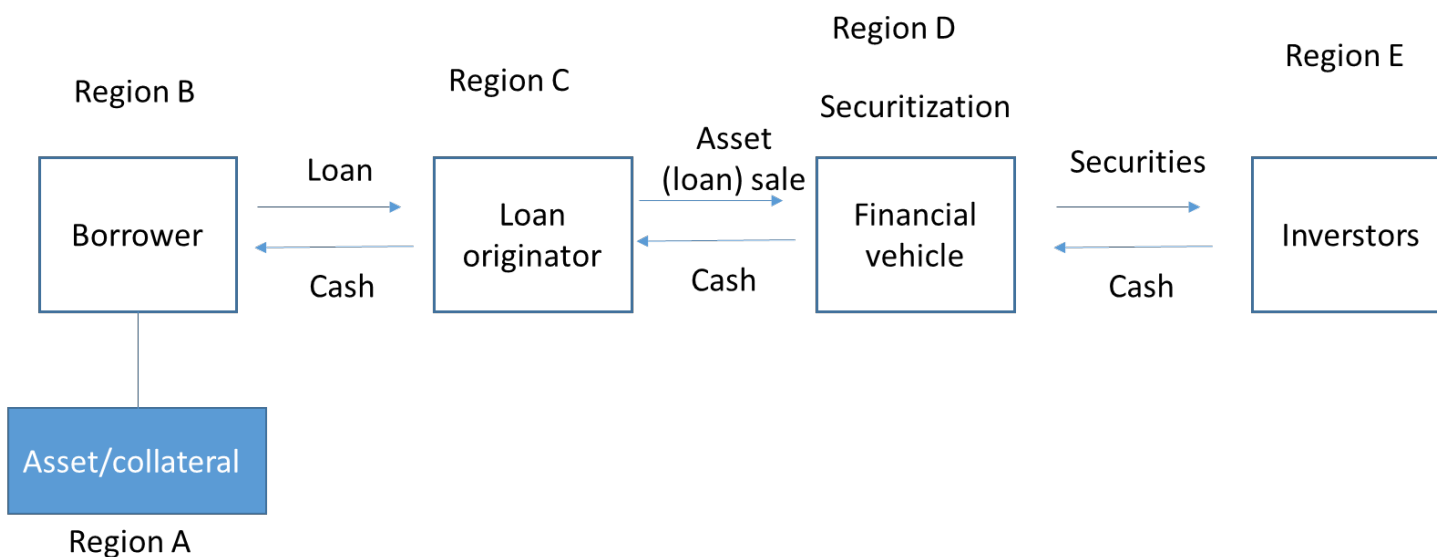
Region-to-Region financial flows in the EDW database. Current Loan values (mean, all dates).



4

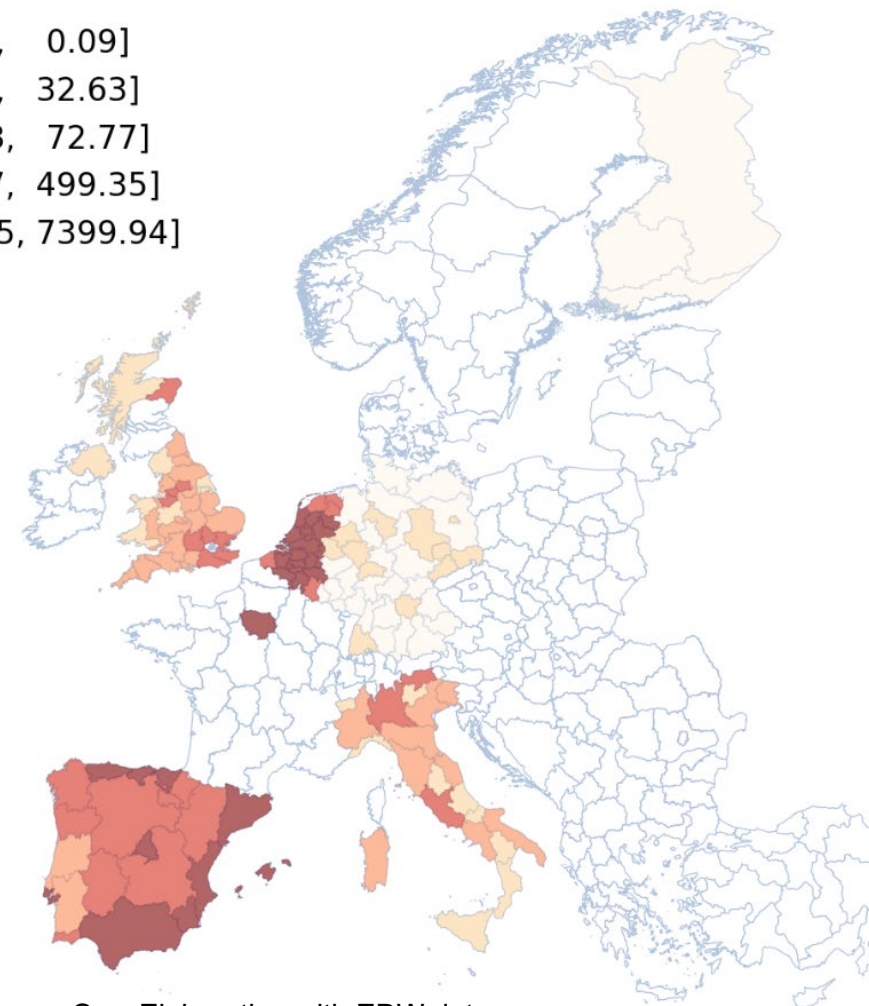
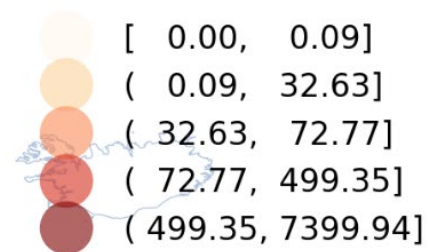
Results. Capital: Loans

Securitization. Financial flows and spatial aspects to be considered in the operation.



Spatial distribution of RMB loans: Mortgages.

Current valued in 2018Q1 Euro Millions.

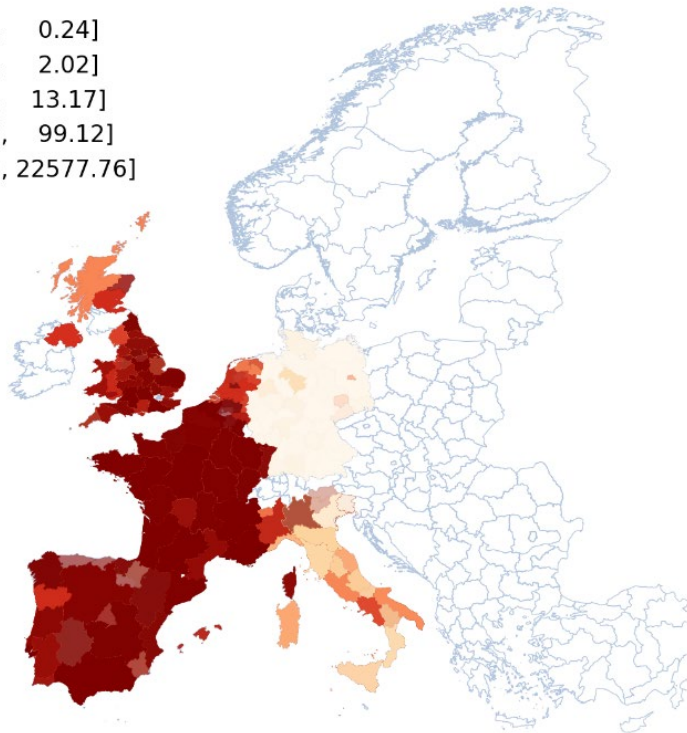
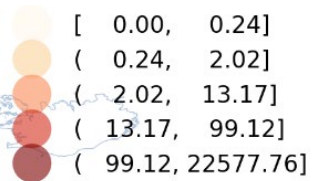


Source: Own Elaboration with EDW data.

4

Results. Capital: Loans

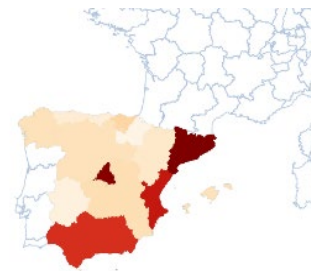
RMBS (securitized mortgage loans. Stock of active loans in 2019. EDW/ECB



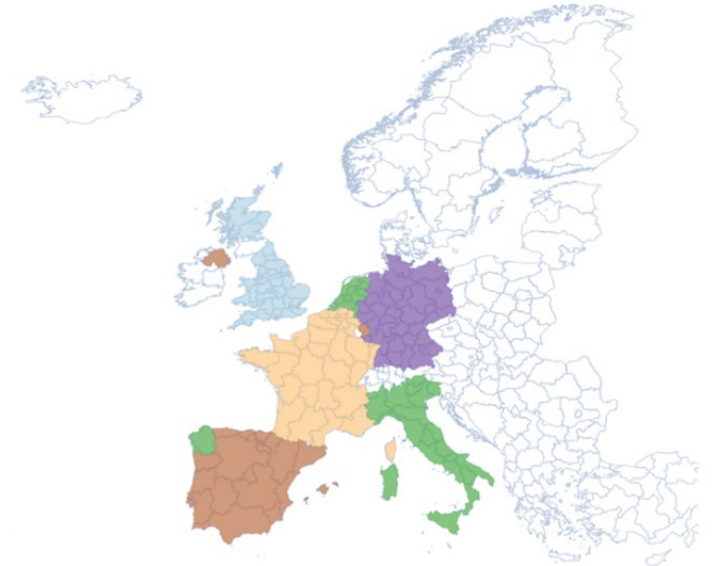
France



Spain



Cluster analysis: mortgage loans.



4

Results. Capital: Loans

Econometric analysis: the regional demand for ABS loans. Panel Data regressions 2019. EDW/ECB

Variables	Description
Density _{it}	Population density by NUTS 2 region (Persons per Km2). Eurostat
Age _{it}	Median age of regional population [MEDAGEPOP]. Eurostat
GDP _{it}	Regional GDP. ESPON Database.
Unemployment rate _{it}	Unemployment rate by NUTS2 regions. Eurostat
Wage (real) _{it}	Real Wage. Own calculations based on Eurostat data: Compensation of employees by NUTS 2 regions, and Employment by region. Wage is divided by country Purchasing power parities (PPPs) from Eurostat.
BUSINESS _i	Business sophistication. European Commission 2019. Composite index by regions composed by Employment, GVA and in the "Financial and insurance activities;;..." sectors (K-N) as % of total figure.. Only data for 2019 year.
RCI _i	Regional competitiveness index by NUTS2 European Commission 2019. Only data for 2019 year
Housing Prices _{ct}	Residential property prices - Real - Index, 2010 = 100. BIS (Bank for international Settlements). Only country data.
NPL _{ct}	Bank nonperforming loans to total gross loans (%). Country level data World Development Indicators. World Bank

Loan demand drivers. Summary of panel data estimations

	Model 1		Model 2					
	Panel OLS	Random Effects	Panel OLS	Random Effects				
C	14.68 (11.3000)	** (3.0776)	7.6793 (7.3605)	** (2.9784)	10.22 (7.3605)	** (2.9784)	5.4612 (2.9784)	**
Real Wage	-0.0388 (-2.1603)	** (0.2940)	0.0061 (0.2940)		0.0041 (0.2648)		0.0205 (1.0531)	**
Pop- density	-0.0002 (-2.1440)	** (-0.7672)	-0.0001 (-0.7672)	**	-0.0001 (-1.2215)		0.0002 (0.7687)	
GDP	0.00000518 (5.2148)	** (5.9492)	0.00000593 (5.9492)	**				
Unemploy.					0.095 (5.2781)	**	0.0091 (0.5962)	
Age	-0.0444 (-1.9213)	** (-0.1394)	-0.0074 (-0.1394)		-0.0128 (-0.5041)		0.0354 (-1.0314)	
Business	0.3619 (1.8461)		0.1485 (0.7344)		0.1822 (1.0065)		0.2799 (1.0620)	
RCI 2019	0.614 (2.4685)	** (-1.5262)	-0.4591 (-1.5262)		1.7628 (7.0110)	**	-0.5875 (-1.3702)	
Housing prices	-0.0437 (-9.4859)	** (-0.1649)	-0.0005 (-0.1649)	**	-0.0338 (-6.4546)	**	0.0022 (0.5405)	**
NPL	0.0125 (0.6349)		0.0101 (1.3605)		0.0809 (5.3296)	**	-0.0026 (-0.3597)	
R-squared	0.4869	0.2116	0.4789	0.2439				
R-Squared (Within)	-0.9056	0.116	-1.8296	0.1933				
R-Squared (Between)	0.5428	0.2001	0.5707	0.0238				
R-Squared (Overall)	0.4506	0.2168	0.3911	0.0359				
F-statistic	161.55	45.794	196.99	69.329				
P-value (F-stat)	0	0	0	0				
Cov. Est.	Clustered	Clustered	Clustered	Clustered				
No. Observations	425	425	541	541				
Hausman Test	p-Value: 7.113733722910155e-41		p-Value: 1.9718946150066573e-69					

4

Results

11. Interregional Flows of Knowledge. Erasmus

- Country-to-country matrixes (c2c)
- Region-to-region matrixes (r2r)
- Analysis

4

Results. Interregional Flows of Knowledge Erasmus

Results at country level (NUTS 0)

- Erasmus country-to-country matrixes - knowledge_erasmus_c2c.xlsx
- Spatial extent:** EU27 + UK, Norway, Lichtenstein, Iceland and Switzerland + Rest of the world (ROW) + Turkey (from 2012 on) + Macedonia (from 2014 on)
- Temporal scope:** 2010 to 2014
- Source:** EU Open Data Portal – Erasmus mobility statistics
- Data features:**
 - Erasmus student exchange
 - 33 x 33 OD matrixes for 2010 and 2011
 - 34 x 34 OD matrix for 2012 and 2013
 - 35 x 35 OD matrix for 2014

	BE	BG	CE	DE	EE	EL	ES	FR	GR	HU	IE	IT	LV	LT	LU	MT	NL	PL	PT	RO	SI	SK	FI	SE	UK	ROW					
1 BE	17	215	215	505	18	37	35	1288	877	18	514	32	7	41	3	115	21	599	151	115	288	54	51	7	282	272	444	9	5	139	
2 BG	88	85	151	285	6	7	20	129	218	19	96	1	28	11	1	37	35	84	207	75	11	13	27	14	28	49	28	49	8	8	
3 CE	227	30	129	300	86	91	144	550	407	35	285	36	47	121	6	50	8	205	305	176	876	6	170	71	381	251	410	20	7	221	
4 DE	60	1	41	413	4	88	13	279	315	1	86	17	4	9	29	15	209	86	25	65	13	5	19	51	466	20	108	108	7		
5 EE	495	51	478	981	256	1040	148	5353	4884	54	1716	48	180	51	560	58	662	547	697	718	86	120	60	187	238	518	124	5	111		
6 EL	24	12	51	25	85	15	70	95	2	46	5	16	6	17	1	37	27	10	64	1	1	5	81	30	50	6	5	1	24		
7 IE	72	11	49	57	284	11	11	398	467	89	4	4	5	26	27	137	58	20	14	10	10	33	98	127	4	1	24	1	24		
8 IT	180	6	216	50	488	11	11	386	583	7	289	40	10	25	6	128	61	351	188	31	18	21	104	87	146	2	1	37			
9 ES	1517	88	805	471	8536	42	621	213	8656	77	6048	34	87	256	9	380	13	1268	520	2484	2133	277	332	224	844	881	2960	38	4	451	
10 FR	987	58	755	488	3336	103	1483	211	4633	67	73	171	48	100	240	17	939	95	666	456	948	415	321	138	115	1143	1604	430	54	2	709
11 HU	38	9	52	5	181	6	4	9	154	67	88	5	7	21	28	2	12	135	113	80	49	37	15	18	25	1	1	1			
12 PT	935	23	297	529	2547	100	299	148	4759	3240	34	23	55	150	13	281	104	705	421	853	1200	210	57	76	448	537	1537	51	511	511	
13 RO	27	4	4	7	1	4	96	31	28	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		
14 LV	51	31	17	61	180	44	2	84	134	99	7	58	21	189	2	29	6	78	33	63	84	11	13	25	81	40	24	8	5	61	
15 LT	80	27	111	84	177	31	6	61	240	143	35	180	45	83	4	67	8	80	47	100	236	11	53	28	156	101	48	6	69		
16 LU	286	8	8	181	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
17 MT	151	15	47	65	705	24	26	35	249	247	13	240	15	12	31	3	3	202	214	169	159	40	25	14	178	35	128	4	4	30	
18 NL	9	68	11	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	
19 PL	245	11	109	314	615	13	198	43	1101	654	9	348	13	26	37	1	3	202	84	205	12	11	10	322	641	1053	22	256			
20 AT	102	3	78	189	144	36	147	26	637	500	36	383	4	13	19	19	21	215	11	44	134	3	29	7	242	609	417	39	160		
21 SK	390	156	467	277	1753	61	89	220	1896	1002	189	1076	78	57	80	8	281	20	285	228	1181	75	178	285	228	1181	426	31	2	198	
22 SI	210	45	395	95	315	28	28	97	1087	523	47	786	8	28	137	6	184	135	99	819	174	138	68	148	58	200	1	50			
23 FI	150	27	83	66	424	8	14	115	510	971	15	466	4	13	17	288	2	75	100	271	247	7	25	37	36	36	5	3			
24 SE	45	3	93	30	119	3	19	5	162	70	31	52	9	2	11	1	1	62	105	48	152	12	9	49	31	40	5	44			
25 UK	73	22	445	36	336	30	13	39	239	205	28	133	2	15	51	1	61	2	49	118	215	159	11	56	88	42	41	10	44		
26 ROW	171	3	175	1021	818	51	1281	30	488	445	11	1353	21	7	5	137	21	612	296	500	121	3	44	20	20	145	481	21	3	481	
27 TUR	85	81	46	405	2	111	17	336	525	5	166	1	8	12	5	320	137	28	80	2	9	17	1	1	1	1	1	1	1		
28 UK	224	1	168	242	2372	29	56	21	2478	2839	12	927	31	2	4	3	58	70	800	187	69	140	5	20	12	191	548	19	135		
29 ROW	6	6	36	36	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	
30 IT	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
31 ROW	48	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
32 CH	64	6	16	105	165	4	60	3	330	382	134	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
33 ROW	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
34 ROW	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
35 ROW	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
36 ROW	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
37 ROW	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
38 ROW	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
39 ROW	6341	475	6043	5081	23874	1107	4866	1874	30900	24851	781	17434	143	1051	2222	110	4110	508	8545	5097	10865	9308	1814	1742	1309	6778	9043	18242	506	37	4303

