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

Matthieu Crozet† Pamina Koenig‡

October 19, 2007

Abstract

This paper provides an empirical investigation of the cohesion versus growth tradeoff on European regions at a fine geographical disaggregation level. 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 that greater spatial disparities foster growth, at least for Northern regions.

Keywords: regional inequalities, agglomeration, growth, European regions.
JEL Classification: R11.

*We thank Marius Brülhart, Philippe Martin, Pierre-Philippe Combes, Laurent Gobillon, Harry Garretsen and Véronique Simonnet for judicious advices. We also thanks participants to HWWA-Hamburg and CEPR-Cagliari conferences.

†University of Reims and CEPII 9 rue Georges Pitard, France. Email: crozet@univ-paris1.fr

‡University of Paris X, 200 avenue de la rpublique, 92000 Nanterre Cedex92245, France. Email: pkoenig@u-paris10.fr

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 faced by policymakers between growth at the aggregate country level and convergence in the development of regions (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 great 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).

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 pertaining to 14 countries. We analyze to what extent the degree of inequality *inside* these regions is an important determinant of regional income growth.

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 visible 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 and Hall, 1996 and Ciccone 2002). Finally, Redding and Venables (2004) shows that access to markets has a great influence on the evolution of per capita incomes at a national level. 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"*. We proposes such a direct empirical investigation, and indeed this paper is the first to our knowledge to test for the existence of the cohesion versus growth tradeoff at a fine regional disaggregated level[1].

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

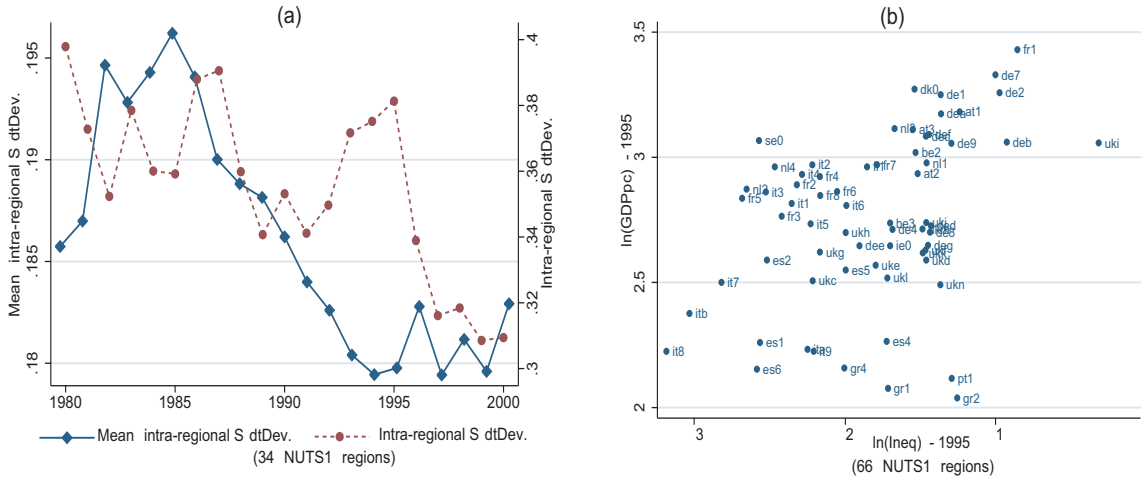
[1] Analyzing six European countries, Sbergami (2002), however, finds that dispersion of economic activities among regions favors growth at the national level.

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, which is measured by standard dispersion of log GDP per capita of the NUTS3 composing the NUTS1 r: $sdev_{r,t} = \sqrt{\sum(\ln z_{i(r),t} - \ln \overline{z}_{r,t})^2}$ (where $z_{i(r)}$ is 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)[2]. $MP_{r,t}$ is a measure of access-to-market This market potential of region r is approximated by the distance weighted sum of GDP 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 GDP per capita and intra-regional inequality 1995



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 regions over 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, 1995-1999. For this period, data is available only for 33 NUTS1 regions belonging to 6 countries (Belgium, Germany, Spain, France, Greece, Italy and the Netherlands). NUTS3 data is unavailable for Italy for 1980-1995; we thus use Italian NUTS2 data to compute regional inequality indexes during this period.

[2]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.

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 shows also the value of income deviation between the corresponding NUTS1. From 1985 to 1995, we observe a steady reduction of both measures of inequality, but inter-regional inequality has been reduced much further than mean intra-regional ones. Figure (1-b) illustrates the relation between the log of GDPpc of the NUTS1 regions and the log intra-regional disparities, using 1995 data for 67 NUTS1 regions. Overall, the relation appears positive: more inequalities inside a region is correlated with a larger GDPpc. However, for regions of Southern Italy as well as for all Spanish, Portuguese and Greek regions, the figure shows an inverted relationship: the relation between intra-regional inequalities and regional income appears downwards sloping.

