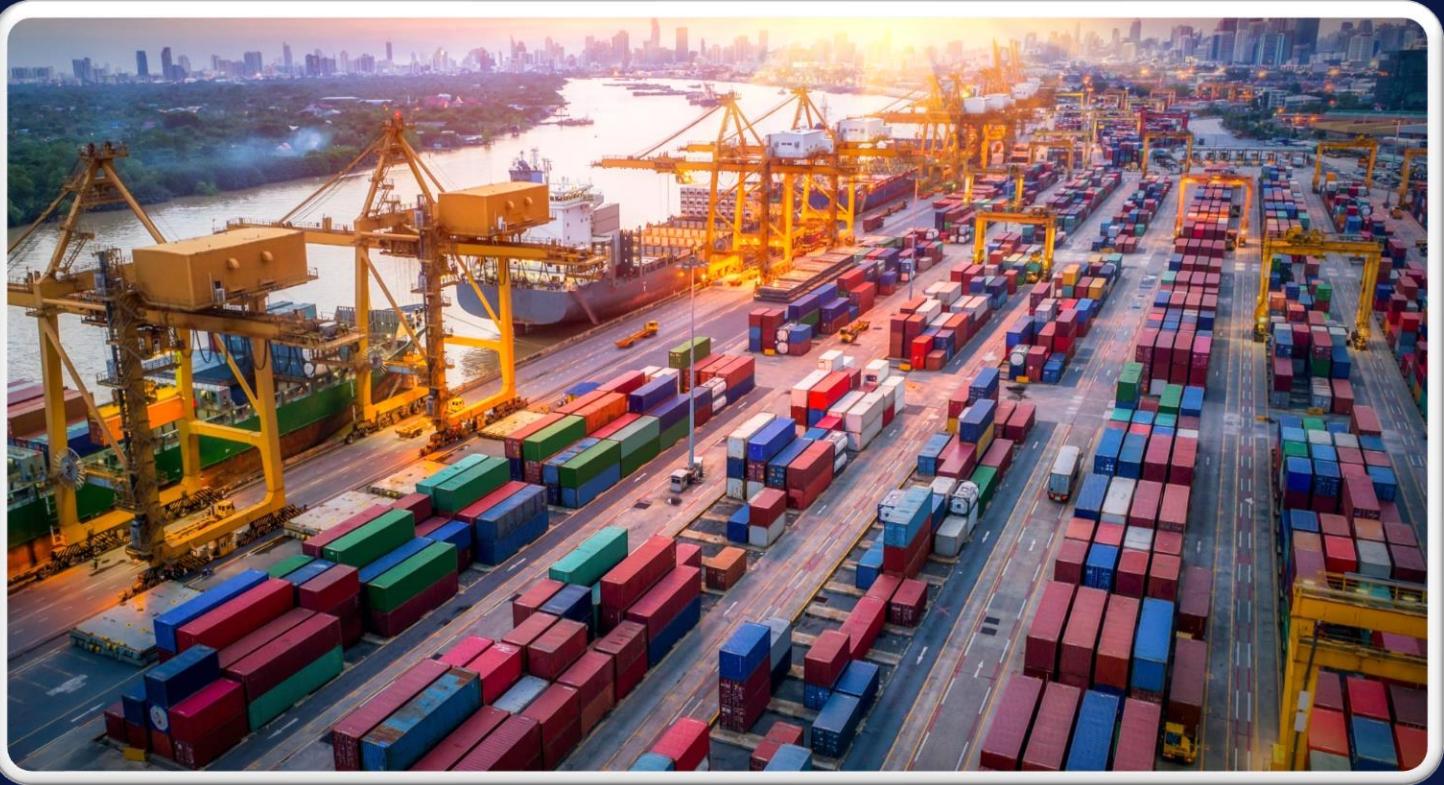


ESPON IRIE

Interregional Relations in Europe



Knowledge flows: patent citations

Carlos Llano, Julián Moral, Santiago Pérez-Balsalobre, Jorge Vindel

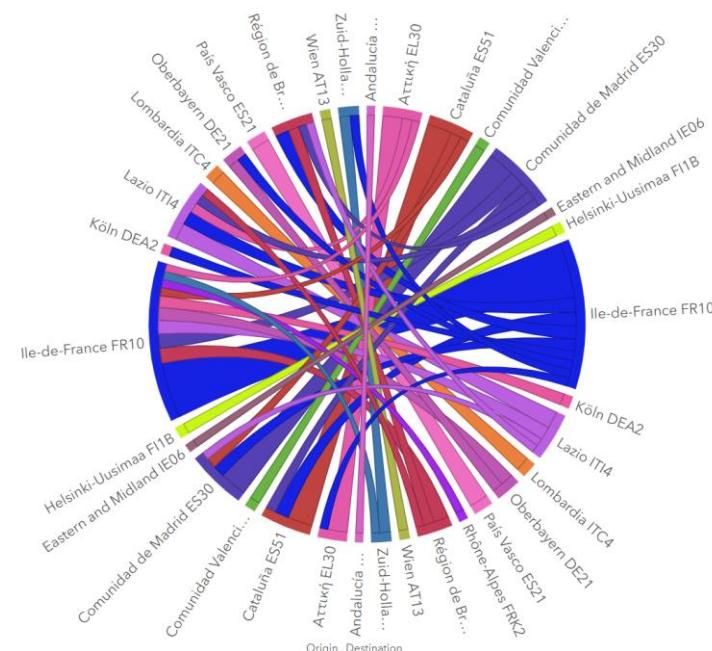
Introduction: Knowledge flows

Erasmus



Total no. partnerships (2015-2020)

