

transport infrastructure & territory
Complutense University of Madrid Research Group

Analyzing the accessibility to markets in the EU countries

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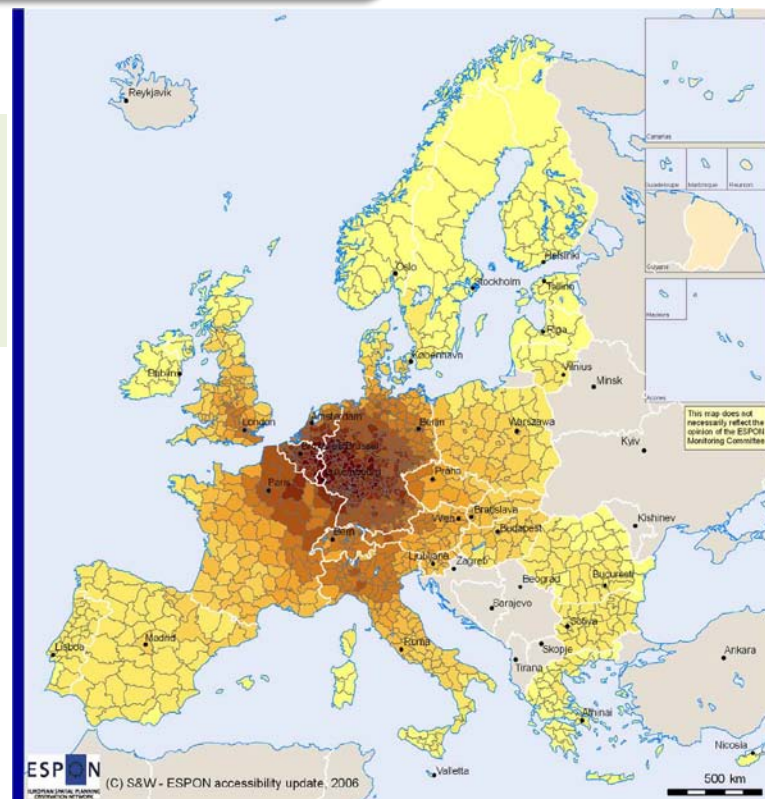


Market potential

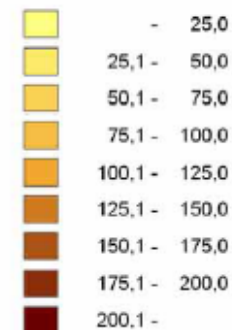


How many trade opportunities are available to a particular country?

Potential
accessibility by
road, 2006



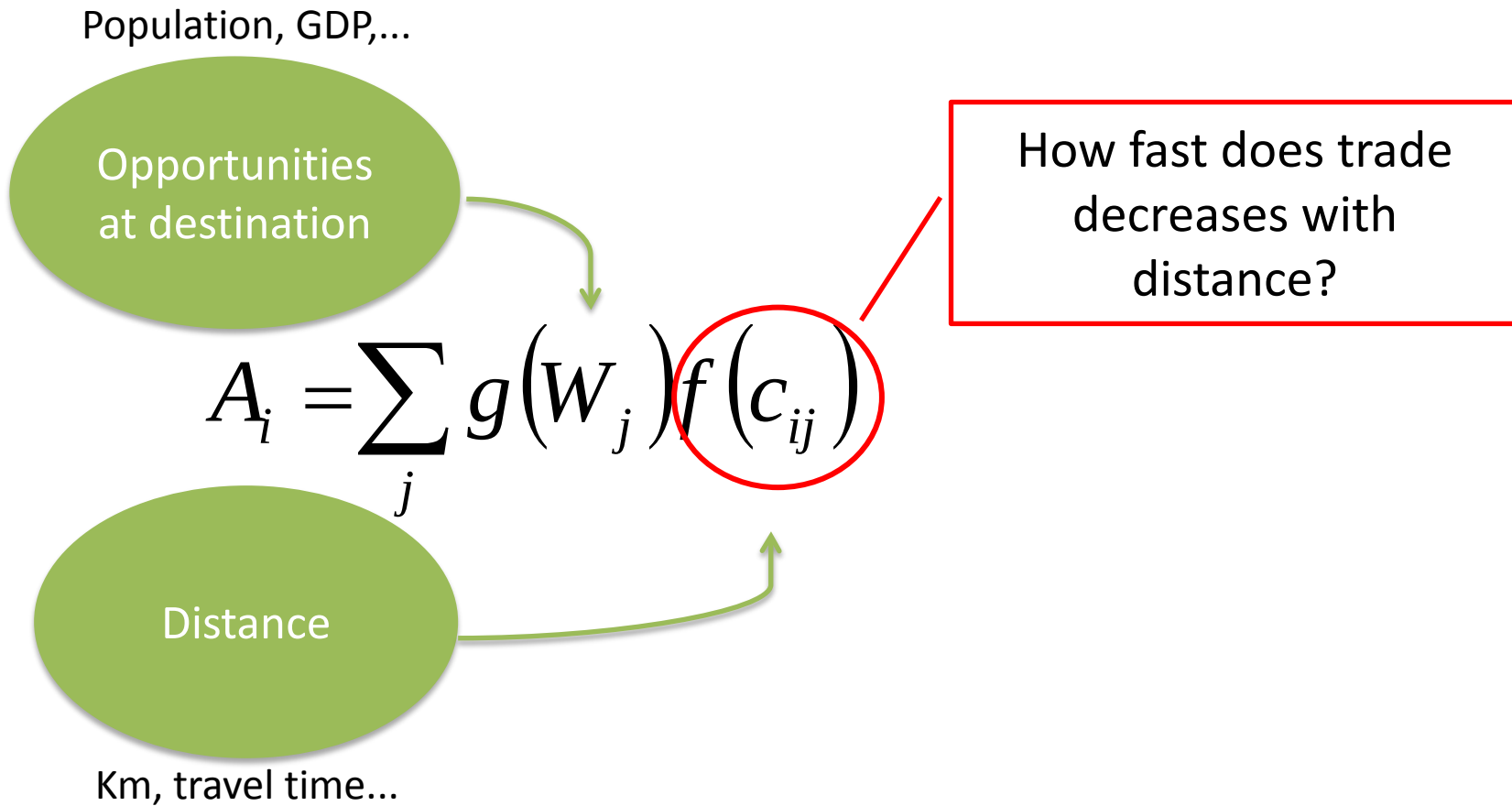
Potential accessibility
Road, 2006 (EU27 = 100)



