The Cohesion vs Growth Tradeoff: Evidence from EU Regions (1980-2000)

Matthieu Crozet* Pamina Koenig†

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Abstract

We use data on GDP per capita at the NUTS3 level for 1980-2000 to estimate the influence of income dispersion within NUTS1 on their economic growth. There is strong evidence of a cohesion versus growth tradeoff, mostly for Northern regions.

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*Corresponding author. TEAM - University of Paris I and CNRS, 106 bd de l'Hôpital, 75647 Paris Cedex 13, France. Email: crozet@univ-paris1.fr

†CREST and TEAM - University of Paris I and CNRS

1 Introduction

A long tradition of development economics has shown that growth processes were closely associated with spatial agglomeration dynamics (Hirschman, 1958). The recent theoretical literature integrating new growth theory and new economic geography provides a clear description of this tradeoff between growth at the aggregate country level and convergence in regional income (see Baldwin and Martin, 2004, for a survey). On the one hand, policies favoring growth at the country level can also trigger agglomeration of industrial activities. On the other hand, it is shown that inequality can be source of more growth, when technological externalities are localized. This recent and plentiful theoretical literature has important policy implications, above all for the European Union. Indeed the EU devotes the largest part of its budget to support rural and lagged regions, but also aims at promoting economic growth for Europe as a whole through the Lisbon strategy (Puga 2002, Sapir et al. 2004).

The existing empirical literature on the relation between spatial inequality and growth encompasses different approaches to the issue. For instance, at a broad geographical level, economic historians and development economists highlight a strong positive relationship at the country level between growth and urbanization (Henderson, 2005). More, it has been shown that the spatial structure of the economy influences local growth (Audretsch and Feldman, 1996; Combes, 2000 ; Ciccone 2002). This large literature emphasizes the role of geographical location and geographical organization of the economic activities on economic growth. However, as underlined by Baldwin and Martin (2004) *"there are (. . .) few direct empirical tests of the relation between agglomeration and growth"*.

In this paper, we propose to shed light on the existence of a cohesion versus growth tradeoff at the level of European regions. We investigate the determinants of GDP per capita growth between 1980 and 2000 of large European regions (i.e. NUTS1) pertaining to 14 countries. We analyze to what extent the degree of inequality *inside* these regions is an important determinant of regional income growth.

2 Data and specification

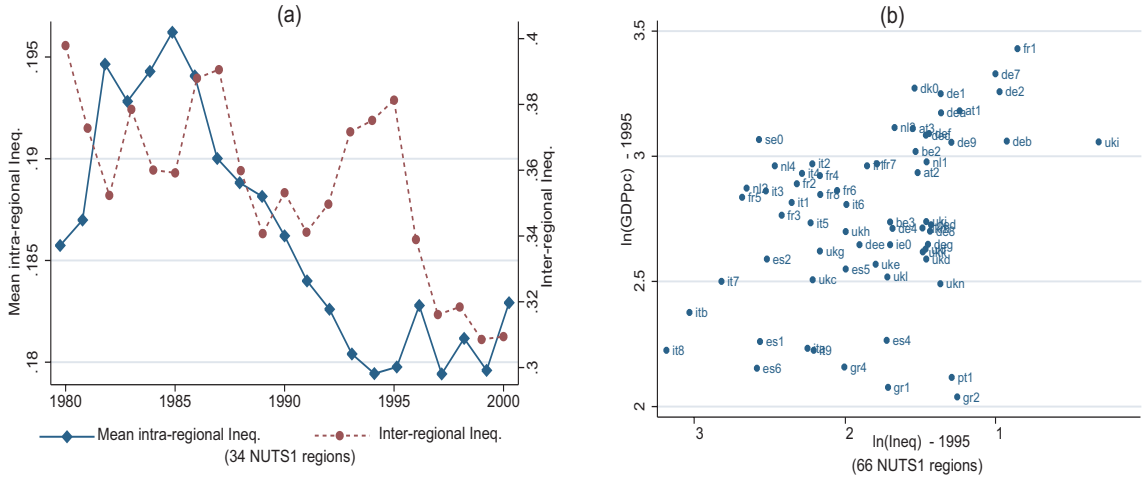
We consider a function of regional growth that refers both to conventional $\beta-$convergence literature and new economic geography models. Growth in a NUTS1 region is supposed to depend on its own investment dynamic, on its external geography (i.e. the change in the demand potentially addressed to the region as in Redding and Venables, 2004), and its internal geography, that is both population density and the change in the level of inequalities inside the region. Noting $y_{r,t}$ the GDP per capita in region r at date t, the growth equation is:

$$\ln\left(\frac{y_{r,t}}{y_{r,t-1}}\right) = \gamma_0 + \gamma_1 \ln\left(\frac{Ineq_{r,t}}{Ineq_{r,t-1}}\right) + \gamma_2 \ln\left(y_{r,t-1}\right) + \gamma_3 \ln\left(\frac{MP_{r,t}}{MP_{r,t-1}}\right) + \gamma_4 Density_{r,t-1}. \quad (1)$$