H2020 partnerships

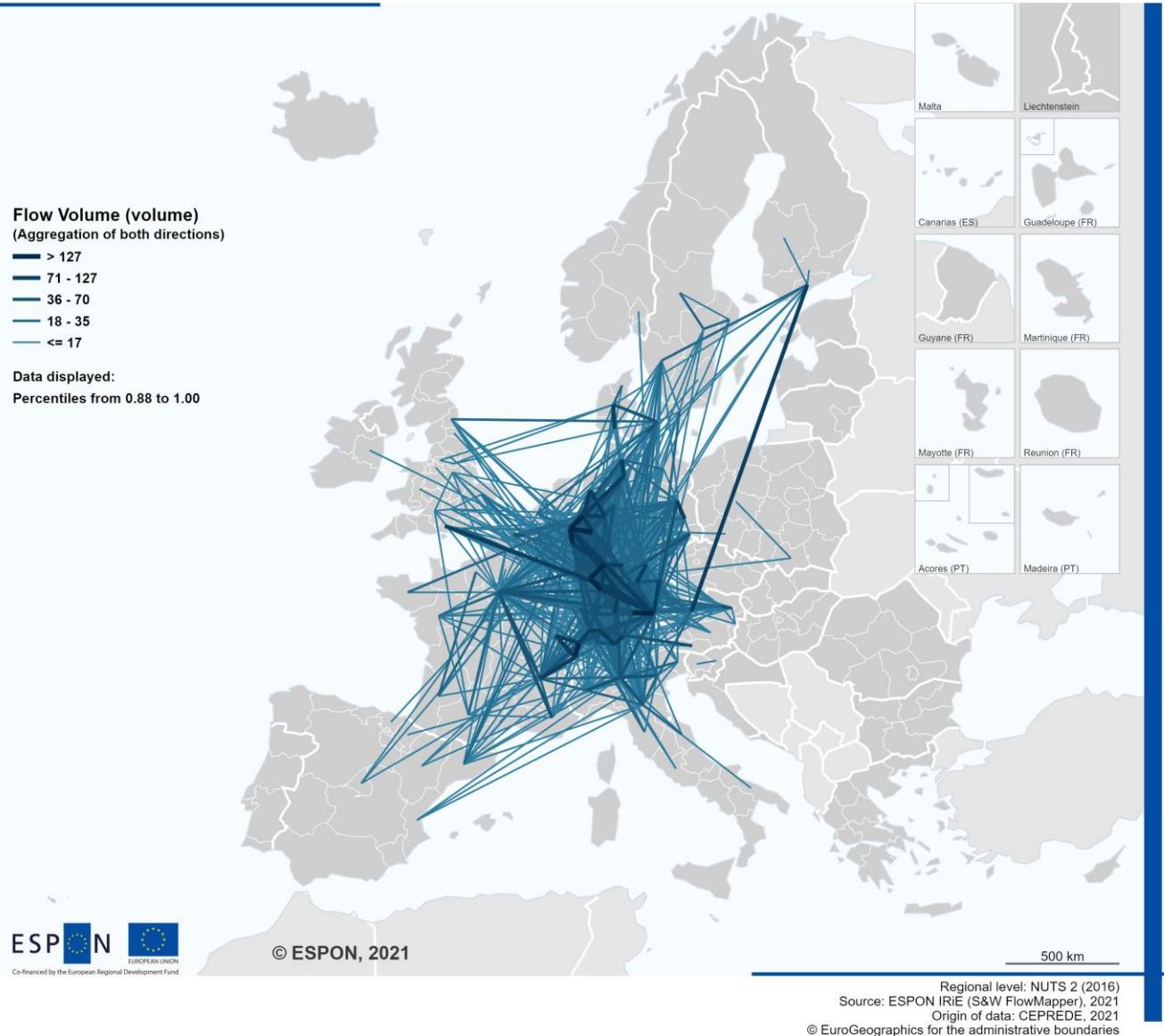


Patent citations



- **Goal:** Estimate and analyze knowledge interregional flows (Nuts 2), using patent citation as a proxy.
- **Scope:** UE-EFTA countries (UE27, UK, Liechtenstein, Norway, Switzerland and Iceland), years 2010 - 2018.
- **Analysis:**
 - Cluster Analysis: Typologies of regions
 - Gravity Model
 - Drivers: GDP, distance, contiguity...
 - Further variables: R+D expenses and employees, PhDs...

Patent citations, 2018



Methodology & Data

- OECD databases:
 - REGPAT: Regionalized patent data (9.768.237 observations, period: 2000-2020)
 - CITATIONS: Data on patent citations. (14.113.005 observations, period: 1978-2020)
- We keep data of EPO patents for the years 2010-2018 and ESPON countries.
- We merge both datasets; aggregated the # of patent for each pair of regions and year.

Most important interregional patent citation flows. Years 2010-2018.

DEA1 (Düsseldorf, Germany);
DEA2 (Cologne, Germany);
DE21 (Upper Bavaria, Germany);
FR10 (Île de France, France);
FRK2 (Rhône-Alpes, France);
DEA1 (Düsseldorf, Germany).

i	j	year	patents
DEA1	DEA1	2010	1101
DEA2	DEA2	2010	898
DE21	DE21	2018	781
FR10	FR10	2010	723
DEA2	DEA1	2010	714

