

Measuring European Integration



Jörg König, University of Göttingen

1. Motivation

Why investigating
European Integration?

1. Motivation

- 1) The European Union (EU) is the largest economy in the world (with a GDP of almost €12 billion in 2009)
- 2) Its integration process is unique, both in aspects of deepening and widening an economic area
- 3) Research papers focus only on specific aspects of European Integration (among many others, Pagano et al. 2004, Frenken 2002, etc.) but not in a comprehensive way

1. Motivation

*How do I want to measure
European Integration?*



**“Mirror, mirror upon the wall.
Who is the most integrated at all?”**



Country A !

Outline

- 1) Motivation
- 2) Defining Regional Integration
- 3) Developing the Indicators
- 4) The “EU Integration Index”
- 5) Some (provisional) Results

2. Defining Regional Integration

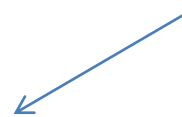
What is European or
Regional Integration?

Stages of Regional Integration

(e.g. Balassa 1961)

- Preferential Trading Area
- Free Trade Area
- Customs Union
- Common Market
- Economic Union
- **Economic and Monetary Union**
- Political Union (Fiscal Union)

EU today!



Stages of Regional Integration

(e.g. Balassa 1961)

- Preferential Trading Area
 - Free Trade Area
 - Customs Union
 - Common Market
 - Economic Union
 - Economic and Monetary Union
 - Political Union (Fiscal Union)
- market (economic)
integration
- political (institutional)
integration
-
- The diagram consists of a list of seven stages of regional integration on the left. The first four stages (Preferential Trading Area, Free Trade Area, Customs Union, and Common Market) are grouped by a blue bracket on the right, labeled 'market (economic) integration'. The last three stages (Economic Union, Economic and Monetary Union, and Political Union (Fiscal Union)) are grouped by another blue bracket on the right, labeled 'political (institutional) integration'.

3. Developing the Indicators

Expected Economic Benefits from European Integration

- 1) Basically the traditional comparative-static and dynamic effects from free trade**
(Riccardo 1817, Heckscher-Ohlin 1919, Krugman 1979, Melitz 2003)
- 2) Being a member of a customs union**
(Viner 1950)
- 3) Being a member of an EMU**
(Article 2 of the EU Treaty since 1992, Rogoff 1996, Rose 2001, Baldwin et al. 2003)

Expected Economic Benefits from European Integration

- 1) **Basically the traditional comparative-static and dynamic effects from free trade**
 - Optimal allocation of resources and factors
 - Efficiency gains from exploiting CA
 - Reduction in production costs from S and ES
 - Increase in competition
 - Larger product variety and enhanced innovation
- Increases production volumes and hence, **increases international transactions!**

This should eventually lead to:

- Increased trade (goods and services)
- Increased factor movements (capital and labour)

Expected Economic Benefits from European Integration

2) Being a member of a customs union

(Viner 1950)

- Reduction of transaction costs within the customs union (as opposed to non-free-trade)
 - Cost: Retaliatory tariffs against the customs union by discriminated third parties (outsiders)
 - Effects of trade creation, trade diversion, and trade deflection
- **eventually increases intra-union transactions**

This should eventually lead to:

- Increased **intra-EU**-trade (goods and services)
- Increased **intra-EU**-factor movements (capital and labour)



**“Customs Union”
(and Common Market)
effect**

Expected Economic Benefits from European Integration

- 1) Basically the traditional comparative-static and dynamic effects from free trade (*Riccardo 1817, Heckscher-Ohlin 1919, Krugman 1979, Melitz 2003*)
- 2) Being a member of a customs union (*Viner 1950*)
- 3) **Being a member of an EMU**
(*Article 2 of the EU Treaty since 1992, Rogoff 1996, Rose 2001, Baldwin et al. 2003*)

