

Determinants of Regional Convergence (Divergence) Insights from Intra-Distribution Dynamics

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Motivation

- The use of transition dynamics has been introduced as an alternative to neo-classical Barro-type regression (Quah, 1993).
- This last is in fact unable to provide sufficient empirical evidence of convergence.
- However, transition dynamics do not help to explain the determinants of development.
- In this paper we attempt to do so using multinomial logistic regression to model transition probabilities and, consequently, intra-distribution dynamics.

Outline

- 1 Intra-distribution dynamics approach
 - Measuring regional convergence
 - Transition tables
 - Multinomial logistic regressions
- 2 Data
 - Data description
 - Data reduction
- 3 Results
- 4 Conclusion

The Convergence Hypothesis

Barro-type growth regression is the most common methodology used to investigate convergence at different levels

$$\left(\frac{1}{T}\right) \log\left(\frac{y_{t+T}}{y_t}\right)_i = a + b \log(y_t)_i + dX_i + e_i$$

$b < 0$ is necessary but not sufficient to measure convergence in terms of disparities reduction, as usually standard deviation is increasing over time.

Still the methodology allowed for interesting extensions:

- panel data and fixed effects estimators
- spatial econometrics and geographical spillovers
- spatial panel data and the hypothesis of spatial heterogeneity vs spatial spillovers

The Intra-Distribution Dynamics Approach

Dividing the entire income distribution into n classes one constructs an $n \cdot n$ matrix describing the transition over a time period

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & & \dots \\ \dots & & \dots & \\ a_{n1} & \dots & \dots & a_{nn} \end{bmatrix}$$

- a_{ij} represents the number of regions in class i at the beginning and in class j at the end
- $E : e_{ij} = \frac{a_{ij}}{\sum_j a_{ij}}$ row standardization to obtain transition probabilities

The Intra-Distribution Dynamics Approach

If ergodic properties hold ($E^s = E^{s+1}$) it is possible to repeat the transition an high number of times to obtain an equilibrium distribution

Hypothesis testing

- Unimodality is taken as evidence of convergence, while bi(multi)modality is considered the result of diverging trajectories
- Nothing can be said about the determinants of convergence (divergence) and even about regional development

The idea of Multinomial Logit

Given different unordered outcomes $j = 1, 2, \dots, J$, the probability of realization of the j^{th} outcome is described by:

$$\Pr(d_i = j) = \frac{\exp(a_j + \sum_m b_j x_m X_m)}{\sum_j \exp(a_j + \sum_m b_j x_m X_m)}$$

Important Note!!!

- Parameters of the model are alternative specific
- Normalization of parameters is required for identification - base category

Data for Empirical Analysis

- Income: GDP per capita in PPS (mean-value standardization)
- Time: 2000-2006
- Area: 250 NUTSII regions belonging to EU25
- Explanatory variables
 - Accessibility
 - Unemployment
 - Innovation and Knowledge
 - Structure of the Economy

Factor Analysis - Varimax Rotation

	Factors				
	1	2	3	4	5
<i>EDUC</i>	-.124	-.068	.315	.328	-.004
<i>RD.EXP</i>	.202	-.128	.618	.031	.035
<i>RD.PER</i>	.104	-.101	.863	.141	-.011
<i>PAT</i>	.416	-.232	.568	-.126	-.073
<i>HRST</i>	.389	-.159	.592	.335	-.043
<i>KIS.MA</i>	.068	.045	-.052	-.639	-.030
<i>KIS.SE</i>	.283	-.039	-.072	.626	-.066
<i>POP.D</i>	.222	.124	.194	.515	.088
<i>POP.CH</i>	.024	-.082	-.018	.147	.941
<i>MIG.CH</i>	-.020	-.132	-.001	.055	.945
<i>EMP.AGR</i>	-.494	.167	-.239	-.329	.103
<i>EMP.IND</i>	.006	.010	.013	-.461	-.157
<i>EMP.SER</i>	.078	-.133	.158	.596	.011
<i>UNEMP</i>	-.083	.940	-.152	-.051	-.117
<i>UNEMP.F</i>	-.186	.932	-.189	-.112	-.042
<i>UNEMP.Y</i>	-.208	.791	-.134	-.037	-.090
<i>INT.USE</i>	.508	-.166	.409	.414	.057
<i>RAIL</i>	.966	-.124	.127	.054	.008
<i>ROAD</i>	.972	-.131	.104	-.110	.008
<i>AIR</i>	.702	-.196	.336	.299	.082