(C) EuroGeographics Association
for the administrative boundaries

Data sources:
RRG GIS Database
S&W Accessibility Model

ESPON (2007). Update of selected potential
accessibility indicators.





Border effect



How much does a country trade less with another country than within itself, other thing being equal?

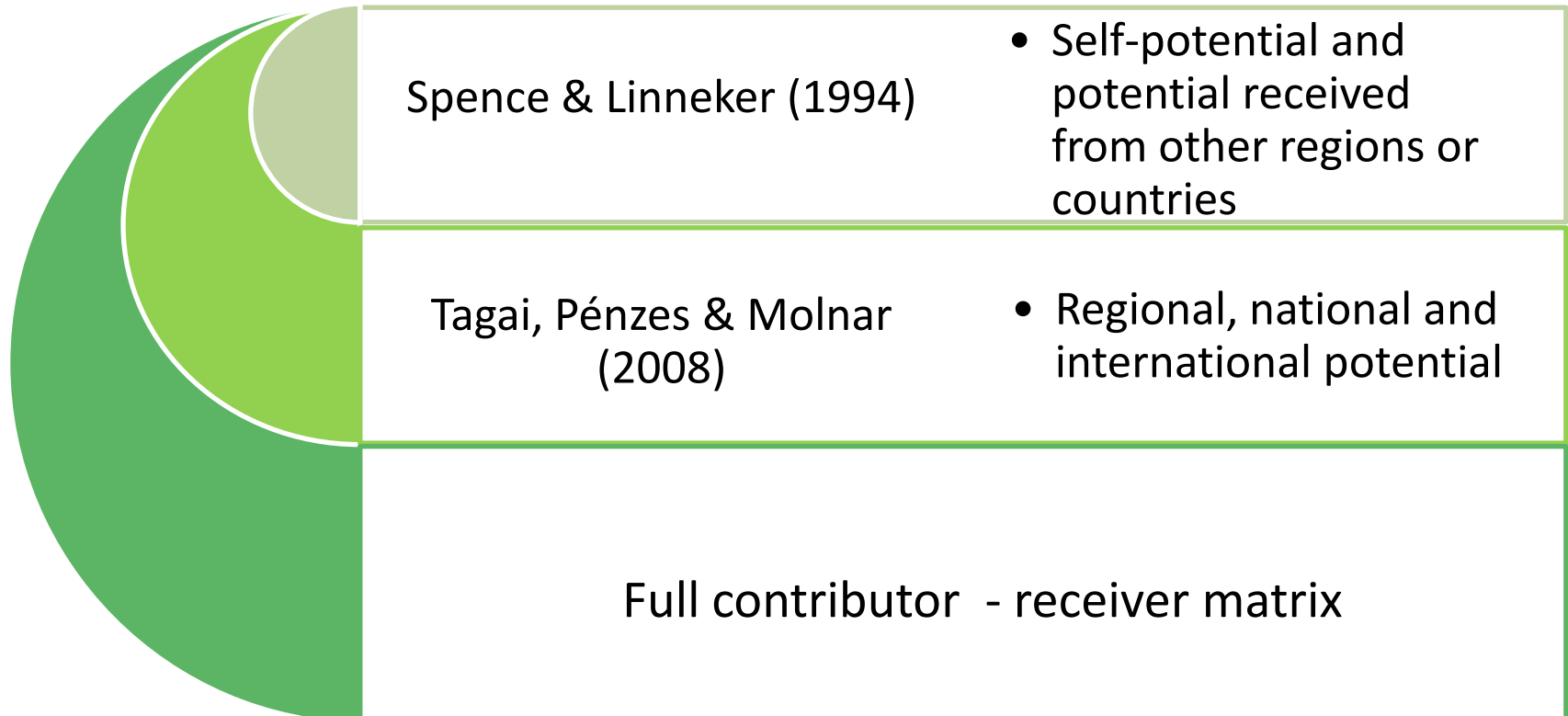
			Other things being equal...
1995	McCallum	US-Canadian border	22 times
1996	Wei	Europe	1.7 times
2000	Nitsch	European countries	7 to 10 times
2004	Chen	EU countries	6 times on average