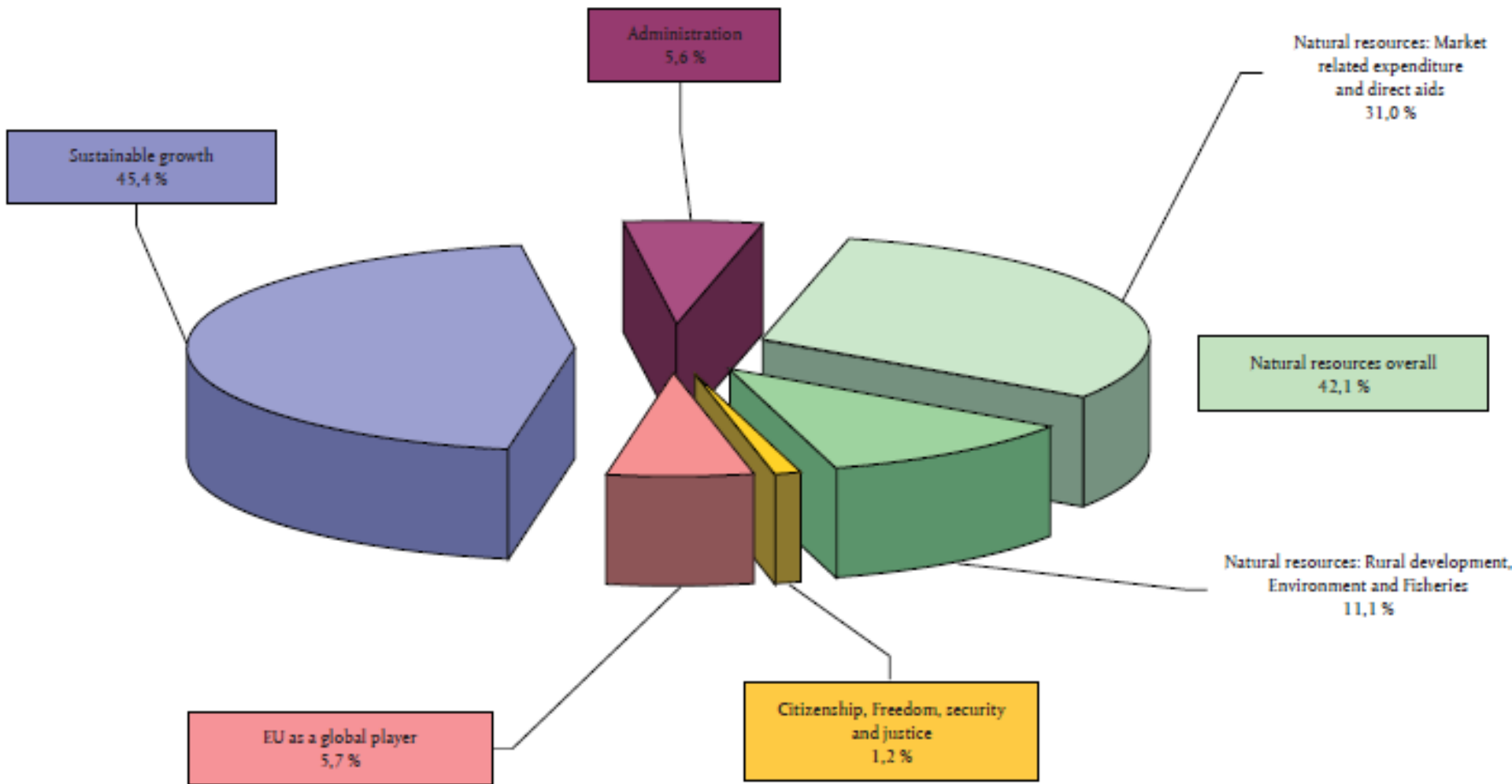
EU Treaty, Article 2

“[...] a harmonious, balanced and sustainable development of economic activities, a high level of employment and of social protection, equality between men and women, sustainable and non-inflationary growth, a high degree of competitiveness and convergence of economic performance, a high level of protection and improvement of the quality of the environment, the raising of the standard of living and quality of life, and economic and social cohesion and solidarity among Member States.”

How is the EU trying to reach these goals?

- through the EU's **Regional and Structural Policy** (cohesion policy) → EU is spending almost half of its yearly budget!
- through the EMU's **Convergence Criteria** (Maastricht Convergence Criteria)

EU-Budget 2010

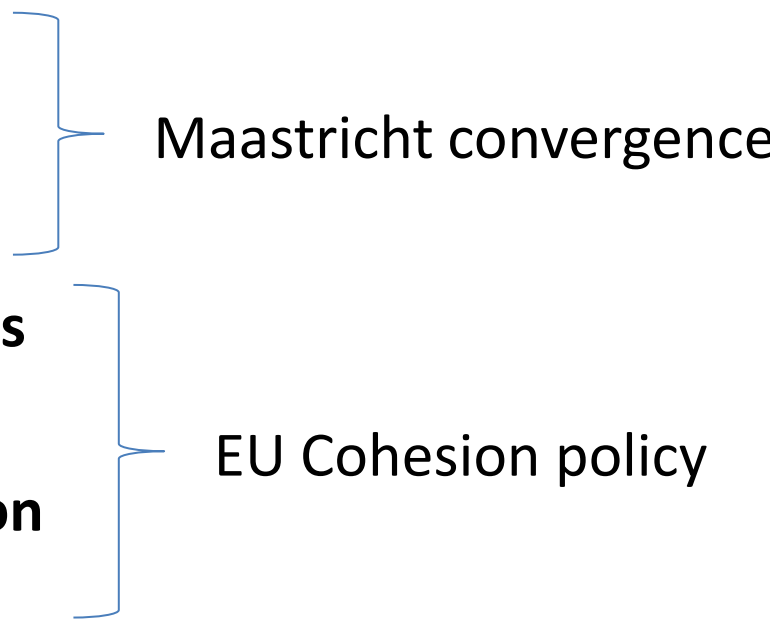


Source: EC (2010), General Budget of the European Union for the Financial Year 2010, p. 8.