4

Results. Interregional Flows of Knowledge Erasmus

- Results at regional level (NUTS 2 – 2016 classification)
 - Erasmus region-to-region matrixes - knowledge_erasmus_r2r.xlsx
 - Spatial extent:** EU27 + UK, Norway, Lichtenstein, Iceland and Switzerland + Rest of the world (ROW) + Turkey (from 2012 on) + Macedonia (from 2014 on)
 - Temporal scope:** 2010 to 2014
 - Source:** EU Open Data Portal – Erasmus mobility statistics
 - Data features:**
 - Erasmus student exchange
 - 318 x 318 OD matrixes for 2010 and 2011
 - 325 x 325 OD matrix for 2012 and 2013
 - 326 x 326 OD matrix for 2014

The screenshot shows an Excel spreadsheet with a data matrix. The columns are labeled 'Country' and 'Order' (1-30). The rows are labeled 'Country' and 'Order' (1-30). The matrix contains numerical values representing knowledge flows between regions. The regions listed are BE10, BE21, BE22, BE23, BE24, BE25, BE31, BE32, BE33, BE34, BE35, BG31, BG32, BG33, BG34, BG41, BG42, CZ201, CZ202, CZ203, CZ204, CZ205, CZ206, CZ207, CZ208, DK201, DK202, DK203, DK204, DK205, DE10, DE11, DE12, DE13.

4

Results. Interregional Flows of Knowledge Erasmus

- **Analysis of the results:**
 - Analysis focused on **bi-yearly intervals**, where differences and similarities are more visible and significant
 - Comparative analysis of the **2009-10, 2011-12 and 2013-14 periods**
 - Flows at country level and at regional level:
 - **Country level**
 - Total number, numbers per country
 - Comparison of students received/sent per 1000 inhabitants
 - Balance between number of sent and received students
 - **Regional level**
 - Sending regions, descriptive statistics
 - Receiving regions, descriptive statistics
 - Top 20 pairs of regions with largest mutual flows
 - Rank-size distribution of all regions

4

Results. Interregional Flows of Knowledge Erasmus

- **Analysis of the results**
- **Country level. Comparison of students received/sent per 1000 inhabitants**

Table 2.6: Send and received students per 1000 inhabitants. Comparison 2009-2010 and 2013-2014.

	Sent		Received		RANK Senders		RANK Receivers	
	2009-10	2013-14	2009-10	2013-14	2009-10	2013-14	2009-10	2013-14
BE	0.49	0.57	0.51	0.59	LU	LT	IS	IS
BG	0.19	0.20	0.05	0.09	LT	FI	FI	FI
CZ	0.51	0.61	0.40	0.57	IS	LU	MT	MT
DK	0.33	0.47	1.03	0.90	FI	LV	DK	IE
DE	0.29	0.38	0.22	0.29	ES	LI	SE	LI
EE	0.54	0.61	0.49	0.82	LV	ES	LI	SE
IE	0.35	0.49	0.88	1.07	SI	SI	IE	DK
EL	0.25	0.32	0.19	0.17	EE	EE	NO	PT
ES	0.59	0.66	0.63	0.66	LI	CZ	ES	NO
FR	0.38	0.42	0.34	0.37	CZ	IS	PT	SI
HR	0.05	0.27	0.00	0.18	AT	BE	SI	EE
IT	0.32	0.37	0.27	0.30	BE	PT	BE	LT
CY	0.25	0.36	0.37	0.63	PT	AT	AT	ES
LV	0.57	0.78	0.19	0.52	FR	SK	EE	CY
LT	0.72	0.85	0.38	0.75	IE	IE	NL	AT
LU	0.90	0.80	0.12	0.20	HU	MT	CZ	BE
HU	0.34	0.33	0.25	0.41	SK	DK	LT	CZ
...

- Student movements per 1000 inhabitants in the Erasmus+ space have increased substantially between 2009-2010 and 2013-2014
- **Sending flows:** smaller and/or sparsely populated countries with high levels of education like Luxembourg, the Baltic states, Finland and Iceland send abroad large numbers of students considering their population. Spain is the only major Erasmus country in absolute terms also ranking highly in relative terms. On the opposite side, the United Kingdom performs poorly as a sending country, considering its large population
- **Receiving flows:** all the Nordic countries rank highly given their population. They have high standards of higher education and are popular destinations for student mobility. Mediterranean countries like Malta and Portugal also perform well as receivers, even if they do not stand out as senders. Ireland – with the advantage of being an English-speaking country - is an increasingly popular student destination

4

Results. Interregional Flows of Knowledge Erasmus

- **Analysis of the results**
- **Country level.** Balance between the number of sent and received students
 - Some countries tend to “specialize” as either senders or receivers
 - Large outward flows can mean that a country or region has a mobile and engaged student population with an interest for learning abroad. But if it comes with comparatively small inward flows it can point to a gradual ‘brain drain’ of a highly educated sector of the population and/or mean that the sending country/region does not have sufficiently attractive higher education institutions or related infrastructure
 - The opposite – low outward and high inward flows – point to the attractiveness of the country/region for higher education studies, but puts into question the engagement of, and the opportunities given to, the local student population

Table 2.7: Balance between sending and receiving flows. Positive percentages mean countries with larger receiving than sending flows, negative percentage mean countries with larger sending than receiving flows.

country	2009-2010	country	2013-2014
MT	267.2%	NO	176.3%
SE	222.0%	SE	171.1%
DK	218.0%	IS	160.8%
NO	170.8%	MT	158.6%
IE	147.4%	IE	120.8%
UK	109.0%	DK	92.7%
IS	90.7%	UK	73.7%
FI	72.2%	CY	73.2%
LI	68.4%	FI	60.0%
CY	49.2%	PT	56.2%
PT	41.5%	LI	48.0%
NL	35.1%	EE	35.4%
ES	6.8%	SI	32.0%
BE	5.4%	HU	27.2%
SI	1.8%	NL	15.7%
AT	-0.7%	AT	12.0%
EE	-8.7%	BE	3.4%
FR	-9.8%	ES	-0.1%
IT	-16.9%	CH	-2.2%
CZ	-22.5%	CZ	-5.2%
DE	-25.4%	PL	-9.3%
EL	-26.2%	FR	-10.6%
HU	-27.7%	LT	-12.3%
LT	-47.5%	IT	-20.2%
SK	-49.7%	DE	-23.4%
PL	-52.3%	HR	-32.7%
TR	-63.8%	LV	-33.8%
RO	-65.5%	EL	-47.5%
LV	-66.2%	SK	-51.1%
BG	-72.2%	BG	-52.9%
LU	-87.2%	TR	-56.0%
HR	-100.0%	RO	-58.6%
MK		LU	-74.5%
CH		MK	-100.0%

↑

↑

RECEIVERS

↓

BALANCED

↓

SENDERS

4

Results. Interregional Flows of Knowledge Erasmus

- **Analysis of the results**
- **Regional level. Sending regions, descriptive statistics; NUTS 2 regions, 2009-2010, 2011-2012 and 2013-2014**
 - A – main sending region
 - B – number of destination regions receiving from main sending region
 - C – total sent by main sending region
 - D – total sent by main sending region as percentage of the total sent by country
 - E – main destination region of main sending region
 - F – total sent to main destination region by main sending region
 - G – percentage of main sending region sent to main destination region
 - H – total received from main sending region in main destination region as percentage of received in country
 - I – total received in main destination region
 - J – total received from main sending region as percentage of received in main destination region
 - K – total received in destination country
 - L – total received from main sending region as percentage of total received in destination country

FR10 – Ile-de-France (Paris)	ES30 – Madrid	IT14 – Lazio (Rome)
FRK2 – Rhone-Alpes	ES51 – Andalucia	ITC4 – Lombardia
DE30 – Berlin	ES61 – Catalunya	TR10 – Istanbul
PT17 – Lisboa	ES52 – Comun. Valenciana	TR51 - Ankara
SE11 – Stockholm	PL91 - Warszawa	

top 10 sending regions 2009-2010												
	A	B	C	D	E	F	G	H	I	J	K	L
1	ES30		6186	22.5%	FR10	459	7.4%	1.7%	6900	6.7%	22020	2.1%
2	FR10		5942	24.3%	ES30	517	8.7%	2.1%	6353	8.1%	29324	1.8%
3	ES61		5901	21.5%	IT14	373	6.3%	1.4%	2641	14.1%	15880	2.3%
4	IT14		4852	25.4%	ES30	396	8.2%	2.1%	6353	6.2%	29324	1.4%
5	ES51		3399	12.4%	FR10	181	5.3%	0.7%	6900	2.6%	22020	0.8%
6	ITC4		3316	17.3%	FR10	259	7.8%	1.4%	6900	3.8%	22020	1.2%
7	DE30		3164	13.2%	FR10	226	7.1%	0.9%	6900	3.3%	22020	1.0%
8	ES52		3116	11.4%	IT14	138	4.4%	0.5%	2641	5.2%	15880	0.9%
9	FRK2		3028	12.4%	SE11	185	6.1%	0.8%	3728	5.0%	8783	2.1%
10	PL91		2559	22.0%	FR10	119	4.7%	1.0%	6900	1.7%	22020	0.5%

top 10 sending regions 2013-2014												
	A	B	C	D	E	F	G	H	I	J	K	L
1	ES30	236	6921	22.3%	FR10	423	6.1%	1.4%	7385	5.7%	24487	1.7%
2	FR10	206	6856	25.0%	ES30	480	7.0%	1.8%	7574	6.3%	30994	1.5%
3	ES61	240	6218	20.0%	IT14	368	5.9%	1.2%	4390	8.4%	17808	2.1%
4	IT14	212	5399	24.2%	ES30	393	7.3%	1.8%	7574	5.2%	30994	1.3%
5	ES51	215	4554	14.7%	IT14	206	4.5%	0.7%	4390	4.7%	17808	1.2%
6	ITC4	205	4229	19.0%	FR10	293	6.9%	1.3%	7385	4.0%	24487	1.2%
7	DE30	187	3825	12.5%	FR10	241	6.3%	0.8%	7385	3.3%	24487	1.0%
8	TR10	209	3729	27.1%	FR10	155	4.2%	1.1%	7385	2.1%	24487	0.6%
9	TR51	208	3593	26.1%	PL61	116	3.2%	0.8%	475	24.4%	10865	1.1%
10	ES52	205	3571	11.5%	IT14	118	3.3%	0.4%	4390	2.7%	17808	0.7%

4

Results. Interregional Flows of Knowledge Erasmus

- **Analysis of the results**
- **Regional level. Sending regions, descriptive statistics; NUTS 2 regions, 2009-2010 and 2013-2014**
- The regional level tables confirm the observations at country level: Southern Europe dominates the Erasmus mobility flows. Madrid (ES30), Paris/Ile-de-France (FR10), Andalucia (ES61) and Lazio/Rome (ITI4) are the main sending regions
- From a total number varying between 317 and 325 NUTS 2 regions, the main senders are connected to a high number of partners, usually close to 200
- Major sending regions tend to have a strong weight in the total number of students send by each country (see column D in the table), especially capital city regions. Paris, Madrid and Rome comprise roughly 25% of all national outward flows, while their NUTS 2 populations vary, respectively, between 18% and 10% of the national population

FR10 – Ile-de-France (Paris)	ES30 – Madrid	ITI4 – Lazio (Rome)
FRK2 – Rhone-Alpes	ES51 – Andalucia	ITC4 – Lombardia
DE30 – Berlin	ES61 – Catalunya	TR10 – Istanbul
PT17 – Lisboa	ES52 – Comun. Valenciana	TR51 - Ankara
SE11 – Stockholm	PL91 - Warszawa	

top 10 sending regions 2009-2010												
	A	B	C	D	E	F	G	H	I	J	K	L
1	ES30		6186	22.5%	FR10	459	7.4%	1.7%	6900	6.7%	22020	2.1%
2	FR10		5942	24.3%	ES30	517	8.7%	2.1%	6353	8.1%	29324	1.8%
3	ES61		5901	21.5%	ITI4	373	6.3%	1.4%	2641	14.1%	15880	2.3%
4	ITI4		4852	25.4%	ES30	396	8.2%	2.1%	6353	6.2%	29324	1.4%
5	ES51		3399	12.4%	FR10	181	5.3%	0.7%	6900	2.6%	22020	0.8%
6	ITC4		3316	17.3%	FR10	259	7.8%	1.4%	6900	3.8%	22020	1.2%
7	DE30		3164	13.2%	FR10	226	7.1%	0.9%	6900	3.3%	22020	1.0%
8	ES52		3116	11.4%	ITI4	138	4.4%	0.5%	2641	5.2%	15880	0.9%
9	FRK2		3028	12.4%	SE11	185	6.1%	0.8%	3728	5.0%	8783	2.1%
10	PL91		2559	22.0%	FR10	119	4.7%	1.0%	6900	1.7%	22020	0.5%

top 10 sending regions 2013-2014												
	A	B	C	D	E	F	G	H	I	J	K	L
1	ES30	236	6921	22.3%	FR10	423	6.1%	1.4%	7385	5.7%	24487	1.7%
2	FR10	206	6856	25.0%	ES30	480	7.0%	1.8%	7574	6.3%	30994	1.5%
3	ES61	240	6218	20.0%	ITI4	368	5.9%	1.2%	4390	8.4%	17808	2.1%
4	ITI4	212	5399	24.2%	ES30	393	7.3%	1.8%	7574	5.2%	30994	1.3%
5	ES51	215	4554	14.7%	ITI4	206	4.5%	0.7%	4390	4.7%	17808	1.2%
6	ITC4	205	4229	19.0%	FR10	293	6.9%	1.3%	7385	4.0%	24487	1.2%
7	DE30	187	3825	12.5%	FR10	241	6.3%	0.8%	7385	3.3%	24487	1.0%
8	TR10	209	3729	27.1%	FR10	155	4.2%	1.1%	7385	2.1%	24487	0.6%
9	TR51	208	3593	26.1%	PL61	116	3.2%	0.8%	475	24.4%	10865	1.1%
10	ES52	205	3571	11.5%	ITI4	118	3.3%	0.4%	4390	2.7%	17808	0.7%

4

Results. Interregional Flows of Knowledge Erasmus

Analysis of the results

Regional level. Receiving regions, descriptive statistics; NUTS 2 regions, 2009-2010 and 2013-2014