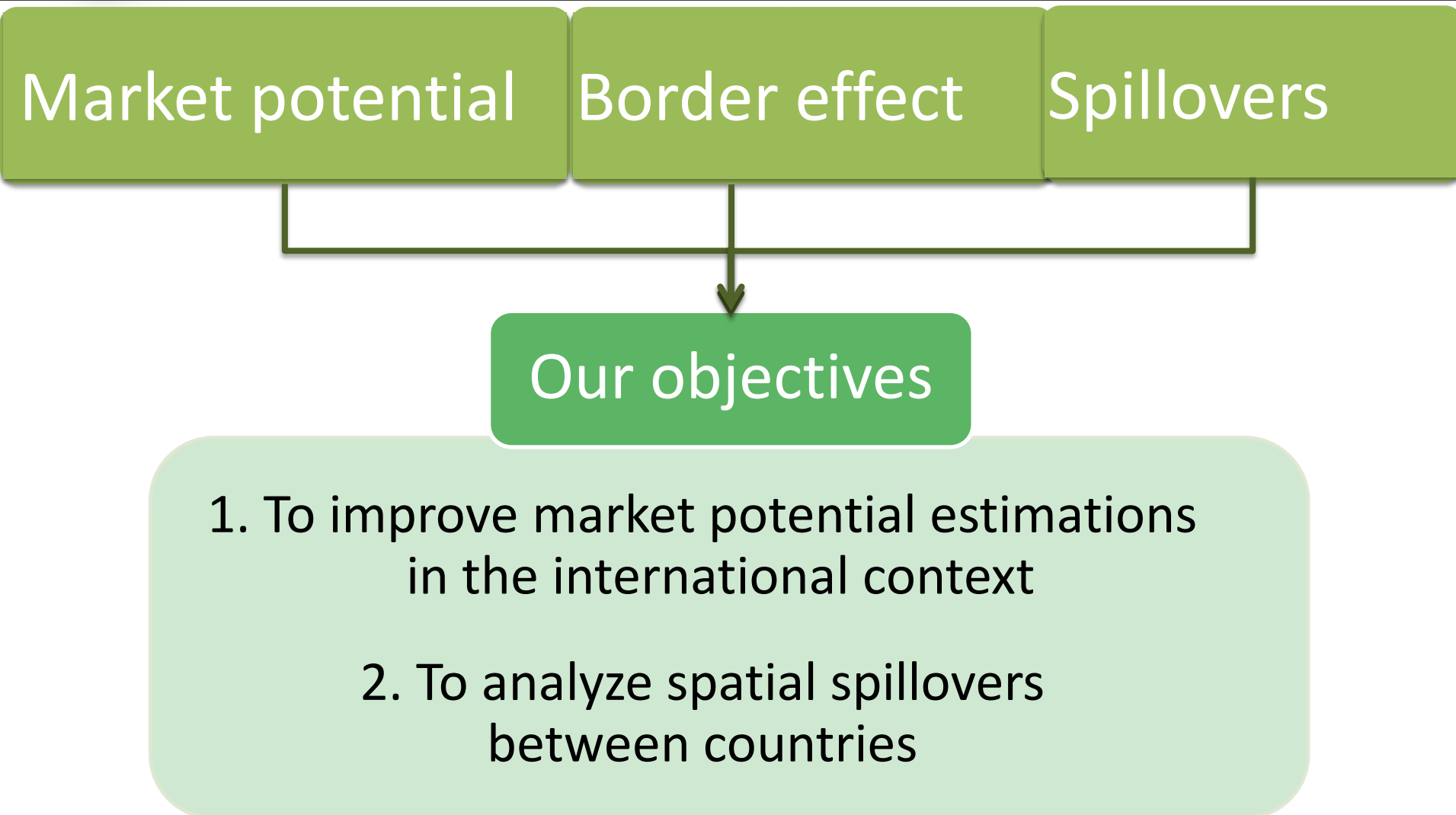


Spillovers



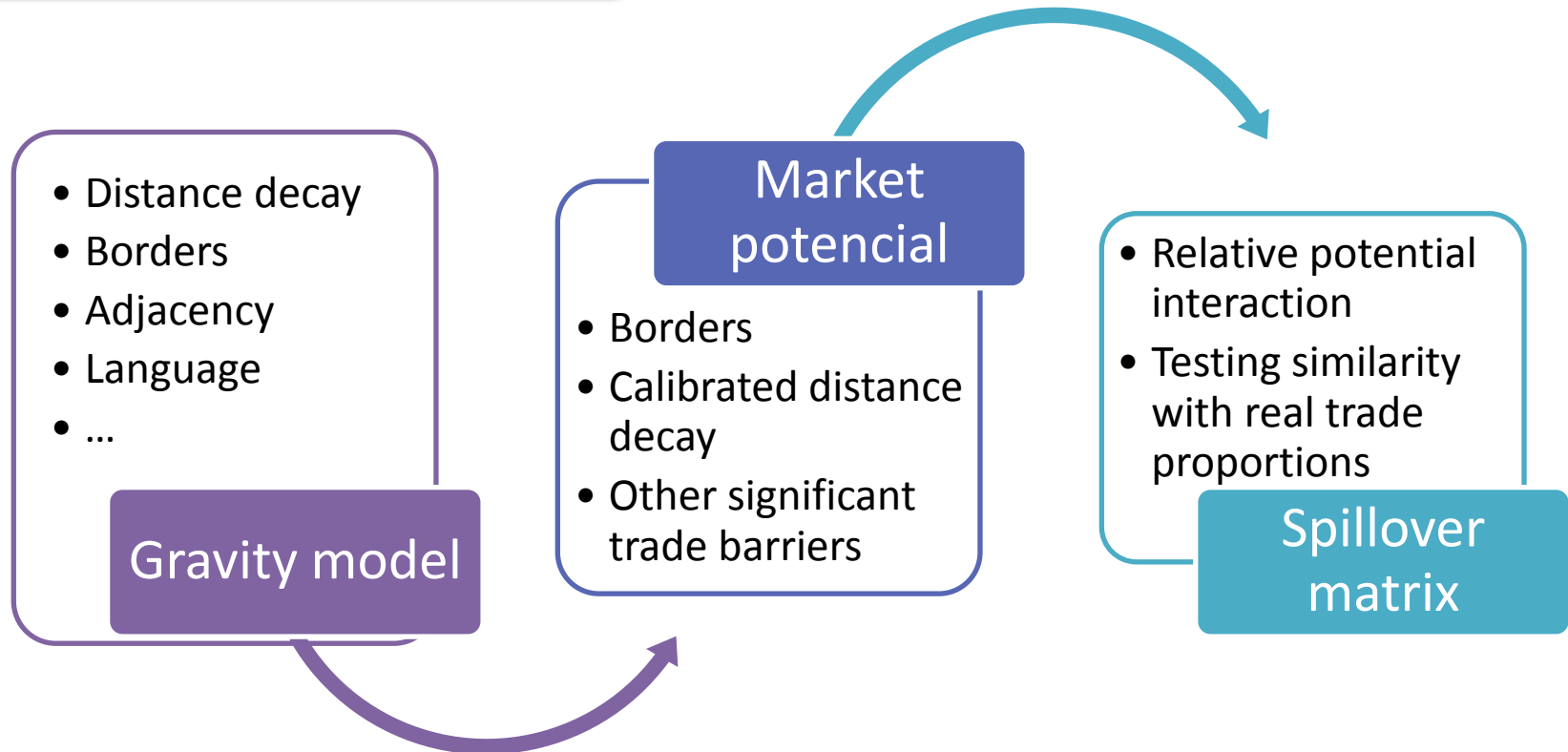
How much market potential does a country receive from each other?