The Maastricht Convergence Criteria

- **Price stability** (inflation rate not allowed to exceed that of the three best performing members by more than 1.5%)
- **Convergence in the long-term interest rate** (not allowed to exceed that of the three best performing members by more than 2%)
- **“Sound” fiscal policy** (national debt < 60% and budget deficit < 3 % of GDP)
- **“Normal” fluctuation margins of exchange rate** ($\pm 15\%$ bound around the central parity for at least 2 years, without devaluing against the euro)

This should eventually lead to:

- Increased intra-EU-trade (goods and services)
 - Increased intra-EU-factor movements (capital and labour)
 - **Convergence processes (in the long-run):**
 - Inflation rates
 - Interest rates
 - Debt levels
 - Employment levels
 - Productivity
 - Income distribution
 - Price levels
- Maastricht convergence
- EU Cohesion policy
- 
- A diagram consisting of two blue curly brackets on the right side of the list. The top bracket groups 'Inflation rates', 'Interest rates', and 'Debt levels' under the label 'Maastricht convergence'. The bottom bracket groups 'Employment levels', 'Productivity', 'Income distribution', and 'Price levels' under the label 'EU Cohesion policy'.

Expected Economic Benefits from European Integration

3) Being a member of a monetary union

- ***Rogoff 1996***
 - Economic integration in general helps harmonize prices and productivity (law of one price)
 - Factor price equalization theorem holds
- ***Rose 2001***
 - Monetary union may greatly increase the amount of trade among member states
- ***Baldwin et al. 2003***
 - Monetary union may help harmonize inflation rates through the channels of increased intra-union trade

To sum up: What do I want to measure?

- **Intra-union transactions**
- **Convergence effects**
- **Institutional compliance**
 - Schengen membership
 - EMU membership
 - ERASMUS participation
 - Infringements to EU law (EC, ECJ)

4. The “EU Integration Index”

Data description

- 19 variables
- 15 EU member states (EU-15)
- Years 1999 – 2009

Source of data:

- EUROSTAT
- ECJ-website

Methodology

- **Normalization**

- For **intra-union transactions**:
 - Intra-EU-15 values / total values
 - For **convergence processes**:
 - Values / EU-15-average values
 - For **institutional compliance**:
 - “worst” = 0 , “best” = 1
- **All values between 0 and 1**

- **Multivariate Analysis**

- **Principal Component Analysis (PCA)**
 - For structural purposes (correlations matrix, Kaiser, varimax)
 - For weighting purposes (squared factor loadings)

Correlations

	fdi_stocks	goods	serv	empl	lab_prod	ppp	hcpi_goods	bonds_int	tax_con	gini	unempl	debt	schengen	emu	ec_letter	ecj_market	ecj_envir	ecj_others	erasmus
fdi_stocks	1	0.3156*	0.3687*	0.3213*	0.1159	-0.0098	0.1527	-0.2133*	0.1136	-0.0330	0.1135	-0.0427	0.1836	0.3824*	-0.1040	-0.0918	-0.1329	-0.1557	-0.0902
goods	0.3156*	1	0.7667*	0.5173*	0.1504	-0.0575	0.3048*	-0.2199*	0.2261*	0.0495	-0.3143*	-0.3629*	0.1802	0.2607*	0.0550	0.1045	0.1412	0.1563	0.1055
serv	0.3687*	0.7667*	1	0.2407*	-0.1181	-0.3544*	0.3743*	-0.2167*	-0.1047	0.1654	-0.1120	-0.0894	0.3470*	0.4629*	-0.1293	-0.1406	-0.1044	-0.0217	0.0652
empl	0.3213*	0.5173*	0.2407*	1	0.7689*	0.4315*	0.0317	-0.3448*	0.4078*	-0.3591*	-0.4241*	-0.4635*	-0.0815	-0.0437	0.2574*	0.1413	0.2126*	0.0859	0.3593*
lab_prod	0.1159	0.1504	-0.1181	0.7689*	1	0.7802*	-0.2091*	-0.3474*	0.5918*	-0.7238*	-0.4423*	-0.4966*	-0.0806	-0.2259*	0.4252*	0.1455	0.2189*	0.0863	0.3267*
ppp	-0.0098	-0.0575	-0.3544*	0.4315*	0.7802*	1	-0.3066*	-0.1555	0.7968*	-0.7202*	-0.4494*	-0.4679*	-0.2841*	-0.3882*	0.4786*	0.3578*	0.2955*	0.2326*	0.0646
hcpi_goods	0.1527	0.3048*	0.3743*	0.0317	-0.2091*	-0.3066*	1	0.0993	-0.1677	0.1784	0.2035*	0.1034	0.1425	0.4409*	-0.1432	-0.1986	-0.1858	-0.1302	0.0536
bonds_int	-0.2133*	-0.2199*	-0.2167*	-0.3448*	-0.3474*	-0.1555	0.0993	1	-0.2244*	0.2916*	0.1668	0.3321*	-0.2637*	-0.1808	-0.1523	0.0775	-0.0912	-0.0803	-0.1080
tax_con	0.1136	0.2261*	-0.1047	0.4078*	0.5918*	0.7968*	-0.1677	-0.2244*	1	-0.6636*	-0.5026*	-0.5148*	-0.0925	-0.2464*	0.5675*	0.4405*	0.4026*	0.3028*	0.1001
gini	-0.0330	0.0495	0.1654	-0.3591*	-0.7238*	-0.7202*	0.1784	0.2916*	-0.6636*	1	0.2158*	0.2513*	-0.1727	0.1381	-0.4291*	-0.1287	-0.2668*	-0.0758	-0.2814*
unempl	0.1135	-0.3143*	-0.1120	-0.4241*	-0.4423*	-0.4494*	0.2035*	0.1668	-0.5026*	0.2158*	1	0.4459*	0.1923	0.1806	-0.2804*	-0.3979*	-0.2350*	-0.2612*	-0.3370*
debt	-0.0427	-0.3629*	-0.0894	-0.4635*	-0.4966*	-0.4679*	0.1034	0.3321*	-0.5148*	0.2513*	0.4459*	1	0.2539*	0.2042*	-0.4755*	-0.2926*	-0.2808*	-0.2887*	0.0019
schengen	0.1836	0.1802	0.3470*	-0.0815	-0.0806	-0.2841*	0.1425	-0.2637*	-0.0925	-0.1727	0.1923	0.2539*	1	0.4306*	-0.1069	-0.3270*	-0.1072	-0.2333*	0.1452
em	0.3824*	0.2607*	0.4629*	-0.0437	-0.2259*	-0.3882*	0.4409*	-0.1808	-0.2464*	0.1381	0.1806	0.2042*	0.4306*	1	-0.2356*	-0.3332*	-0.2751*	-0.2752*	0.0625
ec_letter	-0.1040	0.0550	-0.1293	0.2574*	0.4252*	0.4786*	-0.1432	-0.1523	0.5675*	-0.4291*	-0.2804*	-0.4755*	-0.1069	-0.2356*	1	0.0925	0.3270*	0.1345	0.0768
ecj_market	-0.0918	0.1045	-0.1406	0.1413	0.1455	0.3578*	-0.1986	0.0775	0.4405*	-0.1287	-0.3979*	-0.2926*	-0.3270*	-0.3332*	0.0925	1	0.4351*	0.5101*	0.1179
ecj_envir	-0.1329	0.1412	-0.1044	0.2126*	0.2189*	0.2955*	-0.1858	-0.0912	0.4026*	-0.2668*	-0.2350*	-0.2808*	-0.1072	-0.2751*	0.3270*	0.4351*	1	0.5547*	0.1378
ecj_others	-0.1557	0.1563	-0.0217	0.0859	0.0863	0.2326*	-0.1302	-0.0803	0.3028*	-0.0758	-0.2612*	-0.2887*	-0.2333*	-0.2752*	0.1345	0.5101*	0.5547*	1	-0.0099
erasmus	-0.0902	0.1055	0.0652	0.3593*	0.3267*	0.0646	0.0536	-0.1080	0.1001	-0.2814*	-0.3370*	0.0019	0.1452	0.0625	0.0768	0.1179	0.1378	-0.0099	1



