

TECHNOLOGICAL DYNAMICS AND SOCIAL CAPABILITY: COMPARING U.S. STATES AND EUROPEAN NATIONS

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Background: The R&D frenzy in European politics

- Creating “The most competitive and dynamic knowledge-based economy in the world” through R&D investments (The Lisbon Agenda & **the 3% goal for R&D**) : Approaching the US level
- But **technological capability** is more than R&D & needs to be backed by adequate **social capabilities**: A broader perspective needed
- And the US and Europe are **heterogeneous** entities: Comparing **European countries to US states** more natural
- Previous research (Crescenzi et al 2007): US and Europe differ a lot in their dynamics. True? Focuses on patents (?) and **employ different models, variables & territorial definitions** in the two continents. Robust conclusions require a better research design.

Technological dynamics: A synthetic framework

- **Technological capability** is a broad phenomenon that cannot be reduced to a single indicator, such as, for example, patents or R&D
- A technologically lagging region may benefit greatly by exploiting such **technology gaps** to its advantage
- “A country’s potential for rapid growth is strong not when it is backward without clarification, but rather when it is technologically backward but socially advanced”(Abramovitz 1986, p. 388): **social capabilities** needed (and need to be measured)
- **Territorial aspects** also need to be taken into account; urbanization, specialization and spillovers

Technological capability: Descriptive statistics (2007)

Variables	United States		Europe	
	Mean	CoV	Mean	CoV
Scientific articles	1,006	0.53	758	0.66
International patents	202	0.73	152	1.07
Doctorates	147	0.44	178	0.55
Business R&D	1.54	0.82	0.98	0.75
University R&D	0.41	0.42	0.39	0.53
Government R&D	0.37	2.63	0.19	0.45
Venture capital	0.12	1.56	0.07	1.04
Number of observations	48		27	

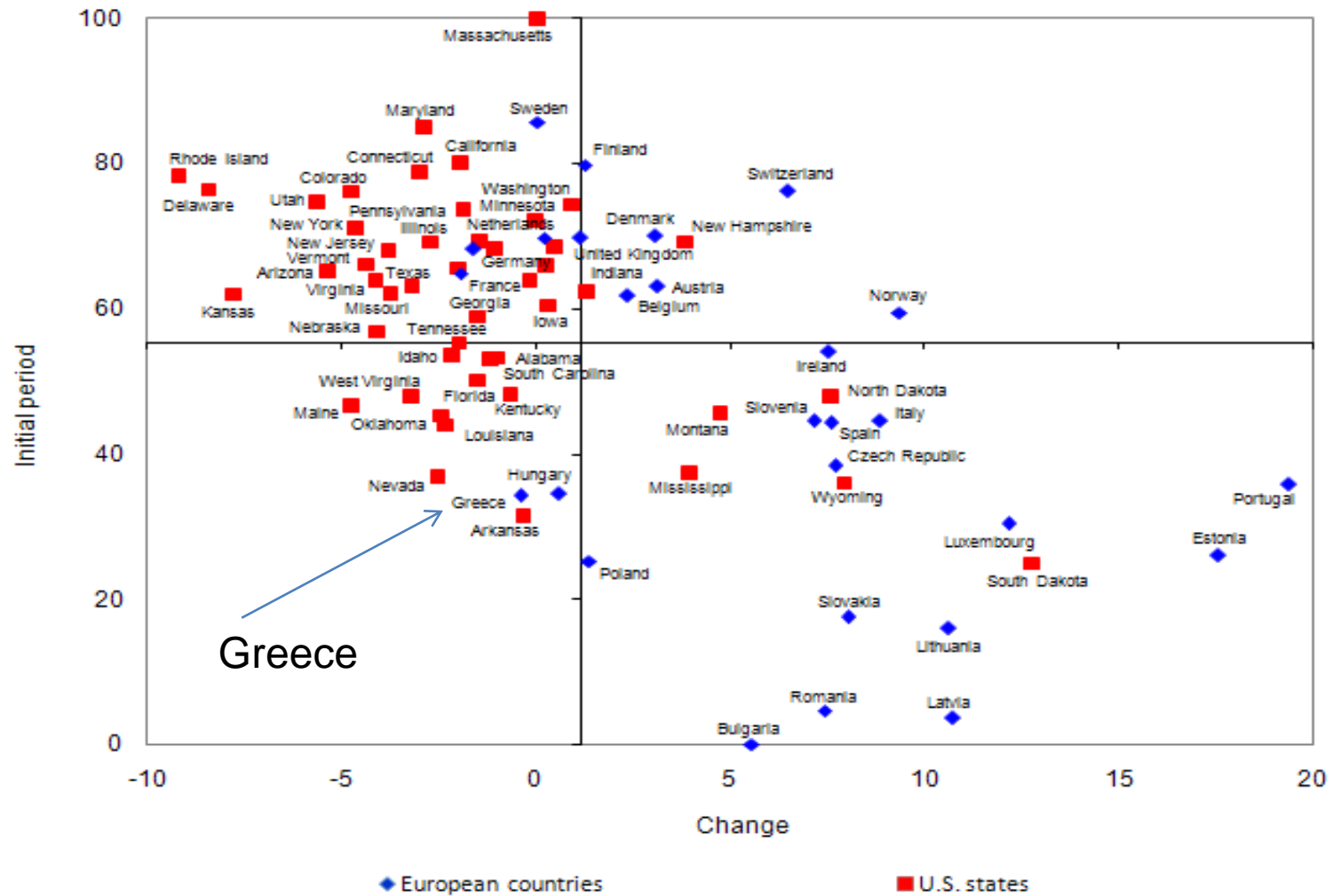
Technological capability: Results of the factor analysis