Methodology





- Distance decay
- Borders
- Adjacency
- Language
- ...

Gravity model

$$\ln X_{ij} = \beta_0 + \beta_1 \ln Y_i + \beta_1 \ln Y_j + \beta_3 \ln D_{ij} + \beta_4 \text{border} + \varepsilon_{ij}$$

McCallum's original model



$$A_i = \sum_j g(w_j) f(c_{ij}) \quad \Rightarrow \quad P_i = \sum_j \frac{Y_j}{t_{ij}^{\beta_3}}$$

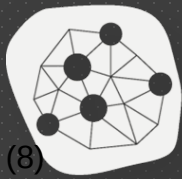
Potential function

- Distance decay
- Borders
- Other significant trade barriers (dummy variables)

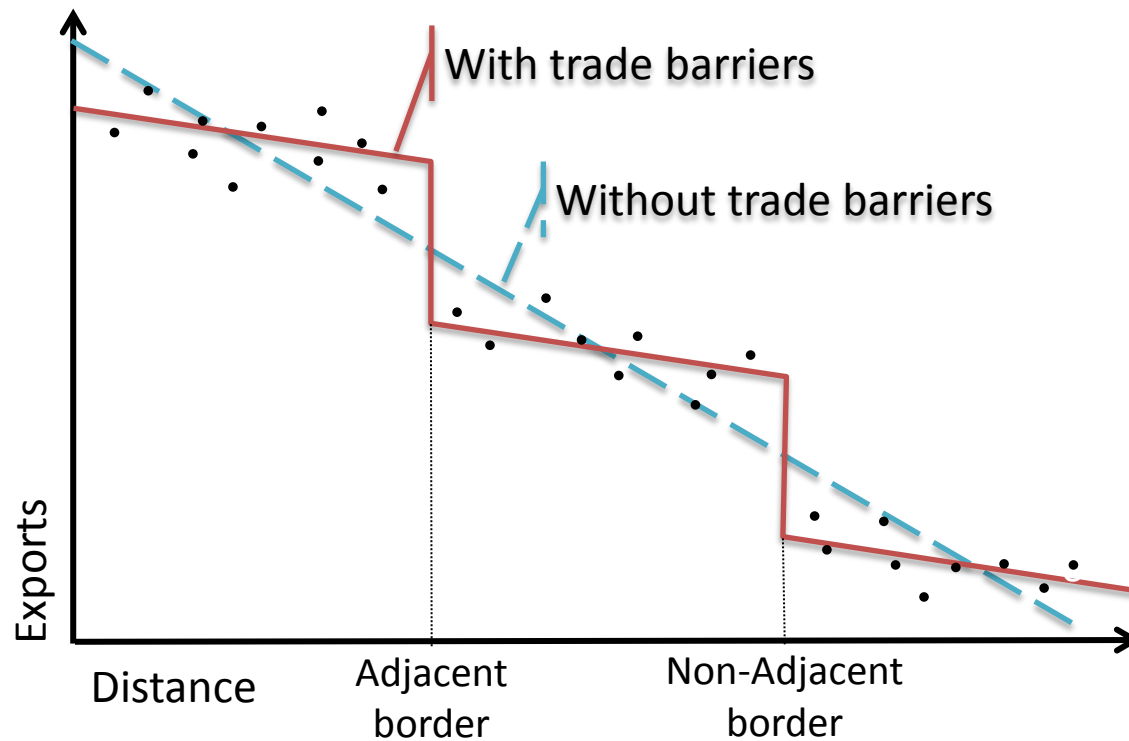
Market potencial

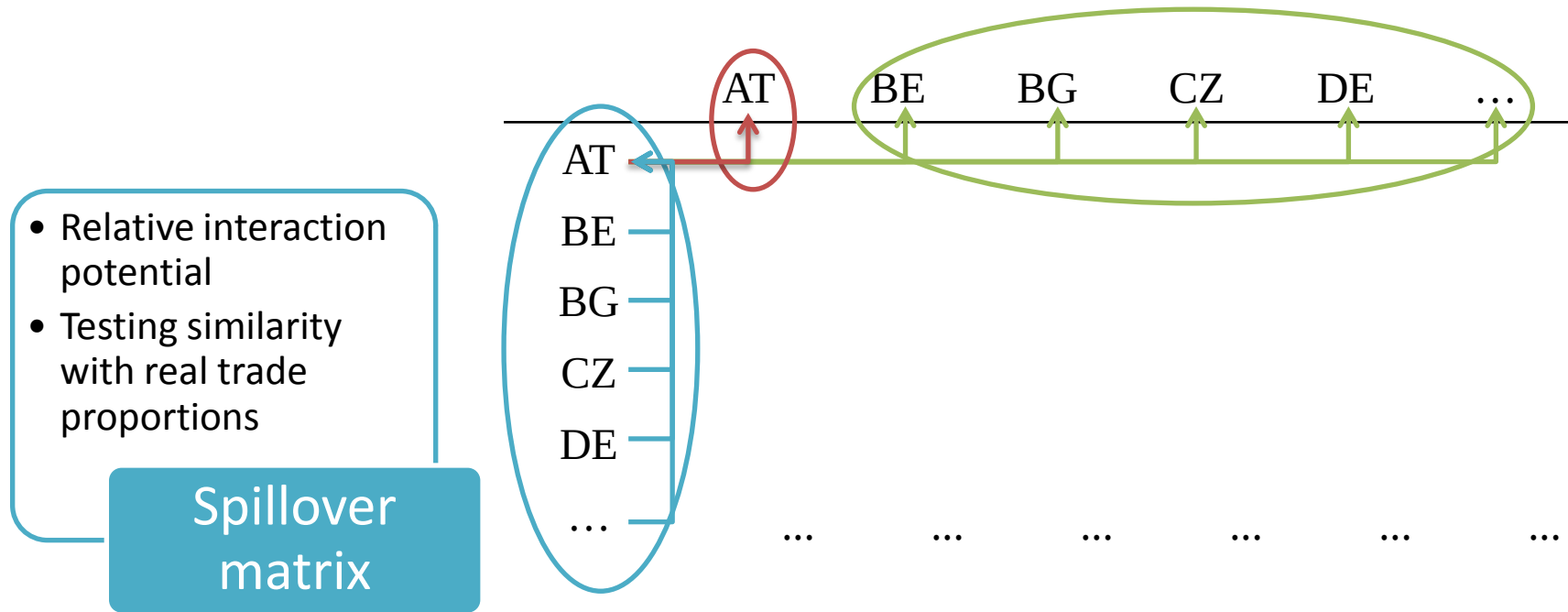
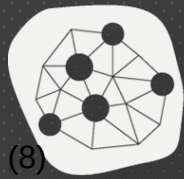
$$P_i = \sum_j \frac{Y_j / (\beta_4 \cdot \beta_n)}{t_{ij}^{\beta_3}}$$

Potential function



Dis-continuous function







Data

REPORTER/PARTNER	AT	BE	BG	CY	CZ	DE	DK
AT		2844524924	354985048	34732476	5254182886	57643938974	552625050
BE	1982823277		840702423	121606252	3012803653	48115894430	1099068161
BG	781777229	445827901		79003127	484731467	2835753856	90913112
CY	45356712	139405277	47873777		21162487	400692970	28542684
CZ	4644592443	2752503018	178469608	111819297		32292795059	667171906
DE	38858074746	57134687819	2136482908	211894648	36264375666		12597165375
DK	702288956	2198933594	83398902	14860405	900525621	14932594867	
EE	117873823	269780795	15123137	7493561	183679251	1411735929	214194926
FS	1806892579	7753630476	510314484	14541128	2400406670	304444843936	1847687156

2012

Transport network

Database of European roads 1957-2012
(Dirk Stelder) ¹