Correlations of Group 1

	fdi_stocks	goods	serv	empl
fdi_stocks	1	0.3156*	0.3687*	0.3213*
goods	0.3156*	1	0.7667*	0.5173*
serv	0.3687*	0.7667*	1	0.2407*
empl	0.3213*	0.5173*	0.2407*	1

* = 1% significance

Correlations of Group 2

	lab_prod	ppp	hcpi_goods	bonds_int	tax_con	gini	unempl	debt
lab_prod	1	0.7802*	-0.2091*	-0.3474*	0.5918*	-0.7238*	-0.4423*	-0.4966*
ppp	0.7802*	1	-0.3066*	-0.1555	0.7968*	-0.7202*	-0.4494*	-0.4679*
hcpi_goods	-0.2091*	-0.3066*	1	0.0993	-0.1677	0.1784	0.2035*	0.1034
bonds_int	-0.3474*	-0.1555	0.0993	1	-0.2244*	0.2916*	0.1668	0.3321*
tax_con	0.5918*	0.7968*	-0.1677	-0.2244*	1	-0.6636*	-0.5026*	-0.5148*
gini	-0.7238*	-0.7202*	0.1784	0.2916*	-0.6636*	1	0.2158*	0.2513*
unempl	-0.4423*	-0.4494*	0.2035*	0.1668	-0.5026*	0.2158*	1	0.4459*
debt	-0.4966*	-0.4679*	0.1034	0.3321*	-0.5148*	0.2513*	0.4459*	1

* = 1% significance

Correlations of Group 3

	schengen	emu	ec_letter	ecj_market	ecj_envir	ecj_others	erasmus
schengen	1	0.4306*	-0.1069	-0.3270*	-0.1072	-0.2333*	0.1452
emu	0.4306*	1	-0.2356*	-0.3332*	-0.2751*	-0.2752*	0.0625
ec_letter	-0.1069	-0.2356*	1	0.0925	0.3270*	0.1345	0.0768
ecj_market	-0.3270*	-0.3332*	0.0925	1	0.4351*	0.5101*	0.1179
ecj_envir	-0.1072	-0.2751*	0.3270*	0.4351*	1	0.5547*	0.1378
ecj_others	-0.2333*	-0.2752*	0.1345	0.5101*	0.5547*	1	-0.0099
erasmus	0.1452	0.0625	0.0768	0.1179	0.1378	-0.0099	1