- A – main receiving region
- B – number of origin regions sending to main receiving region
- C – total received by main receiving region
- D – total received by main receiving region as percentage of the total received by country
- E – main origin region sending to main receiving region
- F – total received in main receiving region from main sending region
- G – percentage of main receiving region sent by main origin region
- H – total received in main destination region sent by main sending region as percentage received in country
- I – total sent by main origin region
- J – total received in main receiving region as percentage of total sent by main origin region
- K – total sent from origin country
- L – total sent to main receiving region as percentage of sent from origin country

top 10 receiving regions 2009-2010												
	A	B	C	D	E	F	G	H	I	J	K	L
1	FR10	211	6900	31.3%	ES30	459	6.7%	2.1%	6186	7.42%	24424	1.9%
2	ES30	224	6353	21.7%	FR10	517	8.1%	1.8%	5942	8.70%	27448	1.9%
3	ES61	219	6006	20.5%	ITI4	356	5.9%	1.2%	4852	7.34%	27448	1.3%
4	ES52	213	4699	16.0%	ITI4	242	5.2%	0.8%	4852	4.99%	27448	0.9%
5	ES51	216	4198	14.3%	ITI4	276	6.6%	0.9%	4852	5.69%	27448	1.0%
6	ITI4	200	4063	25.6%	ES30	384	9.5%	2.4%	6186	6.21%	19116	2.0%
7	SE11	195	3728	42.4%	FR10	236	6.3%	2.7%	5942	3.97%	2728	8.7%
8	DE30	193	3571	19.9%	FR10	269	7.5%	1.5%	5942	4.53%	24028	1.1%
9	PT17	200	3244	49.0%	ES61	146	4.5%	2.2%	5901	2.47%	4675	3.1%
10	FRK2	187	2848	12.9%	ITI4	171	6.0%	0.8%	4852	3.52%	24424	0.7%

top 10 receiving regions 2013-2014												
	A	B	C	D	E	F	G	H	I	J	K	L
1	ES30	236	7574	24.4%	FR10	480	6.3%	1.5%	6856	7.0%	27379	1.8%
2	FR10	222	7385	30.2%	ES30	423	5.7%	1.7%	6921	6.1%	31039	1.4%
3	ES61	243	6580	21.2%	ITI4	376	5.7%	1.2%	5399	7.0%	22314	1.7%
4	PT17	227	4699	50.5%	ES30	214	4.6%	2.3%	6921	3.1%	31039	0.7%
5	ES51	227	4500	14.5%	ITI4	262	5.8%	0.8%	5399	4.9%	22314	1.2%
6	ITI4	220	4390	24.7%	ES61	368	8.4%	2.1%	6218	5.9%	31039	1.2%
7	ES52	215	4213	13.6%	ITI4	201	4.8%	0.6%	5399	3.7%	22314	0.9%
8	DE30	199	4105	17.6%	FR10	258	6.3%	1.1%	6856	3.8%	27379	0.9%
9	SE11	202	4071	45.0%	FR10	261	6.4%	2.9%	6856	3.8%	27379	1.0%
10	TR10	195	3545	58.5%	DE30	169	4.8%	2.8%	3825	4.4%	30522	0.6%

4 Results. Interregional Flows of Knowledge

Erasmus

- **Analysis of the results**
- **Regional level. Receiving regions, descriptive statistics; NUTS 2 regions, 2009-2010 and 2013-2014**
- Dominance of Madrid (ES30) and Paris/Ile-de-France
- The remaining Spanish regions perform better as receivers than as senders and approach the top of the tables, to the disadvantage of Italian regions, with only Lazio/Rome remains in a slightly lower rank
- the issue of regional hegemony corresponds precisely to what was detected in the sending regions analysis. The top 10 regions - roughly 3% of the total – also attract about 25% of all the incoming flows, suggesting that the general distribution of the regions follows a power law in which the top players see their results boosted in comparison to others

top 10 receiving regions 2009-2010												
	A	B	C	D	E	F	G	H	I	J	K	L
1	FR10	211	6900	31.3%	ES30	459	6.7%	2.1%	6186	7.42%	24424	1.9%
2	ES30	224	6353	21.7%	FR10	517	8.1%	1.8%	5942	8.70%	27448	1.9%
3	ES61	219	6006	20.5%	ITI4	356	5.9%	1.2%	4852	7.34%	27448	1.3%
4	ES52	213	4699	16.0%	ITI4	242	5.2%	0.8%	4852	4.99%	27448	0.9%
5	ES51	216	4198	14.3%	ITI4	276	6.6%	0.9%	4852	5.69%	27448	1.0%
6	ITI4	200	4063	25.6%	ES30	384	9.5%	2.4%	6186	6.21%	19116	2.0%
7	SE11	195	3728	42.4%	FR10	236	6.3%	2.7%	5942	3.97%	2728	8.7%
8	DE30	193	3571	19.9%	FR10	269	7.5%	1.5%	5942	4.53%	24028	1.1%
9	PT17	200	3244	49.0%	ES61	146	4.5%	2.2%	5901	2.47%	4675	3.1%
10	FRK2	187	2848	12.9%	ITI4	171	6.0%	0.8%	4852	3.52%	24424	0.7%

top 10 receiving regions 2013-2014												
	A	B	C	D	E	F	G	H	I	J	K	L
1	ES30	236	7574	24.4%	FR10	480	6.3%	1.5%	6856	7.0%	27379	1.8%
2	FR10	222	7385	30.2%	ES30	423	5.7%	1.7%	6921	6.1%	31039	1.4%
3	ES61	243	6580	21.2%	ITI4	376	5.7%	1.2%	5399	7.0%	22314	1.7%
4	PT17	227	4699	50.5%	ES30	214	4.6%	2.3%	6921	3.1%	31039	0.7%
5	ES51	227	4500	14.5%	ITI4	262	5.8%	0.8%	5399	4.9%	22314	1.2%
6	ITI4	220	4390	24.7%	ES61	368	8.4%	2.1%	6218	5.9%	31039	1.2%
7	ES52	215	4213	13.6%	ITI4	201	4.8%	0.6%	5399	3.7%	22314	0.9%
8	DE30	199	4105	17.6%	FR10	258	6.3%	1.1%	6856	3.8%	27379	0.9%
9	SE11	202	4071	45.0%	FR10	261	6.4%	2.9%	6856	3.8%	27379	1.0%
10	TR10	195	3545	58.5%	DE30	169	4.8%	2.8%	3825	4.4%	30522	0.6%

4

Results. Interregional Flows of Knowledge Erasmus

Analysis of the results

Regional level. Top 20 pairs of regions with largest flows

- Dominance of Southern European interregional relations, (Spain, France, Italy), with only occasional appearances from other regions, usually large capitals (London, Berlin, Stockholm, Lisbon).
- Not only are Southern European regions popular student destinations as well as senders, but they also tend to build more intensive exchanges with nearby countries, with some linguistic, cultural and climate proximity. The Paris-Madrid bilateral link is particularly strong, consistently at the top of the tables.
- Among the NUTS 2 regions that dominate the tables, the pattern of strongly networked regions is rather multicentric in Spain and Italy, each with four regions represented which tend to mutually connect, the regular presence of France is limited to one region (Ile-de-France/Paris). This illustrates the centralized territorial and urban system of France

FR10 – Ile-de-France (Paris)	ES30 – Madrid	ITI4 – Lazio (Rome)
UKI3-7* - London	ES51 – Andalucia	ITC4 – Lombardia
DE30 – Berlin	ES61 – Catalunya	ITI1 – Toscana
PT17 – Lisboa	ES52 – Comun. Valenciana	ITH5 – Emilia Romagna
SE11 – Stockholm		

NUTS 2 region pairs with greatest mutual interaction 2009-10 to 2013-14. Colours are used to differentiate between countries and regions

	2009-2010			2011-2012			2013-14		
	Sending	Receiving	No.	Sending	Receiving	No.	Sending	Receiving	No.
1	FR10	ES30	517	FR10	ES30	541	FR10	ES30	480
2	ES30	FR10	459	ES30	FR10	505	ES30	FR10	423
3	ITI4	ES30	396	ES61	ITI4	454	ITI4	ES30	393
4	ES30	ITI4	384	ES30	ITI4	440	ITI4	ES61	376
5	ES61	ITI4	373	ITI4	ES30	423	ITI4	FR10	374
6	ITI4	FR10	368	ITI4	ES61	402	ES61	ITI4	368
7	ITI4	ES61	354	ITI4	FR10	368	ES30	ITI4	334
8	ITI4	ES51	276	FR10	ES61	273	FR10	UKI3-7*	305*
9	FR10	DE30	269	ITC4	FR10	266	ITC4	FR10	293
10	ITC4	FR10	259	ES61	ITH5	259	ITI4	ES51	262
11	FR10	UKI3-7*	251*	ITC4	ES30	259	FR10	SE11	261
12	FR10	ES51	247	FR10	DE30	258	FR10	DE30	258
13	FR10	ES61	245	ES61	FR10	257	ITC4	ES30	256
14	ITI4	ES52	242	FR10	UKI3-7*	257*	DE30	FR10	241
15	FR10	SE11	236	ITI4	ES51	252	UKI3-7*	FR10	238*
16	ES61	ITI1	231	FR10	SE11	246	ES61	ITH5	228
17	DE30	FR10	226	ES30	ITI1	241	FR10	ES61	225
18	ITC4	ES30	220	ES30	ITC4	241	ES30	PT17	214
19	ES61	FR10	217	DE30	FR10	238	ITC4	ES51	209
20	ES30	ITC4	215	ES61	ITI1	235	ES51	ITI4	206

4 Results. Interregional Flows of Knowledge Erasmus

- **Analysis of the results**
- **Regional level. Balance between the number of sent and received students in NUTS 2 regions**

- The high receivers are Nordic regions, namely in Norway and Sweden, in most cases barely populated regions in the North with a small student population, but which may have specialized higher education institutions attracting a specific cohort of students
- There are regions whose higher education institutions are less well-ranked - and less well-known abroad – and whose language is less commonly spoken by foreign visitors
- There is no particular trend for the most balanced regions other than they include some concentration of Dutch, Spanish and Polish regions

Balance between sending and receiving flows in NUTS 2 regions. Positive percentages mean countries with larger receiving than sending flows, negative percentages mean countries with larger sending than receiving flows.

Major senders					
2009-2010	2011-2012		2013-2014		
TR72	-96.6%	UKJ4	-98.6%	TRB1	-95.1%
PL62	-95.5%	TRA2	-97.2%	TRC1	-94.4%
TR32	-93.5%	TR63	-96.7%	TR72	-90.5%
TR63	-92.5%	TRB1	-95.3%	TRA1	-90.4%
TRC1	-90.4%	TR82	-95.0%	TR71	-85.7%
RO41	-89.3%	TR72	-93.5%	TR33	-84.8%
TRA1	-89.2%	TRA1	-92.3%	TR52	-83.3%
LU00	-87.2%	TRC1	-87.5%	TR32	-83.2%
TRA2	-86.7%	EL64	-87.5%	RO41	-82.0%
TR52	-84.6%	TR83	-84.0%	EL64	-81.2%
BG32	-80.1%	TR33	-83.9%	BG34	-80.8%
TR22	-79.7%	TR21	-83.6%	TR83	-79.7%
ITF5	-79.0%	RO41	-81.5%	RO42	-79.6%
TR83	-78.8%	LU00	-80.1%	TR62	-78.0%
TR42	-78.0%	TR71	-80.0%	TR41	-77.7%
BG34	-76.2%	TR42	-78.9%	TR51	-77.0%
TR90	-75.9%	TR41	-78.5%	TR61	-76.4%
TR61	-75.8%	DE93	-74.5%	LU00	-74.4%
TR51	-74.9%	TR51	-74.3%	RO21	-72.9%
TR33	-74.8%	TR52	-73.3%	TR21	-68.0%

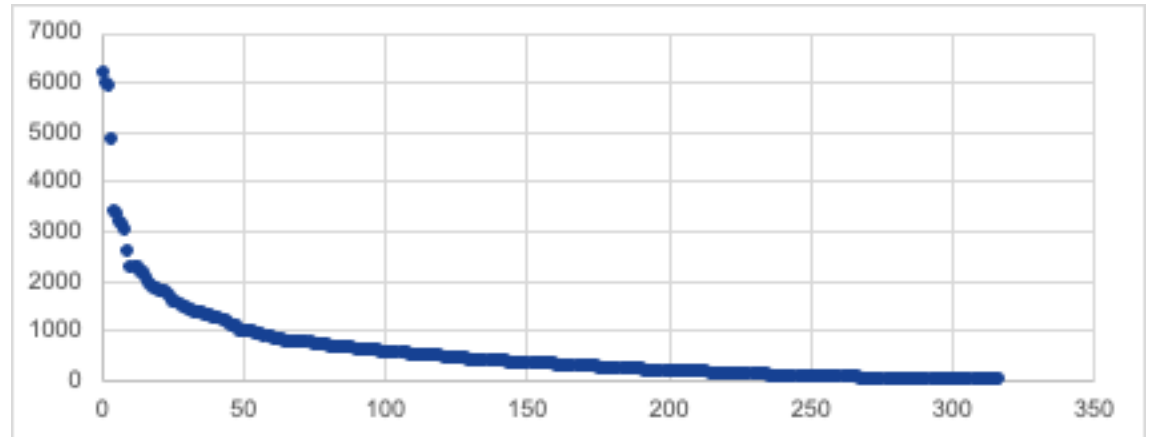
Major receivers					
2009-2010	2011-2012		2013-2014		
SE31	909.8%	NO07	750.0%	NO03	575.6%
UKH2	750.0%	SE31	691.8%	SE32	575.0%
SE23	607.3%	NO03	650.0%	SE23	564.6%
DK05	559.0%	UKH2	647.9%	UKH2	506.8%
UKG2	521.4%	SE32	628.5%	NL23	328.5%
NO03	504.3%	UKI7	610.0%	NO07	312.5%
DK03	443.9%	UKF3	560.0%	UKK2	268.7%
UKF3	395.0%	MT00	355.3%	UKF3	263.1%
DK04	336.5%	SE23	352.8%	UKI7	252.8%
UKG1	333.3%	UKG1	327.2%	NO06	237.8%
NO07	314.3%	UKI4	319.4%	UKM6	233.3%
MT00	267.2%	DK05	311.5%	PT15	200.0%
UKI4	257.2%	DK03	273.8%	UKI6	194.7%
PT30	253.8%	UKK3	263.4%	UKI4	193.3%
NO04	253.0%	DK04	234.5%	UKK3	185.7%
UKI7	232.8%	UKE1	221.5%	SE21	163.7%
UKM5	232.7%	UKI6	216.9%	IS00	160.8%
PT20	227.3%	SE21	212.5%	IE05	160.5%
NO02	220.8%	UKG2	200.0%	MT00	156.5%
SE11	211.7%	NO06	197.0%	SE22	151.3%

4

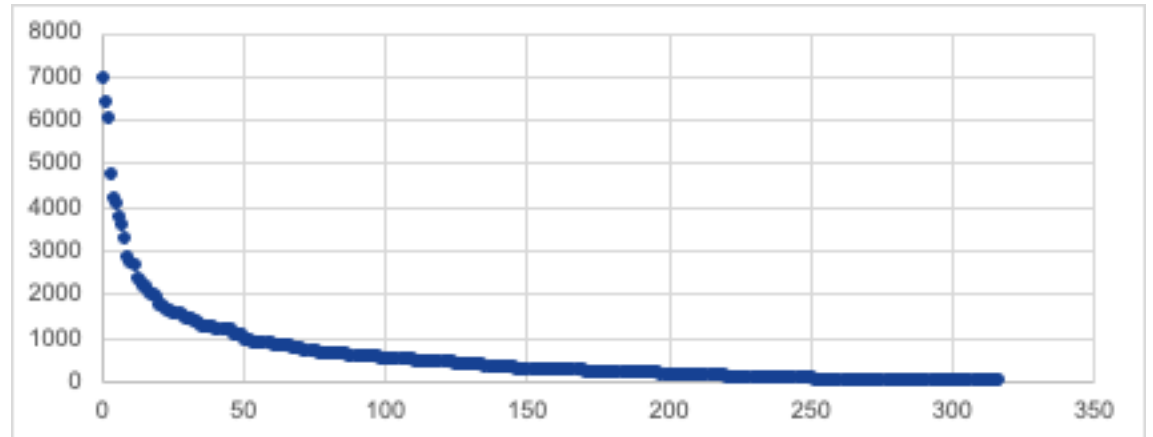
Results. Interregional Flows of Knowledge Erasmus

- **Analysis of the results**
- **Regional level. Rank-size distribution of sending and receiving regions**
- The tables show the distribution of student mobility numbers by rank of NUTS 2 region.
- Objective: to verify whether the distribution follows a power law similar to what is usually observed when plotting city or region populations according to rank. This would indicate a small selection of highly-ranked regions very active as senders and receivers (or both), arguably achieving hegemony, followed by many regions with little variation among them.