Road & ferry

Travel time

Trade flows

Comext (Eurostat)

Country-to-country

Freight

Value (Euros)



¹ A full description of this database is available in *Changes in road infrastructure and accessibility in Europe since 1960; Final Report, Revision and additions September, 2013.*



Results

Comparison of global gravity models (OLS)

Year: 2012		Model 0		Model I		Model II		Model III		Model IV		Model V	
Variables	B	Sig	B	Sig	B	Sig	B	Sig	B	Sig	B	Sig	
Intercept	-6.359	0.000	-8.258	0.000	-8.886	0.000	-8.882	0.000	-8.934	0.000	-9.267	0.000	
GDPi	0.807	0.000	0.804	0.000	0.799	0.000	0.798	0.000	0.801	0.000	0.805	0.000	
GDPj	0.750	0.000	0.747	0.000	0.742	0.000	0.741	0.000	0.744	0.000	0.748	0.000	
Dij (travel time)	-1.984	0.000	-1.694	0.000	-1.568	0.000	-1.566	0.000	-1.577	0.000	-1.554	0.000	
Border			-1.495	0.000	-1.768	0.000	-1.773	0.000	-1.747	0.000	-1.831	0.000	
Non-Adjacency					-0.379	0.003	-0.360	0.007	-0.463	0.001	-0.406	0.001	
Language barrier (strict)							-0.083	0.674					
Language barrier (lax)									0.203	0.217			
Currency barrier											0.137	0.038	
Exp Home			4.459		5.856		5.889		5.740		6.243		
Exp Adj					1.460		1.434		1.589		1.501		
R2	0.872		0.889		0.890		0.890		0.891		0.891		
Adj R2	0.871		0.888		0.889		0.889		0.889		0.890		
F-Stat	1340.71	0.000	1137.78	0.00	925.07	0.00	769.81	0.00	771.85	0.00	776.11	0.00	
Wald	2947.85	0.000	3751.16	0.00	3834.03	0.00	3836.66	0.00	3829.11	0.00	3954.18	0.00	
AICc	1341.25		1279.62		1272.49		1274.36		1273.00		1270.18		