* = 1% significance

Principal Component Analysis

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	5.4972	2.2964	0.2893	0.2893
Comp2	3.2008	1.2498	0.1685	0.4578
Comp3	1.9511	0.6876	0.1027	0.5605
Comp4	1.2635	0.0825	0.0665	0.6270
Comp5	1.1811	0.2179	0.0622	0.6891
Comp6	0.9632	0.0206	0.0507	0.7398
Comp7	0.9426	0.2090	0.0496	0.7894
Comp8	0.7336	0.0952	0.0386	0.8281
Comp9	0.6384	0.0860	0.0336	0.8617
⋮	⋮	⋮	⋮	⋮

Kaiser-Criteria: Eigenvalue > 1

PCA: “Intra-union-transactions”

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.30164	1.49811	0.5754	0.5754
Comp2	0.803529	0.0726107	0.2009	0.7763
Comp3	0.730918	0.567005	0.1827	0.959
Comp4	0.163913	.	0.041	1

Principal components (eigenvectors)

Variable	Comp1
fdi_stocks	0.4051
goods	0.5918
serv	0.5439
empl	0.4357

PCA: “Convergence processes”

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.9660	2.9654	0.4957	0.4957
Comp2	1.0006	0.0543	0.1251	0.6208
Comp3	0.9463	0.0482	0.1183	0.7391
Comp4	0.8981	0.3868	0.1123	0.8514
⋮	⋮	⋮	⋮	⋮

Rotated components (orthogonal varimax)

Variable	Comp1	Comp2
lab_prod	0.4090	-0.1533
ppp	0.5238	0.0622
tax_con	0.4230	-0.1064
gini	-0.4680	-0.0819
unempl	-0.1997	0.3004
debt	-0.0975	0.5728
hcpi_goods	-0.3242	-0.3145
bonds_int	0.0765	0.6613

PCA: “Institutional compliance”

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.5223	1.2686	0.3603	0.3603
Comp2	1.2537	0.2690	0.1791	0.5394
Comp3	0.9847	0.1340	0.1407	0.6801
Comp4	0.8508	0.2987	0.1215	0.8016
⋮	⋮	⋮	⋮	⋮

Rotated components (orthogonal varimax)

Variable	Comp1	Comp2
schengen	-0.0986	0.6243
emu	-0.2442	0.4601
erasmus	0.2931	0.5901
ec_letter	0.3122	0.0766
ecj_market	0.4546	-0.1301
ecj_envir	0.5609	0.1400
ecj_others	0.4753	-0.0891

Indices and variables		Weights
A.	Intra-union transactions	[24%]
	FDI stocks (EU-15, percentage of total volumes)	(16%)
	Goods trade (EU-15, percentage of total volumes)	(35%)
	Services trade (EU-15, percentage of total volumes)	(30%)
	Foreign employees (EU-15, percentage of total employees)	(19%)
	[Convergence processes]	
B.	i) Maastricht convergence	[21%]
	Inflation rate (goods, in relation to EU-15 average)	(10%)
	Long-term interest rate (bonds, in relation to EU-15 average)	(21%)
	Unemployment rate (in relation to EU-15 average)	(32%)
	National debt ratio (in relation to EU-15 average)	(37%)
C.	ii) Cohesion policy	[23%]
	Labour productivity (per hour, in relation to EU-15 average)	(24%)
	Purchasing Power Parity (in relation to EU-15 average)	(28%)
	Implicit consumer taxes (in relation to EU-15 average)	(24%)
	GINI-coefficient (in relation to EU-15 average)	(24%)
	[Institutional compliance]	
D.	i) EU-participation	[11%]
	Schengen membership (dummy variable)	(47%)
	Economic Monetary Union membership (dummy, 0.5 for ERM II)	(44%)
	Erasmus participation (EU-students, percentage of total students)	(9%)
E.	ii) EU-infringements	[21%]
	"Formal letter" by EC (as percentage of "best")	(8%)
	Judgements by ECJ (internal market, as percentage of "best")	(27%)
	Judgements by ECJ (environment, as percentage of "best")	(33%)
	Judgements by ECJ (others, as percentage of "best")	(32%)