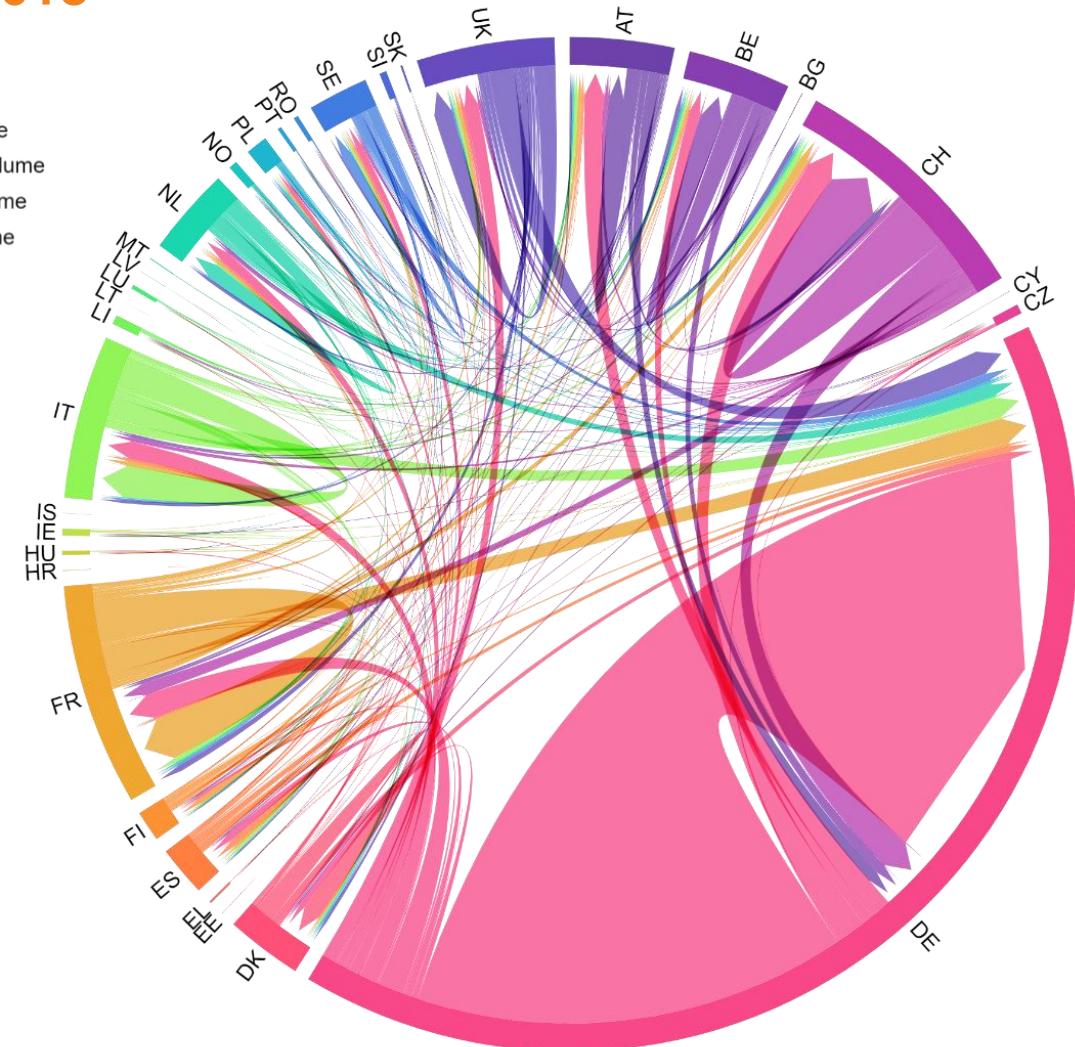
Results: patent citations at the country level