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

	1980-1999 (4 years growth)				1995-2000 (5 years growth)			
γ_1	0.077^{***}	0.072^{***}			0.128^{**}	0.099^{*}		
γ_1 $North$			0.089^{***}	0.078^{***}			0.234^{***}	0.165^{*}
γ_1 $South$			0.048	0.055			0.025	0.035
γ_2	2.891^{***}		2.916^{***}		2.594^{***}		2.616^{***}	
γ_3	-0.091^{***}	-0.115^{***}	-0.091^{***}	-0.115^{***}	-0.069^{**}	-0.101^{***}	-0.072^{**}	-0.103^{***}
γ_4	0.028^{***}	0.027^{***}	0.027^{***}	0.027^{***}	0.003	0.003	0.007	0.006
$\gamma_0 s$	-0.404^{***}	0.645^{***}	-0.414^{***}	0.646^{***}	-0.186	0.684	-0.177	0.709
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 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 issue about the endogeneity of this variable[4]. For the 1980-1999 sample, we use fixed effects by four-year sub-period.

All estimations fits 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 patterns 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 **??**, allowing the coefficient γ_1 to be different for Northern and Southern regions proves that

[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 **??**, 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.

the impact of widening intra-regional income inequalities is very different; 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 estimations and model definitions[5].

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

		1980-1999 (4 years growth)				1995-2000 (5 years growth)			
GDP	γ_1	0.154***				0.360*			
	γ_1 $North$		0.154***				0.624**		
	γ_1 $South$		0.154				0.055		
POP	γ_1			-0.003				-0.060	
	γ_1 $North$				-0.005				-0.168
	γ_1 $South$				1.313**				0.393
	γ_2	3.060***	3.060***	2.939***	3.076***	2.495***	2.479***	2.585***	2.621***
	γ_3	-0.080***	-0.080***	-0.095***	-0.080***	-0.078**	-0.078**	-0.062**	-0.052
	γ_4	0.025***	0.025***	0.029***	0.027***	0.004	0.008	0.002	0.001
	γ_0	-0.485***	-0.485***	-0.405**	-0.488***	-0.134	-0.125	-0.204	-0.243
	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

Finally, we consider the question whether other definitions of intra-regional spatial inequality may influence economic growth of the regions. Thus, we compute two alternative measures of spatial inequality within each NUTS1: standard dispersion of log *population density* of the NUTS3 and standard dispersion of log *GDP 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) traduced unambiguously the degree of spatial agglomeration of economic activities, whereas inequality in terms of population density characterizes the level of urbanization. Results displayed in table 2 are clear. 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 GDPpc of the NUTS1. One may interpret this result has 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, leading 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.

[5]As a robustness check we have introduced dummies variables 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 these results may be provided upon request

4 Concluding remarks

In this paper we assess the relevance of such a tradeoff between GDPpc growth and spatial income inequality for European NUTS1 regions. However, this tradeoff is not effective for Southern European regions. In the North, the influence of widening intra-regional disparities of production density has much greater influence on income growth than growing inequalities in terms of population density.

5 References

Audretsch, D. B. and M. P. Feldman, 1996, R&D Spillovers and the Geography of Innovation and Production, American Economic Review 86, 630-640.

Baldwin, R. E. and P. Martin, 2004, Agglomeration and Regional Growth, in: J. V Henderson and J-F Thisse, eds., Handbook of Urban and Regional Economics, Vol. 4 (North-Holland, Amsterdam).

Ciccone, A. and R. E. Hall, 1996, Productivity and the Density of Economic Activity, American Economic Review 86, 57-70.

Ciccone, A., 2002, Agglomeration Effects in Europe, European Economic Review 46, 213-227.

Combes, P-P., 2000, Economic Structure and Local Growth: France, 1984-1993, Journal of Urban Economics 47, 329-355.

Henderson, V., 2005, Urbanization, economic geography, and growth, in: P. Aghion and S. Durlauf, eds., Handbook of Economic Growth, , Vol. 1B (North-Holland, Amsterdam).

Hirschman, A. O., 1958, The Strategy of Economic Development, (Yale University Press, Newhaven, CT).

Puga, D., 2002, European regional policy in light of recent location theories, Journal of Economic Geography 2, 372-406.

Redding, S. and A. J. Venables, 2004, Economic Geography and International Inequality, Journal of International Economics 62, 53-82.

Sapir, A., P. Aghion, G. Bertola, M. Hellwig, J. Pisani-Ferry, D. Rosati, J. Viñals and H. Wallace, 2004, An Agenda for a Growing Europe, the Sapir report, (Oxford University Press).

Sbergami, F., 2002, Agglomeration and Economic Growth: Some Puzzles, HEI Working Paper N. 02/2002.