$Ineq_{r,t}$ is *intra-regional inequality*. It is measured by standard dispersion of log GDP per capita of

the NUTS3 regions composing the NUTS1 r. Noting $z_{i(r)}$ the GDP per capita of a NUTS3 i pertaining to NUTS1 r and $\overline{z}_r$ the average NUTS3 GDP per capita in NUTS1 r)[1], $Ineq_{r,t} = \sqrt{\sum(\ln z_{i(r),t} - \ln \overline{z}_{r,t})^2}$. $MP_{r,t}$ is the *market potential* of region r which measures its proximity to markets. It is computed as the distance weighted sum of all EU-15 NUTS1 regions' GDP, but itself: $MP_{r,t} = \sum_{s \neq r} \frac{GDP_{s,t}}{d_{rs}}$. Distances d_{rs} are the road distances between the two capital cities of regions r and s. They are computed from an electronic road atlas. $Density_{r,t-1}$ is population density (i.e. per squared km) of region r and is supposed to capture the influence of urban externalities at the NUTS1 level.

Figure 1: Regional inequality



Regional data are available from Eurostat. Data scarcity at the NUTS3 level imposes to consider two distinct time periods. On the one side, the period 1995-2000, on which we provide cross-sectional estimations results. For this period, we have 66 NUTS1 of all UE-15 countries but Luxembourg. On the other side, the period 1980-2000 which is subdivided into four non-overlapping periods: 1980-1984, 1985-1989, 1990-1994, and 1995-1999. For this period, data is available only for 33 NUTS1 belonging to 6 countries (Belgium, Germany, Spain, France, Greece, Italy and the Netherlands)[2].

Figure (1-a) displays the mean values of intra-regional income inequality (computed for the 34 regions for which data is available for the period 1980-2000). It also shows the value of income deviation between the corresponding NUTS1. From 1985 to 1995, we observe a steady reduction of both measures of inequality. However inter-regional inequality has been reduced much more than mean intra-regional ones. Figure (1-b) illustrates the relationship between the log of GDPpc of the NUTS1 regions and the log intra-regional disparities, using 1995 data for 67 NUTS1 regions. Overall, more inequalities inside a region seems to be correlated with a larger GDPpc. However, for regions of Southern Italy as well as for all Spanish, Portuguese and Greek regions, the Figure shows a downwards sloping relationship.

[1] We do not consider the influence of the *level* of spatial inequality on growth because the level of regional inequality indices computed for different regions cannot be compared; these indices are indeed sensitive to the number of regional subdivisions and to their relative size.

[2] NUTS3 data is unavailable for Italy for 1980-1995; we thus use Italian NUTS2 data to compute regional inequality indexes.

3 Econometric results

Table (1) shows the basic regressions for the two samples separately. In order to control for possible spatial autocorrelation in the error term, we estimate the maximum likelihood spatial error model[3]. Moreover, we also perform estimations without the market potential variable to prevent a possible endogeneity issue[4]. For the 1980-1999 sample, we use fixed effects by four-year sub-period.

All estimations fit the data well. Change in market potential has a large impact on GDPpc growth rate in both samples. Initial level of GDPpc has the expected negative influence on regional growth, confirming that a convergence pattern occurs between NUTS1. Finally, initial level of population density has a positive influence on economic growth, at least for the 1980-1999 sample. Besides, Table (1) shows clear evidence of a cohesion versus growth tradeoff for European regions; growth in intra-regional spatial income inequality has a significant positive influence on regional economic performances. As suggested by Figure 1, the impact of widening intra-regional income inequalities is very different between groups of regions. It is rather strong for Northern regions while non significative in the Southern periphery of the EU. All these results are robust to alternative methods of estimation and model definitions[5].

Table 1: Spatial income inequality and growth (spatial error model)

	1980-1999 (4 years growth)				1995-2000 (5 years growth)			
$\Delta Ineq.$	0.077***	0.072***			0.128**	0.099*		
	(0.023)	(0.023)			(0.051)	(0.059)		
$\Delta Ineq.$			0.089***	0.078***			0.234***	0.165*
$North$			(0.027)	(0.027)			(0.074)	(0.085)
$\Delta Sdev$			0.048	0.055			0.025	0.035
$South$			(0.043)	(0.043)			(0.073)	(0.084)
ΔMP	2.891***		2.916***		2.594***		2.616***	
	(0.409)		(0.406)		(0.274)		(0.238)	
$GDPcp_{t-1}$	-0.091***	-0.115***	-0.091***	-0.115***	-0.069**	-0.101***	-0.072**	-0.103***
	(0.023)	(0.027)	(0.023)	(0.027)	(0.029)	(0.036)	(0.028)	(0.036)
$Dens_{t-1}$	0.028***	0.027***	0.027***	0.027***	0.003	0.003	0.007	0.006
	(0.008)	(0.009)	(0.008)	(0.009)	(0.009)	(0.011)	(0.009)	(0.011)
$Intercept$	-0.404***	0.645***	-0.414***	0.646***	-0.186	0.684	-0.177	0.709
	(0.155)	(0.116)	(0.154)	(0.115)	(0.128)	(0.523)	(0.119)	(0.523)
λ	0.546***	0.882***	0.529***	0.882***	0.713***	0.984	0.635***	0.984***
Log L.	180.13	165.40	180.45	165.50	95.79	81.47	97.69	82.03