Results at country level. 2018



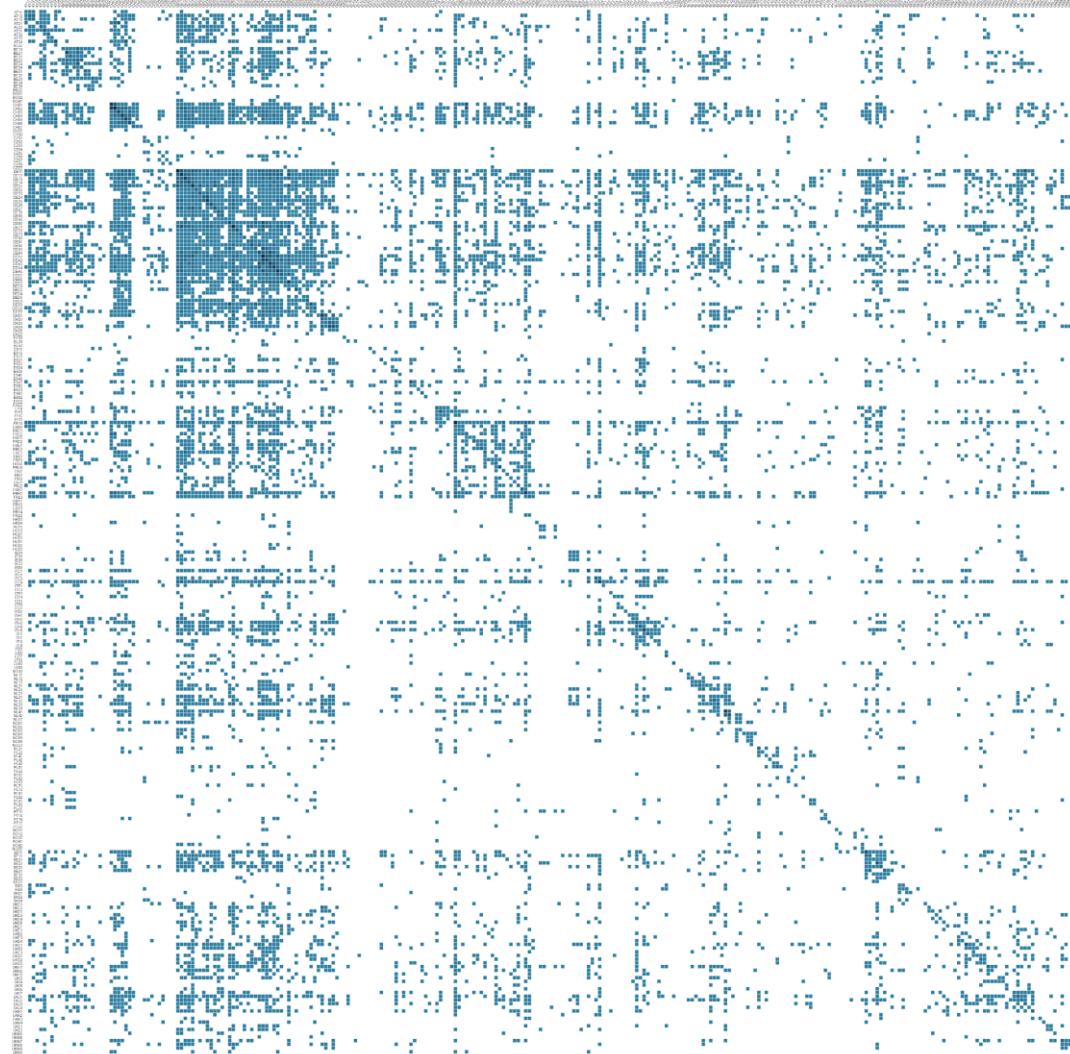
Flow Volume

- > 1,161 volume
- 687 - 1,161 volume
- 289 - 686 volume
- 73 - 288 volume
- <= 72 volume



Results: patent citations at the regional level

Patent citations, 2018



Patent citations, 2018

Outgoing flows (volume) per inhabitant

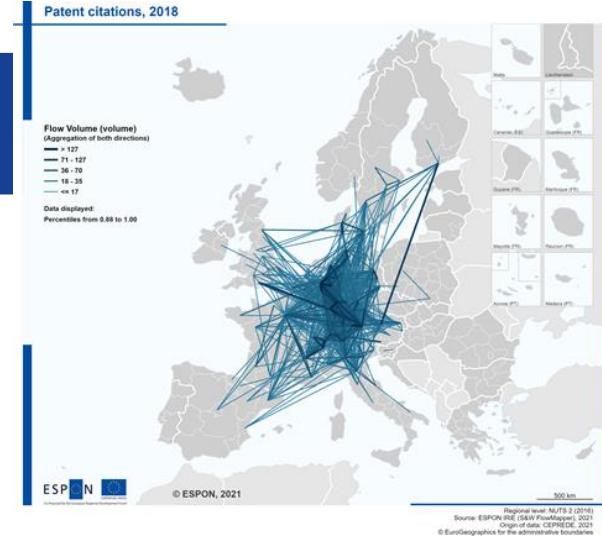
- > 0.00074
 - 0.00017 - 0.00025
 - < 0.00016
- No population data

ESPON
Co-financed by the European Regional Development Fund

© ESPON, 2021

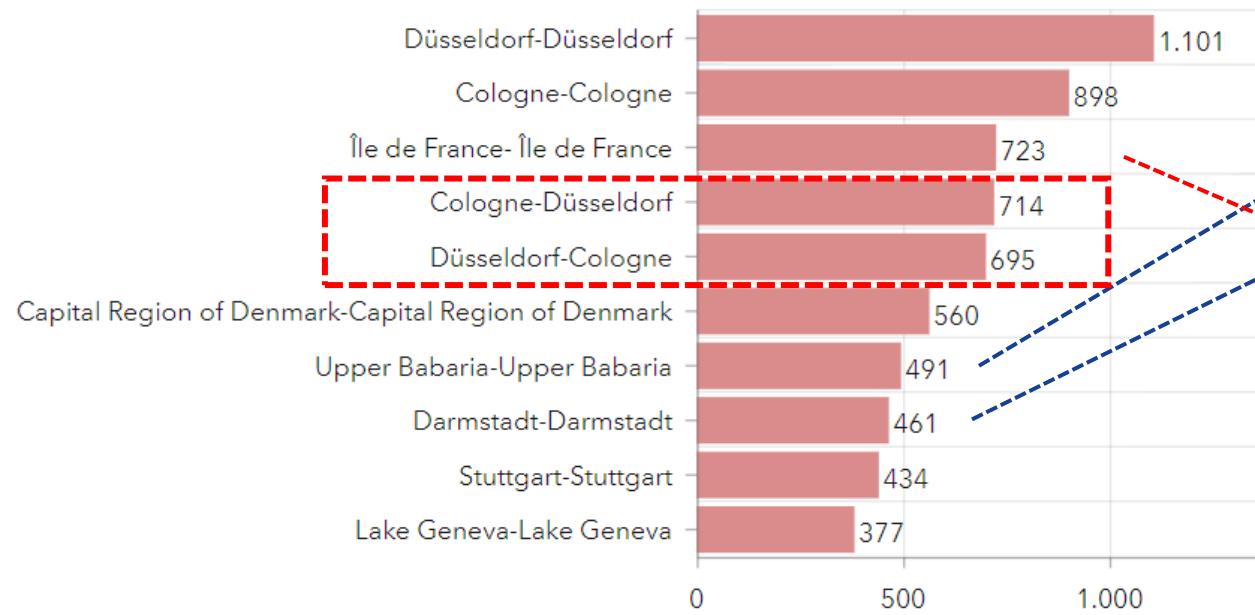


Results: regional and temporal analysis.