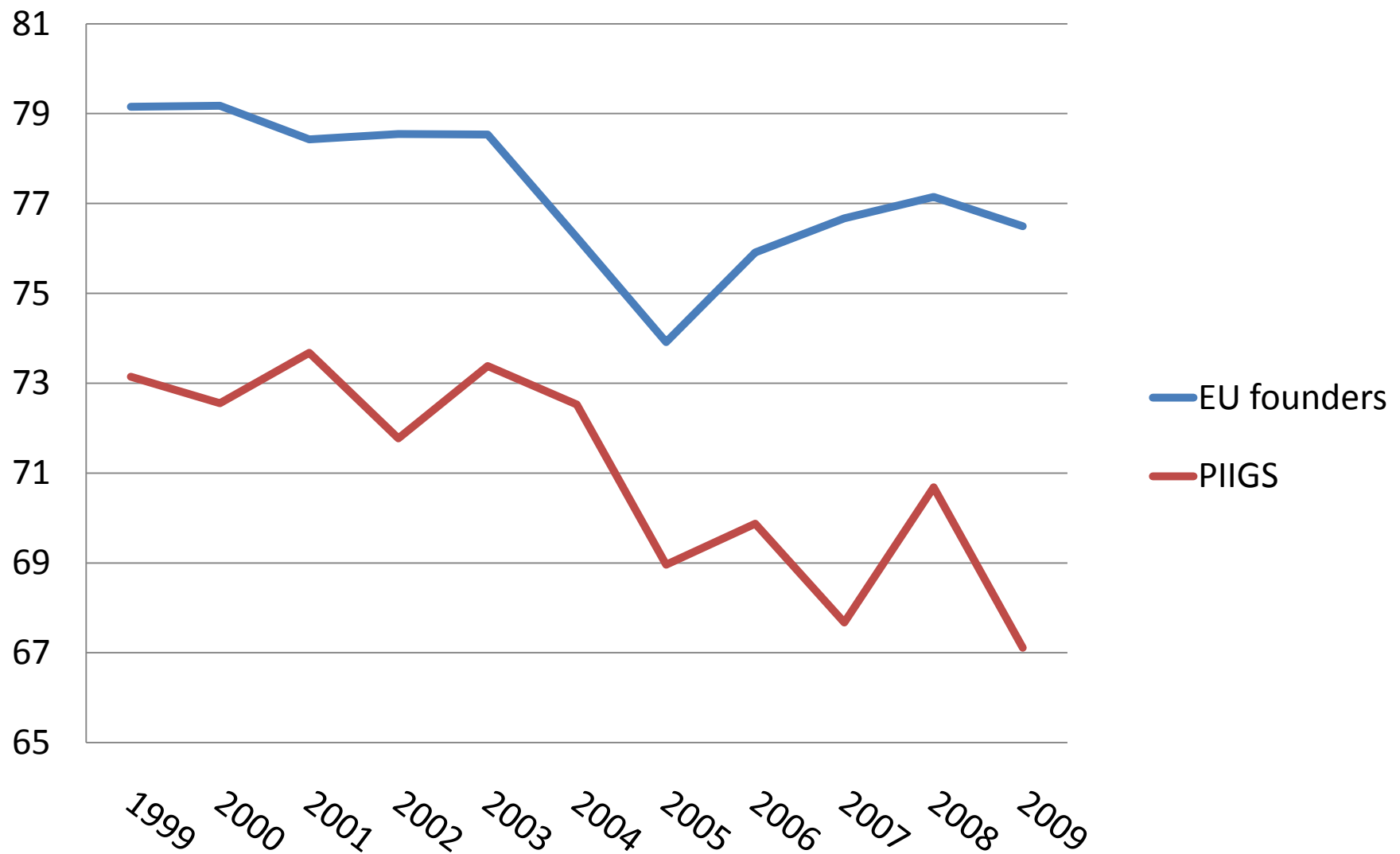
5. Some (provisional) results

And the “Winner” is ...