[3]We use here a spatial weight matrix where each non-diagonal element is the inverse of the squared inter-regional distance. Whatever the model, the Lagrange Multiplier (λ) denotes a significative spatial error dependency.

[4]We have also performed IV estimates of equation 1, using $\ln(MP_{r,t-1})$ and the distance from region r to Brussels as instruments. The Sargan test confirms the validity of the instruments, but the Durbin-Wu-Hausman test rejects the endogeneity hypothesis and the estimated coefficients remain almost the same.

[5]As a robustness check we have introduced dummies for southern regions, or country-specific fixed effects, or (for the 1980-1999 sample) region-specific fixed effects, or other variables such as population growth or the share of skilled population. None of these changes alters significantly the conclusions. Controlling for possible outliers performing robust regression does not change the result either. Moreover, we have also performed all the econometric tests using the Theil index as an alternative measure of intra-regional spatial inequality. Again, results remain globally the same. All results may be provided upon request

Table 2: Agglomeration, urbanization and growth (spatial error model)

	1980-1999 (4 years growth)				1995-2000 (5 years growth)			
	GDP density Ineq.		Pop. density Ineq.		GDP density Ineq.		Pop. density Ineq.	
$\Delta Ineq.$	0.154***		-0.003		0.360*		-0.060	
	(0.039)		(0.016)		(0.209)		(0.305)	
$\Delta Ineq.$,		0.154***		-0.005		0.624**		-0.168
$North$		(0.039)		(0.016)		(0.292)		(0.348)
$\Delta Ineq.$		0.154		1.313**		0.055		0.393
$South$		(0.210)		(0.521)		(0.310)		(0.771)
ΔMP	3.060***	3.060***	2.939***	3.076***	2.495***	2.479***	2.585***	2.621***
	(0.416)	(0.417)	(0.409)	(0.352)	(0.278)	(0.251)	(0.289)	(0.294)
$GDPcap_{t-1}$	-0.080***	-0.080***	-0.095***	-0.080***	-0.078**	-0.078**	-0.062**	-0.052
	(0.023)	(0.023)	(0.024)	(0.023)	(0.031)	(0.030)	(0.030)	(0.034)
$Dens_{t-1}$	0.025***	0.025***	0.029***	0.027***	0.004	0.008	0.002	0.001
	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)	(0.010)	(0.010)	(0.010)
$Intercept$	-0.485***	-0.485***	-0.405**	-0.488***	-0.134	-0.125	-0.204	-0.243
	(0.159)	(0.159)	(0.156)	(0.140)	(0.135)	(0.129)	(0.135)	(0.148)
λ	0.567***	0.567***	0.463***	0.279	0.685***	0.619***	0.696***	0.696***
Log L.	181.96	181.96	174.65	177.82	94.27	95.14	92.83	93.04

Beside income dispersions, other definitions of intra-regional spatial inequality may also influence economic growth. We compute two alternative measures of spatial inequality within each NUTS1: standard dispersion of log *GDP density* of the NUTS3 and standard dispersion of log *population density* of the NUTS3. These two measures are more explicitly linked to economic agglomeration than the income dispersion used in table 1. Dispersion of *GDP density* (i.e. GDP per squared kilometer) indicates unambiguously the degree of spatial *agglomeration* of production, whereas inequality in terms of population density characterizes the level of *urbanization*. Results are displayed in table 2. In the North, regions in which the agglomeration of production has been strengthened have experienced higher growth rates. On the contrary, a growth in urbanization trends has no influence on GDPpc of the NUTS1. One may interpret this result as both the consequence of spatially bounded externalities in production processes and congestion costs that encourage households to leave the densest areas. Hence, it seems that in most developed regions of the EU, economic growth is supported by the concentration of production in business centers and an increase in relative urban sprawl, i.e. to an increase in commuting time. Here again, Southern regions present a very different pattern. A greater agglomeration of production has no significant influence on income growth. However, we observe a positive influence of greater urbanization for the 1980-1999 sample. It seems that, during this period, urbanization economies dominated congestion costs in the lagged regions of the EU-15.

4 Conclusion

In this paper we assess the relevance of a tradeoff between GDPpc growth and spatial income inequality for most developed European NUTS1 regions. In the North, the influence of widening intra-regional disparities of production density has much greater influence on income growth than widening inequalities in terms of population density.

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