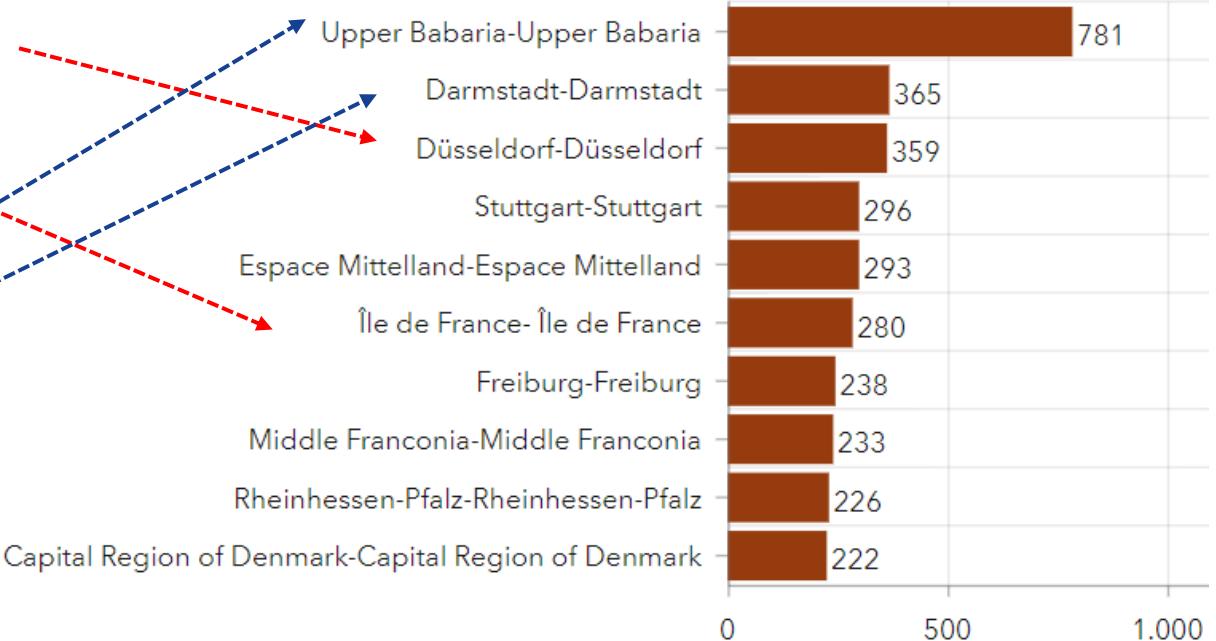


Dynamics: Ranking of the main patent citations

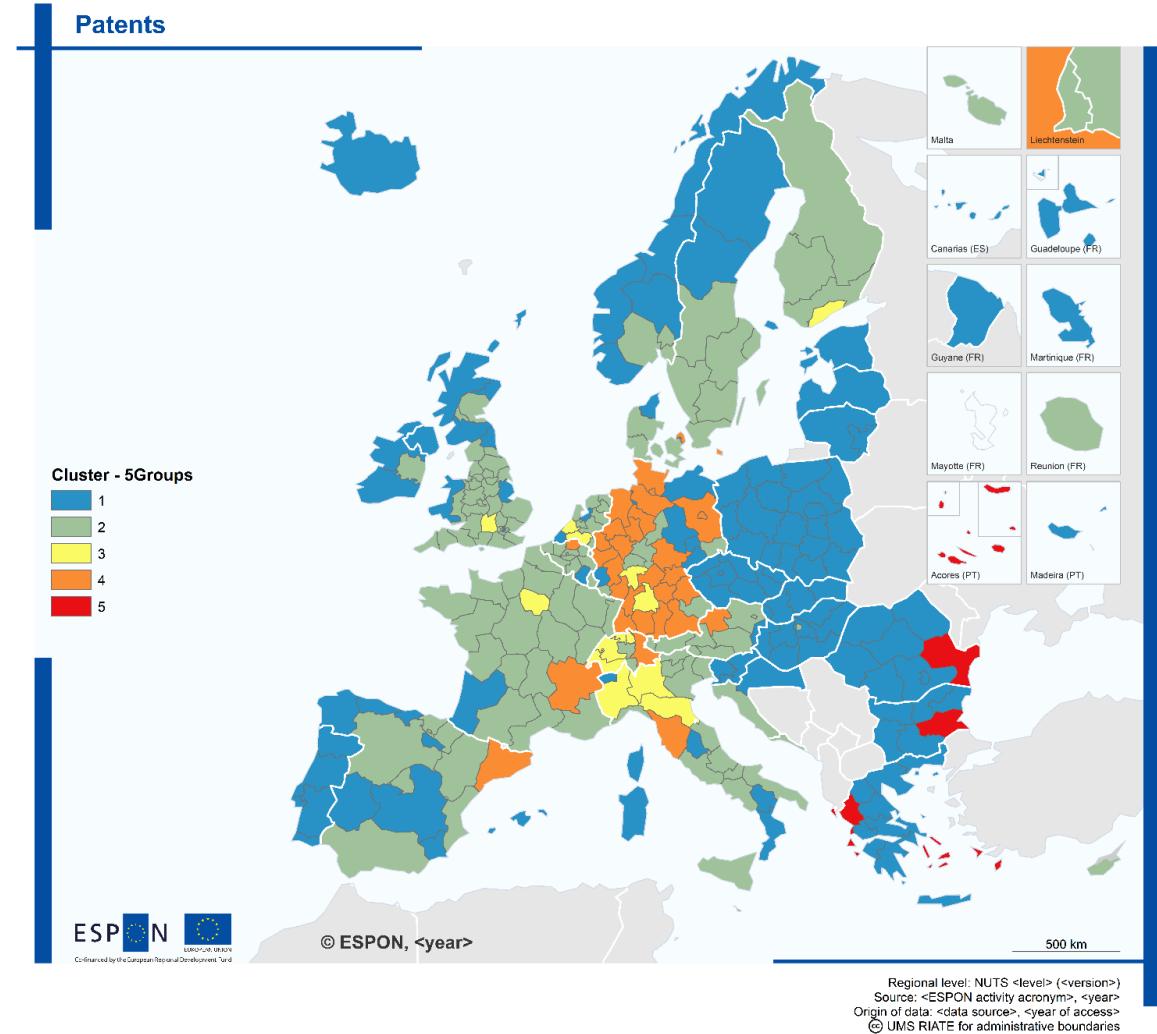
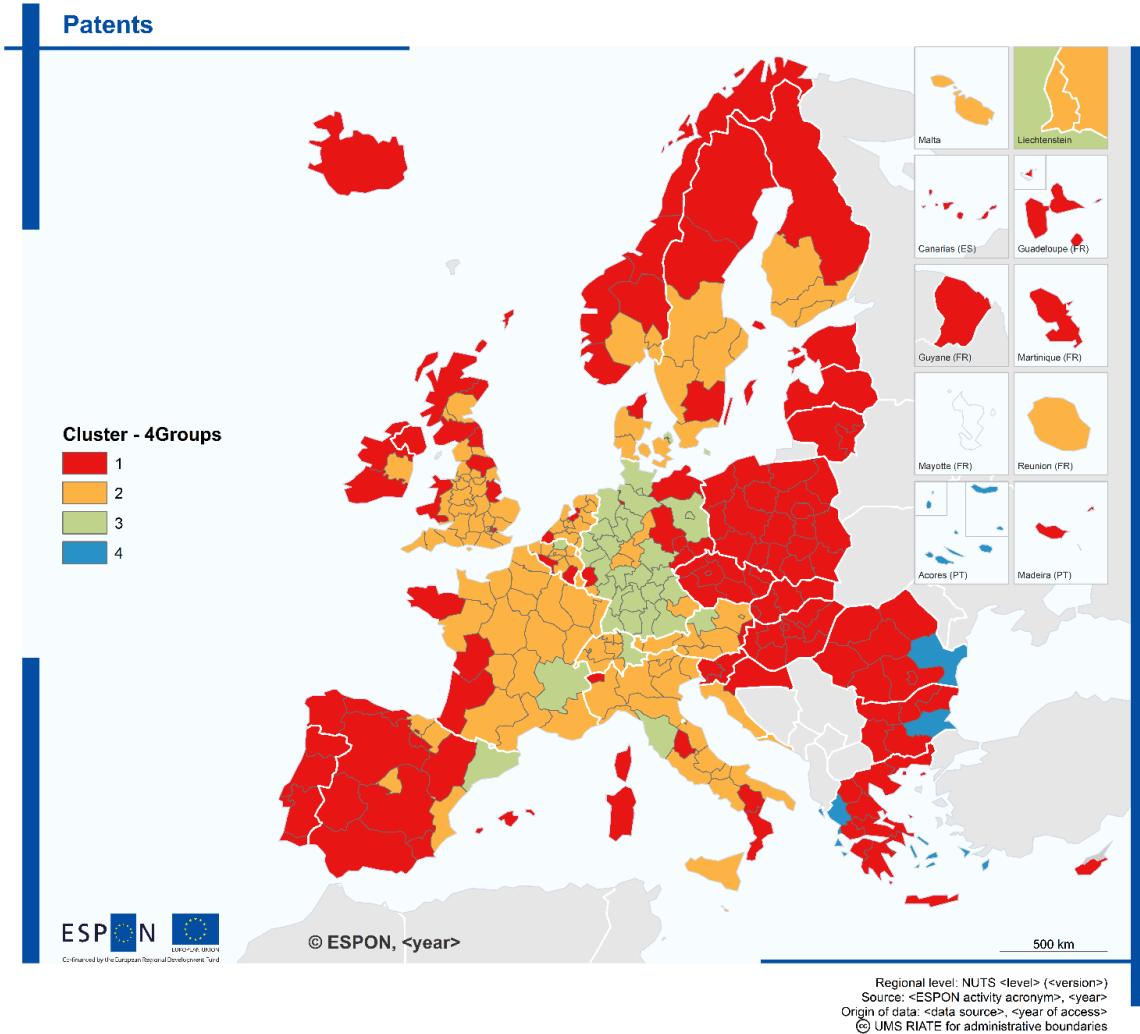
2010