Transition Table

Transition Matrix

	upper limit			
initial	.82	1	1.2	Inf
70	61	9		
54	7	39	8	
72		11	56	5
53			7	46

Transition Probabilities				
	0.871	0.128		
	0.129	0.722	0.148	
		0.153	0.778	0.069
			0.132	0.868

Ergodic Distribution				
	0.289	0.287	0.278	0.146

Regression Output

Origin Destination	1 2	2 1	2 3	3 2	3 4	4 3
<i>Access</i>	.506 (1.07)	-.266 (.786)	.593 (.77)	-1.972 (1.25)+	-.351 (.95)	-.980 (.85)
<i>Unemp</i>	-.545 (.64)	2.135 (1.08)**	-1.945 (1.10)**	8.834 (4.05)***	.992 (1.88)	2.029 (1.63)
<i>Inno</i>	6.853 (2.62)***	-.670 (1.38)	2.421 (.88)***	-4.762 (2.25)***	2.004 (2.005)	-1.038 (.87)
<i>Ser Urb</i>	2.920 (1.39)***	-.119 (1.16)	.289 (.86)	-1.554 (1.14)	2.030 (1.71)	-1.094 (.84)
<i>Pop Ch</i>	1.237 (.905)	-.567 (.90)	.292 (.56)	-1.017 (.78)	1.521 (1.31)	-.763 (.85)
<i>PROD ENV</i>	.199 (3.83)	2.171 (11.44)	-13.02 (13.52)	-6.259 (17.04)	.243 (10.06)	6.518 (12.44)
<i>HUM RES</i>	5.987 (5.39)	-71.910 (66.17)	-35.694 (19.45)**	(21.757) (19.31)	-1.530 (13.02)	-21.151 (32.88)
<i>INFR</i>	-.725 (7.25)	-7.252 (23.98)	46.42 (21.72)***	-115.413 (108.31)	12.403 (9.68)	-2.872 (22.02)
<i>Intercept</i>	.421 (1.51)	-1.079 (1.44)	-1.69 (1.02)*	1.005 (1.76)	-5.328 (3.09)*	-.075 (1.55)
<i>LR</i>	27.98***	34.37 ***		51.18 ***		7.65
<i>Pseudo R²</i>	.5209	.4066		.5323		.1849
<i>Log-likelihood</i>	-12.87	-25.08		-22.48		-16.86

Note: SE in parenthesis. ***, ** and * denote significance at 99%, 95% and 90%

Conclusion

- Regional development in Europe is characterized by divergence - low mobility
- Different factors are important in different stages of development
- Results allow to discuss only factors which contribute to sustained growth - not development in general
- Results may suffer from bias due to arbitrary definition of class boundaries - we only keep those regions at the margin

Policy Implications

- Relative (not so much) importance of accessibility and infrastructure
 - short run VS long-run horizon for evaluating returns from infrastructure investments
 - not only benefits: investing in infrastructure may be a zero-sum game
- Unemployment and labor market conditions determine the development path in middle income regions
- The same conclusion holds for innovation: cohesion can be improved filling technological gaps
- Only funds for infrastructure projects have been influencing growth and only for middle income regions. Other funds have been not successful or either non-optimally allocated

THANKS FOR YOUR ATTENTION

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