Rank-size distribution of sending NUTS 2 regions, 2009-2010.



Rank-size distribution of receiving NUTS 2 regions, 2009-2010.

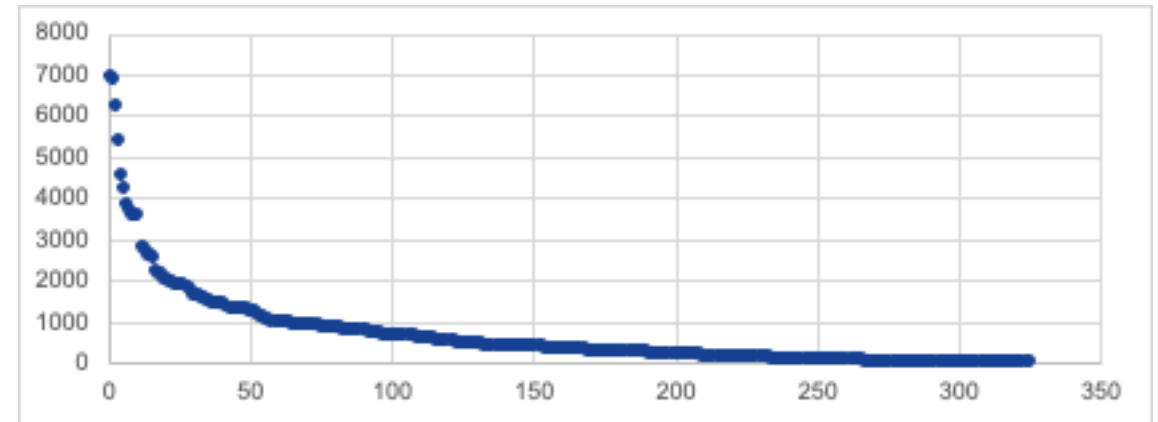


4

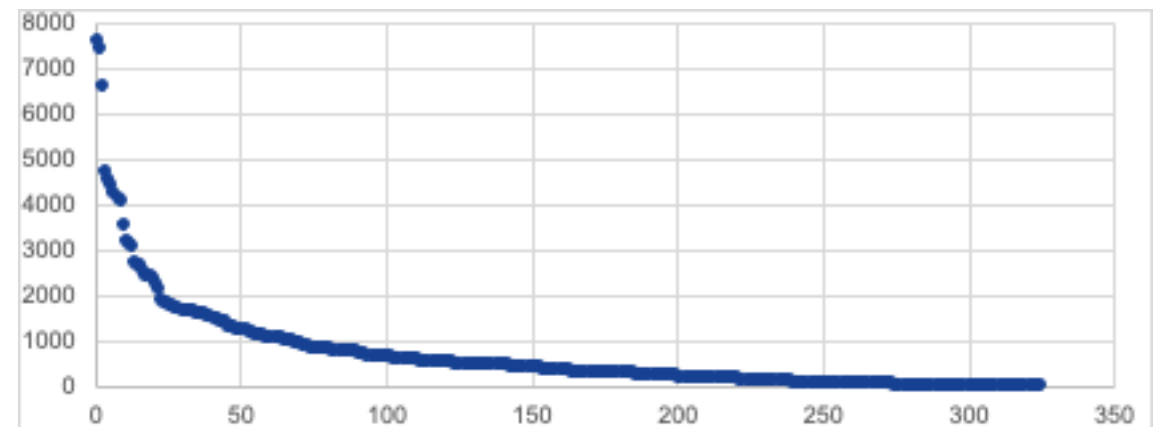
Results. Interregional Flows of Knowledge Erasmus

- **Analysis of the results**
- **Regional level. Rank-size distribution of sending and receiving regions**
- The tables show the distribution of student mobility numbers by rank of NUTS 2 region.
- Objective: to verify whether the distribution follows a power law similar to what is usually observed when plotting city or region populations according to rank. This would indicate a small selection of highly-ranked regions very active as senders and receivers (or both), arguably achieving hegemony, followed by many regions with little variation among them.

Rank-size distribution of sending NUTS 2 regions, 2013-2014.



Rank-size distribution of receiving NUTS 2 regions, 2013-2014.



4

Results

12. Interregional Flows of Knowledge. Horizon 2020 partnerships

- Country-to-country matrixes (c2c)
- Region-to-region matrixes (r2r)
- Descriptive statistics

4

Results. Interregional Flows of Knowledge H2020

- Results at country level (NUTS 0)
 - H2020 country-to-country matrixes - knowledge_h2020_c2c.xlsx
 - Spatial extent: EU27 + UK, Norway, Lichtenstein, Iceland and Switzerland
 - Temporal scope: 2015 to 2020
 - Source: CORDIS database (organizations and projects)
 - Data features:
 - Partnerships in H2020 networks
 - 32 x 32 OD matrixes C2C

Order	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33				
	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK	IS	LI	NO	CH	ROW				
1	87	3	5	18	99	6	6	18	50	91	1	61	1	2	3	6	6	0	69	19	11	18	3	11	3	8	25	77	0	0	4	16	0				
2	1	18	2	0	3	0	2	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	3	0	0	0	0	0	0	0	0	0	0				
3	1	1	13	0	1	0	0	0	3	1	0	1	0	0	1	1	0	0	0	2	2	0	0	0	4	0	0	2	0	0	0	0	0				
4	17	3	5	53	41	2	11	4	21	22	2	8	2	5	2	2	3	3	21	13	8	9	4	3	2	9	21	48	2	0	6	3	0				
5	112	18	39	51	548	13	36	71	190	223	12	207	12	12	8	7	23	3	148	104	44	41	16	20	14	46	69	257	4	0	30	56	0				
6	0	1	0	0	4	11	0	1	2	3	0	2	0	0	0	0	0	0	5	1	1	0	0	0	0	2	2	6	0	0	0	0	0	0			
7	16	0	5	9	43	1	49	13	23	25	2	29	1	1	0	1	1	13	6	2	8	2	4	0	4	4	60	1	0	7	4	0	0				
8	20	6	4	6	81	2	10	97	53	31	5	83	12	1	2	6	4	1	32	11	14	14	2	3	2	6	19	83	1	0	3	22	0				
9	78	7	10	34	208	2	25	58	448	146	9	179	5	4	4	4	20	0	96	36	23	52	11	20	3	44	44	183	1	0	31	36	0				
10	77	6	23	23	198	6	28	34	151	325	4	130	7	0	7	11	17	3	67	30	26	28	12	3	10	28	38	167	4	0	40	43	0				
11	0	0	0	0	1	0	0	0	1	1	6	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
12	63	6	25	18	201	10	18	69	169	124	5	389	5	8	2	5	18	4	88	45	29	36	27	24	7	40	39	162	3	0	20	48	0				
13	0	0	0	0	7	0	0	3	5	3	0	10	14	0	0	0	0	0	2	4	0	2	0	0	1	0	0	5	0	0	1	1	0	0			
14	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0		
15	0	0	0	0	0	1	0	0	0	0	0	0	0	1	7	0	0	0	0	1	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0		
16	0	0	0	0	5	0	0	0	4	3	0	4	0	0	1	6	1	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	1	0	0	
17	4	1	0	1	13	1	2	4	6	2	1	7	1	1	0	0	18	2	2	3	1	1	1	1	1	1	1	2	9	1	0	4	1	0	0		
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
19	108	8	20	51	225	12	15	25	94	118	6	102	1	1	5	7	16	4	293	45	21	38	20	12	5	28	48	181	2	0	17	35	0	0			
20	21	5	11	9	109	2	4	13	35	45	8	41	2	5	0	2	9	1	43	69	12	15	11	12	6	13	26	45	0	7	15	0	0	0			
21	2	0	5	1	21	0	0	3	1	8	1	1	0	1	1	1	0	3	3	38	2	1	1	2	4	2	9	2	0	1	1	0	0	0	0		
22	15	0	2	3	40	1	4	13	28	21	0	23	7	1	1	2	0	0	18	6	4	63	0	0	1	8	9	33	0	0	4	6	0	0			
23	2	0	0	0	3	0	1	0	1	3	0	4	0	0	0	1	0	0	1	0	0	0	27	1	0	0	0	0	0	0	0	0	0	0	0	0	
24	2	1	1	2	19	0	2	4	11	9	3	11	0	0	3	0	0	0	0	4	1	3	1	24	0	3	2	7	0	0	0	0	0	0	0		
25	1	0	2	0	7	0	0	0	6	3	0	1	0	0	0	0	0	0	2	0	5	0	0	0	11	6	0	0	0	0	0	0	0	0	0		
26	23	0	1	12	56	3	3	8	31	31	1	24	2	2	1	0	2	0	18	14	8	2	2	11	3	47	19	51	0	0	8	7	0	0			
27	16	1	5	17	75	1	5	9	50	32	1	26	0	3	2	0	10	1	15	8	11	8	5	1	4	19	70	45	0	5	13	0	0	0			
28	86	4	23	35	285	6	35	50	164	186	6	166	12	3	6	5	18	1	127	39	21	44	13	18	4	36	66	421	4	0	26	40	0	0			
29	0	0	0	1	3	0	0	0	1	5	0	4	0	0	0	0	1	0	0	0	2	0	3	0	0	0	1	1	5	0	4	0	0	0	0		
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
31	14	3	4	8	48	2	6	5	32	28	1	29	0	0	1	0	1	1	16	4	3	4	0	1	1	4	16	37	2	0	48	5	0	0	0		
32	6	1	3	1	32	1	4	2	12	24	3	18	2	0	1	2	2	0	8	3	3	2	1	2	0	4	1	25	1	0	1	8	0	0	0		
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

4

Results. Interregional Flows of Knowledge H2020

- **Results at regional level (NUTS 2 – 2016 classification)**
 - **H2020 region-to-region matrices** - knowledge_h2020_r2r.xlsx
 - **Spatial extent:** EU27 + UK, Norway, Lichtenstein, Iceland and Switzerland
 - **Temporal scope:** 2015 to 2020
 - **Source:** CORDIS database (organizations and projects)
 - **Data features:**
 - Partnerships in H2020 networks
 - 329 x 329 OD matrix R2R

Order	Coun	O/O	BE10	BE21	BE22	BE23	BE24	BE25	BE31	BE32	BE33	BE34	BE35	BEZZ	BG31	BG32	BG33	BG34	BG41	BG42	BGZZ	CZ01	CZ02	CZ03	CZ04	CZ05	CZ06	CZ07	CZ08	CZZZ	DK01	DK02
1	BE	BE10	23	2	0	4	5	2	0	2	0	0	0	0	0	0	0	0	3	0	0	4	4	0	0	1	4	1	0	0	7	
2	BE	BE21	6	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0		
3	BE	BE22	0	1	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0		
4	BE	BE23	2	2	1	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3		
5	BE	BE24	8	4	4	4	8	2	1	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	6		
6	BE	BE25	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0		
7	BE	BE31	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
8	BE	BE32	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
9	BE	BE33	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
10	BE	BE34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
11	BE	BE35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
12	BE	BEZZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
13	BG	BG31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
14	BG	BG32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
15	BG	BG33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
16	BG	BG34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
17	BG	BG41	0	0	0	0	0	0	0	0	0	0	0	0	1	4	3	4	25	4	0	0	0	0	0	0	0	0	0	0		
18	BG	BG42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
19	BG	BGZZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
20	CZ	CZ01	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	2	0	1	1		
21	CZ	CZ02	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0		
22	CZ	CZ03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
23	CZ	CZ04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
24	CZ	CZ05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
25	CZ	CZ06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1		
26	CZ	CZ07	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
27	CZ	CZ08	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
28	CZ	CZZZ	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
29	DK	DK01	8	0	1	3	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	26		
30	DK	DK02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

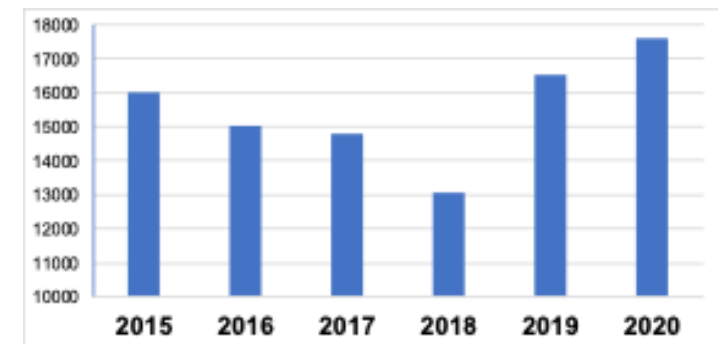
4

Results. Interregional Flows of Knowledge H2020

▪ Analysis of the results:

- Analysis transforms coordinating and participating partner roles in origin and destination logic for the matrices
- Comparative analysis between 2015 and 2020
- Flows at country level and at regional level:
 - **Country level**
 - Rank as sender (number of partnerships as project coordinator), for each year; changes over time.
 - Rank as receiver (number of partnerships as project participant), for each year; changes over time.
 - Send-receive balance (ratio between coordinator and participant roles); changes over time.
 - Percentage of international partnerships (vs. national ones).
 - Preferred international partner of each country (2015 and 2020).

Changes in the total number of H2020 project partnerships among ESPON countries from 2015 to 2020.



4

Results. Interregional Flows of Knowledge H2020

▪ Analysis of the results:

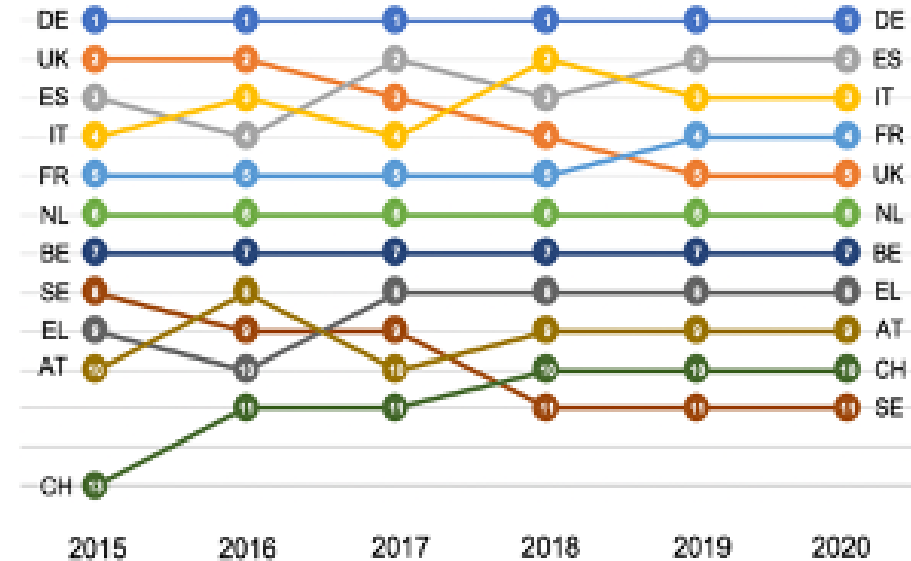
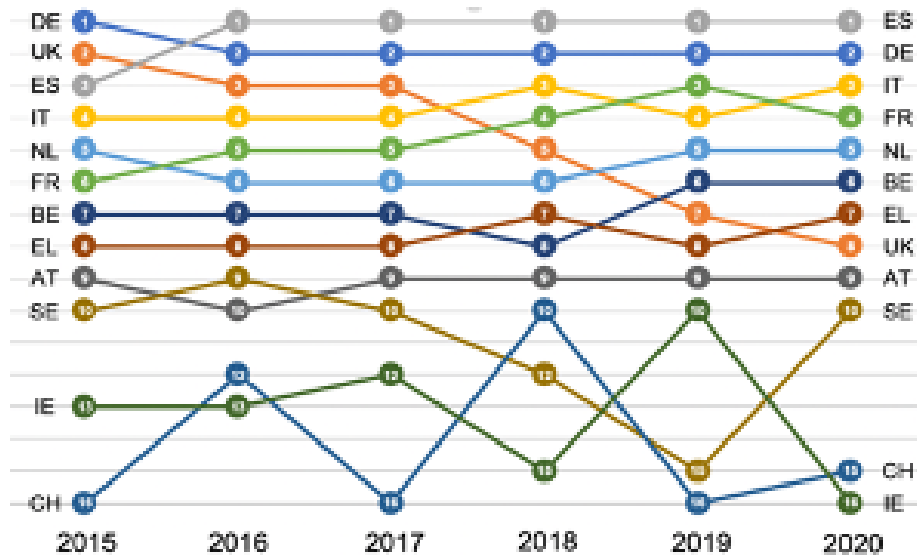
- Analysis transforms coordinating and participating partner roles in origin and destination logic for the matrices.
- Comparative analysis between 2015 and 2020
- Flows at country level and at regional level:
 - **Regional level**
 - Rank as sender (number of partnerships as project coordinator), top 25 for each year; changes over time.
 - Rank as receiver (number of partnerships as project participant), top 25 for each year; changes over time.
 - Weight of leading regions in respective countries
 - Send-receive balance (ratio between coordinator and participant roles), top 25 for each year.
 - Strongest partnerships (most frequent region pairs), highlighting whether these are intra-regional, national or international
 - Proportion of strongest partnership in total partnership (sender) count (2015 and 2020).
 - European capital regions, top performers (as coordinators), trends 2015-2020