Market potential values: effects of the introduction of the different parameters of model II (results per country)

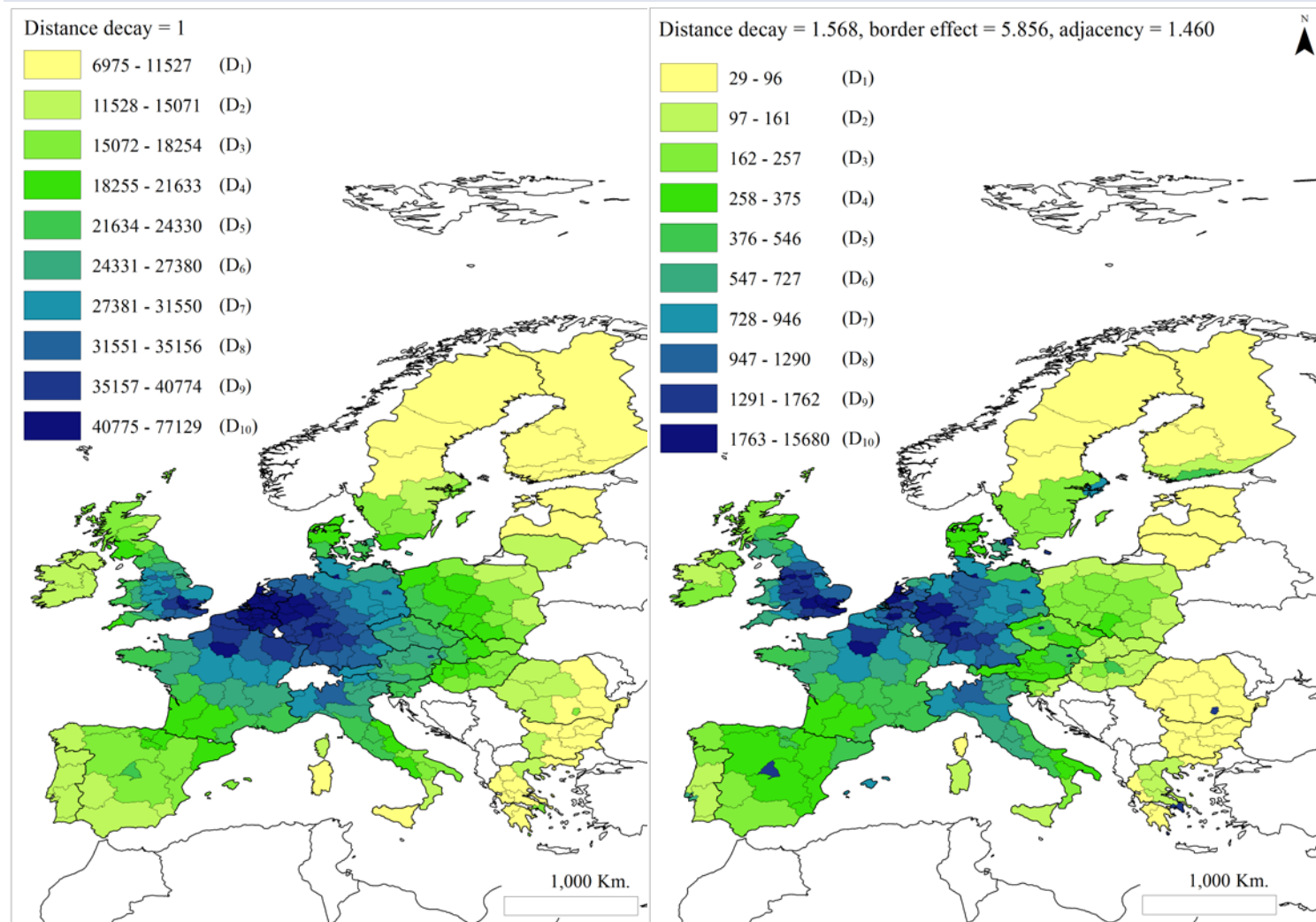
Country	Non-calibrated market potential	Calibrated market potential (Model II)			Differences (in %)		
	Distance decay = 1	Introducing calibrated distance decay	Introducing calibrated border effect	Introducing calibrated non- adjacency	Loss due to introducing calibrated distance decay	Loss due to border effect	Loss due non- adjacency
Austria	23960913794	771747511	249497546	236339512	-96.8	-67.7	-5.3
Belgium	38721056742	1914776761	874591269	857905792	-95.1	-54.3	-1.9
Bulgaria	11466733331	230356800	50160285	39815469	-98.0	-78.2	-20.6
Czech R.	24009974229	775359814	202694579	187155937	-96.8	-73.9	-7.7
Germany	30561012096	1121202255	671210141	661253569	-96.3	-40.1	-1.5
Denmark	20510208440	633362109	238362900	222817923	-96.9	-62.4	-6.5
Estonia	10127956500	193968165	46003642	36634167	-98.1	-76.3	-20.4
Spain	15092098624	365527339	162448594	154005166	-97.6	-55.6	-5.2
Finland	8309518380	153635474	61516859	56078398	-98.2	-60.0	-8.8
France	24934796939	772028881	370295677	360177042	-96.9	-52.0	-2.7
Great Britain	25060581925	913405188	627879050	609917048	-96.4	-31.3	-2.9
Greece	10310972087	211294376	80574416	72223560	-98.0	-61.9	-10.4
Hungary	18418595082	507274211	128925201	108701479	-97.2	-74.6	-15.7
Ireland	14677616554	394660748	152711150	143776344	-97.3	-61.3	-5.9
Italy	18135861315	471735929	217942431	206501614	-97.4	-53.8	-5.2
Lithuania	12529711404	270226210	63513134	51833980	-97.8	-76.5	-18.4
Latvia	11264659362	228933745	52752444	41936808	-98.0	-77.0	-20.5
Netherlands	37181744685	1811090249	928840682	905769604	-95.1	-48.7	-2.5
Poland	18403832910	495459200	152018397	139196124	-97.3	-69.3	-8.4
Portugal	13137878521	324683219	120531289	111302724	-97.5	-62.9	-7.7
Romania	11986804915	246268618	62441038	51090888	-97.9	-74.6	-18.2
Sweden	13477653190	302701861	100689640	87830214	-97.8	-66.7	-12.8
Slovenia	21653480100	653460918	151223155	125373416	-97.0	-76.9	-17.1
Slovakia	19366309111	550806817	125260165	105524789	-97.2	-77.3	-15.8
Average	18887498760	596415267	245503487	232215065	-97.2	-63.9	-10.1
STD	8063181662	455607688	254045813	252098460	0.8	12.4	6.5
CV	42.7	76.4	103.5	108.6	-0.8	-19.5	-64.1