	Technological capability
	TECH
Scientific articles	0.93
International patents	0.89
Doctorates	0.75
Business R&D	0.83
University R&D	0.69
Government R&D	0.09
Venture capital	0.66
Number of observations	150

Technological capability: Top & bottom

US states		EU/EFTA countries	
Top 5			
Massachusetts	100	Sweden	86
Maryland	82	Switzerland	83
California	78	Finland	81
Connecticut	76	Denmark	73
Washington	75	United Kingdom	71
Average	60	Average	51
Bottom 5			
Louisiana	42	Poland	27
Mississippi	41	Slovakia	26
South Dakota	38	Latvia	14
Nevada	34	Romania	12
Arkansas	31	Bulgaria	6

Technological dynamics: Convergence



Social capabilities: Descriptive statistics

	United States		Europe	
	Mean	CoV	Mean	CoV
Labor force with tertiary education (% of labor force)	22.35	0.19	21.16	0.34
Professional and associated jobs (% total jobs)	30.70	0.10	34.51	0.17
Teacher-pupil ratio in public schools in elementary and secondary education	0.07	0.13	0.08	0.18
Income inequality (quintile share ratio)	6.65	0.12	4.31	0.22
Election turnout (% of voting-age population)	52.87	0.13	69.32	0.17
Homicides (per million adults)	59.42	0.55	33.33	1.07
Unemployment (% of labor force)	3.83	0.23	8.44	0.57
Labor force participation (% of working age population)	78.31	0.05	69.81	0.08
Number of observations	48		27	