4

Results. Interregional Flows of Knowledge H2020

Analysis of the results. Country level:

- Changes in country rank – in coordinating and participant roles: DE, ES, IT at the top, UK regular drop; rise of smaller countries

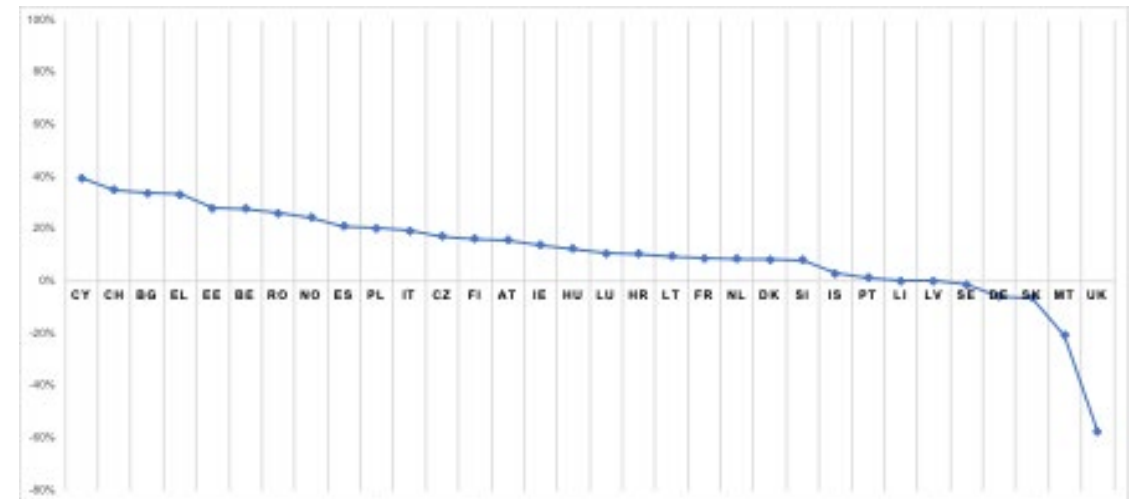
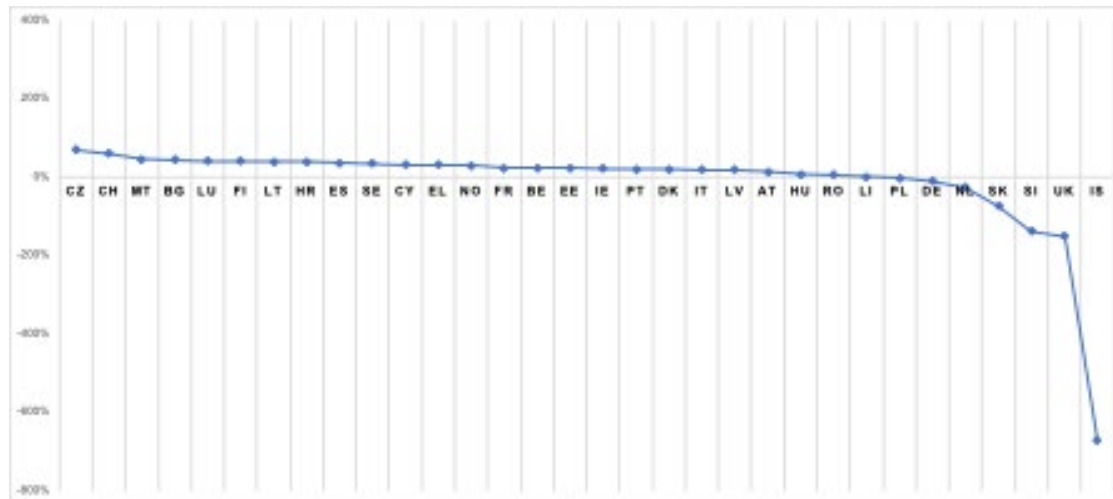


4

Results. Interregional Flows of Knowledge H2020

- **Analysis of the results. Country level:**

- Send-receive balance – sender/participant ratio kept/increased in most countries; big drops in IS, UK, SI, SK (2015-2020)
- Send receive balance – participant/sender role strongly increased in most countries; big drops in UK, MT (2015-2020)



4

Results. Interregional Flows of Knowledge H2020

Analysis of the results. Country level:

- International partnerships are majority in most countries, kept high 2015-2020 (>80%)
- Strong losses in RO, BG, PL, strong gains in LV, HR, LT, CZ
- Preferred international partner tends to be DE (19 out of 32 countries). UK had relevant role, gradually lost between 2015-2020.
- Weight of preferred partnership in total partnerships varies between 4% and 50%, median value around 14%.

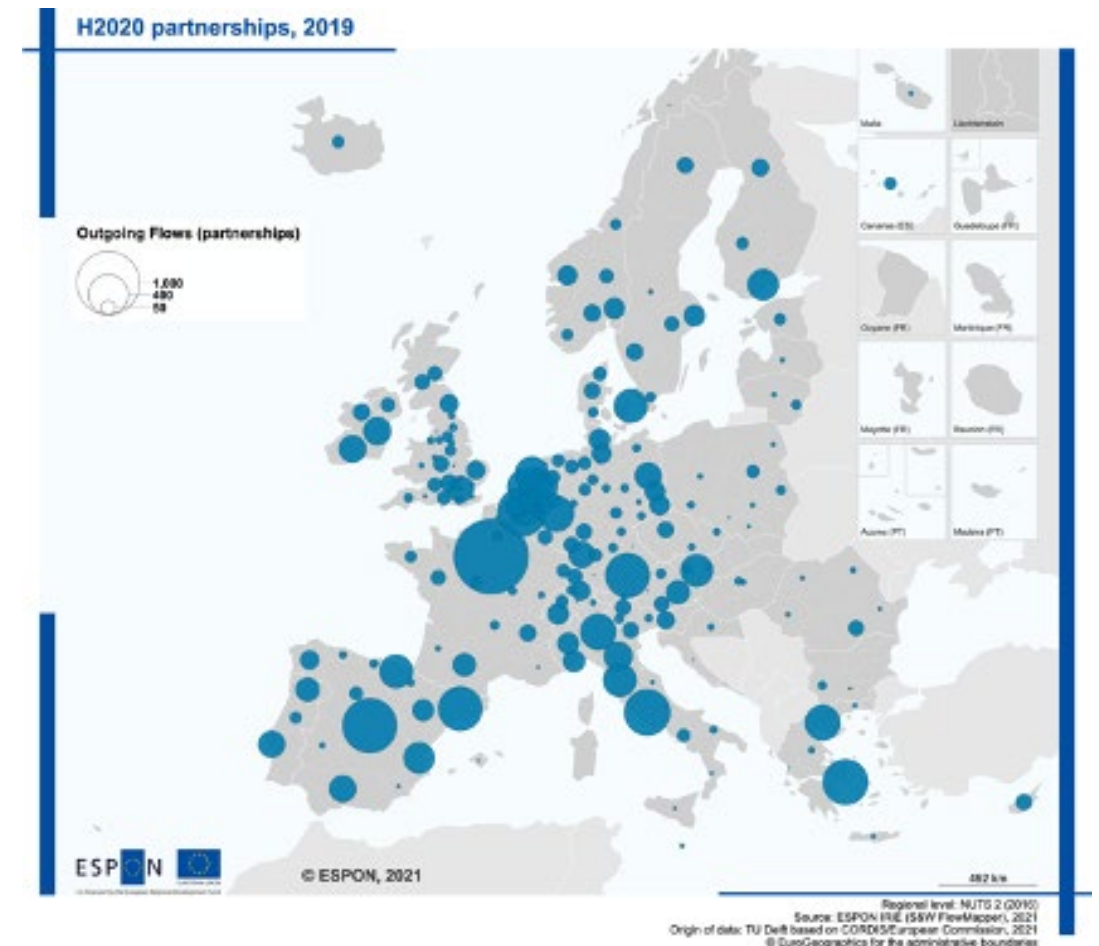
International partnerships		
	year 2015	year 2020
CH	95%	89%
AT	88%	86%
BE	88%	88%
FI	88%	87%
IE	85%	85%
NO	85%	85%
DK	85%	89%
EL	85%	83%
SE	85%	91%
IS	84%	75%
NL	81%	82%
HU	80%	78%
PT	80%	85%
FR	79%	78%
SI	79%	81%
LU	79%	93%
UK	78%	78%
DE	77%	82%
IT	77%	75%
CY	76%	83%
ES	75%	76%
SK	75%	84%
EE	73%	85%
PL	67%	55%
CZ	61%	92%
LT	46%	81%
BG	44%	27%
HR	40%	63%
RO	39%	13%
LV	30%	67%
MT	20%	33%
LI	N/A	N/A

Preferred partner country				
	year 2015		year 2020	
BE	DE	14%	DE	13%
BG	DE	9%	AT	4%
CZ	SK	12%	ES	10%
DK	UK	14%	DE	15%
DE	UK	11%	FR	9%
EE	UK	15%	FI	13%
IE	UK	18%	ES	11%
EL	UK	13%	ES	11%
ES	DE	11%	DE	11%
FR	DE	13%	DE	14%
HR	DE	10%	CH	13%
IT	DE	12%	DE	11%
CY	IT	17%	EL	18%
LV	SE	20%	DE	17%
LT	SE	15%	DE	14%
LU	DE	21%	DE	13%
HU	DE	14%	DE	17%
MT	NL	20%	UK	11%
NL	DE	14%	DE	14%
AT	DE	18%	DE	15%
PL	DE	18%	IT	14%
PT	DE	13%	ES	10%
RO	IT	9%	DE	4%
SI	DE	17%	DE	21%
SK	DE	16%	DE	16%
FI	DE	14%	DE	9%
SE	DE	16%	DE	15%
UK	DE	15%	FR	12%
IS	FR	16%	FR	50%
LI	N/A	N/A	N/A	N/A
NO	DE	15%	DE	10%
CH	DE	18%	DE	16%

4

Results. Interregional Flows of Knowledge H2020

- **Analysis of the results. Regional level (sending role):**
 - FR10 has large advantage over all other regions. Other top performers are ES30, ES51, ES21, ITI4, DE21, EL30, BE10, NL33, FI1B.
 - Strong decrease of London during study period.
 - Two patterns visible at the top: regions that capture (much) more than half of their national flows (FR10, BE10, EL30, FI1B), and high performers that capture less than one third of the national flows.
 - One third of all regions with zero coordinating project roles. Most unbalanced countries here are BG, HU, HR, RO, SE. Most balanced are NO, CH, FI, IE.
 - Patterns very similar in receiving role.



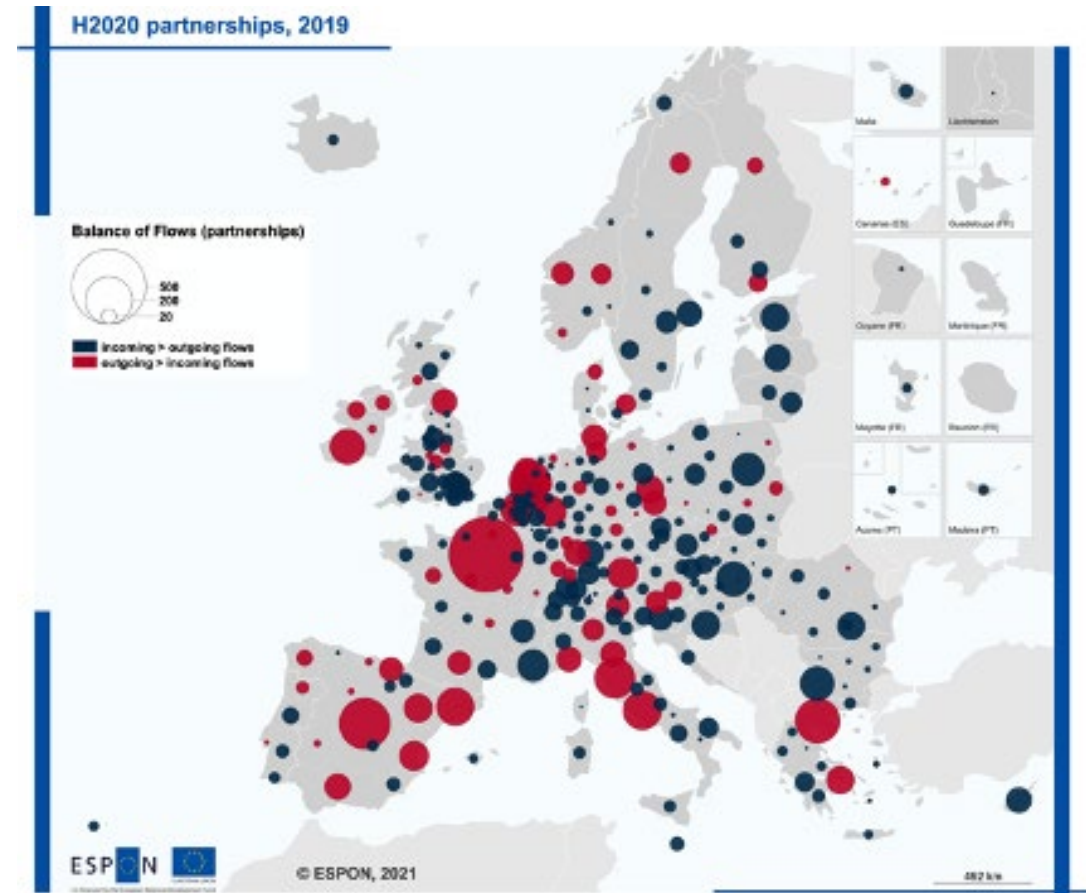
4

Results. Interregional Flows of Knowledge H2020

- Analysis of the results. Regional level (send-receive balance):
 - Top performers discussed earlier do well both as senders and receivers (coordinators and participants)
 - No clear geographical pattern in specialized receivers and senders, balance changes every year. Smaller regions tend to be more unbalanced, with the exception of RO32 (Bucarest), a big receiver.