Self-potential values in percentage: effects of the introduction of the different parameters of model II (results per country)

Non calibrated market potential		Calibrated market potential (Model II)			Differences (in %)		
Country	Distance decay = 1	Introducing calibrated distance decay	Introducing calibrated border effect	Introducing calibrated non-adjacency	Gain due to Distance Decay	Gain due to border effect	Gain due to non-adjacency
Austria	9.6	18.4	56.9	60.1	92.1	209.3	5.6
Belgium	17.0	34.5	75.5	77.0	102.9	118.9	1.9
Bulgaria	2.1	5.7	26.0	32.8	172.2	359.2	26.0
Czech R.	5.3	10.9	41.8	45.3	104.6	282.5	8.3
Germany	40.3	51.6	86.2	87.5	28.2	67.0	1.5
Denmark	11.0	24.8	65.9	70.5	125.4	165.7	7.0
Estonia	2.0	8.0	33.8	42.4	309.8	321.6	25.6
Spain	21.3	33.0	74.3	78.3	55.3	125.0	5.5
Finland	10.8	27.7	69.2	75.9	156.0	149.7	9.7
France	28.6	37.3	77.7	79.8	30.1	108.5	2.8
Great Britain	43.2	62.3	90.6	93.3	44.2	45.5	2.9
Greece	10.1	25.4	66.6	74.3	150.7	162.2	11.6
Hungary	4.3	10.1	39.6	46.9	135.4	293.5	18.6
Ireland	10.1	26.1	67.4	71.6	157.0	158.4	6.2
Italy	25.2	35.1	76.0	80.2	39.3	116.5	5.5
Lithuania	2.4	7.8	33.0	40.4	221.9	325.5	22.5
Latvia	2.0	7.2	31.2	39.3	261.0	334.0	25.8
Netherlands	22.7	41.3	80.4	82.5	81.9	95.0	2.5
Poland	9.5	16.4	53.5	58.4	73.6	225.9	9.2
Portugal	9.6	24.2	65.1	70.5	152.8	169.4	8.3
Romania	4.6	10.0	39.4	48.1	116.7	294.4	22.2
Sweden	10.8	19.5	58.7	67.3	80.9	200.6	14.6
Slovenia	2.4	7.3	31.6	38.1	202.5	332.1	20.6
Slovakia	3.0	6.8	30.0	35.7	128.4	339.7	18.7
Average	12.8	23.0	57.1	62.3	126.0	208.3	11.8
STD	11.5	15.0	19.8	18.3	70.5	96.2	8.3
CV	89.8	65.3	34.7	29.3	56.0	46.2	70.3