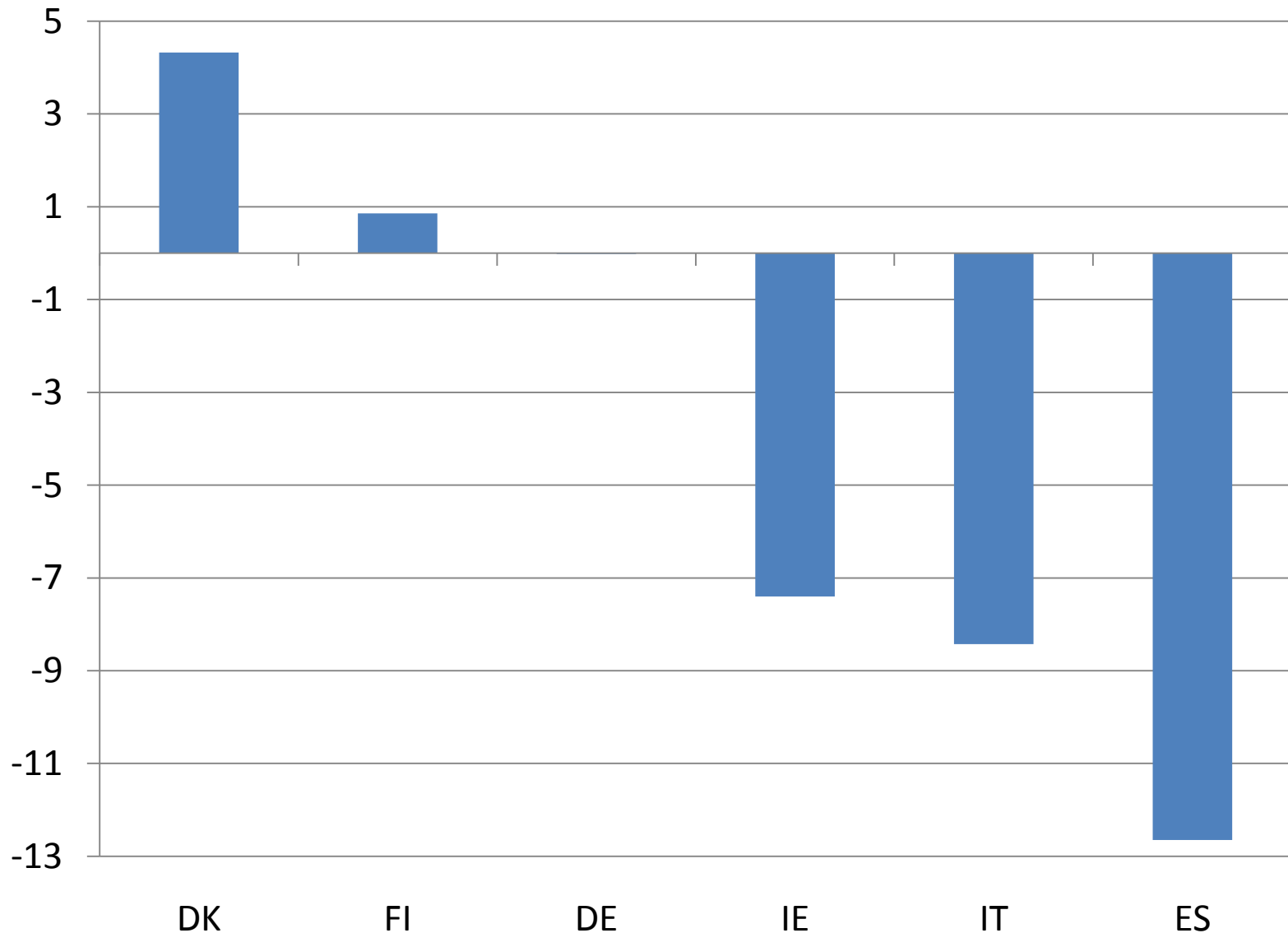
EU-15 Integration Index 2009

<u>Rank</u>	<u>Country</u>	<u>EU-15 Integration Index-points</u>
1	Germany	79.25
2	Austria	78.49
3	France	78.04
4	Belgium	76.80
5	Finland	75.78
6	Netherlands	75.50
7	Portugal	73.62
8	Luxembourg	72.88
9	Denmark	71.36
10	Ireland	69.39
11	Sweden	69.36
12	Italy	66.31
13	Spain	65.42
14	United Kingdom	62.15
15	Greece	60.02

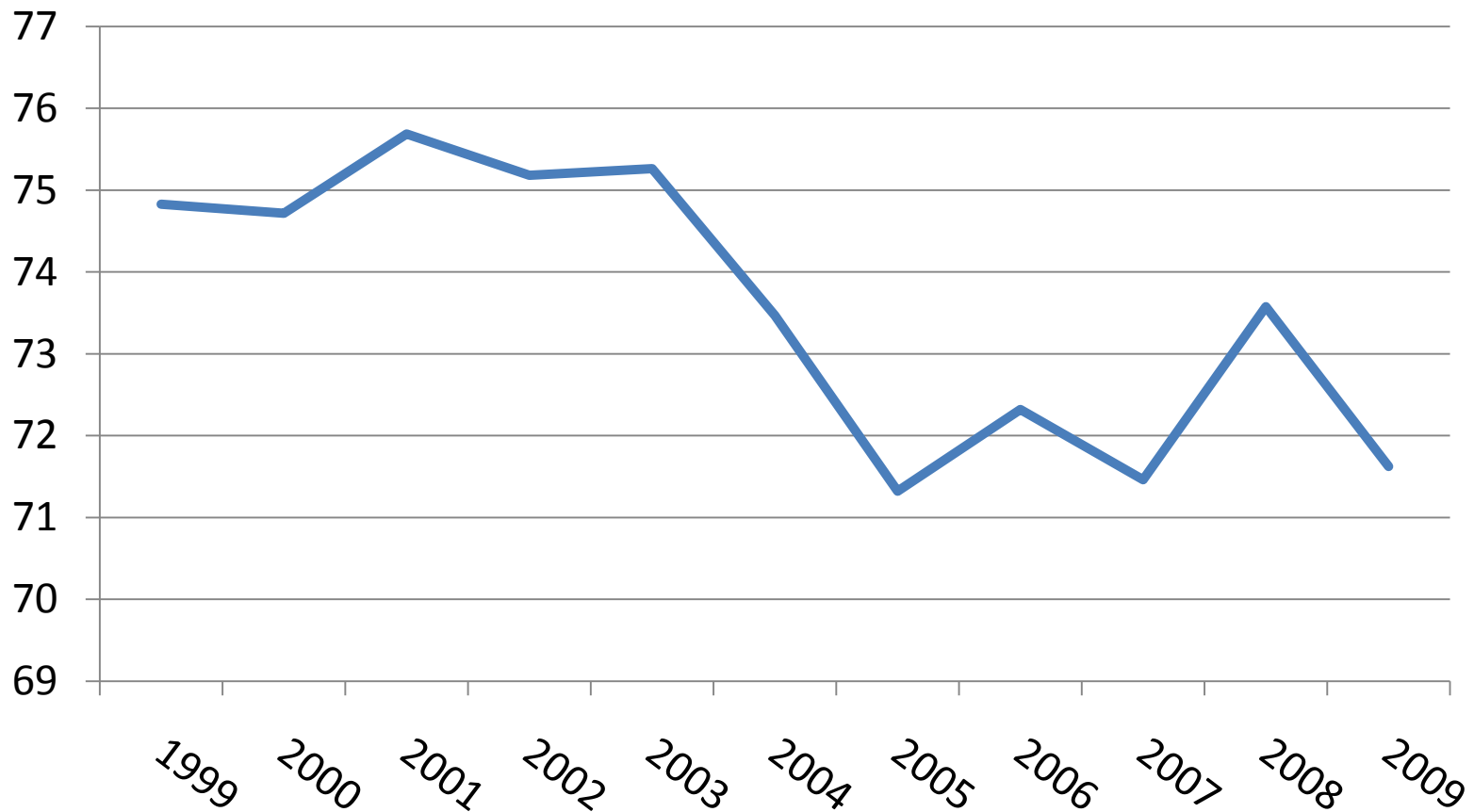
EU-15 Integration Index, by regions:



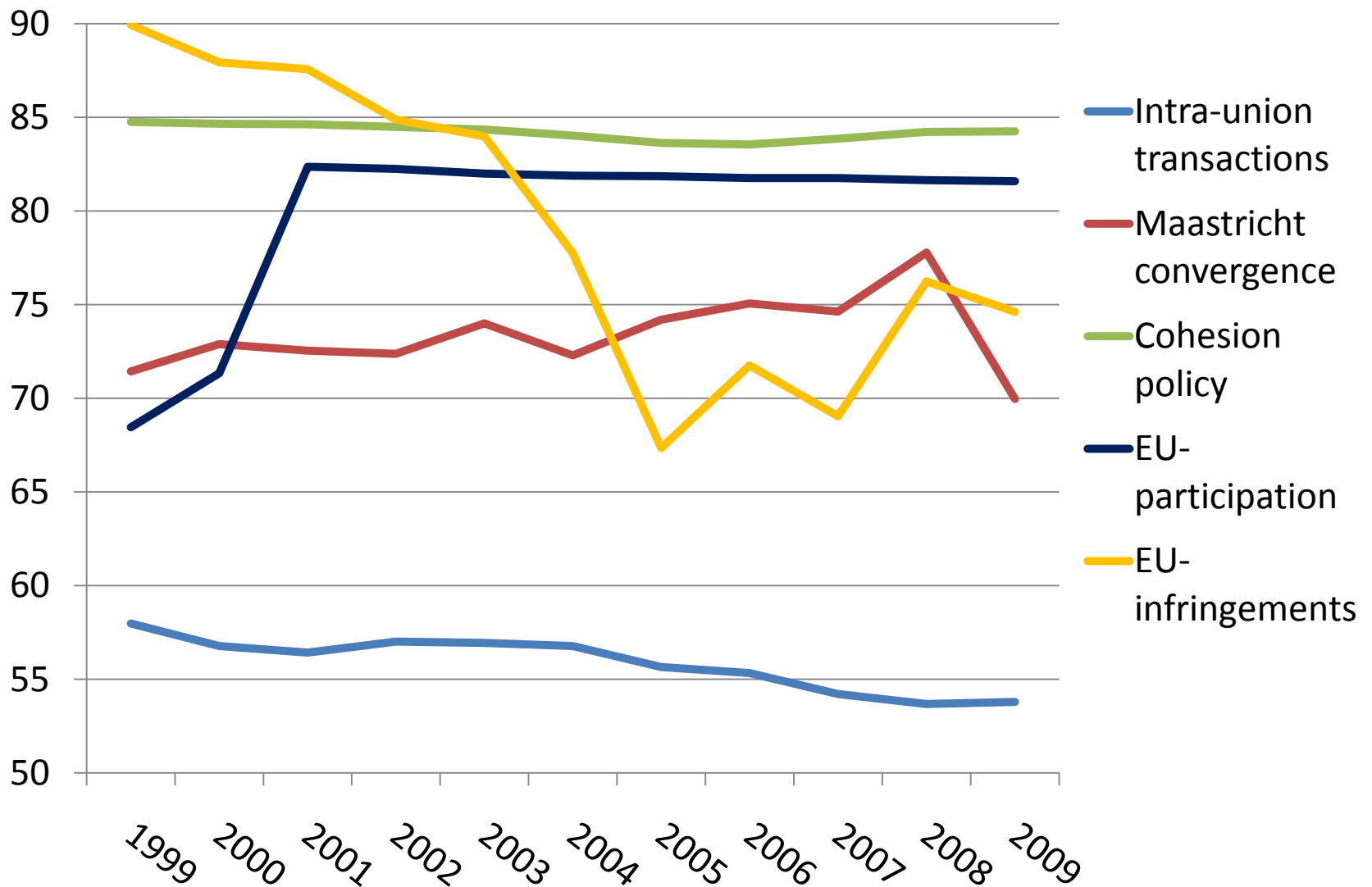
Three “best” and “worst” developers (1999-2009)



EU-15 Integration Index (1999-2009)



EU-15 Integration Index, by sub-indices:



Thank you very much for your attention!