Top 10 Specialized Receivers (Project Participants)

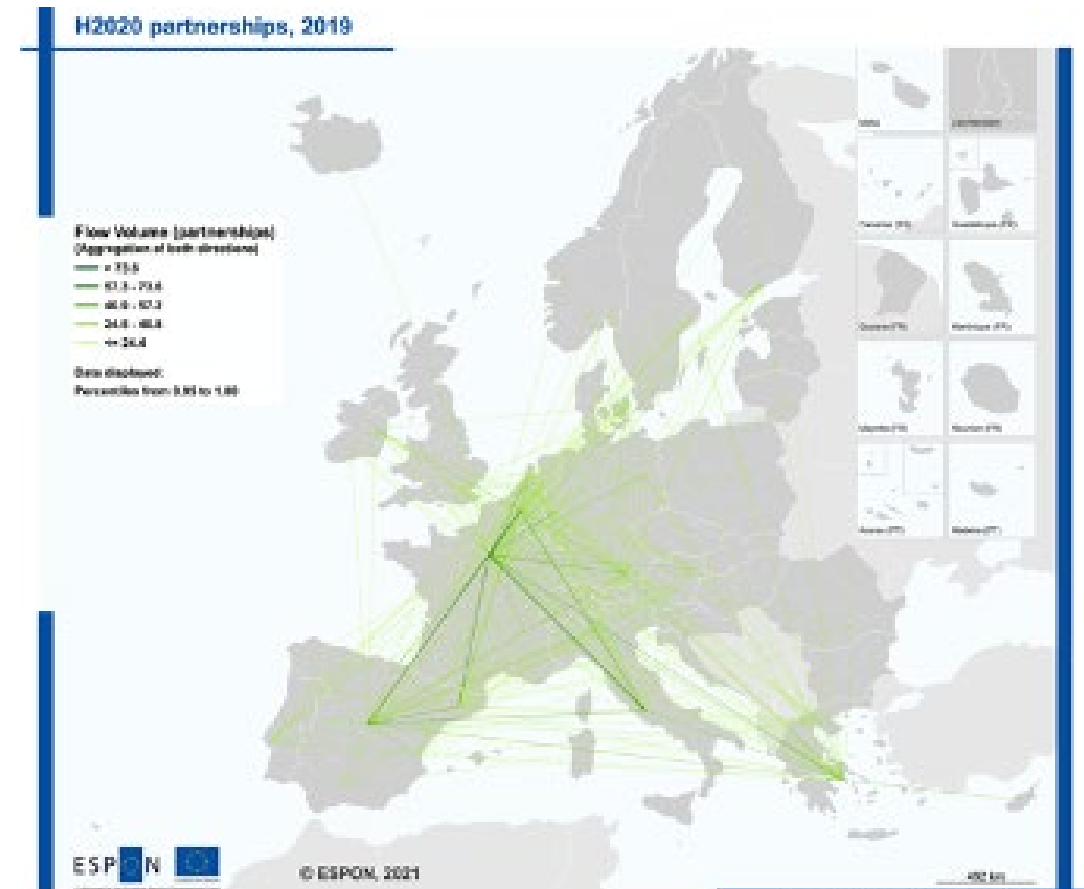
2015		2016		2017		2018		2019		2020	
Reg.	Ratio	Reg.	Ratio	Reg.	Ratio	Reg.	Ratio	Reg.	Ratio	Reg.	Ratio
CZ01	-1486%	F1C	-2800%	FRB0	-2300%	RO32	-2733%	DE14	-4700%	DE14	-2100%
LT01	-1200%	BE31	-2600%	PL21	-1600%	F1C	-1700%	UKI4	-4500%	ES13	-1900%
DE23	-1100%	DE27	-1600%	SK01	-975%	FRG0	-1600%	FRL0	-3100%	PL91	-986%
HU33	-1100%	PL63	-1600%	PL22	-900%	DED5	-1500%	BE31	-2900%	BE31	-933%
UKC1	-1050%	FRK1	-1300%	FRH0	-880%	NO05	-1200%	BE33	-2900%	SI03	-840%
DE72	-1000%	CZ02	-1150%	DE C0	-850%	SE22	-1025%	NO04	-2100%	ES53	-750%
ES13	-1000%	BE22	-1100%	ITI3	-850%	FRE2	-800%	HR03	-1900%	IS00	-750%
NO02	-1000%	DE72	-1000%	PL41	-775%	SI03	-800%	ITF1	-1700%	BE32	-700%
RO32	-742%	SK04	-1000%	RO32	-764%	SK01	-800%	DE23	-1500%	ITH4	-700%
PL41	-620%	DEB1	-900%	DEB3	-700%	DED2	-700%	CH06	-1200%	FRC1	-500%



4

Results. Interregional Flows of Knowledge H2020

- **Analysis of the results. Regional level (strongest partnerships):**
 - Strongest connections tend to be within the same regions (FR10-FR10, ES51-ES51, etc.), tendency to pair up with close-by partners.
 - Then come international partnerships. Strongest one in 2020 is FR10-BE10 (Paris-Brussels), most strong international links involve FR10.
 - National inter-regional partnerships do not appear at the top, except Spanish regions.
 - Strongest partnerships are among top performers, meaning that their share of the total number of partnerships is not too high.



4 Results. Interregional Flows of Knowledge H2020

Analysis of the results. Regional level (patterns of change):

- Fastest-growing regions depart from modest starting points (CZ01, EL63, CH03 as senders; CH06, RO11, HR03 as receivers) but a few start high and grow a lot (ES61, ITH3, SE23 as senders, ITF3 as receiver)
- Many UK regions have reduced their sending role (coordinators) to zero between 2015 and 2020.
- Remote and rural regions are the fastest-shrinking ones, except RO32 (Bucarest).

Top 10 Emerging Coordinating (Sending) Partner Regions			
2015			
Region	# 2015	# 2020	% change
CZ01	7	48	586%
ES61	27	153	467%
ITH3	21	115	448%
EL63	5	25	400%
DED5	18	80	344%
CH03	8	33	313%
NO07	7	26	271%
SE23	105	387	269%
DK05	10	36	260%
AT31	8	26	225%

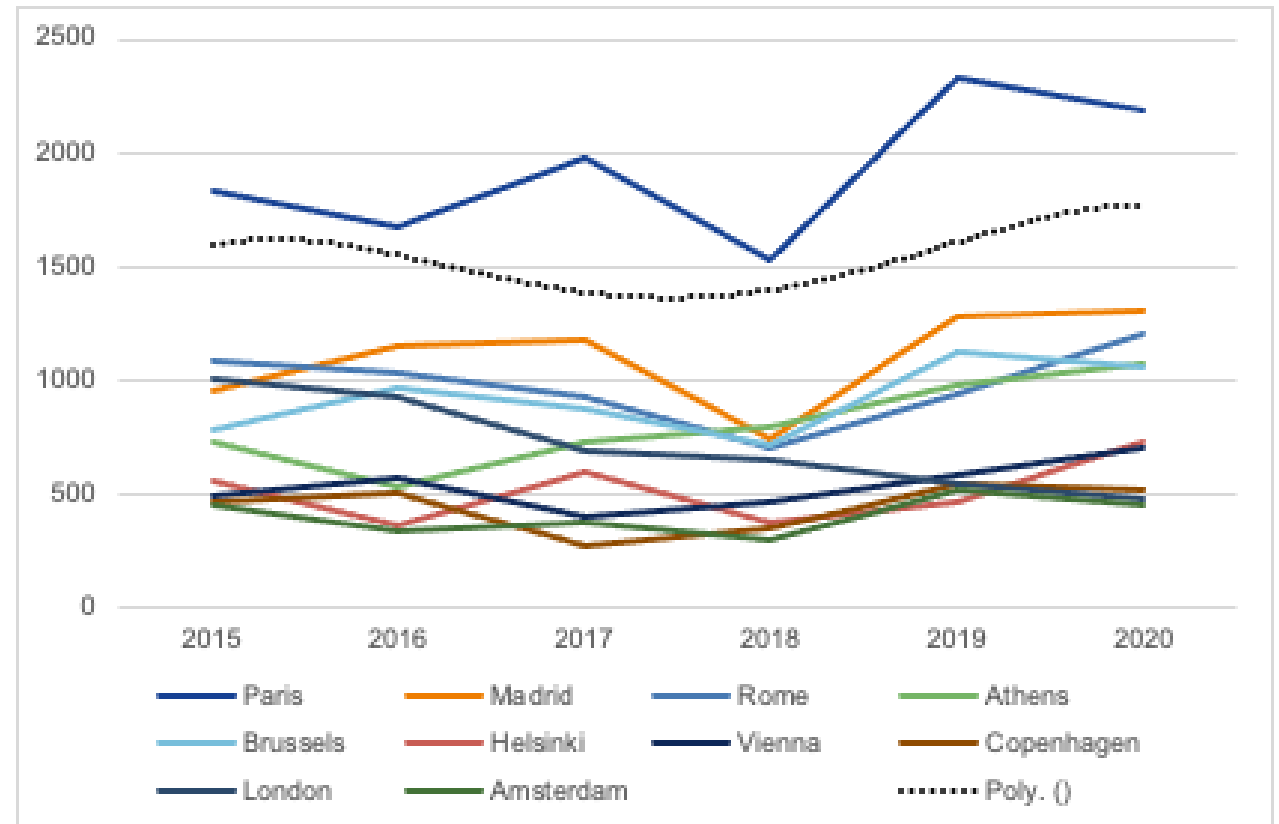
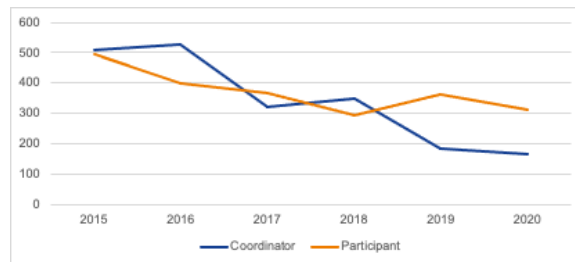
Top 10 Emerging Participant Partner (Receiving) Regions			
2015			
Region	# 2015	# 2020	% change
CH06	6	26	333%
RO11	9	36	300%
HR03	7	19	171%
ITH1	6	16	167%
NL13	6	16	167%
RO21	9	23	156%
PT30	6	14	133%
ES23	8	18	125%
FRC2	8	18	125%
ITF3	41	92	124%

4

Results. Interregional Flows of Knowledge H2020

- **Analysis of the results. Regional level (European Capital Regions):**
 - Large capitals are top performers and have been evolving in line with overall H2020 trends
 - Strongest regions have decreased and increased more sharply (Paris and Madrid) than general.
 - Athens has grown unaffected by the general changes in H2020 project numbers.
 - London has decreased continuously between 2015 and 2020, both as sender and receiver.

London:



4

Results

13. Interregional Flows of Knowledge: Patent citations

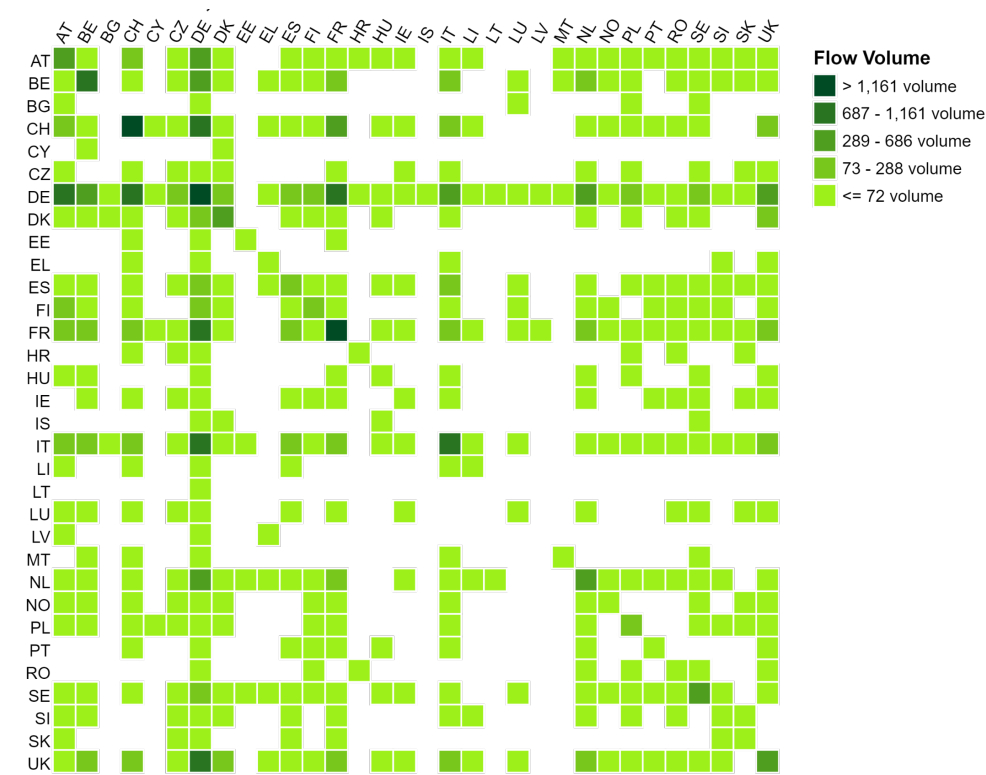
- Country-to-country matrixes (c2c)
- Region-to-region matrixes (r2r)

4

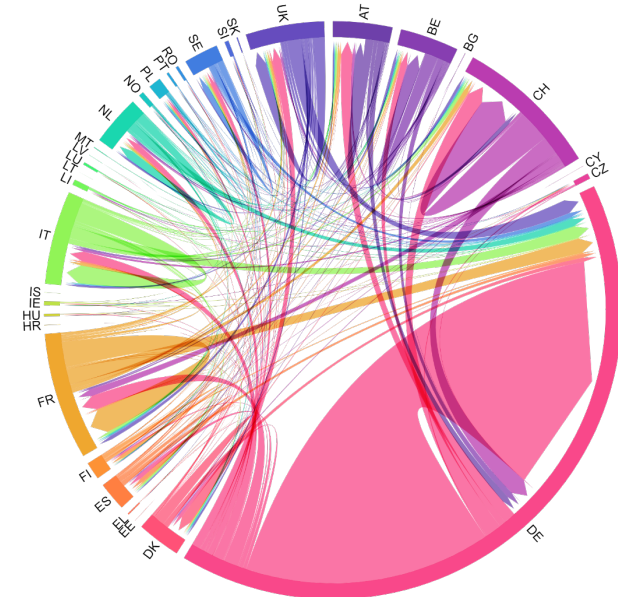
Results. Knowledge: Patent citations

- **Results at country level (NUTS 0)**
 - Patent citations country-to-country matrixes
 - **Spatial extent:** EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland
 - **Temporal scope:** 2010 to 2018
 - **Source:** OECD-PATSTAT-REGPAT.
 - **Data features:**
 - 32 X 32 OD matrixes for each year
 - Variable under consideration: patent citations

To be completed for D5!!!



Patent citations. 2018



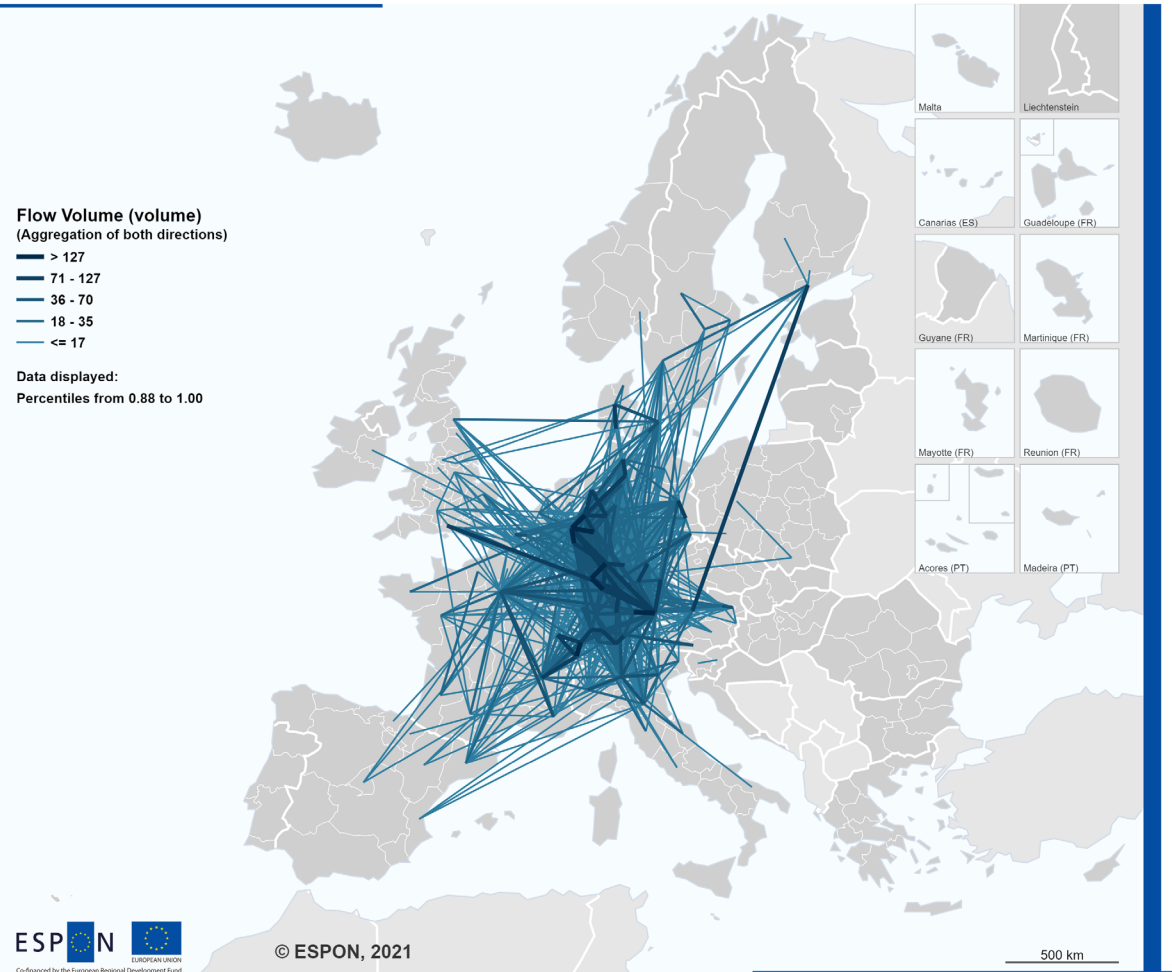
4

Results. Knowledge: Patent citations

- **Results at R2R level (NUTS 2)**
 - Patent citations R2R matrixes
 - **Spatial extent:** EU27 + UK + Norway, Lichtenstein, Iceland and Switzerland
 - **Temporal scope:** 2010 to 2018
 - **Source:** **OECD-PATSTAT-REGPAT.**
 - **Data features:**
 - 329 X 329 OD matrixes for each year
 - Variable under consideration: patent citations

To be completed for D5!!!