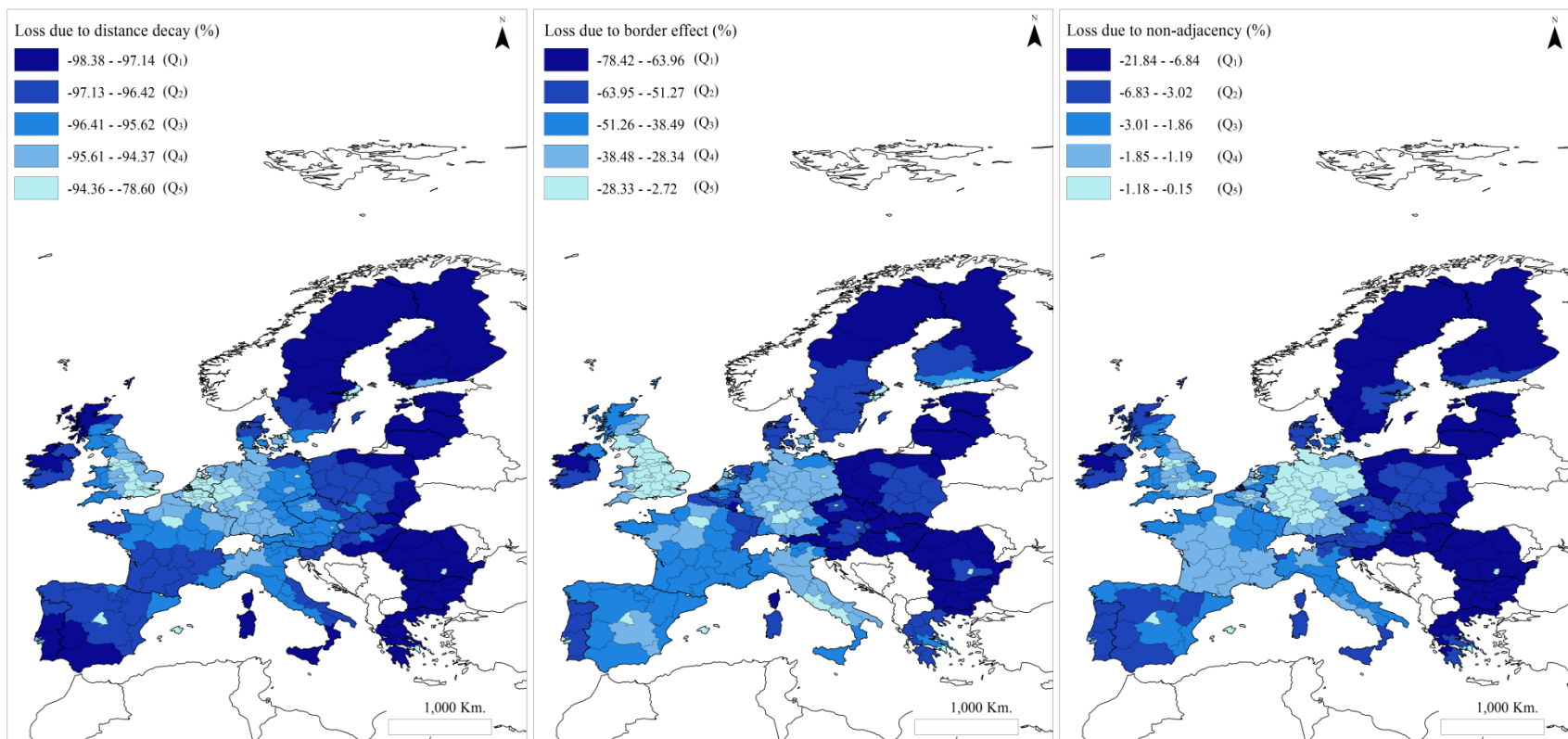


Market potential values according to different formulations: results per NUT 2 (in millions of market potential units)





Difference in market potential results after introducing subsequent control variables, as a percentage





Spillover matrix: market potential received from of each country
(as a percentage)

[illegible]



Coefficient of variation of the market potential received by each country

Country	Coefficient of variation
Austria	204.7
Belgium	213.7
Bulgaria	121.4
Czech R	219.8
Germany	150.7
Denmark	227.5
Estonia	126.3
Spain	196.2
Finland	130.8
France	190.3
Great Britain	172.1
Greece	135.5
Hungary	135.4
Ireland	250.1
Italy	182.0
Lithuania	138.0
Latvia	128.0
Netherlands	236.9
Poland	215.1
Portugal	200.4
Romania	130.1
Sweden	158.7
Slovenia	159.9
Slovakia	135.4



Market potential provided to/received from other European countries (in millions of market potential units)

Country	Provided to other countries	Received from other countries	Difference received - provided	Ratio received / provided
Austria	61	94	33	1.5
Belgium	78	198	120	2.5
Bulgaria	3	27	24	9.3
Czech R	29	102	74	3.6
Germany	455	83	-372	0.2
Denmark	21	66	45	3.2
Estonia	1	21	20	14.3
Spain	51	33	-17	0.7
Finland	7	14	7	2.0
France	198	73	-125	0.4
Great Britain	130	41	-89	0.3
Greece	9	19	9	2.0
Hungary	17	58	40	3.3
Ireland	7	41	34	6.0
Italy	116	41	-75	0.4
Lithuania	4	31	27	8.7
Latvia	3	25	23	9.5
Netherlands	120	159	39	1.3
Poland	49	58	9	1.2
Portugal	6	33	26	5.1
Romania	10	27	16	2.6
Sweden	22	29	7	1.3
Slovenia	6	78	72	13.3
Slovakia	13	68	54	5.0



Correlation coefficients between the actual international trade matrix and market potential matrices

Market potential specification	Pearson's correlation coefficient	Sig.
Non-calibrated market potential: Distance decay = 1	0.463	0.022
Model 0: Calibrating distance decay without trade barriers = 1.943	0.783	0.000
Model II: Calibrating distance decay and trade barriers: Introducing calibrated distance decay = 1.568 calibrated border effect = 5.856 calibrated non-adjacency = 1.460	0.913	0.000



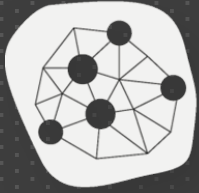
Conclusions

- ❑ Market potential studies assume that trade decreases progressively with distance (the distance decay parameter). However research on the border effect shows that **borders cause trade to fall abruptly**
- ❑ Introducing the border effect in the market potential specification evidences the **previous over-estimation of the distance decay parameter**, thus unveiling that opportunities for interaction **decrease with distance in a discontinuous way** due to the presence of international borders
- ❑ Introducing the calibrated impedance parameters (distance decay and trade barriers) in the market potential model leads to more realistic results, dramatically **increasing self-potential values and spatial disparities in market potential**



Conclusions

- ❑ Border and non-adjacency effects especially affect sparsely populated border regions, which are highly dependent on the market potential received from other countries.
- ❑ The spillover matrix shows the degree of concentration of the potential that a country receives from other countries, thus evidencing the degree of dependency from the largest contributors. This is significant from the point of view of the vulnerability of a country's exports.
- ❑ The consideration of these impedance parameters enables longitudinal studies to be produced in order to evaluate not only the impact of transport policies (e.g. the extension of trans-European networks) but also to assess the effect of the progressively diminishing role of borders on market potential.



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Thank you for your attention

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