2018



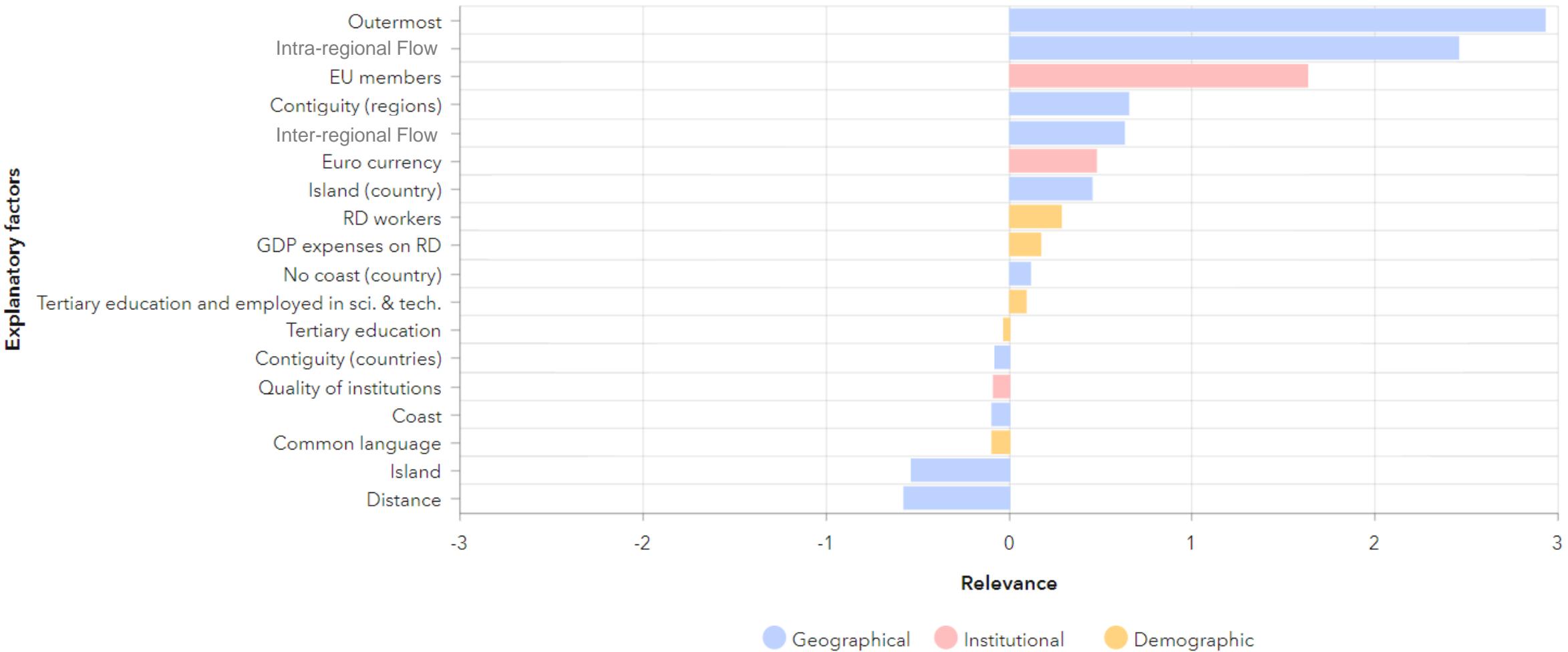
Results: regional typologies based on patent citations.