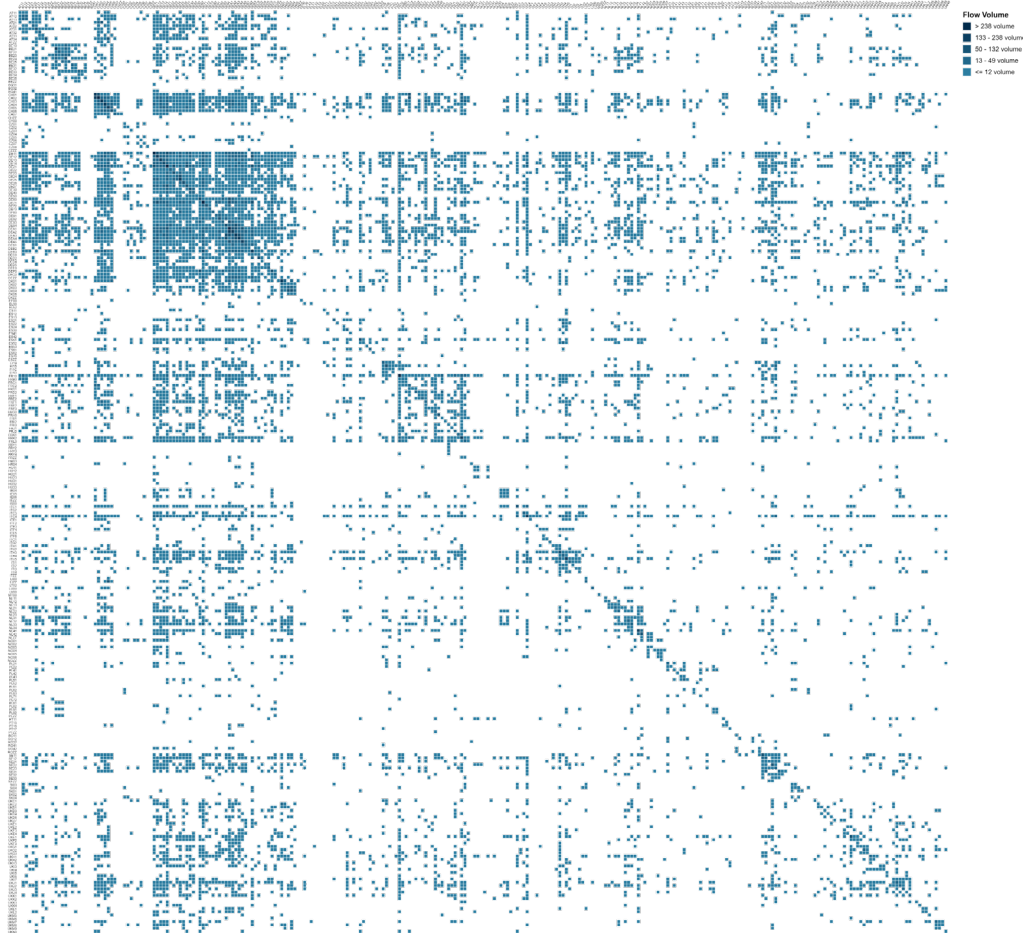
Patent citations, 2018



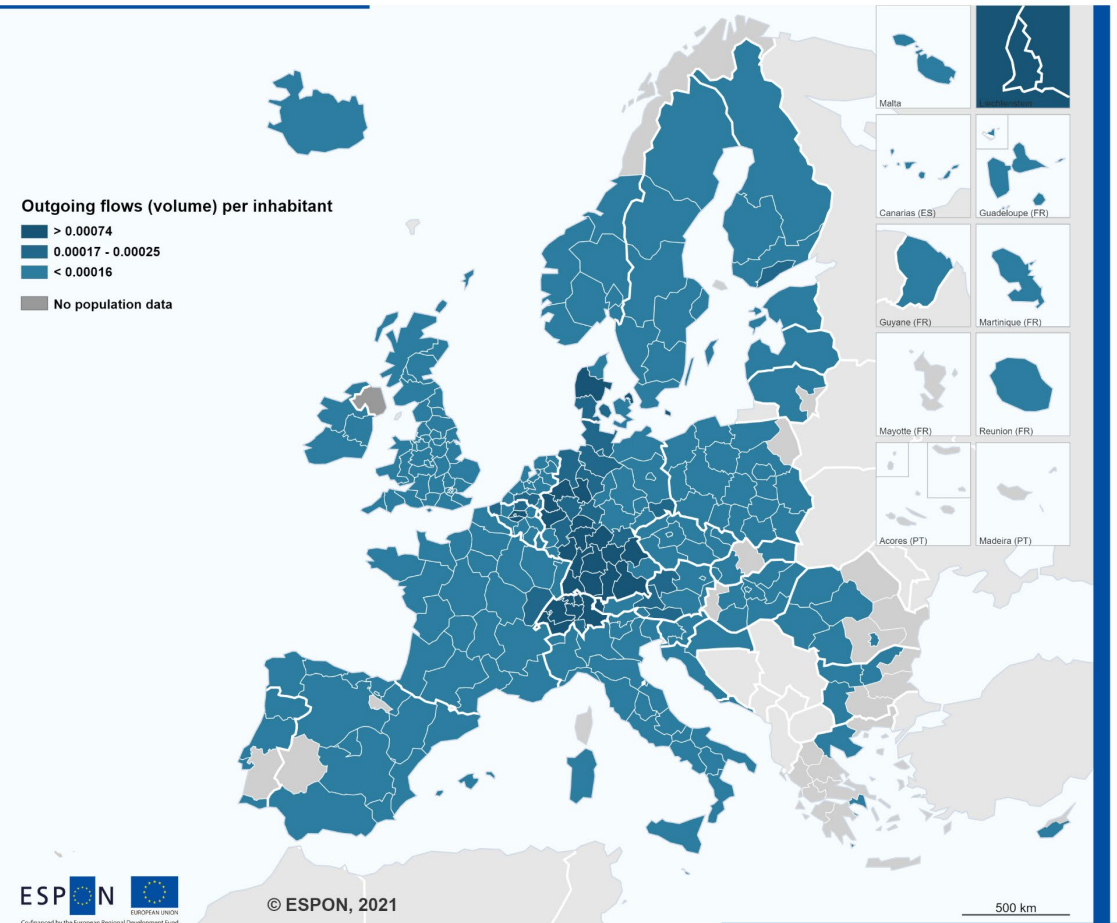
4

Results. Knowledge: Patent citations

Patent citations, 2018



Patent citations, 2018



4

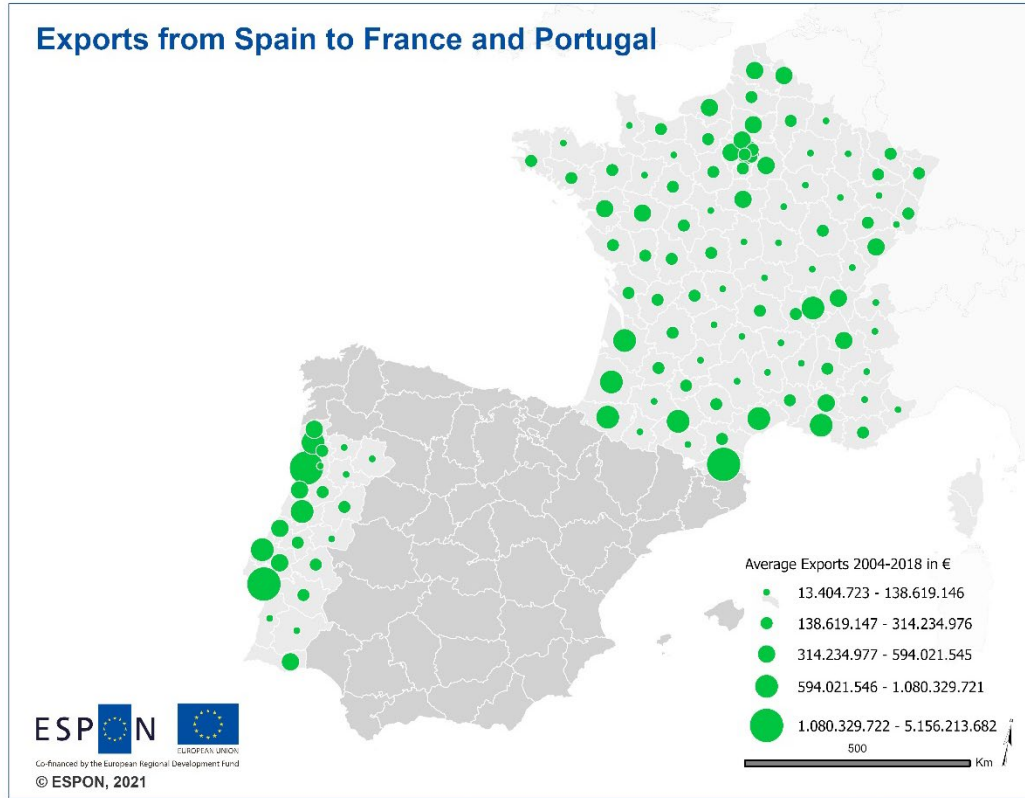
Results: Case studies

1. Interregional trade of goods between Spain, France and Portugal (NUTS 3 level; 2004 – 2018)

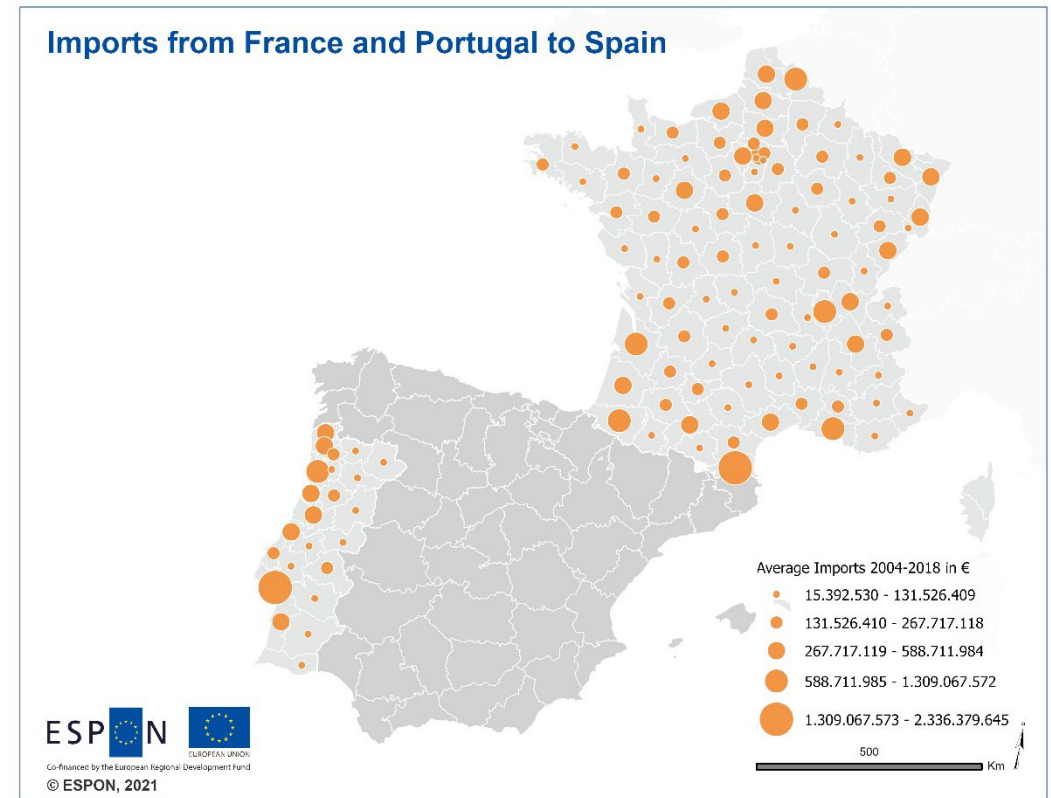
4

Case Studies:

Interregional trade of goods between Spain France and Portugal (Nuts 3; 2004-2018).

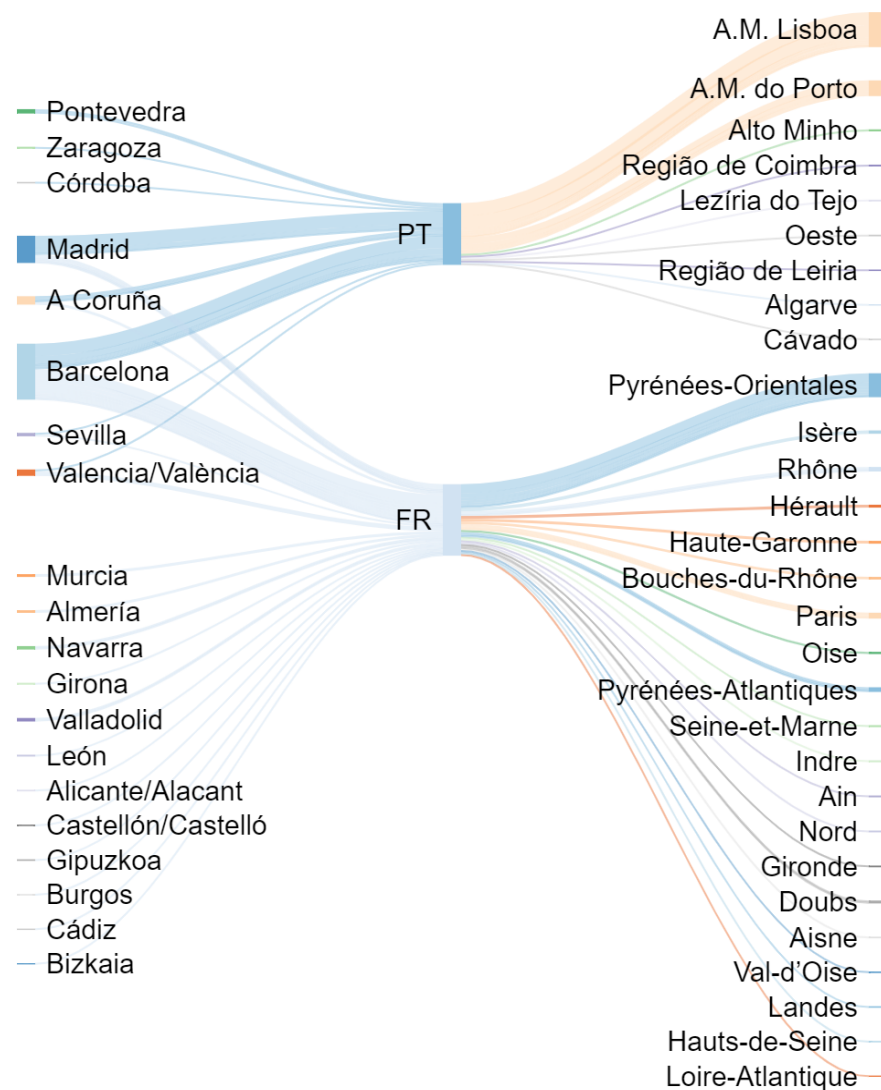


Regional level: NUTS 3 (2016)
Source: ESPON IRIE, 2021
Origin of data: CEPREDE - C-interreg, 2021
UMS RIATE for administrative boundaries



Regional level: NUTS 3 (2016)
Source: ESPON IRIE, 2021
Origin of data: CEPREDE - C-interreg, 2021
UMS RIATE for administrative boundaries