Social capabilities: The factor analysis

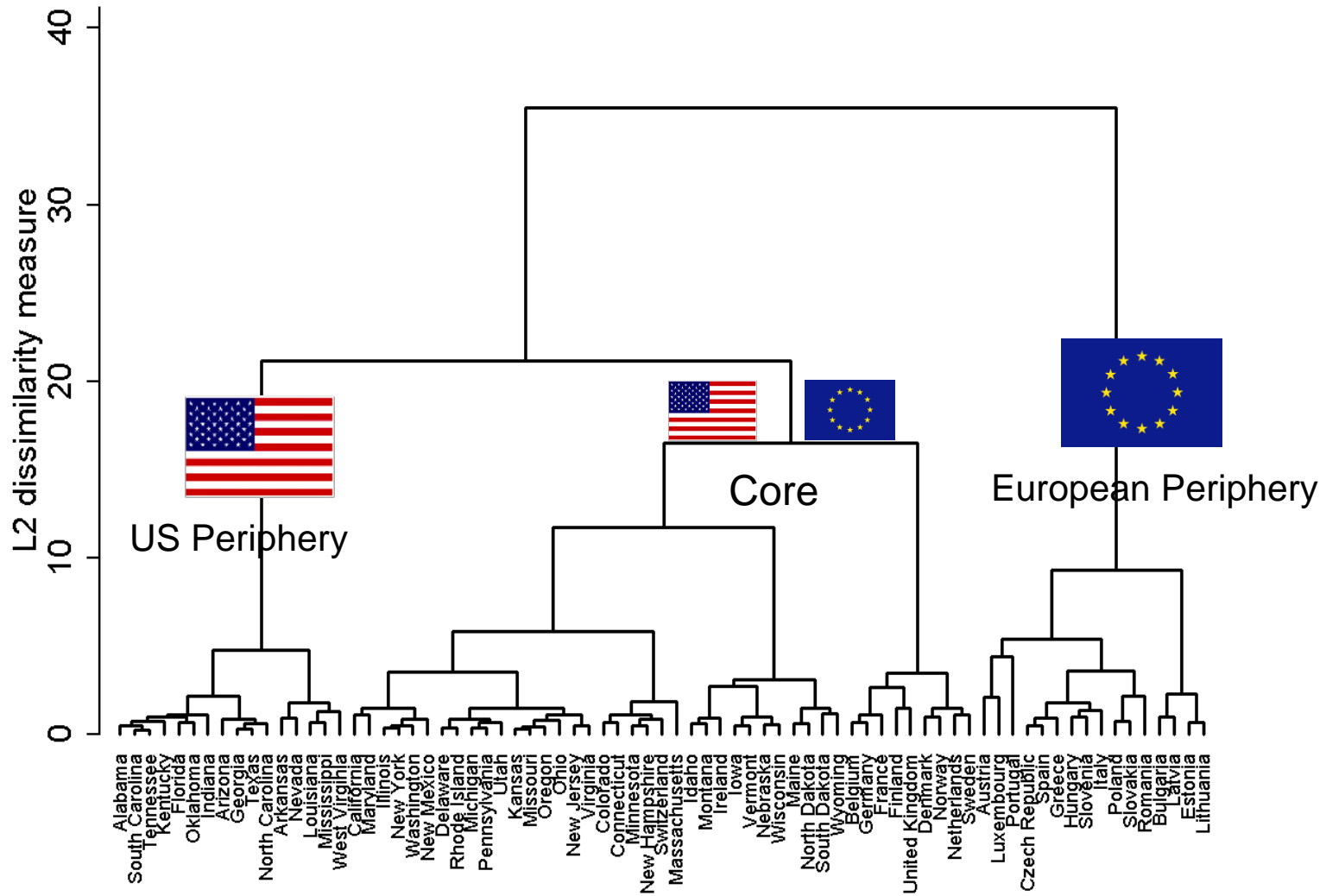
	Educated Labor	Social Cohesion	Labor Market
	EDU	SOC	MKT
Labor force with tertiary education	0.82	-0.11	0.30
Professional and associated jobs	0.89	0.15	-0.16
Teacher-pupil ratio in public schools	-0.17	0.72	-0.04
Income inequality	-0.16	-0.74	0.30
Election turnout	0.17	0.82	-0.16
Homicides	0.05	-0.91	-0.30
Unemployment	0.05	-0.10	-0.96
Labor force participation	0.19	-0.17	0.82
Number of observations	75		

Social capabilities

- **Educated Labour (EDU):** Europe slightly ahead, the top five performers all European (Finland, Sweden, Norway, Netherlands UK), less differences towards the bottom
- **Social Cohesion (SOC):** Europe far ahead, 50% of US states below the least advanced European country (Estonia). Only four US states (North and South Dakota, Maine and Vermont) above the European median.
- **Labour Market (MKT):** US far ahead, more than 50% of European countries below the least advanced US state. Only two European countries (Switzerland and Norway) above the US median.

Who belongs together with whom?

A Cluster analysis



Cluster characteristics

	US & Europe core		US periphery		Europe periphery	
	Mean	CoV	Mean	CoV	Mean	CoV
TECH	67	0.20	51	0.21	29	0.60
EDU	70	0.16	48	0.18	52	0.38
SOC	44	0.47	17	0.46	62	0.35
MKT	71	0.23	63	0.14	27	0.75
Number of observations	43		16		16	

Exploring technological dynamics

- The basic model (Cornwall-Barro conditional catch-up) :