Results. Drivers and barriers of knowledge flows

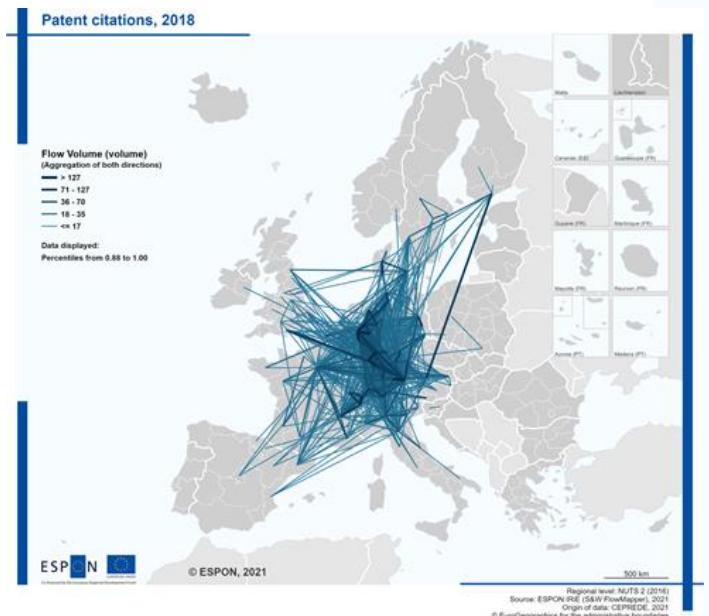
Gravity model. Nuts 2 Regions (EU-EFTA). Panel: 2010-2018.

Var: # of patents generated in region “i” cited in region “j”.



Further research: exploring the gender dimension

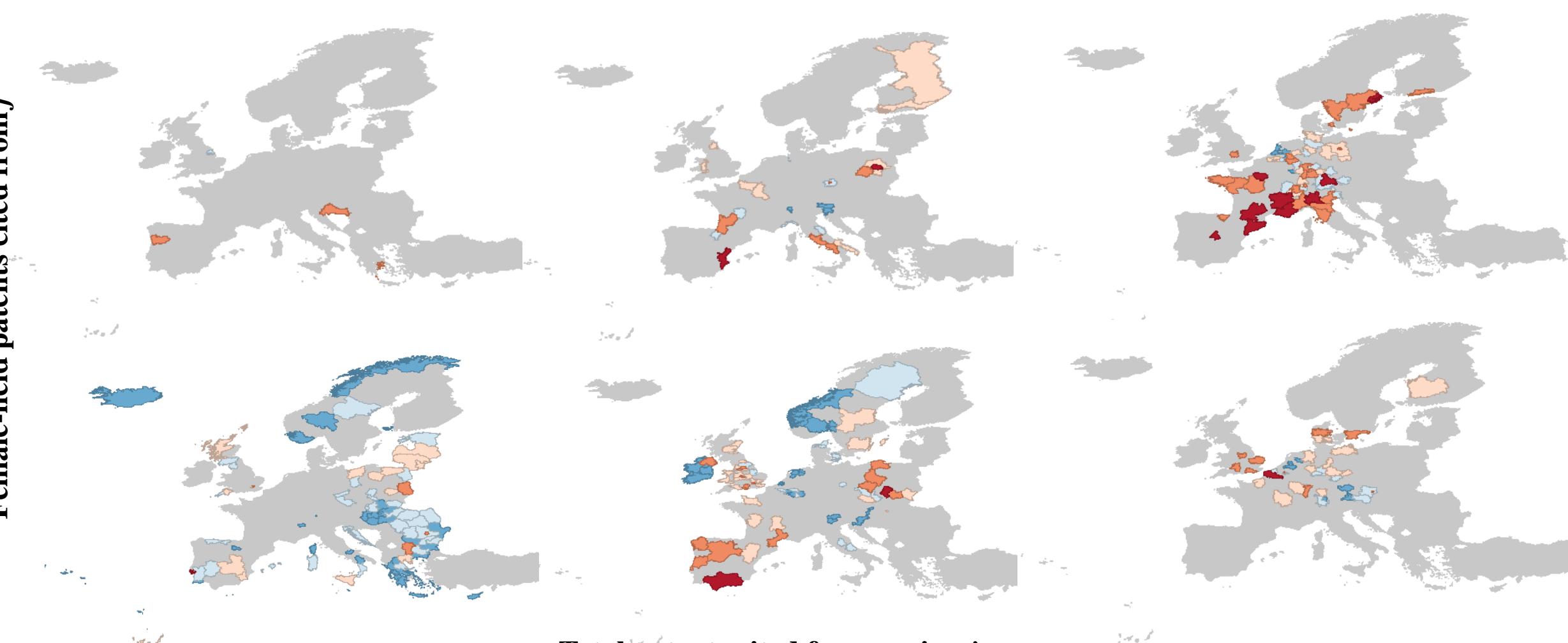
- The gender dimension of citations.
 - Identify the gender-name link
 - Compare spatial structures of males vs women
 - Confront with labour mobility of scientists & technicians.