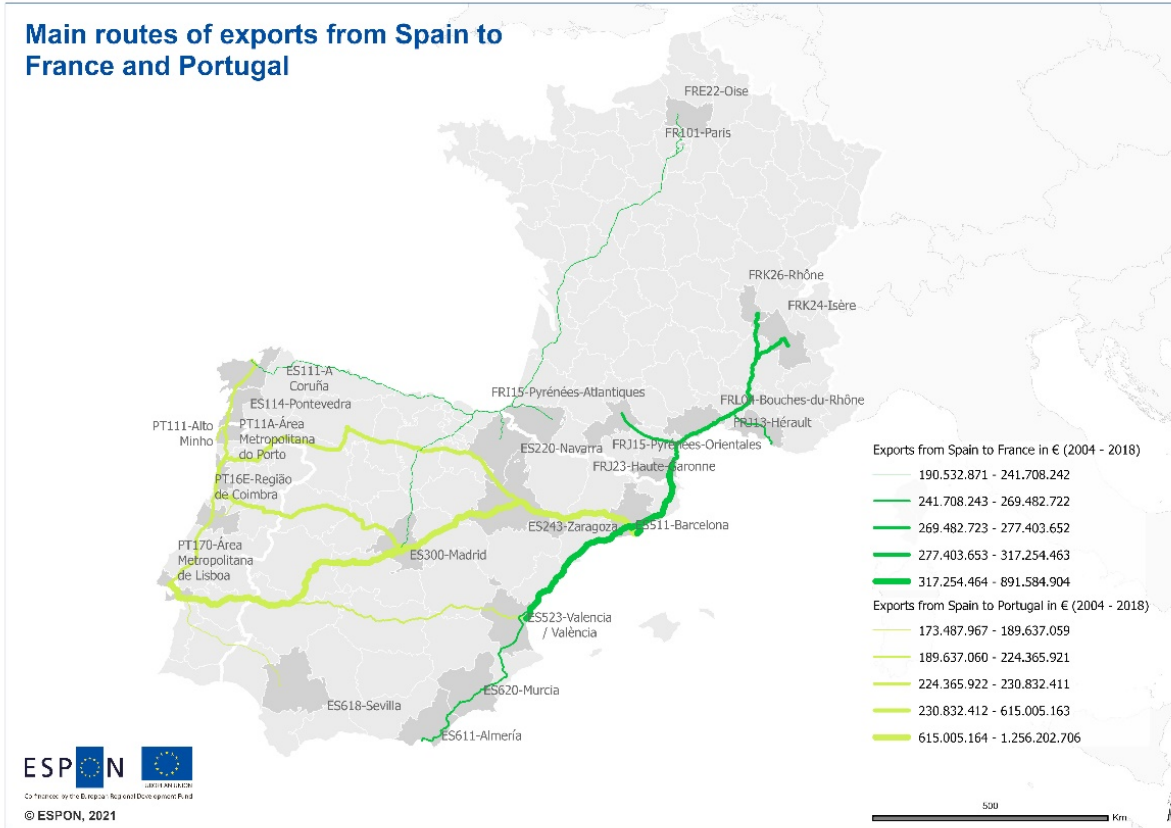
Top-50 Spanish exports to France and Portugal (NUTS 3). Average flows for the period 2004-2018. In Euros.



4

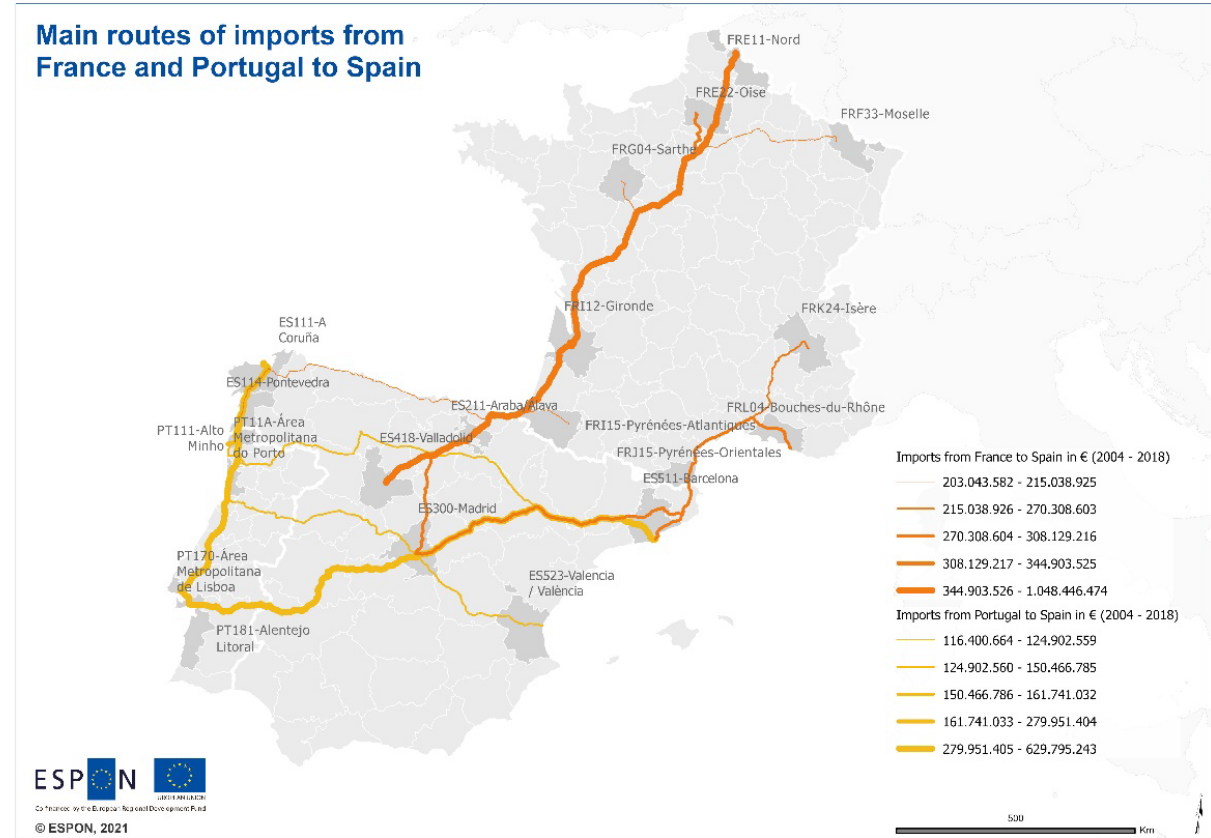
T.1.6. Case Studies: Interregional trade of goods between Spain France and Portugal (Nuts 3; 2004-2018).

Main routes of exports from Spain to France and Portugal



Regional level: NUTS 3 (2016)
 Source: ESPON IRIE, 2021
 Origin of data: CEPREDE - C-Intereg, 2021
 UMS RIATE for administrative boundaries

Main routes of imports from France and Portugal to Spain



Regional level: NUTS 3 (2016)
 Source: ESPON IRIE, 2021
 Origin of data: CEPREDE - C-Intereg, 2021
 UMS RIATE for administrative boundaries

4

T.1.6. Case Studies: Interregional trade of goods between Spain France and Portugal (Nuts 3; 2004-2018).

Augmented gravity equation for inter-national exports from Spain to France and Portugal. NUTS 3 level. PPML. Period: 2004 – 2018.

$$T_{ijt} = \beta_0 + \beta_1 \text{Capital}_i + \beta_2 \text{Capital}_j + \beta_3 \log(D_{ij}) + \beta_4 \text{Home Bias-es-pt}_{ij} + \beta_5 \text{Home Bias-es-fr}_{ij} + \beta_6 \text{contig}_{ij} + \beta_7 \text{mountain}_i + \beta_8 \text{mountain}_j + \beta_9 \text{coastal}_i + \beta_{10} \text{coastal}_j + \mu_i + \mu_j + \mu_t + \varepsilon_{ijt}$$

	(1)	(2)	(3)	(4)	(5)
Capital _i	1.938*** (0.308)	1.964*** (0.307)	2.266*** (0.293)	3.023*** (0.318)	3.096*** (0.324)
Capital _j	2.544*** (0.284)	2.573*** (0.284)	2.617*** (0.280)	2.399*** (0.253)	2.382*** (0.261)
log(D _{ij})	-0.997*** (0.0953)	-0.980*** (0.0934)	-0.976*** (0.0966)	-0.960*** (0.0958)	
D _{ij}					-2.731*** (0.368)
D _{ij} ²					0.879*** (0.184)
intern-contig _{ij}	-0.0349 (0.344)				
intern-contig-es-pt _{ij}		1.035*** (0.208)	1.317*** (0.217)	1.336*** (0.216)	1.907*** (0.208)
intern-contig-es-fr _{ij}		-0.314 (0.357)	-0.358 (0.345)	-0.352 (0.343)	-0.0797 (0.329)
border-es-pt _i			-0.502** (0.200)	-0.293 (0.211)	-0.256 (0.214)
border-es-fr _i			1.298*** (0.203)	1.158*** (0.204)	1.215*** (0.212)
border-pt _j			-1.287*** (0.208)	-1.094*** (0.205)	-1.077*** (0.210)
border-fr _j			0.728*** (0.272)	0.752*** (0.274)	0.753*** (0.275)
mountain _i				0.240 (0.198)	0.292 (0.198)
mountain _j				-0.298 (0.203)	-0.277 (0.201)
coastal _i				1.075*** (0.147)	1.075*** (0.144)
coastal _j				0.688*** (0.163)	0.730*** (0.162)
Constant	8.213*** (0.0979)	8.185*** (0.0975)	7.929*** (0.0963)	6.929*** (0.231)	8.642*** (0.330)
Observations	82,391	82,391	82,391	82,391	82,391
R-squared	0.597	0.615	0.621	0.625	0.616

4

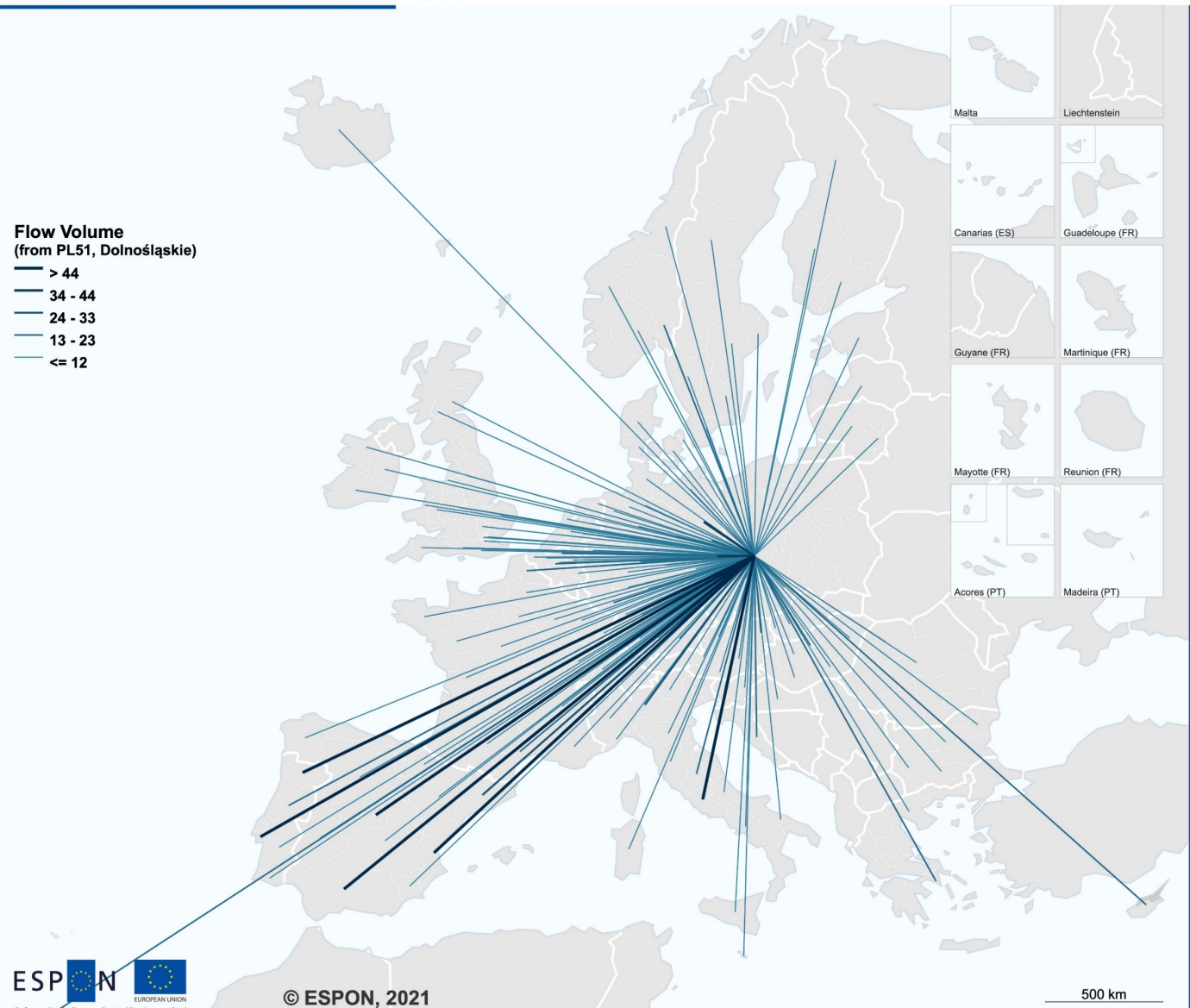
T.1.6. Case Studies.

The interregional flows of students in the EU: attractors and barriers

Erasmus students from PL51 2014

Flow Volume (from PL51, Dolnośląskie)

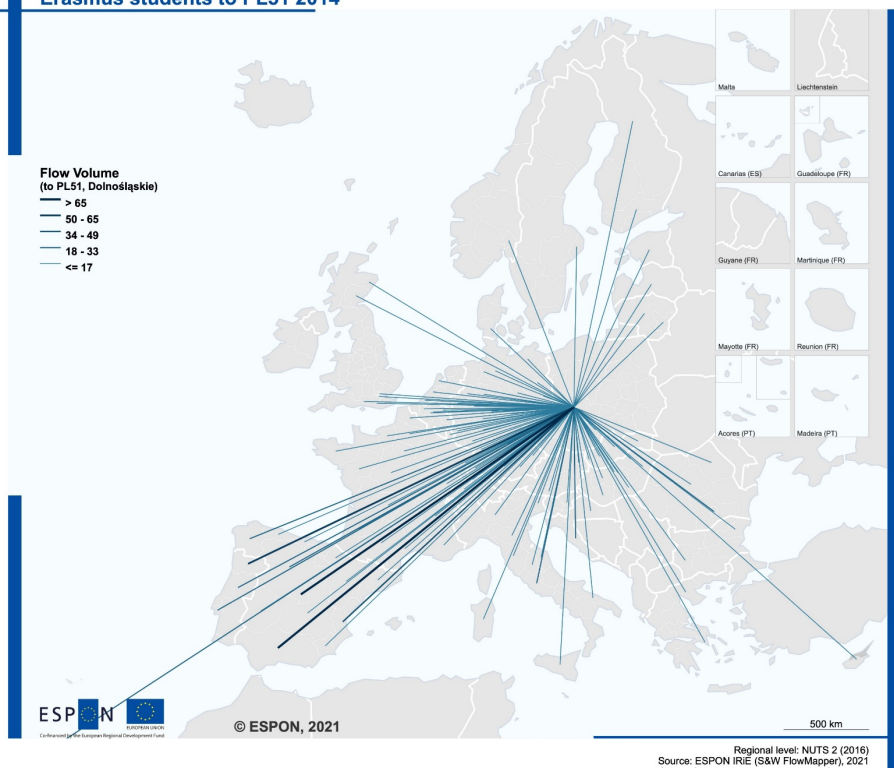
- > 44
- 34 - 44
- 24 - 33
- 13 - 23
- <= 12



Erasmus students to PL51 2014

Flow Volume (to PL51, Dolnośląskie)

- > 65
- 50 - 65
- 34 - 49
- 18 - 33
- <= 17



Regional level: NUTS 2 (2016)
Source: ESPON IRIE (S&W FlowMapper), 2021
Origin of data: <data source>, <year of access>
© EuroGeographics for the administrative boundaries

Regional level: NUTS 2 (2016)
Source: ESPON IRIE (S&W FlowMapper), 2021
Origin of data: <data source>, <year of access>
© EuroGeographics for the administrative boundaries



Co-financed by the European Regional Development Fund

Inspire Policy Making with Territorial Evidence

// Thank you



Institute of Geography
and Spatial Organization
Polish Academy of Sciences



This presentation is available at: <https://www.espon.eu/programme/projects/espon-2020/applied-research/interregional-relations-europe>