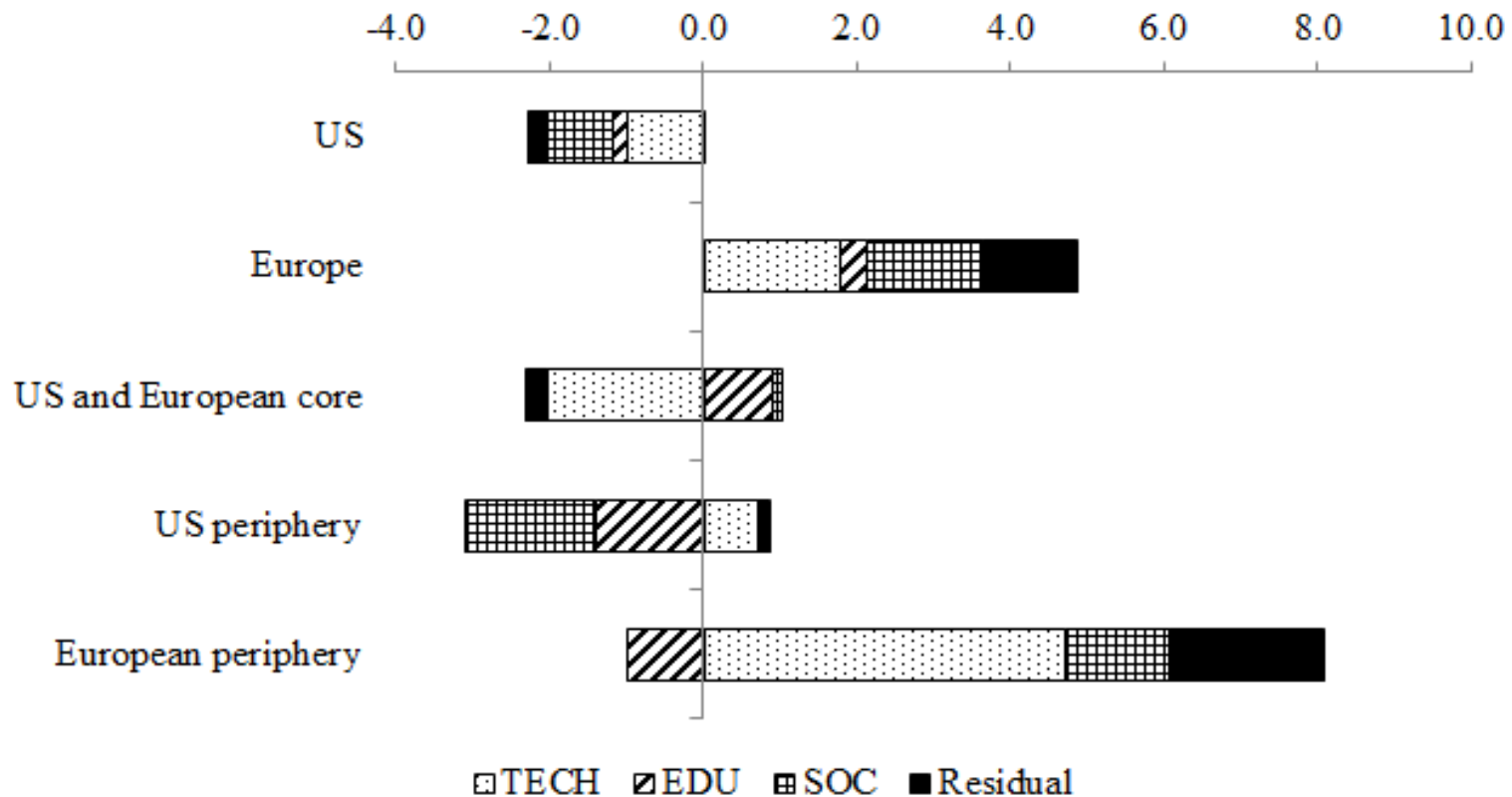
$$\Delta TECH = TECH_1 - TECH_0 = \beta_0 + \beta_1 TECH_0 + \beta_2 EDU_0 + \beta_3 SOC_0 + \beta_4 MKT_0 + \beta_5 X_0 + e$$

- TECH is technological capability, EDU, SOC and MKT are social capabilities; X is a set of other conditioning factors; and e is the standard residual.
- The «x-set» includes «technological spillovers» from neighbouring regions, migration, urbanization and specialization (k-index)
- Estimated for 75 US states/ European countries for the period 2000-2007 (robust regressions)

Testing for differences across the US and Europe

- Method: Introducing continent & cluster specific slope dummies & test for explanatory power
- No evidence of parameter heterogeneity for central variables (TECH, EDU and SOC)
- Some evidence of differences in the working of other variables, especially MKT (degree of labour market participation), which matters more in Europe
- Crescenzi et al (2007)'s assertions of different “growth models” in the US and Europe not supported (examples: migration & knowledge-spillovers)

Implications: contributions to change in technological capability 2000-2007, relative to sample average



Based on model 8 ("best model")

Conclusions

- Technological capability: Most European countries are **just as capable** as US states, diagnosis behind “Lisbon Agenda” misguided
- Europe more **dynamic**: More diversity in Europe due to the recent dissolution of the Soviet empire, these differences are rapidly diminishing (technological **convergence**)
- Exception: **Greece** (& to some extent Hungary)
- Many US states are falling behind (technological **divergence**) due to low educational investments and lacking social cohesion: More R&D won't solve this problem
- More research needed (and may indeed be possible!)