Further research: exploring the gender dimension

Average patent citation flows: 2010-18.

Female-held patents cited from j



Total patents cited from region j

Colour: female scientists moved to j

Conclusions

- Using OECD data, we built a dataset of region-to-region (NUTS 2) flows or **patent citations** between and within EU27 and EEE countries using a common methodology.
- The flows cover the period 2010-2018.
- Both, at the country and regional level, the **gravity model** performs well explaining the knowledge flows (GDP; distance; intra, contiguity, etc.).
- At the country level, the main flows correspond to **Germany, Switzerland and France**.
- At the regional level, the main flows are intra-national and intra-regional. The only inter-regional flows in the top-10 flows are between Cologne and Upper Babaria, in Germany.
- The econometric analysis identified the main drivers and barriers of the flows. Although knowledge is, in principle, very mobile, we find signs of strong “**home bias**”: patents are generated and cited mainly within the **regional hubs**.



EUROPEAN UNION

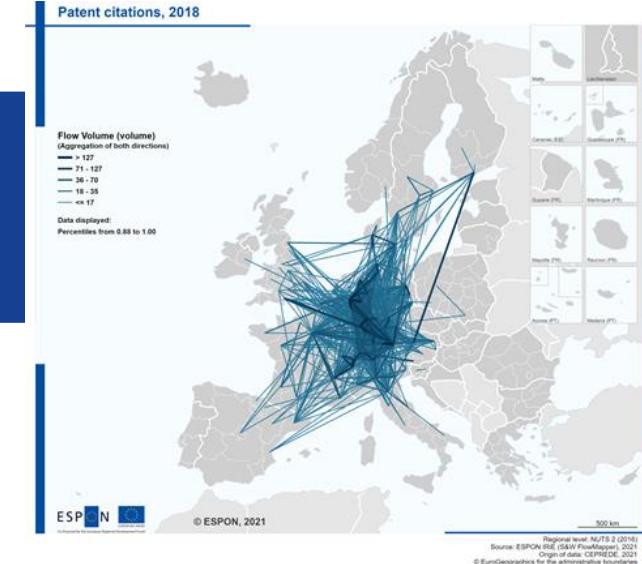
Co-financed by the European Regional Development Fund

Inspire Policy Making with Territorial Evidence

// Thank you

6

Results.



Dynamics: Ranking of the main patent citations

2010				2015				2018			
Ranking	i	j	patents	Ranking	i	j	patents	Ranking	i	j	patents
1	DEA1	DEA1	1101	1	DE21	DE21	545	1	DE21	DE21	781
2	DEA2	DEA2	898	2	DEA1	DEA1	466	2	DE71	DE71	365
3	FR10	FR10	723	3	FR10	FR10	421	3	DEA1	DEA1	359
4	DEA2	DEA1	714	4	DE11	DE11	362	4	DE11	DE11	296
5	DEA1	DEA2	695	5	CH03	CH03	346	5	CH02	CH02	293
6	DK01	DK01	560	6	DE71	DE71	336	6	FR10	FR10	280
7	DE21	DE21	491	7	FRK2	FRK2	331	7	DE13	DE13	238
8	DE71	DE71	461	8	CH02	CH02	328	8	DE25	DE25	233
9	DE11	DE11	434	9	DEA2	DEA2	317	9	DEB3	DEB3	226
10	CH01	CH01	377	10	DE12	DE12	266	10	DK01	DK01	222

6

Results. Drivers and barriers

Gravity model.

Nuts 2 Regions (EU-EFTA).
Panel: 2010-2018.

Var: # of patents generated in
region i cited in region j.

Source: own elaboration using REGPAT, Citations,
CEPII, Eurostat, JRC and institutions quality index by
Charron et al., 2014

VARIABLES	M1 OLS	M2 PPML	M3 PPML	M4 PPML	M5 PPML	M6 PPML
lndgdp_i	0.129***	0.966***	0.994***	0.997***	0.109	
lndgdp_j	0.149***	0.766***	0.822***	0.827***	0.0665	
Indist	-0.00736	-0.331***	-0.443***	-0.441***	-0.407***	-0.408***
intra	1.176***	0.876***	0.862***	0.861***	0.970***	0.963***
Contig_c	-0.0443***	-0.340***	-0.239***	-0.239***	-0.276***	-0.277***
contig_r	0.447***	0.883***	0.750***	0.752***	0.667***	0.662***
comlang_off	0.247***	0.786***	0.351***	0.351***	0.415***	0.415***
EU	-0.0783***	-0.917***	-0.0409	-0.0417	-0.0301	-0.0304
UEM	0.0444***	0.532***	0.322***	0.323***	0.336***	0.335***
island	0.0217***	-0.204*	-0.249***	-0.249***	-0.0423	-0.00794
coast	-0.129***	-0.555***	-0.325***	-0.324***	-0.364***	-0.365***
inst	0.0397***	0.543***	0.587***	0.586***		
outermost	0.0567***	-2.278***	-1.605***	-1.601***	-2.076***	-2.230***
island_c	-0.110***	-0.584***	0.0841	0.0787	0.0751	0.0762
nocoast_c	-0.0185***	0.0210	-0.518***	-0.521***	-0.563***	-0.567***
Constant	-2.541***	-16.92***	-17.36***	-17.46***	2.858	5.011***
Observations	764,64	764,64	764,64	759,446	756,864	645,901
Pseudo R2	0.321	0.727	0.781	0.783	0.815	0.818
*** p<0.01, ** p<0.05, * p<0.1						